Report Number: P WMA 06/D00/00/3423/17

water & sanitation

Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Directorate: Water Resource Development Planning
Department of Water & Sanitation
Private Bag X313
Pretoria
0001
South Africa

Greater Mangaung Water Augmentation Project

Water Use License Application Summary Report

Xhariep Pipeline Feasibility Study



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REPUBLIC OF SOUTH AFRICA

Directorate Water Resource Development Planning

Water Use License Application Summary Report

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CONSULTANT: ZUTARI (PTY) LTD
Approved for the Consultant:

Stephan Kleynhans
Signed by Stephan Kleynhans, stephan.kleynhans@zutari.com

S KLEYNHANS
Design Director | Study Leader

DEPARTMENT OF WATER & SANITATION
Directorate: Water Resource Development Planning
Approved for Department of Water & Sanitation:

M MUGUMO
Chief Engineer: Water Resource Development Planning

C POURIE
Director: Water Resource Development Planning

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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

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Author signature	Margaret Phiri Margaret Phiri 18/03/2025	Approver signature	Roshantha Kolapen Signed by Roshantha Kolapen, Roshantha.Kolapen@zutari.com 18/03/2025 15:25:24(UTC+02:00)
Name	Tiisetso Margaret Phiri	Name	Roshantha Kolapen
Title	Environmental Consultant *Pr. Sci. Nat (123524)*	Title	Senior Environmental Consultant *Pr. Sci. Nat (114421)*

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Report Structure

This report forms part of the following suite for the study:

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4	Data analysis and collection Report	P WMA 06/D00/00/3423/4
5	Pre-feasibility Study Report	P WMA 06/D00/00/3423/5
6	Main Feasibility Study Report	P WMA 06/D00/00/3423/6
7	Geological and Materials Investigations Report	P WMA 06/D00/00/3423/7
8	Topographical Survey and Mapping Report	P WMA 06/D00/00/3423/8
9	Feasibility Design Report – Pipeline, Pump Stations & Reservoirs	P WMA 06/D00/00/3423/9
10	Socio-Economic Impact Assessment and Legal, Institutional and Financing Arrangements Report	P WMA 06/D00/00/3423/10
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16	Summary Feasibility Study Report	P WMA 06/D00/00/3423/16
17	**Water Use License Application Summary Report**	**P WMA 06/D00/00/3423/17**
18	Integrated Water and Waste Management Plan	P WMA 06/D00/00/3423/18
19	Water Resource Analysis Report	P WMA 06/D00/00/3423/19

Reference

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Prepared by Zutari (Pty) Ltd

Cover Page

Attached to this cover page is the Water Use License Application Summary Report which contains the summary report in the DWS format for submission as part of the application during the Detailed Design Phase of the Xhariep Pipeline Project.

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X313, Pretoria, 0001, Sedibeng Building, 185 Francis Baard Street, Pretoria,
Tel: (012) 336-7500 Fax: (012) 323-4472 / (012) 326-2715

WATER USE LICENCE APPLICATION SUMMARY

NAME OF APPLICANT:

Department of Water and Sanitation

Compiled by:
Tiisetso Margaret Phiri

Reviewed by:
Roshantha Kolapen

Signature:

Date: 24 February 2025

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List of Acronyms

Term	Description
BA	Basic Assessment
BAR	Basic Assessment Report
BMP	Best Management Practices
CMS	Catchment Management Strategy
CVB	Channel Valley Bottom
CSIR	Council for Scientific and Industrial Research
DAFF	Department of Agriculture, Fisheries and Forestry
DESTEA	Free State Department of Economic, Small Business Development, Tourism & Environmental Affairs
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECA	Environmental Conservation Act
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
EMC	Ecological Management Class
EMPr	Environmental Management Programme
ES	Ecological Sensitivity
e-WULAAS	Electronic Water Use Licence Application and Authorisation System
GG	Government Gazette
GIS	Geographic Information System
GN	General Notice
PFS	Pre-Feasibility Study
GBWSS	Greater Bloemfontein Water Supply System
GQM	Groundwater Quality Management
HGM	Hydrogeomorphic
I&APs	Interested and Affected Parties
IAIAsa	International Association for Impact Assessment South Africa
IAP	Invasive Alien Plants
IDA	Infrastructure Development Act (Act No. 23 of 2014)
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IHI	In stream Habitat Integrity
IWMSA	Institute of Waste Management of Southern Africa
IWUL	Integrated Water Use Licence
IWULA	Integrated Water Use Licence Application
IWWMP	Integrated Water and Waste Management Plan
KLM	Kopanong Local Municipality
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
MAR	Mean Annual Runoff
MMM	Mangaung Metropolitan Municipality
MPRDA	Mineral and Petroleum Resources Development Act (Act No. 28 of 2002)
NEMBA	National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
WTW	Water Treatment Works
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NEMWA	National Environmental Management Waste Act (Act No 59.2008)
NFEPA	National Freshwater Ecosystem Priority Area
NPV	Net Present Value
NWA	National Water Act (Act No. 36 of 1998)
NWRS	National Water Resource Strategy
PC	Principal Contractor
PES	Present Ecological State
PFS	Pre-Feasibility Study
PICC	Presidential Infrastructure Coordinating Commission
PM	Project Manager
PPP	Public Participation Process

Term	Description
REC	Recommended Ecological Category
RMO	Recommended Management Objectives
RWQO	Resource Water Quality Objectives
SACNASP	South African Council for Natural Scientific Professions
SANRAL	South African National Roads Agency Limited
SG	Surveyor General
SIP	Strategic Integrated Project
SOP	Standard Operating Procedure
SWMP	Stormwater Management Plan
TCTA	Trans-Caledon Tunnel Authority
URS	Unit Reference Values
UVB	Unchanneled Valley Bottom
VCWB	Vaal Central Water Board
WRC	Water Research Commission
WTE	Water Trading Entity
WUL	Water Use Licence
WULA	Water Use Licence Application
WQ	Water Quality
WQA	Water Quality Assessments
WTP	Water Treatment Plant
WTW	Water Treatment Works
XDM	Xhariep District Municipality



1. Applicant details

Contact Details	
Name of Company	**Department of Water and Sanitation** (Directorate: National Water Resource Planning)
Physical Address	Sedibeng Building, 185 Francis Baard Street Pretoria 0001
Postal Adress	Private Bag x3131 Pretoria 0001
Telephone Number	012 336 7500
Project Manager and Delegated Person for the WULA	
1. Applicant Representative	
Name	Ms Sanet van Jaarsveld
Position	Engineer
Telephone	012 336 7500
Mobile Number	079 510 8523
Email Address	vanjaarsvelds@dws.gov.za

2. Person submitting application

Company/Consultant Name	Zutari (Pty) Ltd	
Responsible Person	Roshantha Kolapen	
Company Registered address	Riverwalk Office Park, 41 Matroosberg Road Ashlea Gardens, Ext 6 Pretoria 0081	
Postal Address	P.O. Box 74381 Lynnwood Ridge 0040	
Telephone	+27 (0) 12 427 2170 +27 (0) 12 427 2904	
Facsimile	+27 (0) 86 556 0521	
Email	**Roshantha.Kolapen@zutari.com** **Michele.Muller@zutari.com** **Margaret.Phiri@zutari.com**	
Professional Affiliation	Roshantha Kolapen	• Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat) • Member, International Association for Impact Assessment South Africa (IAIAsa)
	Michele Muller	• Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat) • Member, Water Institute of South Africa (WISA) • Member Institute of Waste Management of Southern Africa
	Tiisetso Margaret Phiri	• Professional Natural Scientist, South African Council for Natural Scientific Professions (Pr. Sci.Nat) • Registered EAP, Environmental Assessment Practitioners Association of South Africa (EAPASA) • Member, International Association for Impact Assessment South Africa (IAIAsa) • Member, Institute of Waste Management of Southern Africa (IWSA)

3. Background and purpose

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 Xhariep Pipeline Project was originally identified in the 2012 Water Reconciliation Strategy Study for the Larger Bulk Water Supply Systems: Greater Bloemfontein Area (DWS, 2012) (hereafter referred to as the "2012 Reconciliation Strategy"). The 2012 Reconciliation Strategy identified that the GBWSS would need to secure a sustainable water supply for the future water demands in the Greater Mangaung area and recommended that the development of a major surface water augmentation scheme should be given consideration as a possible option in conjunction with the implementation of various other interventions. It is reported that following the 2012 Reconciliation Strategy, the areas in and around the Mangaung Metropolitan Municipality (MMM) experienced water shortages and the major surface water augmentation scheme option, now called the Greater Mangaung Water Augmentation Project – Xhariep Pipeline ("the Project"), was accelerated.

DWS appointed Zutari Pty (Ltd) (hereinafter referred to as Zutari) as the independent Environmental Consultant to undertake the Basic Assessment (BA) in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and the Water Use Licence Application (WULA) in terms of the National Water Act, 1998 (Act No. 36 of 1998) (NWA) for the Project.

The project falls into the ambit of SIPS 18 and 19 – Water and Sanitation Infrastructure, aimed to address the current backlog of adequate water supply to households and basic sanitation needs of areas in and around the MMM area. This includes the provision of sustainable supply of water to meet social needs and support economic growth. Additionally, the project will provide new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of infrastructure. Moreover, the project is line with the municipality Spatial Development Framework (SDF) and the Integrated Development Plan (IDP).

The proposed project entails the construction of a potable water pipeline of approximately 244.4 km with a minimum internal diameter of approximately 1400 mm, and a maximum of 2000 mm. A 100m wide corridor was evaluated for the proposed pipeline routes. The construction corridor is likely to be 40 m wide with a final servitude width of 15 m to be registered. The project would also require supporting amenities to service and incrementally meet the demand of the development. To unlock and implement the bulk infrastructure as per presented in the report, the project requires an Integrated Water Use Licence (IWUL) to authorise the intended water uses in terms of the National Water Act (NWA).

The proposed pipeline route is known as Scheme 1B and will be a potable bulk water pipeline from Gariep Dam to Bloemfontein and Botshabelo / Thaba Nchu consisting of the following infrastructure in point form:

1. Tie-in at the existing DN2100 pipeline downstream of Gariep Dam Wall,
2. The Xhariep Raw Water Pump Station downstream of the connection to the Gariep Dam,
3. The Xhariep WTW (with sludge lagoons) with the Xhariep High Lift Pump Station,
4. Command Reservoir No 1 (80 Mℓ storage),
5. A Booster Pump Station with Suction Reservoir (10 Mℓ storage),
6. Command Reservoir No 2 (80 Mℓ storage),
7. The entire pipeline route from the Gariep Dam to the connection points in Bloemfontein and near Rustfontein WTW (supplying Botshabelo / Thaba Nchu),
8. Tie-in at existing Longridge reservoir in Bloemfontein,
9. Tie-in at existing Rustfontein clear water pump station,
10. Access roads:
    a. From existing road to raw water pump station
    b. From R701 to WTW and high lift pump station
    c. From farm road S345 to command reservoir No 1
    d. From N1 to booster pump station with suction reservoir
    e. From R702 to command reservoir No 2

The construction and operation of bulk infrastructure that would service the development will trigger the following water uses:

- Section 21 (a): Taking water from a water resource
- Section 21 (b): Storage of water
- Section 21 (c): Impeding or diverting the flow of water in a watercourse;
- Section 21 (i): Altering the bed, banks, course or characteristics of a watercourse;
- Section 21 (f): Discharging waste or water containing waste into a water resource; and
- Section 21 (g): Disposing of waste in a manner that may detrimentally impact on a water resource.
- Section 21 (j): Removing, discharging or disposing of water found underground if it is necessary of the efficient continuation of an activity or for the safety of the people.

4. Location of water uses

The proposed project will involve the abstraction of water near the Gariep Dam wall by connecting to an existing pipeline, a raw water pump 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 two command reservoirs and a booster pump station on the route. Refer to **Figure 1** and **Figure 2** below for the Locality Maps of the Project.

The pipeline project will traverse the Xhariep District Municipality, Kopanong Local Municipality, as well as the Mangaung Metropolitan Municipality (MMM). The entire project is located within the Free State Province**.**

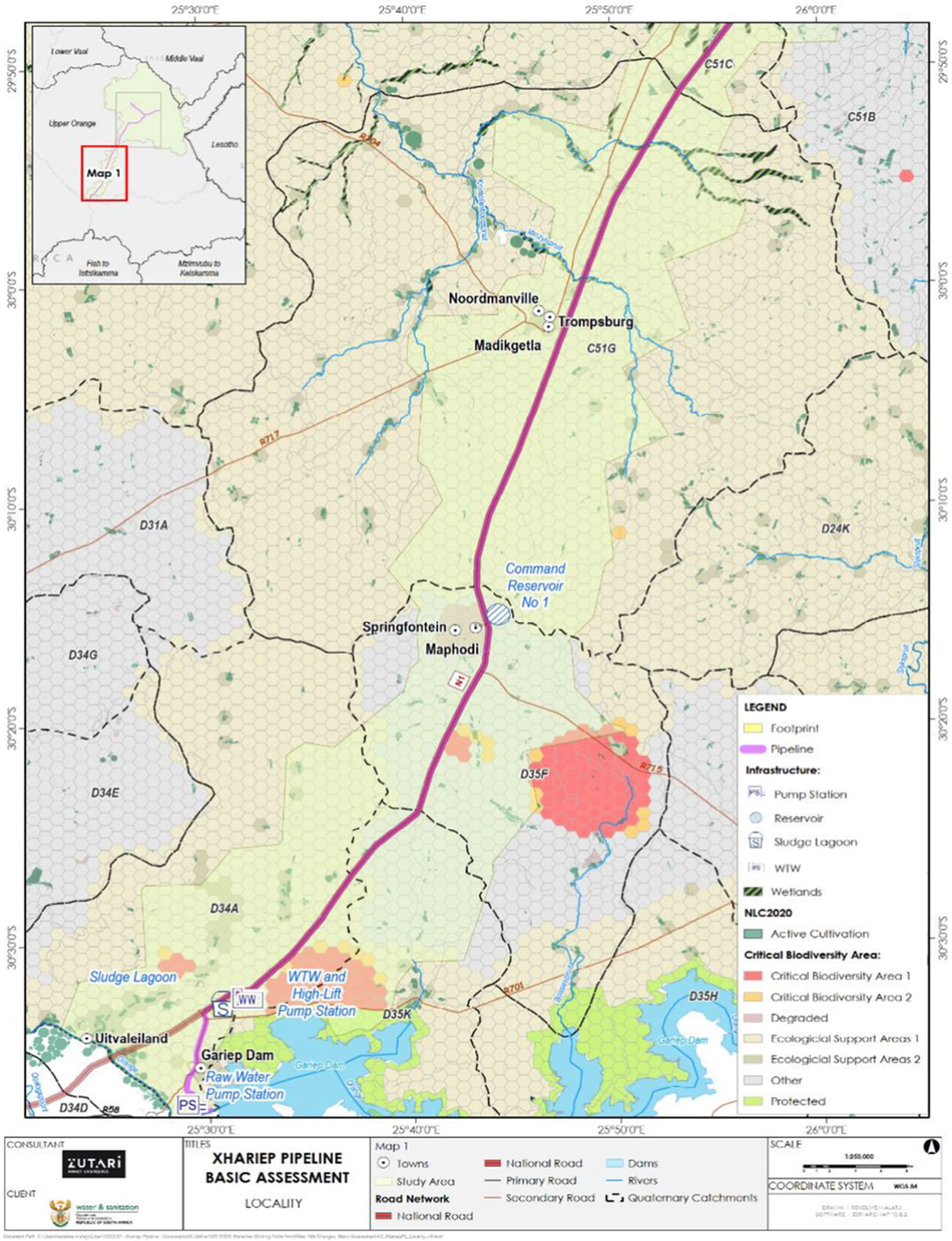


Figure 1: Project layout map for the Xhariep Pipeline Augmentation Scheme 1B

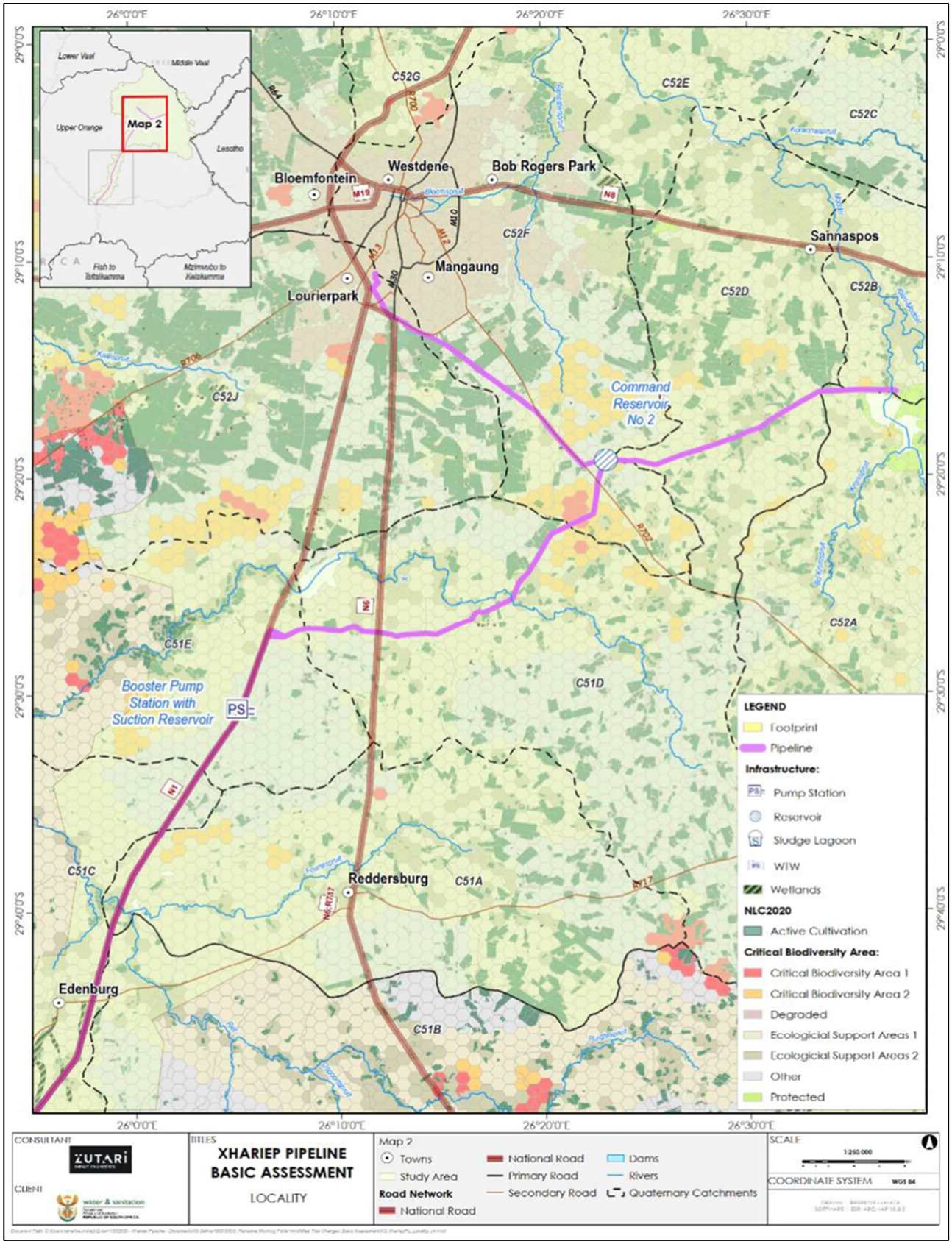


Figure 2: Project layout map for the Xhariep Pipeline Augmentation Scheme 1B

The entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and Riet-Modder Rivers Sub WMA (Figure 3). The project falls within the following Quaternary Catchments: C51A, C51B, C51C, C51D, C51E, C51G, C52F, C52H, C52J, C52B, C52D, D34A, D35F and D35K (Figure 4).

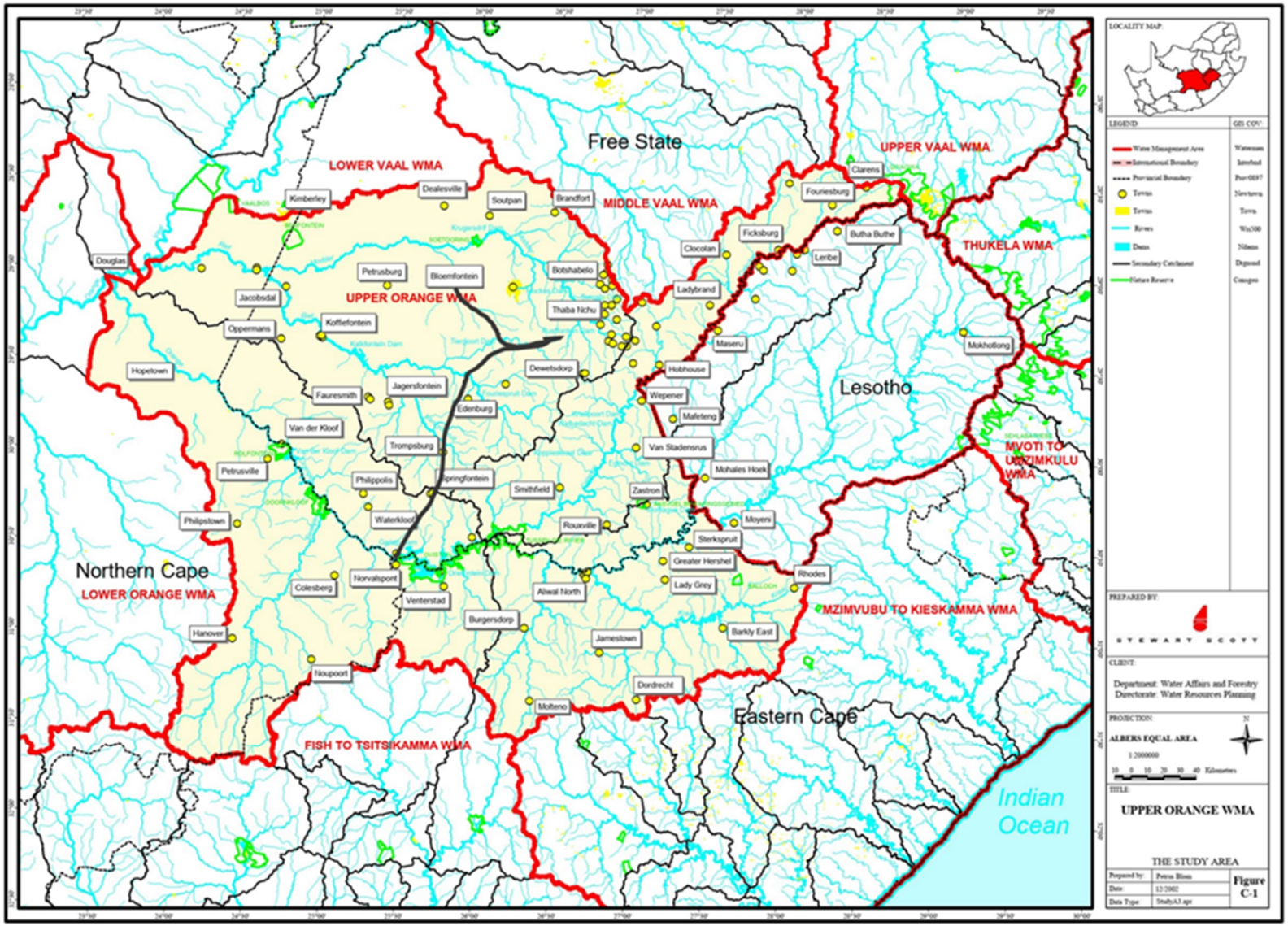


Figure 3: Upper Orange WMA (Project indicated in black outline for illustrative purposes - not drawn to scale)

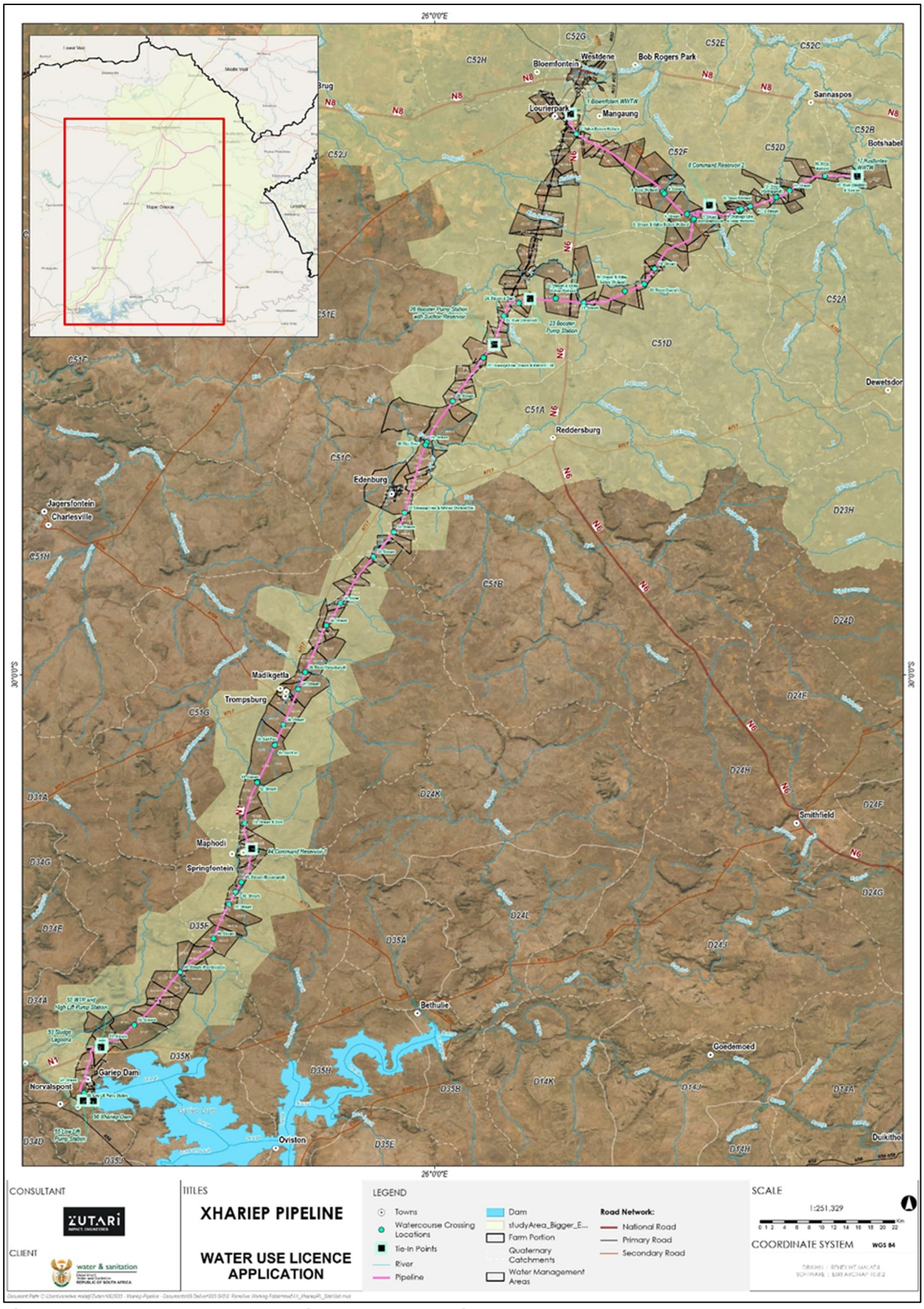


Figure 4: Upper Orange WMA and quaternary catchments

The proposed Scheme 1B and ancillary works traverses multiple properties which some are 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 Community Safety, Roads and Transport, and Transnet. It is assumed that negotiations will take place and agreements will be reached with each of the landowners to register a servitude on the land parcel.

The properties shown in Table 1 below are relevant to the application and its associated infrastructure.

Table 1: Properties relevant to the Project (Zutari, 2024)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
1	GARIEP DAM	651	0	30°35'16.81S	25°29'25.54E	Erven	F02600060000065100000	Option 1B (Potable water Gariep - Rustfontein)
2	KOPPIESKRAAL	407	0	29°24'23.35S	26°12'52.99E	Farm	F00300000000040700000	Option 1B (Potable water Gariep - Rustfontein)
3	H.F VERWOERDDAM	523	0	30°35'58.59S	25°29'0.02E	Farm	F02600000000052300000	Option 1B (Potable water Gariep - Rustfontein)
4	SUMMER HILL	275	0	30°33'59.45S	25°29'23.09E	Farm	F02600000000027500000	Option 1B (Potable water Gariep - Rustfontein)
5	MORGENZON	339	0	29°55'27.2S	25°48'38.72E	Farm	F03400000000033900000	Option 1B (Potable water Gariep - Rustfontein)
6	HAMILTON MANOR	499	0	30°12'40.49S	25°44'10.53E	Farm	F00200000000049900000	Option 1B (Potable water Gariep - Rustfontein)
7	KLEINPLAAS A	228	0	29°54'54.26S	25°50'1.05E	Farm	F03400000000022800000	Option 1B (Potable water Gariep - Rustfontein)
8	KOPPIESKRAAL	2944	0	29°25'17S	26°11'39.38E	Farm	F00300000000294400000	Option 1B (Potable water Gariep - Rustfontein)
9	MOUNT BRAND	278	0	30°21'3.82S	25°42'51.29E	Farm	F00200000000027800000	Option 1B (Potable water Gariep - Rustfontein)
10	MOOIVLEY	43	0	29°24'48.92S	26°18'47.4E	Farm	F00300000000004300000	Option 1B (Potable water Gariep - Rustfontein)
11	VAALBANK	478	0	29°23'36.41S	26°19'13.5E	Farm	F00300000000047800000	Option 1B (Potable water Gariep - Rustfontein)
12	BOSCHRAND A	405	0	30°24'31.12S	25°37'56.27E	Farm	F00200000000040500000	Option 1B (Potable water Gariep - Rustfontein)
13	CIJPRESSDEEL	1148	0	29°23'34.89S	26°19'53.03E	Farm	F00300000000114800000	Option 1B (Potable water Gariep - Rustfontein)
14	FONTEINTJE	419	0	29°52'17.54S	25°52'4.93E	Farm	F01000000000041900000	Option 1B (Potable water Gariep - Rustfontein)
15	ROOIRANTJES	304	0	29°53'23.19S	25°51'44.99E	Farm	F01000000000030400000	Option 1B (Potable water Gariep - Rustfontein)
16	GOEDEHOOP	211	0	29°40'58.18S	25°58'50.46E	Farm	F01000000000021100000	Option 1B (Potable water Gariep - Rustfontein)
17	FAIRVIEW	546	0	29°33'27.09S	26°2'29.41E	Farm	F01000000000054600000	Option 1B (Potable water Gariep - Rustfontein)
18	DE HOOP	548	0	29°34'30.33S	26°2'19.88E	Farm	F01000000000054800000	Option 1B (Potable water Gariep - Rustfontein)
19	AANELKAARSKRAAL	2	0	29°43'2.61S	25°58'8.74E	Farm	F01000000000000200000	Option 1B (Potable water Gariep - Rustfontein)
20	DRAAIHOEK A	479	0	29°43'43.48S	25°57'56.86E	Farm	F01000000000047900000	Option 1B (Potable water Gariep - Rustfontein)
21	ELIM	550	0	29°35'41.36S	26°1'29.42E	Farm	F01000000000055000000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
22	BRANDNEGELFONTEIN	165	0	29°46'34.08S	25°56'14.08E	Farm	F01000000000016500000	Option 1B (Potable water Gariep - Rustfontein)
23	AASVOGEL KNOP	623	0	29°50'26.82S	25°53'42.5E	Farm	F01000000000062300000	Option 1B (Potable water Gariep - Rustfontein)
24	FORTUIN	207	0	29°31'19.95S	26°3'39.79E	Farm	F01000000000020700000	Option 1B (Potable water Gariep - Rustfontein)
25	MEADOWS A	501	0	29°49'38.63S	25°55'4.39E	Farm	F01000000000050100000	Option 1B (Potable water Gariep - Rustfontein)
26	COURLAND	527	0	29°49'7.96S	25°56'10.26E	Farm	F01000000000052700000	Option 1B (Potable water Gariep - Rustfontein)
27	VAALPLAAT	478	0	29°42'13.24S	25°58'42.48E	Farm	F01000000000047800000	Option 1B (Potable water Gariep - Rustfontein)
28	WELGELUK	612	0	29°42'56.05S	25°58'51.71E	Farm	F01000000000061200000	Option 1B (Potable water Gariep - Rustfontein)
29	TAPFONTEIN	116	0	29°53'58.19S	25°51'15.29E	Farm	F01000000000011600000	Option 1B (Potable water Gariep - Rustfontein)
30	DIEPFONTEIN	160	0	29°32'44.07S	26°3'48.83E	Farm	F02700000000016000000	Option 1B (Potable water Gariep - Rustfontein)
31	DORPS GROND VAN	104	0	29°43'43.2S	25°56'5.3E	Farm	F01000000000010400000	Option 1B (Potable water Gariep - Rustfontein)
32	WILGE DRAAI	125	0	29°25'44.68S	26°18'4E	Farm	F02700000000012500000	Option 1B (Potable water Gariep - Rustfontein)
33	VAALBANK	127	0	29°28'32.21S	26°6'1.85E	Farm	F02700000000012700000	Option 1B (Potable water Gariep - Rustfontein)
34	OVERSCHOT	615	0	29°36'54S	26°2'9.1E	Farm	F01000000000061500000	Option 1B (Potable water Gariep - Rustfontein)
35	AANDEEL	79	0	29°26'59.67S	26°18'2.72E	Farm	F02700000000007900000	Option 1B (Potable water Gariep - Rustfontein)
36	RUSTFONTEIN	120	0	29°16'18.36S	26°35'19.66E	Farm	F00300000000012000000	Option 1B (Potable water Gariep - Rustfontein)
37	DONKERPOORT	128	0	29°16'56.47S	26°29'6.98E	Farm	F00300000000012800000	Option 1B (Potable water Gariep - Rustfontein)
38	TYGERPOORT	1636	0	29°26'15.56S	26°9'0.54E	Farm	F00300000000163600000	Option 1B (Potable water Gariep - Rustfontein)
39	CYPRESHOEK	1892	0	29°24'13.72S	26°19'28.29E	Farm	F00300000000189200000	Option 1B (Potable water Gariep - Rustfontein)
40	GERLACHSTHAL	458	0	30°16'10.92S	25°43'17.22E	Farm	F00200000000045800000	Option 1B (Potable water Gariep - Rustfontein)
41	MONTAGU	1228	0	29°18'37.35S	26°26'28.2E	Farm	F00300000000122800000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
42	UITHOEK	108	0	29°31'31.76S	26°5'24.93E	Farm	F02700000000010800000	Option 1B (Potable water Gariep - Rustfontein)
43	KIEL	37	0	30°20'5.97S	25°41'39.77E	Farm	F00200000000003700000	Option 1B (Potable water Gariep - Rustfontein)
44	LANGVERWACHT	864	0	29°15'40.79S	26°36'17.48E	Farm	F00300000000086400000	Option 1B (Potable water Gariep - Rustfontein)
45	ALLEMANSPUNT	151	0	29°51'33.41S	25°52'36.18E	Farm	F01000000000015100000	Option 1B (Potable water Gariep - Rustfontein)
46	VLAKDAM	589	0	29°46'23.4S	25°57'30.32E	Farm	F01000000000058900000	Option 1B (Potable water Gariep - Rustfontein)
47	GELUKSDAM	551	0	29°35'16.65S	26°2'49.39E	Farm	F01000000000055100000	Option 1B (Potable water Gariep - Rustfontein)
48	LASTFONTEIN	261	0	29°48'20.24S	25°57'12.81E	Farm	F01000000000026100000	Option 1B (Potable water Gariep - Rustfontein)
49	VETVLAKTE	357	0	29°51'45.54S	25°53'30.57E	Farm	F01000000000035700000	Option 1B (Potable water Gariep - Rustfontein)
50	BELLEVUE	166	0	29°46'43.56S	25°56'43.11E	Farm	F01000000000016600000	Option 1B (Potable water Gariep - Rustfontein)
51	VLEIPLAATS	152	0	30°5'54.41S	25°46'3.07E	Farm	F03400000000015200000	Option 1B (Potable water Gariep - Rustfontein)
52	EENZAAM B	333	0	29°27'13.3S	26°13'52.34E	Farm	F02700000000033300000	Option 1B (Potable water Gariep - Rustfontein)
53	KLIP KUIL	215	0	29°26'31.91S	26°16'27.4E	Farm	F02700000000021500000	Option 1B (Potable water Gariep - Rustfontein)
54	HELDERFONTEIN	184	0	29°15'18.83S	26°32'13.38E	Farm	F00300000000018400000	Option 1B (Potable water Gariep - Rustfontein)
55	BEWEE	93	0	29°17'45.23S	26°31'38.62E	Farm	F00300000000009300000	Option 1B (Potable water Gariep - Rustfontein)
56	VERLAAT	2339	0	29°23'10.98S	26°21'5.72E	Farm	F00300000000233900000	Option 1B (Potable water Gariep - Rustfontein)
57	PALMIETFONTEIN	67	0	29°15'42.17S	26°38'8.98E	Farm	F03200000000006700000	Option 1B (Potable water Gariep - Rustfontein)
58	TWEEFONTEIN	1580	0	29°17'43.17S	26°28'38.52E	Farm	F00300000000158000000	Option 1B (Potable water Gariep - Rustfontein)
59	KINDERSPRUIT	120	0	29°29'23.37S	26°5'43.3E	Farm	F02700000000012000000	Option 1B (Potable water Gariep - Rustfontein)
60	STANDERTON	1227	0	29°18'15.57S	26°26'36.62E	Farm	F00300000000122700000	Option 1B (Potable water Gariep - Rustfontein)
61	VLAK FONTEIN	430	0	29°27'38.55S	26°15'58.65E	Farm	F02700000000043000000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
62	EENSGEVONDEN	331	0	30°28'50.01S	25°36'23.62E	Farm	F02600000000033100000	Option 1B (Potable water Gariep - Rustfontein)
63	PLAATJESFONTEIN	130	0	29°18'37.71S	26°31'7.74E	Farm	F00300000000013000000	Option 1B (Potable water Gariep - Rustfontein)
64	SOPHIAS DAL	382	0	29°27'19.53S	26°10'47.64E	Farm	F00300000000038200000	Option 1B (Potable water Gariep - Rustfontein)
65	EXCELSIOR	267	0	30°23'22S	25°40'58.96E	Farm	F00200000000026700000	Option 1B (Potable water Gariep - Rustfontein)
66	BOSCHRAND B	404	0	30°24'48.24S	25°39'8.05E	Farm	F00200000000040400000	Option 1B (Potable water Gariep - Rustfontein)
67	BETHANY	610	0	29°36'24.58S	25°58'31.2E	Farm	F01000000000061000000	Option 1B (Potable water Gariep - Rustfontein)
68	ATLEHANG	3001	0	29°20'30.33S	26°25'18.64E	Farm	F00300000000300100000	Option 1B (Potable water Gariep - Rustfontein)
69	DONKERPOORT SCHOOLSITE 472	1	0	30°31'40.51S	25°29'42.52E	Farm	F02600000000000100000	Option 1B (Potable water Gariep - Rustfontein)
70	VLEIPLAATS	356	0	30°7'50.11S	25°45'59.27E	Farm	F03400000000035600000	Option 1B (Potable water Gariep - Rustfontein)
71	JENNY`S PASS	279	0	30°21'57.89S	25°41'44.74E	Farm	F00200000000027900000	Option 1B (Potable water Gariep - Rustfontein)
72	KOPPIE ALLEEN	497	0	30°13'59.45S	25°43'12.81E	Farm	F00200000000049700000	Option 1B (Potable water Gariep - Rustfontein)
73	NIET ZO GROOT	465	0	29°47'27.75S	25°57'25.2E	Farm	F01000000000046500000	Option 1B (Potable water Gariep - Rustfontein)
74	TROMPSBURG B	142	0	30°3'59.79S	25°46'12.9E	Farm	F03400000000014200000	Option 1B (Potable water Gariep - Rustfontein)
75	INHOEK	495	0	30°31'38.15S	25°30'15.57E	Farm	F02600000000049500000	Option 1B (Potable water Gariep - Rustfontein)
76	TWEE ZUSTERS	140	0	29°55'6.29S	25°50'47.05E	Farm	F03400000000014000000	Option 1B (Potable water Gariep - Rustfontein)
77	KUILFONTEIN	195	0	30°17'17.01S	25°43'7.55E	Farm	F00200000000019500000	Option 1B (Potable water Gariep - Rustfontein)
78	MEADOWS B	503	0	29°48'8.04S	25°55'31.36E	Farm	F01000000000050300000	Option 1B (Potable water Gariep - Rustfontein)
79	VEELGELUK	136	0	29°27'23.16S	26°13'7.22E	Farm	F02700000000013600000	Option 1B (Potable water Gariep - Rustfontein)
80	BLOEMHOF	186	0	29°58'54.53S	25°49'7.67E	Farm	F03400000000018600000	Option 1B (Potable water Gariep - Rustfontein)
81	ERFPOS	1465	0	29°16'36.99S	26°32'32.66E	Farm	F00300000000146500000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
82	VAALKOP	2589	0	29°29'53.88S	26°4'7.16E	Farm	F00300000000258900000	Option 1B (Potable water Gariep - Rustfontein)
83	GRAYSHAVEN	2995	0	29°25'7.08S	26°10'31.52E	Farm	F00300000000299500000	Option 1B (Potable water Gariep - Rustfontein)
84	VLAKFONTEIN A	101	0	29°27'17.83S	26°14'49.94E	Farm	F02700000000010100000	Option 1B (Potable water Gariep - Rustfontein)
85	GALIPPOLI	1548	0	29°27'29.08S	26°6'8.7E	Farm	F00300000000154800000	Option 1B (Potable water Gariep - Rustfontein)
86	WASCHBANK	274	0	30°37'25.03S	25°29'29.42E	Farm	F02600000000027400000	Option 1B (Potable water Gariep - Rustfontein)
87	HELDERPOORT	907	0	29°16'23.65S	26°31'4.4E	Farm	F00300000000090700000	Option 1B (Potable water Gariep - Rustfontein)
88	LIEUW KOP	105	0	29°20'18.96S	26°22'52.36E	Farm	F00300000000010500000	Option 1B (Potable water Gariep - Rustfontein)
89	KLIPFONTEIN	109	0	30°7'43.13S	25°45'16.05E	Farm	F03400000000010900000	Option 1B (Potable water Gariep - Rustfontein)
90	HEREFORD	294	0	30°26'41.04S	25°39'4.47E	Farm	F00200000000029400000	Option 1B (Potable water Gariep - Rustfontein)
91	LORRAINE	342	0	30°0'15.9S	25°47'45.74E	Farm	F03400000000034200000	Option 1B (Potable water Gariep - Rustfontein)
92	DRIEKUIL	130	0	30°30'55.84S	25°33'30.63E	Farm	F02600000000013000000	Option 1B (Potable water Gariep - Rustfontein)
93	ZUURFONTEIN	266	0	29°18'24.68S	26°28'9.4E	Farm	F00300000000026600000	Option 1B (Potable water Gariep - Rustfontein)
94	ANNEX	2522	0	29°21'38.68S	26°21'6.5E	Farm	F00300000000252200000	Option 1B (Potable water Gariep - Rustfontein)
95	AASVOGEL KNOP	1	0	29°50'31.4S	25°53'49.96E	Farm	F01000000000000100000	Option 1B (Potable water Gariep - Rustfontein)
96	TWYFELFONTEIN	2083	0	29°18'53.17S	26°27'28.7E	Farm	F00300000000208300000	Option 1B (Potable water Gariep - Rustfontein)
97	HILLSIDE	301	0	30°10'43.54S	25°43'41.17E	Farm	F03400000000030100000	Option 1B (Potable water Gariep - Rustfontein)
98	POORTJE 365	362	0	29°30'33.7S	26°5'58.38E	Farm	F02700000000036200000	Option 1B (Potable water Gariep - Rustfontein)
99	DONKERPOORT STATION 53	2	0	30°31'50.06S	25°29'46.31E	Farm	F02600000000000200000	Option 1B (Potable water Gariep - Rustfontein)
100	KLIPBANKFONTEIN	116	0	30°27'0.03S	25°36'26.35E	Farm	F02600000000011600000	Option 1B (Potable water Gariep - Rustfontein)
101	PRIOR GRANGE	282	0	30°18'58.27S	25°41'5.35E	Farm	F00200000000028200000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
102	TROMPSBURG DOPS GROUND	141	0	30°2'48.39S	25°46'55.16E	Farm	F03400000000014100000	Option 1B (Potable water Gariep - Rustfontein)
103	SPRINGFONTEIN TOWNLAND B	495	0	30°14'55.64S	25°42'10.5E	Farm	F00200000000049500000	Option 1B (Potable water Gariep - Rustfontein)
104	KINDERSPRUIT	428	0	29°29'29.61S	26°6'4.61E	Farm	F02700000000042800000	Option 1B (Potable water Gariep - Rustfontein)
105	STOFKRAAL	110	0	29°57'40.25S	25°50'43.3E	Farm	F03400000000011000000	Option 1B (Potable water Gariep - Rustfontein)
106	KRAPFONTEIN	2720	0	29°27'3.89S	26°7'27.53E	Farm	F00300000000272000000	Option 1B (Potable water Gariep - Rustfontein)
107	DRIEKUIL	499	0	30°29'44.93S	25°35'23.77E	Farm	F02600000000049900000	Option 1B (Potable water Gariep - Rustfontein)
108	LINDE`S VLEY	908	0	29°17'39.46S	26°30'40.22E	Farm	F00300000000090800000	Option 1B (Potable water Gariep - Rustfontein)
109	VEREENIGING	329	0	30°27'56.09S	25°35'29.91E	Farm	F02600000000032900000	Option 1B (Potable water Gariep - Rustfontein)
110	VILJOENSDAM	498	0	30°14'53.32S	25°44'22.37E	Farm	F00200000000049800000	Option 1B (Potable water Gariep - Rustfontein)
111	GRUISFONTEIN	35	0	30°1'15.58S	25°48'38.98E	Farm	F03400000000003500000	Option 1B (Potable water Gariep - Rustfontein)
112	BOSCHRAND A	405	2	30°26'3.46S	25°37'43.47E	Farm Portion	F00200000000040500002	Option 1B (Potable water Gariep - Rustfontein)
113	BOSCHRAND B	404	0	30°25'3.99S	25°39'18.14E	Farm Portion	F00200000000040400000	Option 1B (Potable water Gariep - Rustfontein)
114	EXCELSIOR	267	2	30°23'55.62S	25°40'20.27E	Farm Portion	F00200000000026700002	Option 1B (Potable water Gariep - Rustfontein)
115	BOSCHRAND B	404	1	30°24'57.68S	25°38'59.91E	Farm Portion	F00200000000040400001	Option 1B (Potable water Gariep - Rustfontein)
116	KOPPIE ALLEEN	497	1	30°13'54.14S	25°43'17.04E	Farm Portion	F00200000000049700001	Option 1B (Potable water Gariep - Rustfontein)
117	HAMILTON MANOR	499	1	30°12'50.07S	25°43'16.87E	Farm Portion	F00200000000049900000	Option 1B (Potable water Gariep - Rustfontein)
118	EXCELSIOR	267	1	30°23'4.02S	25°40'35.87E	Farm Portion	F00200000000026700001	Option 1B (Potable water Gariep - Rustfontein)
119	KUILFONTEIN	195	3	30°16'45.72S	25°44'0.12E	Farm Portion	F00200000000019500003	Option 1B (Potable water Gariep - Rustfontein)
120	KIEL	37	1	30°19'48S	25°42'8.15E	Farm Portion	F00200000000003700001	Option 1B (Potable water Gariep - Rustfontein)
121	KOPPIE ALLEEN	497	0	30°13'54.97S	25°43'39.8E	Farm Portion	F00200000000049700000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
122	HEREFORD	294	0	30°26'40.04S	25°39'10.39E	Farm Portion	F00200000000029400000	Option 1B (Potable water Gariep - Rustfontein)
123	ANNEX	2522	0	29°21'38.68S	26°21'6.5E	Farm Portion	F00300000000252200000	Option 1B (Potable water Gariep - Rustfontein)
124	HAMILTON MANOR	499	0	30°12'39.36S	25°44'19.18E	Farm Portion	F00200000000049900001	Option 1B (Potable water Gariep - Rustfontein)
125	JENNY`S PASS	279	1	30°21'37.71S	25°41'11.28E	Farm Portion	F00200000000027900001	Option 1B (Potable water Gariep - Rustfontein)
126	GERLACHSTHAL	458	7	30°15'59.47S	25°43'47.41E	Farm Portion	F00200000000045800007	Option 1B (Potable water Gariep - Rustfontein)
127	GERLACHSTHAL	458	0	30°15'47.42S	25°44'7.99E	Farm Portion	F00200000000045800000	Option 1B (Potable water Gariep - Rustfontein)
128	HELDERPOORT	907	0	29°16'51.38S	26°31'16.34E	Farm Portion	F00300000000090700000	Option 1B (Potable water Gariep - Rustfontein)
129	PRIOR GRANGE	282	2	30°19'15.12S	25°42'26.37E	Farm Portion	F00200000000028200002	Option 1B (Potable water Gariep - Rustfontein)
130	MOOIVLEY	43	4	29°24'50.08S	26°19'11.31E	Farm Portion	F00300000000004300004	Option 1B (Potable water Gariep - Rustfontein)
131	CIJPRESSDEEL	1148	0	29°23'34.89S	26°19'53.03E	Farm Portion	F00300000000114800000	Option 1B (Potable water Gariep - Rustfontein)
132	VAALBANK	478	0	29°23'36.41S	26°19'13.5E	Farm Portion	F00300000000047800000	Option 1B (Potable water Gariep - Rustfontein)
133	MOOIVLEY	43	3	29°24'34.36S	26°19'27.03E	Farm Portion	F00300000000004300003	Option 1B (Potable water Gariep - Rustfontein)
134	KRAPFONTEIN	2720	0	29°26'49.72S	26°7'47.17E	Farm Portion	F00300000000272000000	Option 1B (Potable water Gariep - Rustfontein)
135	VLAK FONTEIN	430	0	29°27'38.58S	26°15'58.64E	Farm Portion	F02700000000043000000	Option 1B (Potable water Gariep - Rustfontein)
136	MOOIVLEY	43	0	29°25'15.5S	26°18'24.2E	Farm Portion	F00300000000004300000	Option 1B (Potable water Gariep - Rustfontein)
137	MOOIVLEY	43	2	29°25'7.3S	26°18'45.82E	Farm Portion	F00300000000004300002	Option 1B (Potable water Gariep - Rustfontein)
138	VLAKFONTEIN A	101	2	29°27'17.83S	26°14'49.94E	Farm Portion	F02700000000010100002	Option 1B (Potable water Gariep - Rustfontein)
139	KLIP KUIL	215	0	29°26'31.91S	26°16'27.4E	Farm Portion	F02700000000021500000	Option 1B (Potable water Gariep - Rustfontein)
140	FONTEINTJE	419	0	29°52'49.18S	25°52'28.5E	Farm Portion	F01000000000041900000	Option 1B (Potable water Gariep - Rustfontein)
141	KIEL	37	0	30°19'44.9S	25°42'12.22E	Farm Portion	F00200000000003700000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
142	BRANDNEGELFONTEIN	165	4	29°47'49.37S	25°56'10.57E	Farm Portion	F01000000000016500004	Option 1B (Potable water Gariep - Rustfontein)
143	BELLEVUE	166	0	29°46'54.58S	25°56'59.27E	Farm Portion	F01000000000016600000	Option 1B (Potable water Gariep - Rustfontein)
144	BRANDNEGELFONTEIN	165	1	29°47'43.59S	25°56'9.7E	Farm Portion	F01000000000016500001	Option 1B (Potable water Gariep - Rustfontein)
145	KUILFONTEIN	195	0	30°16'4.61S	25°44'33.55E	Farm Portion	F00200000000019500000	Option 1B (Potable water Gariep - Rustfontein)
146	VETVLAKTE	357	0	29°51'47.81S	25°53'33.23E	Farm Portion	F01000000000035700000	Option 1B (Potable water Gariep - Rustfontein)
147	LASTFONTEIN	261	1	29°47'33.11S	25°56'18.67E	Farm Portion	F01000000000026100001	Option 1B (Potable water Gariep - Rustfontein)
148	BRANDNEGELFONTEIN	165	2	29°45'52.52S	25°57'17.86E	Farm Portion	F01000000000016500002	Option 1B (Potable water Gariep - Rustfontein)
149	BOSCHRAND A	405	0	30°26'5.06S	25°37'44.44E	Farm Portion	F00200000000040500000	Option 1B (Potable water Gariep - Rustfontein)
150	VETVLAKTE	357	1	29°51'31.36S	25°53'5.75E	Farm Portion	F01000000000035700001	Option 1B (Potable water Gariep - Rustfontein)
151	NIET ZO GROOT	465	0	29°47'28.23S	25°57'27.83E	Farm Portion	F01000000000046500000	Option 1B (Potable water Gariep - Rustfontein)
152	DONKERPOORT	128	0	29°16'56.47S	26°29'6.98E	Farm Portion	F00300000000012800000	Option 1B (Potable water Gariep - Rustfontein)
153	TAPFONTEIN	116	0	29°53'54.81S	25°51'48.95E	Farm Portion	F01000000000011600000	Option 1B (Potable water Gariep - Rustfontein)
154	TAPFONTEIN	116	1	29°53'56S	25°51'33.19E	Farm Portion	F01000000000011600001	Option 1B (Potable water Gariep - Rustfontein)
155	BRANDNEGELFONTEIN	165	3	29°45'50.34S	25°57'23.41E	Farm Portion	F01000000000016500003	Option 1B (Potable water Gariep - Rustfontein)
156	DORPS GROND VAN	104	14	29°44'37.29S	25°57'40.11E	Farm Portion	F01000000000010400014	Option 1B (Potable water Gariep - Rustfontein)
157	WELGELUK	612	0	29°42'56.05S	25°58'51.71E	Farm Portion	F01000000000061200000	Option 1B (Potable water Gariep - Rustfontein)
158	ALLEMANSPUNT	151	1	29°51'55.46S	25°52'50.32E	Farm Portion	F01000000000015100001	Option 1B (Potable water Gariep - Rustfontein)
159	GOEDEHOOP	211	2	29°41'1.23S	25°59'18.98E	Farm Portion	F01000000000021100002	Option 1B (Potable water Gariep - Rustfontein)
160	DRAAIHOEK A	479	1	29°43'43.48S	25°57'56.86E	Farm Portion	F01000000000047900001	Option 1B (Potable water Gariep - Rustfontein)
161	FORTUIN	207	3	29°31'11.04S	26°5'0.49E	Farm Portion	F01000000000020700002	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
162	GOEDEHOOP	211	1	29°40'56.78S	25°58'46.27E	Farm Portion	F01000000000021100001	Option 1B (Potable water Gariep - Rustfontein)
163	VAALPLAAT	478	1	29°42'22.31S	25°58'20.44E	Farm Portion	F01000000000047800001	Option 1B (Potable water Gariep - Rustfontein)
164	ROOIRANTJES	304	1	29°53'18.85S	25°51'57.01E	Farm Portion	F01000000000030400001	Option 1B (Potable water Gariep - Rustfontein)
165	OVERSCHOT	615	0	29°36'54.01S	26°2'9.11E	Farm Portion	F01000000000061500000	Option 1B (Potable water Gariep - Rustfontein)
166	FAIRVIEW	546	2	29°33'50.75S	26°3'7.8E	Farm Portion	F01000000000054600002	Option 1B (Potable water Gariep - Rustfontein)
167	MEADOWS B	503	0	29°48'11.65S	25°56'0.22E	Farm Portion	F01000000000050300000	Option 1B (Potable water Gariep - Rustfontein)
168	DE HOOP	548	1	29°34'29.82S	26°2'32.18E	Farm Portion	F01000000000054800001	Option 1B (Potable water Gariep - Rustfontein)
169	VAALPLAAT	478	0	29°42'4.27S	25°59'7.71E	Farm Portion	F01000000000047800000	Option 1B (Potable water Gariep - Rustfontein)
170	DORPS GROND VAN	104	0	29°45'1S	25°57'45.77E	Farm Portion	F01000000000010400000	Option 1B (Potable water Gariep - Rustfontein)
171	COURLAND	527	0	29°49'8.47S	25°56'11.42E	Farm Portion	F01000000000052700000	Option 1B (Potable water Gariep - Rustfontein)
172	BETHANY	610	0	29°38'33.79S	26°1'22.51E	Farm Portion	F01000000000061000000	Option 1B (Potable water Gariep - Rustfontein)
173	KRAPFONTEIN	2720	3	29°27'29.83S	26°8'4.88E	Farm Portion	F00300000000272000003	Option 1B (Potable water Gariep - Rustfontein)
174	MEADOWS B	503	1	29°48'13.41S	25°55'47.2E	Farm Portion	F01000000000050300001	Option 1B (Potable water Gariep - Rustfontein)
175	AASVOGEL KNOP	623	0	29°50'26.82S	25°53'42.5E	Farm Portion	F01000000000062300000	Option 1B (Potable water Gariep - Rustfontein)
176	UITHOEK	108	1	29°31'33.23S	26°4'41.42E	Farm Portion	F02700000000010800001	Option 1B (Potable water Gariep - Rustfontein)
177	DIEPFONTEIN	160	0	29°32'45.14S	26°4'1.9E	Farm Portion	F02700000000016000000	Option 1B (Potable water Gariep - Rustfontein)
178	KLIPBANKFONTEIN	116	0	30°27'31.2S	25°37'31.39E	Farm Portion	F02600000000011600000	Option 1B (Potable water Gariep - Rustfontein)
179	DRIEKUIL	130	6	30°31'31.24S	25°34'15.75E	Farm Portion	F02600000000013000006	Option 1B (Potable water Gariep - Rustfontein)
180	DE HOOP	548	0	29°34'25.84S	26°2'55.31E	Farm Portion	F01000000000054800000	Option 1B (Potable water Gariep - Rustfontein)
181	FAIRVIEW	546	1	29°33'46.94S	26°3'1.94E	Farm Portion	F01000000000054600001	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
182	EENSGEVONDEN	331	0	30°28'51.71S	25°36'49.14E	Farm Portion	F02600000000033100000	Option 1B (Potable water Gariep - Rustfontein)
183	EENSGEVONDEN	331	5	30°28'50.61S	25°35'42.87E	Farm Portion	F02600000000033100005	Option 1B (Potable water Gariep - Rustfontein)
184	DIEPFONTEIN	160	1	29°32'40.3S	26°3'52.06E	Farm Portion	F02700000000016000001	Option 1B (Potable water Gariep - Rustfontein)
185	INHOEK	495	3	30°32'9.31S	25°31'26.92E	Farm Portion	F02600000000049500003	Option 1B (Potable water Gariep - Rustfontein)
186	SOPHIAS DAL	382	4	29°26'6.68S	26°10'6.03E	Farm Portion	F00300000000038200004	Option 1B (Potable water Gariep - Rustfontein)
187	INHOEK	495	1	30°32'32.19S	25°31'49.22E	Farm Portion	F02600000000049500001	Option 1B (Potable water Gariep - Rustfontein)
188	INHOEK	495	4	30°32'50.41S	25°29'57.34E	Farm Portion	F02600000000049500004	Option 1B (Potable water Gariep - Rustfontein)
189	BLOEMHOF	186	1	29°58'28.92S	25°49'8.35E	Farm Portion	F03400000000018600001	Option 1B (Potable water Gariep - Rustfontein)
190	AANELKAARSKRAAL	2	1	29°43'2.61S	25°58'8.74E	Farm Portion	F01000000000000200001	Option 1B (Potable water Gariep - Rustfontein)
191	LASTFONTEIN	261	0	29°48'20.53S	25°57'13.13E	Farm Portion	F01000000000026100000	Option 1B (Potable water Gariep - Rustfontein)
192	BAKENKOP	457	2	29°51'8.73S	25°53'20.6E	Farm Portion	F01000000000045700000	Option 1B (Potable water Gariep - Rustfontein)
193	HILLSIDE	301	0	30°10'56.28S	25°44'14.17E	Farm Portion	F03400000000030100000	Option 1B (Potable water Gariep - Rustfontein)
194	LORRAINE	342	1	30°0'10.29S	25°48'27.41E	Farm Portion	F03400000000034200001	Option 1B (Potable water Gariep - Rustfontein)
195	DRIEKUIL	130	7	30°30'58.12S	25°33'22.81E	Farm Portion	F02600000000013000007	Option 1B (Potable water Gariep - Rustfontein)
196	VEREENIGING	329	1	30°28'3.51S	25°36'6.38E	Farm Portion	F02600000000032900001	Option 1B (Potable water Gariep - Rustfontein)
197	LINDE`S VLEY	908	1	29°17'32.62S	26°30'49.69E	Farm Portion	F00300000000090800001	Option 1B (Potable water Gariep - Rustfontein)
198	LINDE`S VLEY	908	2	29°18'10.41S	26°30'42.28E	Farm Portion	F00300000000090800002	Option 1B (Potable water Gariep - Rustfontein)
199	RUSTFONTEIN	120	0	29°15'58.62S	26°34'23.86E	Farm Portion	F00300000000012000000	Option 1B (Potable water Gariep - Rustfontein)
200	ERFPOS	1465	0	29°16'36.99S	26°32'32.66E	Farm Portion	F00300000000146500000	Option 1B (Potable water Gariep - Rustfontein)
201	GELUKSDAM	551	0	29°35'16.88S	26°2'51.08E	Farm Portion	F01000000000055100000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
202	GELUKSDAM	551	1	29°35'10.42S	26°2'4.19E	Farm Portion	F01000000000055100001	Option 1B (Potable water Gariep - Rustfontein)
203	MEADOWS A	501	0	29°49'50.11S	25°55'11.89E	Farm Portion	F01000000000050100000	Option 1B (Potable water Gariep - Rustfontein)
204	VLAKDAM	589	0	29°46'24.49S	25°57'33.06E	Farm Portion	F01000000000058900000	Option 1B (Potable water Gariep - Rustfontein)
205	SUMMER HILL	275	4	30°33'8.03S	25°29'29.43E	Farm Portion	F02600000000027500004	Option 1B (Potable water Gariep - Rustfontein)
206	DRIEKUIL	499	0	30°29'58.08S	25°36'2.85E	Farm Portion	F02600000000049900000	Option 1B (Potable water Gariep - Rustfontein)
207	EENSGEVONDEN	331	2	30°28'28.79S	25°35'47.26E	Farm Portion	F02600000000033100002	Option 1B (Potable water Gariep - Rustfontein)
208	EENSGEVONDEN	331	3	30°28'47.22S	25°35'33.32E	Farm Portion	F02600000000033100003	Option 1B (Potable water Gariep - Rustfontein)
209	MOUNT BRAND	278	0	30°21'8.96S	25°42'53.64E	Farm Portion	F00200000000027800000	Option 1B (Potable water Gariep - Rustfontein)
210	EENZAAM B	333	0	29°27'13.3S	26°13'52.34E	Farm Portion	F02700000000033300000	Option 1B (Potable water Gariep - Rustfontein)
211	H.F VERWOERDDAM	523	2	30°35'41.9S	25°29'42.87E	Farm Portion	F02600000000052300002	Option 1B (Potable water Gariep - Rustfontein)
212	TWEEFONTEIN	1580	0	29°17'43.17S	26°28'38.52E	Farm Portion	F00300000000158000000	Option 1B (Potable water Gariep - Rustfontein)
213	ATLEHANG	3001	5	29°19'20.83S	26°26'29.3E	Farm Portion	F00300000000300100005	Option 1B (Potable water Gariep - Rustfontein)
214	H.F VERWOERDDAM	523	3	30°35'40.16S	25°29'20.25E	Farm Portion	F02600000000052300003	Option 1B (Potable water Gariep - Rustfontein)
215	SPRINGFONTEIN TOWNLAND B	495	3	30°15'19.84S	25°43'43.11E	Farm Portion	F00200000000049500003	Option 1B (Potable water Gariep - Rustfontein)
216	VILJOENSDAM	498	0	30°14'50.02S	25°44'41.06E	Farm Portion	F00200000000049800000	Option 1B (Potable water Gariep - Rustfontein)
217	HEREFORD	294	2	30°26'7.78S	25°37'39.07E	Farm Portion	F00200000000029400002	Option 1B (Potable water Gariep - Rustfontein)
218	FONTEINTJE	419	1	29°52'28.89S	25°52'29.05E	Farm Portion	F01000000000041900001	Option 1B (Potable water Gariep - Rustfontein)
219	BELLEVUE	166	1	29°46'51.58S	25°56'52.41E	Farm Portion	F01000000000016600001	Option 1B (Potable water Gariep - Rustfontein)
220	KLIPFONTEIN	109	1	30°8'0.49S	25°45'7.26E	Farm Portion	F03400000000010900001	Option 1B (Potable water Gariep - Rustfontein)
221	STOFKRAAL	110	0	29°57'38.07S	25°50'51.18E	Farm Portion	F03400000000011000000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
222	HELDERFONTEIN	184	0	29°15'18.83S	26°32'13.38E	Farm Portion	F00300000000018400000	Option 1B (Potable water Gariep - Rustfontein)
223	MONTAGU	1228	0	29°18'41.18S	26°26'32.02E	Farm Portion	F00300000000122800000	Option 1B (Potable water Gariep - Rustfontein)
224	STANDERTON	1227	0	29°18'22.88S	26°26'37.84E	Farm Portion	F00300000000122700000	Option 1B (Potable water Gariep - Rustfontein)
225	VAALBANK	127	1	29°28'32.47S	26°6'2.27E	Farm Portion	F02700000000012700001	Option 1B (Potable water Gariep - Rustfontein)
226	VAALBANK	127	0	29°28'44.81S	26°6'13.64E	Farm Portion	F02700000000012700000	Option 1B (Potable water Gariep - Rustfontein)
227	ALLEMANSPUNT	151	2	29°51'59.52S	25°52'50.17E	Farm Portion	F01000000000015100002	Option 1B (Potable water Gariep - Rustfontein)
228	NIET ZO GROOT	465	1	29°47'18.03S	25°56'30.96E	Farm Portion	F01000000000046500001	Option 1B (Potable water Gariep - Rustfontein)
229	ROOIRANTJES	304	0	29°53'21.16S	25°52'6E	Farm Portion	F01000000000030400000	Option 1B (Potable water Gariep - Rustfontein)
230	GRUISFONTEIN	35	0	30°1'22.56S	25°48'46.35E	Farm Portion	F03400000000003500000	Option 1B (Potable water Gariep - Rustfontein)
231	TROMPSBURG DOPS GROUND	141	9	30°2'20.23S	25°47'34.64E	Farm Portion	F03400000000014100009	Option 1B (Potable water Gariep - Rustfontein)
232	VILJOENSDAM	498	1	30°14'44.64S	25°43'32.09E	Farm Portion	F00200000000049800001	Option 1B (Potable water Gariep - Rustfontein)
233	KUILFONTEIN	195	0	30°17'45.36S	25°43'29.45E	Farm Portion	F00200000000019500000	Option 1B (Potable water Gariep - Rustfontein)
234	KUILFONTEIN	195	1	30°17'26.26S	25°43'32.9E	Farm Portion	F00200000000019500001	Option 1B (Potable water Gariep - Rustfontein)
235	KLEINPLAAS A	228	1	29°56'6.19S	25°50'9.88E	Farm Portion	F03400000000022800001	Option 1B (Potable water Gariep - Rustfontein)
236	STOFKRAAL	110	1	29°57'38.05S	25°49'34.18E	Farm Portion	F03400000000011000001	Option 1B (Potable water Gariep - Rustfontein)
237	HILLSIDE	301	1	30°10'48.71S	25°43'50.79E	Farm Portion	F03400000000030100001	Option 1B (Potable water Gariep - Rustfontein)
238	PRIOR GRANGE	282	0	30°19'13.94S	25°42'34.23E	Farm Portion	F00200000000028200000	Option 1B (Potable water Gariep - Rustfontein)
239	JENNY`S PASS	279	0	30°22'7S	25°42'16.59E	Farm Portion	F00200000000027900000	Option 1B (Potable water Gariep - Rustfontein)
240	VLEIPLAATS	356	1	30°7'48.2S	25°46'5.33E	Farm Portion	F03400000000035600001	Option 1B (Potable water Gariep - Rustfontein)
241	LANGVERWACHT	864	2	29°16'5.27S	26°36'49.01E	Farm Portion	F00300000000086400002	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
242	BEWEE	93	0	29°17'45.23S	26°31'38.62E	Farm Portion	F00300000000009300000	Option 1B (Potable water Gariep - Rustfontein)
243	VAALKOP	2589	1	29°30'44.74S	26°5'12.2E	Farm Portion	F00300000000258900001	Option 1B (Potable water Gariep - Rustfontein)
244	CYPRESHOEK	1892	0	29°24'13.72S	26°19'28.29E	Farm Portion	F00300000000189200000	Option 1B (Potable water Gariep - Rustfontein)
245	ATLEHANG	3001	8	29°19'41.9S	26°25'16.45E	Farm Portion	F00300000000300100008	Option 1B (Potable water Gariep - Rustfontein)
246	ATLEHANG	3001	3	29°18'56.42S	26°26'16.59E	Farm Portion	F00300000000300100003	Option 1B (Potable water Gariep - Rustfontein)
247	KRAPFONTEIN	2720	7	29°27'1.87S	26°6'36.34E	Farm Portion	F00300000000272000007	Option 1B (Potable water Gariep - Rustfontein)
248	KRAPFONTEIN	2720	2	29°27'46.54S	26°7'19.42E	Farm Portion	F00300000000272000002	Option 1B (Potable water Gariep - Rustfontein)
249	SOPHIAS DAL	382	5	29°27'47.12S	26°11'54.53E	Farm Portion	F00300000000038200005	Option 1B (Potable water Gariep - Rustfontein)
250	BETHANY	610	1	29°38'12.54S	25°59'56.93E	Farm Portion	F01000000000061000001	Option 1B (Potable water Gariep - Rustfontein)
251	TROMPSBURG B	142	1	30°4'29.09S	25°46'39.93E	Farm Portion	F03400000000014200001	Option 1B (Potable water Gariep - Rustfontein)
252	AASVOGEL KNOP	1	1	29°50'27.78S	25°53'54.44E	Farm Portion	F01000000000000100001	Option 1B (Potable water Gariep - Rustfontein)
253	FORTUIN	207	2	29°31'15.02S	26°4'54.75E	Farm Portion	F01000000000020700003	Option 1B (Potable water Gariep - Rustfontein)
254	ELIM	550	0	29°35'56.18S	26°1'52.75E	Farm Portion	F01000000000055000000	Option 1B (Potable water Gariep - Rustfontein)
255	ELIM	550	2	29°36'7.69S	26°1'25.34E	Farm Portion	F01000000000055000002	Option 1B (Potable water Gariep - Rustfontein)
256	MEADOWS A	501	1	29°49'25.57S	25°54'45.91E	Farm Portion	F01000000000050100001	Option 1B (Potable water Gariep - Rustfontein)
257	COURLAND	527	1	29°48'46.32S	25°55'18.51E	Farm Portion	F01000000000052700001	Option 1B (Potable water Gariep - Rustfontein)
258	VLAKDAM	589	1	29°46'15.84S	25°57'10.87E	Farm Portion	F01000000000058900001	Option 1B (Potable water Gariep - Rustfontein)
259	WILGE DRAAI	125	0	29°25'44.68S	26°18'4E	Farm Portion	F02700000000012500000	Option 1B (Potable water Gariep - Rustfontein)
260	KLIPBANKFONTEIN	116	2	30°26'55.22S	25°36'59.42E	Farm Portion	F02600000000011600002	Option 1B (Potable water Gariep - Rustfontein)
261	POORTJE 365	365	1	29°30'5.45S	26°5'27.77E	Farm Portion	F02700000000036500001	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
262	VEELGELUK	136	0	29°27'23.16S	26°13'7.22E	Farm Portion	F02700000000013600000	Option 1B (Potable water Gariep - Rustfontein)
263	KLEINPLAAS A	228	2	29°56'10.27S	25°50'13.01E	Farm Portion	F03400000000022800002	Option 1B (Potable water Gariep - Rustfontein)
264	LORRAINE	342	0	30°0'6.42S	25°48'44.11E	Farm Portion	F03400000000034200000	Option 1B (Potable water Gariep - Rustfontein)
265	BLOEMHOF	186	0	29°59'2.27S	25°49'37.52E	Farm Portion	F03400000000018600000	Option 1B (Potable water Gariep - Rustfontein)
266	MORGENZON	339	0	29°56'42.09S	25°49'39.9E	Farm Portion	F03400000000033900000	Option 1B (Potable water Gariep - Rustfontein)
267	MORGENZON	339	9	29°56'46S	25°49'52.47E	Farm Portion	F03400000000033900009	Option 1B (Potable water Gariep - Rustfontein)
268	PALMIETFONTEIN	67	2	29°16'20.24S	26°36'59.4E	Farm Portion	F03200000000006700002	Option 1B (Potable water Gariep - Rustfontein)
269	RUSTFONTEIN	120	1	29°16'6.46S	26°36'12.77E	Farm Portion	F00300000000012000001	Option 1B (Potable water Gariep - Rustfontein)
270	SUMMER HILL	275	1	30°33'59S	25°29'21.03E	Farm Portion	F02600000000027500001	Option 1B (Potable water Gariep - Rustfontein)
271	TWEE ZUSTERS	140	0	29°55'7.96S	25°50'59.23E	Farm Portion	F03400000000014000000	Option 1B (Potable water Gariep - Rustfontein)
272	TWEE ZUSTERS	140	2	29°55'6.14S	25°50'48.2E	Farm Portion	F03400000000014000002	Option 1B (Potable water Gariep - Rustfontein)
273	VLEIPLAATS	152	1	30°5'54.41S	25°46'3.07E	Farm Portion	F03400000000015200001	Option 1B (Potable water Gariep - Rustfontein)
274	PALMIETFONTEIN	67	0	29°16'2.91S	26°38'40.57E	Farm Portion	F03200000000006700000	Option 1B (Potable water Gariep - Rustfontein)
275	LANGVERWACHT	864	1	29°16'7.98S	26°36'45.55E	Farm Portion	F00300000000086400001	Option 1B (Potable water Gariep - Rustfontein)
276	H.F VERWOERDDAM	523	6	30°35'22.13S	25°29'27.19E	Farm Portion	F02600000000052300006	Option 1B (Potable water Gariep - Rustfontein)
277	SUMMER HILL	275	2	30°34'28.04S	25°29'46.72E	Farm Portion	F02600000000027500002	Option 1B (Potable water Gariep - Rustfontein)
278	PLAATJESFONTEIN	130	0	29°18'37.71S	26°31'7.74E	Farm Portion	F00300000000013000000	Option 1B (Potable water Gariep - Rustfontein)
279	ATLEHANG	3001	7	29°18'59.48S	26°24'36.39E	Farm Portion	F00300000000300100007	Option 1B (Potable water Gariep - Rustfontein)
280	LIEUW KOP	105	0	29°20'19.87S	26°22'51.35E	Farm Portion	F00300000000010500000	Option 1B (Potable water Gariep - Rustfontein)
281	ZUURFONTEIN	266	0	29°18'41.59S	26°28'14.22E	Farm Portion	F00300000000026600000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
282	INHOEK	495	0	30°33'15.91S	25°30'26.45E	Farm Portion	F02600000000049500000	Option 1B (Potable water Gariep - Rustfontein)
283	VERLAAT	2339	0	29°23'7.78S	26°20'59.88E	Farm Portion	F00300000000233900000	Option 1B (Potable water Gariep - Rustfontein)
284	SOPHIAS DAL	382	3	29°27'41.84S	26°12'18.01E	Farm Portion	F00300000000038200003	Option 1B (Potable water Gariep - Rustfontein)
285	BOSCHRAND B	404	2	30°24'6.72S	25°40'12.88E	Farm Portion	F00200000000040400002	Option 1B (Potable water Gariep - Rustfontein)
286	ATLEHANG	3001	4	29°19'5.92S	26°27'0.33E	Farm Portion	F00300000000300100004	Option 1B (Potable water Gariep - Rustfontein)
287	WASCHBANK	274	1	30°37'25.87S	25°29'27.27E	Farm Portion	F02600000000027400001	Option 1B (Potable water Gariep - Rustfontein)
288	AANDEEL	79	0	29°26'59.67S	26°18'2.72E	Farm Portion	F02700000000007900000	Option 1B (Potable water Gariep - Rustfontein)
289	H.F VERWOERDDAM	523	0	30°35'25.28S	25°28'46.69E	Farm Portion	F02600000000052300000	Option 1B (Potable water Gariep - Rustfontein)
290	MOUNT BRAND	278	1	30°20'29.91S	25°41'44.44E	Farm Portion	F00200000000027800001	Option 1B (Potable water Gariep - Rustfontein)
291	GRUISFONTEIN	35	1	30°1'20.19S	25°47'58.59E	Farm Portion	F03400000000003500001	Option 1B (Potable water Gariep - Rustfontein)
292	SOPHIAS DAL	382	3	29°27'37.13S	26°11'21.56E	Farm Portion	F00300000000038200003	Option 1B (Potable water Gariep - Rustfontein)
293	EXCELSIOR	267	0	30°23'27.3S	25°41'27.01E	Farm Portion	F00200000000026700000	Option 1B (Potable water Gariep - Rustfontein)
294	BOSCHRAND B	404	3	30°23'57.29S	25°40'19.67E	Farm Portion	F00200000000040400003	Option 1B (Potable water Gariep - Rustfontein)
295	MOUNT BRAND	278	3	30°20'41.96S	25°41'40.15E	Farm Portion	F00200000000027800003	Option 1B (Potable water Gariep - Rustfontein)
296	UITHOEK	108	0	29°31'32.46S	26°5'25.35E	Farm Portion	F02700000000010800000	Option 1B (Potable water Gariep - Rustfontein)
297	TWYFELFONTEIN	2083	0	29°18'57.99S	26°27'35.67E	Farm Portion	F00300000000208300000	Option 1B (Potable water Gariep - Rustfontein)
298	GRAYSHAVEN	2995	0	29°25'8.72S	26°10'34.95E	Farm Portion	F00300000000299500000	Option 1B (Potable water Gariep - Rustfontein)
299	KINDERSPRUIT	120	1	29°29'22.52S	26°5'43.26E	Farm Portion	F02700000000012000001	Option 1B (Potable water Gariep - Rustfontein)
300	SPRINGFONTEIN TOWNLAND B	495	0	30°15'18.83S	25°43'52.89E	Farm Portion	F00200000000049500000	Option 1B (Potable water Gariep - Rustfontein)
301	VEREENIGING	329	0	30°28'7.07S	25°36'27.69E	Farm Portion	F02600000000032900000	Option 1B (Potable water Gariep - Rustfontein)

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
302	ATLEHANG	3001	0	29°19'46.02S	26°25'51.67E	Farm Portion	F00300000000300100000	Option 1B (Potable water Gariep - Rustfontein)
303	KOPPIESKRAAL	2944	2	29°26'18.88S	26°12'0.2E	Farm Portion	F00300000000294400002	Option 1B (Potable water Gariep - Rustfontein)
304	KOPPIESKRAAL	2944	1	29°26'30.72S	26°11'11.1E	Farm Portion	F00300000000294400001	Option 1B (Potable water Gariep - Rustfontein)
305	KOPPIESKRAAL	407	1	29°24'21.37S	26°13'1.53E	Farm Portion	F00300000000040700001	Option 1B (Potable water Gariep - Rustfontein)
306	TROMPSBURG DOPS GROUND	141	0	30°3'12.08S	25°47'40.3E	Farm Portion	F03400000000014100000	Option 1B (Potable water Gariep - Rustfontein)
307	PALMIETFONTEIN	67	11	29°16'14.16S	26°37'6.59E	Farm Portion	F03200000000006700011	Option 1B (Potable water Gariep - Rustfontein)
308	VAALKOP	2589	2	29°30'48.93S	26°5'19.78E	Farm Portion	F00300000000258900002	Option 1B (Potable water Gariep - Rustfontein)
309	ATLEHANG	3001	6	29°19'18.26S	26°25'50.85E	Farm Portion	F00300000000300100006	Option 1B (Potable water Gariep - Rustfontein)
310	GALIPPOLI	1548	1	29°27'43.45S	26°6'22.58E	Farm Portion	F00300000000154800001	Option 1B (Potable water Gariep - Rustfontein)
311	GALIPPOLI	1548	2	29°27'49.61S	26°6'27.94E	Farm Portion	F00300000000154800002	Option 1B (Potable water Gariep - Rustfontein)
312	KINDERSPRUIT	428	0	29°29'31.15S	26°6'4.44E	Farm Portion	F02700000000042800000	Option 1B (Potable water Gariep - Rustfontein)
313	POORTJE 365	365	0	29°30'31.54S	26°5'59.26E	Farm Portion	F02700000000036500000	Option 1B (Potable water Gariep - Rustfontein)
314	TROMPSBURG B	142	0	30°4'39.83S	25°46'59.26E	Farm Portion	F03400000000014200000	Option 1B (Potable water Gariep - Rustfontein)
315	KRAPFONTEIN	2720	11	29°27'3.93S	26°6'44.1E	Farm Portion	F00300000000272000011	Option 1B (Potable water Gariep - Rustfontein)
316	WASCHBANK	274	12	30°37'24.49S	25°29'58.72E	Farm Portion	F02600000000027400012	Option 1B (Potable water Gariep - Rustfontein)
317	BLOEMFONTEIN	20848	0	29°9'26.42S	26°9'53.85E	Erven	F00300030002084800000	Option 1B Gravity pipeline to Bloemfontein
318	BLOEMFONTEIN	20539	0	29°8'45.72S	26°9'27.74E	Erven	F00300030002053900000	Option 1B Gravity pipeline to Bloemfontein
319	BLOEMFONTEIN	20163	0	29°10'0.35S	26°10'13.83E	Erven	F00300030002016300000	Option 1B Gravity pipeline to Bloemfontein
320	BLOEMFONTEIN	20544	0	29°8'48.8S	26°9'32.05E	Erven	F00300030002054400000	Option 1B Gravity pipeline to Bloemfontein
321	BLOEMFONTEIN	20551	0	29°8'53.09S	26°9'38.06E	Erven	F00300030002055100000	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
322	BLOEMFONTEIN	20798	0	29°9'0.05S	26°9'43.52E	Erven	F00300030002079800000	Option 1B Gravity pipeline to Bloemfontein
323	BLOEMFONTEIN	21216	0	29°9'40.7S	26°10'1.76E	Erven	F00300030002121600000	Option 1B Gravity pipeline to Bloemfontein
324	BLOEMFONTEIN	21224	0	29°9'47.6S	26°10'5.52E	Erven	F00300030002122400000	Option 1B Gravity pipeline to Bloemfontein
325	BLOEMFONTEIN	20157	0	29°10'3.9S	26°10'16.81E	Erven	F00300030002015700000	Option 1B Gravity pipeline to Bloemfontein
326	BLOEMFONTEIN	20160	0	29°10'2.43S	26°10'15.2E	Erven	F00300030002016000000	Option 1B Gravity pipeline to Bloemfontein
327	BLOEMFONTEIN	21245	0	29°9'35.72S	26°9'56.87E	Erven	F00300030002124500000	Option 1B Gravity pipeline to Bloemfontein
328	BLOEMFONTEIN	20535	0	29°8'43.09S	26°9'23.98E	Erven	F00300030002053500000	Option 1B Gravity pipeline to Bloemfontein
329	BLOEMFONTEIN	20541	0	29°8'46.95S	26°9'29.46E	Erven	F00300030002054100000	Option 1B Gravity pipeline to Bloemfontein
330	BLOEMFONTEIN	20546	0	29°8'50.01S	26°9'33.75E	Erven	F00300030002054600000	Option 1B Gravity pipeline to Bloemfontein
331	BLOEMFONTEIN	21220	0	29°9'44.27S	26°10'3.22E	Erven	F00300030002122000000	Option 1B Gravity pipeline to Bloemfontein
332	BLOEMFONTEIN	21222	0	29°9'45.88S	26°10'4.28E	Erven	F00300030002122200000	Option 1B Gravity pipeline to Bloemfontein
333	BLOEMFONTEIN	20133	0	29°10'17.89S	26°10'35.09E	Erven	F00300030002013300000	Option 1B Gravity pipeline to Bloemfontein
334	BLOEMFONTEIN	20817	0	29°9'11.9S	26°9'48.32E	Erven	F00300030002081700000	Option 1B Gravity pipeline to Bloemfontein
335	BLOEMFONTEIN	20849	0	29°9'25.23S	26°9'53.7E	Erven	F00300030002084900000	Option 1B Gravity pipeline to Bloemfontein
336	BLOEMFONTEIN	20844	0	29°9'30.52S	26°9'54.62E	Erven	F00300030002084400000	Option 1B Gravity pipeline to Bloemfontein
337	BLOEMFONTEIN	20845	0	29°9'29.5S	26°9'54.43E	Erven	F00300030002084500000	Option 1B Gravity pipeline to Bloemfontein
338	BLOEMFONTEIN	20819	0	29°9'20.8S	26°9'53.86E	Erven	F00300030002081900000	Option 1B Gravity pipeline to Bloemfontein
339	BLOEMFONTEIN	20501	0	29°8'42.59S	26°9'21.73E	Erven	F00300030002050100000	Option 1B Gravity pipeline to Bloemfontein
340	BLOEMFONTEIN	20156	0	29°10'13.16S	26°10'26.83E	Erven	F00300030002015600000	Option 1B Gravity pipeline to Bloemfontein
341	BLOEMFONTEIN	20538	0	29°8'45.08S	26°9'26.84E	Erven	F00300030002053800000	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
342	BLOEMFONTEIN	20540	0	29°8'46.33S	26°9'28.6E	Erven	F00300300020540000000	Option 1B Gravity pipeline to Bloemfontein
343	BLOEMFONTEIN	20543	0	29°8'48.18S	26°9'31.19E	Erven	F00300300020543000000	Option 1B Gravity pipeline to Bloemfontein
344	BLOEMFONTEIN	20548	0	29°8'51.25S	26°9'35.49E	Erven	F00300300020548000000	Option 1B Gravity pipeline to Bloemfontein
345	BLOEMFONTEIN	20550	0	29°8'52.47S	26°9'37.21E	Erven	F00300300020550000000	Option 1B Gravity pipeline to Bloemfontein
346	BLOEMFONTEIN	20801	0	29°9'1.26S	26°9'44.14E	Erven	F00300300020801000000	Option 1B Gravity pipeline to Bloemfontein
347	BLOEMFONTEIN	21217	0	29°9'41.64S	26°10'1.35E	Erven	F00300300021217000000	Option 1B Gravity pipeline to Bloemfontein
348	BLOEMFONTEIN	20846	0	29°9'28.47S	26°9'54.24E	Erven	F00300300020846000000	Option 1B Gravity pipeline to Bloemfontein
349	BLOEMFONTEIN	20847	0	29°9'27.45S	26°9'54.04E	Erven	F00300300020847000000	Option 1B Gravity pipeline to Bloemfontein
350	BLOEMFONTEIN	20870	0	29°9'3.21S	26°9'44.45E	Erven	F00300300020870000000	Option 1B Gravity pipeline to Bloemfontein
351	BLOEMFONTEIN	20881	0	29°9'7.29S	26°9'46.27E	Erven	F00300300020881000000	Option 1B Gravity pipeline to Bloemfontein
352	BLOEMFONTEIN	20554	0	29°8'54.98S	26°9'40.71E	Erven	F00300300020554000000	Option 1B Gravity pipeline to Bloemfontein
353	BLOEMFONTEIN	20555	0	29°8'55.7S	26°9'41.72E	Erven	F00300300020555000000	Option 1B Gravity pipeline to Bloemfontein
354	BLOEMFONTEIN	20884	0	29°9'8.91S	26°9'47.16E	Erven	F00300300020884000000	Option 1B Gravity pipeline to Bloemfontein
355	BLOEMFONTEIN	20552	0	29°8'53.7S	26°9'38.92E	Erven	F00300300020552000000	Option 1B Gravity pipeline to Bloemfontein
356	BLOEMFONTEIN	20553	0	29°8'54.32S	26°9'39.78E	Erven	F00300300020553000000	Option 1B Gravity pipeline to Bloemfontein
357	BLOEMFONTEIN	21243	0	29°9'33.67S	26°9'54.63E	Erven	F00300300021243000000	Option 1B Gravity pipeline to Bloemfontein
358	BLOEMFONTEIN	21246	0	29°9'33.14S	26°10'4.57E	Erven	F00300300021246000000	Option 1B Gravity pipeline to Bloemfontein
359	BLOEMFONTEIN	20158	0	29°10'4.36S	26°10'15.91E	Erven	F00300300020158000000	Option 1B Gravity pipeline to Bloemfontein
360	BLOEMFONTEIN	20161	0	29°10'2.87S	26°10'14.3E	Erven	F00300300020161000000	Option 1B Gravity pipeline to Bloemfontein
361	BLOEMFONTEIN	20536	0	29°8'43.8S	26°9'25E	Erven	F00300300020536000000	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
362	BLOEMFONTEIN	21196	0	29°9'39.94S	26°10'0.17E	Erven	F00300300021196000000	Option 1B Gravity pipeline to Bloemfontein
363	BLOEMFONTEIN	20545	0	29°8'49.41S	26°9'32.91E	Erven	F00300300020545000000	Option 1B Gravity pipeline to Bloemfontein
364	BLOEMFONTEIN	20547	0	29°8'50.63S	26°9'34.62E	Erven	F00300300020547000000	Option 1B Gravity pipeline to Bloemfontein
365	BLOEMFONTEIN	21221	0	29°9'45.08S	26°10'3.75E	Erven	F00300300021221000000	Option 1B Gravity pipeline to Bloemfontein
366	BLOEMFONTEIN	21223	0	29°9'46.79S	26°10'4.78E	Erven	F00300300021223000000	Option 1B Gravity pipeline to Bloemfontein
367	BLOEMFONTEIN	21240	0	29°9'48.89S	26°10'6.11E	Erven	F00300300021240000000	Option 1B Gravity pipeline to Bloemfontein
368	BLOEMFONTEIN	20879	0	29°9'5.39S	26°9'46.97E	Erven	F00300300020879000000	Option 1B Gravity pipeline to Bloemfontein
369	BLOEMFONTEIN	21218	0	29°9'42.65S	26°10'2.13E	Erven	F00300300021218000000	Option 1B Gravity pipeline to Bloemfontein
370	BLOEMFONTEIN	20159	0	29°10'16.58S	26°10'26.33E	Erven	F00300300020159000000	Option 1B Gravity pipeline to Bloemfontein
371	BLOEMFONTEIN	20800	0	29°9'0.71S	26°9'45.08E	Erven	F00300300020800000000	Option 1B Gravity pipeline to Bloemfontein
372	BLOEMFONTEIN	20557	0	29°8'57.37S	26°9'43.48E	Erven	F00300300020557000000	Option 1B Gravity pipeline to Bloemfontein
373	BLOEMFONTEIN	20886	0	29°9'9.73S	26°9'48.36E	Erven	F00300300020886000000	Option 1B Gravity pipeline to Bloemfontein
374	BLOEMFONTEIN	20885	0	29°9'8.36S	26°9'48.11E	Erven	F00300300020885000000	Option 1B Gravity pipeline to Bloemfontein
375	BLOEMFONTEIN	19166	0	29°9'8.62S	26°9'49.08E	Erven	F00300300019166000000	Option 1B Gravity pipeline to Bloemfontein
376	BLOEMFONTEIN	20872	0	29°9'3.71S	26°9'46.2E	Erven	F00300300020872000000	Option 1B Gravity pipeline to Bloemfontein
377	BLOEMFONTEIN	19169	0	29°9'5.66S	26°9'47.93E	Erven	F00300300019169000000	Option 1B Gravity pipeline to Bloemfontein
378	BLOEMFONTEIN	20818	0	29°9'11.34S	26°9'49.27E	Erven	F00300300020818000000	Option 1B Gravity pipeline to Bloemfontein
379	BLOEMFONTEIN	20799	0	29°8'59.47S	26°9'44.52E	Erven	F00300300020799000000	Option 1B Gravity pipeline to Bloemfontein
380	BLOEMFONTEIN	20871	0	29°9'2.57S	26°9'45.59E	Erven	F00300300020871000000	Option 1B Gravity pipeline to Bloemfontein
381	BLOEMFONTEIN	20159	1	29°10'7.5S	26°10'18.8E	Erven	F00300300020159000001	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
382	BLOEMFONTEIN	21164	0	29°9'53.95S	26°10'8.44E	Erven	F00300030002116400000	Option 1B Gravity pipeline to Bloemfontein
383	BLOEMFONTEIN	20820	0	29°9'20.32S	26°9'55.16E	Erven	F00300030002082000000	Option 1B Gravity pipeline to Bloemfontein
384	BLOEMFONTEIN	20502	0	29°8'41.84S	26°9'22.41E	Erven	F00300030002050200000	Option 1B Gravity pipeline to Bloemfontein
385	BLOEMFONTEIN	20843	0	29°9'31.65S	26°9'54.81E	Erven	F00300030002084300000	Option 1B Gravity pipeline to Bloemfontein
386	BLOEMFONTEIN	20850	0	29°9'24.68S	26°9'52.82E	Erven	F00300030002085000000	Option 1B Gravity pipeline to Bloemfontein
387	BLOEMFONTEIN	20537	0	29°8'44.43S	26°9'25.92E	Erven	F00300030002053700000	Option 1B Gravity pipeline to Bloemfontein
388	BLOEMFONTEIN	20873	0	29°9'4.28S	26°9'45.21E	Erven	F00300030002087300000	Option 1B Gravity pipeline to Bloemfontein
389	BLOEMFONTEIN	20542	0	29°8'47.56S	26°9'30.33E	Erven	F00300030002054200000	Option 1B Gravity pipeline to Bloemfontein
390	BLOEMFONTEIN	20878	0	29°9'5.91S	26°9'46.07E	Erven	F00300030002087800000	Option 1B Gravity pipeline to Bloemfontein
391	BLOEMFONTEIN	20549	0	29°8'51.87S	26°9'36.35E	Erven	F00300030002054900000	Option 1B Gravity pipeline to Bloemfontein
392	BLOEMFONTEIN	20556	0	29°8'56.44S	26°9'42.78E	Erven	F00300030002055600000	Option 1B Gravity pipeline to Bloemfontein
393	BLOEMFONTEIN	21219	0	29°9'43.47S	26°10'2.68E	Erven	F00300030002121900000	Option 1B Gravity pipeline to Bloemfontein
394	BLOEMFONTEIN	21241	0	29°9'44.71S	26°10'2.26E	Erven	F00300030002124100000	Option 1B Gravity pipeline to Bloemfontein
395	BLOEMFONTEIN	20880	0	29°9'6.67S	26°9'47.35E	Erven	F00300030002088000000	Option 1B Gravity pipeline to Bloemfontein
396	CALEB MOTSABI	5702	0	29°13'30.37S	26°14'37.93E	Erven	F00300900000570200000	Option 1B Gravity pipeline to Bloemfontein
397	KLIPFONTEIN	716	0	29°13'23.91S	26°15'46.42E	Farm	F00300000000071600000	Option 1B Gravity pipeline to Bloemfontein
398	LIEUW KOP	105	0	29°20'18.96S	26°22'52.36E	Farm	F00300000000010500000	Option 1B Gravity pipeline to Bloemfontein
399	HALDON	894	0	29°8'30.16S	26°9'11.16E	Farm	F00300000000089400000	Option 1B Gravity pipeline to Bloemfontein
400	BLYDSCHAP	504	0	29°15'30.83S	26°18'59.28E	Farm	F00300000000050400000	Option 1B Gravity pipeline to Bloemfontein
401	GROOTVLEI	206	0	29°14'19.66S	26°17'25.87E	Farm	F00300000000020600000	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
402	RAVENSWOOD	1611	0	29°14'8.58S	26°16'14.34E	Farm	F00300000000161100000	Option 1B Gravity pipeline to Bloemfontein
403	TOCHGEKRIJ	2301	0	29°16'10.61S	26°20'37.31E	Farm	F00300000000230100000	Option 1B Gravity pipeline to Bloemfontein
404	WELGEVONDEN	112	0	29°17'39.13S	26°19'45.82E	Farm	F00300000000011200000	Option 1B Gravity pipeline to Bloemfontein
405	SYDENHAM	445	0	29°12'40.95S	26°11'43.88E	Farm	F00300000000044500000	Option 1B Gravity pipeline to Bloemfontein
406	DANIELSRUST	717	0	29°13'29.13S	26°13'20.81E	Farm	F00300000000071700000	Option 1B Gravity pipeline to Bloemfontein
407	NALISVIEW	2835	0	29°14'14.67S	26°13'50.55E	Farm	F00300000000283500000	Option 1B Gravity pipeline to Bloemfontein
408	CALEB MOTSABI	3016	0	29°12'55.23S	26°14'41.78E	Farm	F00300000000301600000	Option 1B Gravity pipeline to Bloemfontein
409	BRANDKOP	702	0	29°10'32.57S	26°9'41.93E	Farm	F00300000000070200000	Option 1B Gravity pipeline to Bloemfontein
410	KARREEFONTEIN	733	0	29°18'46.81S	26°21'33.28E	Farm	F00300000000073300000	Option 1B Gravity pipeline to Bloemfontein
411	ROCKLANDS 684	655	0	29°12'9.4S	26°12'28.7E	Farm	F00300000000065500000	Option 1B Gravity pipeline to Bloemfontein
412	MANGAUNG 3005	656	0	29°12'29.59S	26°13'7.18E	Farm	F00300000000065600000	Option 1B Gravity pipeline to Bloemfontein
413	BLOEMFONTEIN	654	0	29°7'34.31S	26°12'3.59E	Farm	F00300000000065400000	Option 1B Gravity pipeline to Bloemfontein
414	WELGEVONDEN	112	2	29°18'6.6S	26°19'42.72E	Farm Portion	F00300000000011200002	Option 1B Gravity pipeline to Bloemfontein
415	WELGEVONDEN	112	0	29°17'49.5S	26°18'20.58E	Farm Portion	F00300000000011200000	Option 1B Gravity pipeline to Bloemfontein
416	RAVENSWOOD	1611	0	29°14'6.92S	26°16'19.69E	Farm Portion	F00300000000161100000	Option 1B Gravity pipeline to Bloemfontein
417	GROOTVLEI	206	0	29°14'18.25S	26°17'30.75E	Farm Portion	F00300000000020600000	Option 1B Gravity pipeline to Bloemfontein
418	TOCHGEKRIJ	2301	0	29°16'11.22S	26°20'41.4E	Farm Portion	F00300000000230100000	Option 1B Gravity pipeline to Bloemfontein
419	BLOEMFONTEIN	654	241	29°8'40.05S	26°9'22.55E	Farm Portion	F00300000000065400241	Option 1B Gravity pipeline to Bloemfontein
420	SYDENHAM	445	0	29°12'9.27S	26°12'0.91E	Farm Portion	F00300000000044500000	Option 1B Gravity pipeline to Bloemfontein
421	BLOEMFONTEIN	654	267	29°9'57.59S	26°10'28.8E	Farm Portion	F00300000000065400267	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
422	BLOEMFONTEIN	654	262	29°9'0.42S	26°9'58.36E	Farm Portion	F00300000000065400262	Option 1B Gravity pipeline to Bloemfontein
423	BLYDSCHAP	504	0	29°15'37.25S	26°18'57.92E	Farm Portion	F00300000000050400000	Option 1B Gravity pipeline to Bloemfontein
424	BLOEMFONTEIN	654	269	29°8'47.32S	26°9'37.79E	Farm Portion	F00300000000065400269	Option 1B Gravity pipeline to Bloemfontein
425	LIEUW KOP	105	0	29°20'19.87S	26°22'51.35E	Farm Portion	F00300000000010500000	Option 1B Gravity pipeline to Bloemfontein
426	HALDON	894	1	29°8'39.24S	26°9'14.45E	Farm Portion	F00300000000089400001	Option 1B Gravity pipeline to Bloemfontein
427	BLOEMFONTEIN	654	0	29°11'9.8S	26°11'22.66E	Farm Portion	F00300000000065400000	Option 1B Gravity pipeline to Bloemfontein
428	ROCKLANDS 684	684	2	29°12'23.86S	26°12'39.81E	Farm Portion	F00300000000068400002	Option 1B Gravity pipeline to Bloemfontein
429	KLIPFONTEIN	716	0	29°13'32.19S	26°15'28.45E	Farm Portion	F00300000000071600000	Option 1B Gravity pipeline to Bloemfontein
430	BRANDKOP	702	0	29°10'11.72S	26°9'3.61E	Farm Portion	F00300000000070200000	Option 1B Gravity pipeline to Bloemfontein
431	ROCKLANDS 684	684	10	29°12'33.8S	26°12'39.55E	Farm Portion	F00300000000068400010	Option 1B Gravity pipeline to Bloemfontein
432	RE/3005 (associated with Mangaung)	3005	0	29°12'36.48S	26°13'7.13E	Farm Portion	F00300000000300500000	Option 1B Gravity pipeline to Bloemfontein
433	BLOEMFONTEIN	654	321	29°10'40.48S	26°11'2.1E	Farm Portion	F00300000000065400321	Option 1B Gravity pipeline to Bloemfontein
434	SYDENHAM	445	6	29°12'19.99S	26°12'10.72E	Farm Portion	F00300000000044500006	Option 1B Gravity pipeline to Bloemfontein
435	BLOEMFONTEIN	654	371	29°9'56.6S	26°10'51.57E	Farm Portion	F00300000000065400371	Option 1B Gravity pipeline to Bloemfontein
436	NALISVIEW	2835	1	29°13'59.92S	26°13'48.77E	Farm Portion	F00300000000283500001	Option 1B Gravity pipeline to Bloemfontein
437	BLOEMFONTEIN	654	0	29°7'29.68S	26°12'39.84E	Farm Portion	F00300000000065400000	Option 1B Gravity pipeline to Bloemfontein
438	BLOEMFONTEIN	654	238	29°10'24.94S	26°10'39.04E	Farm Portion	F00300000000065400238	Option 1B Gravity pipeline to Bloemfontein
439	BLOEMFONTEIN	654	441	29°11'0.22S	26°11'42.46E	Farm Portion	F00300000000065400441	Option 1B Gravity pipeline to Bloemfontein
440	WELGEVONDEN	112	3	29°16'39.12S	26°20'34.71E	Farm Portion	F00300000000011200003	Option 1B Gravity pipeline to Bloemfontein
441	ROCKLANDS 684	684	1	29°12'0.52S	26°12'30.57E	Farm Portion	F00300000000068400001	Option 1B Gravity pipeline to Bloemfontein

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
442	KARREEFONTEIN	733	0	29°18'48.3S	26°21'37.91E	Farm Portion	F00300000000073300000	Option 1B Gravity pipeline to Bloemfontein
443	DANIELSRUST	717	0	29°13'29.03S	26°13'26.58E	Farm Portion	F00300000000071700000	Option 1B Gravity pipeline to Bloemfontein
444	CALEB MOTSABI	3016	5	29°13'20.6S	26°14'38.87E	Farm Portion	F00300000000301600005	Option 1B Gravity pipeline to Bloemfontein
445	BLOEMFONTEIN	654	277	29°9'27.12S	26°9'59.26E	Farm Portion	F00300000000065400277	Option 1B Gravity pipeline to Bloemfontein
446	ROCKLANDS 684	684	9	29°12'26.14S	26°12'57.51E	Farm Portion	F00300000000068400009	Option 1B Gravity pipeline to Bloemfontein
447	ROCKLANDS AGRICULTURAL PLOTS	4	0	29°12'14.53S	26°12'30.61E	Agri Holding	F00300720000000400000	Option 1B Gravity pipeline to Bloemfontein
448	BLOEMFONTEIN	21165	0	29°9'54.13S	26°10'7.96E	Public Place	F00300030002116500000	Option 1B Gravity pipeline to Bloemfontein
449	BLOEMFONTEIN	20854	0	29°9'18.05S	26°9'47.91E	Public Place	F00300030002085400000	Option 1B Gravity pipeline to Bloemfontein
450	BLOEMFONTEIN	21244	0	29°9'35.46S	26°9'55.99E	Public Place	F00300030002124400000	Option 1B Gravity pipeline to Bloemfontein
451	BLOEMFONTEIN	21242	0	29°9'44.91S	26°10'1.78E	Public Place	F00300030002124200000	Option 1B Gravity pipeline to Bloemfontein
452	BLOEMFONTEIN	20162	0	29°10'1.07S	26°10'12.63E	Public Place	F00300030002016200000	Option 1B Gravity pipeline to Bloemfontein
453	BLOEMFONTEIN	654	0	29°7'34.31S	26°12'3.59E	Farm	F00300000000065400000	Welbedacht to Longridge pipeline
454	BLOEMFONTEIN	654	441	29°11'0.22S	26°11'42.46E	Farm Portion	F00300000000065400441	Welbedacht to Longridge pipeline
455	BLOEMFONTEIN	654	0	29°7'29.68S	26°12'39.84E	Farm Portion	F00300000000065400000	Welbedacht to Longridge pipeline
456	ATLEHANG	3001	0	29°20'30.33S	26°25'18.64E	Farm	F00300000000300100000	Option 1B reservoirs and roads
457	LIEUW KOP	105	0	29°20'18.96S	26°22'52.36E	Farm	F00300000000010500000	Option 1B reservoirs and roads
458	CICILIA	1641	0	29°21'12.75S	26°23'48.6E	Farm	F00300000000164100000	Option 1B reservoirs and roads
459	KARREEFONTEIN	733	0	29°18'46.81S	26°21'33.28E	Farm	F00300000000073300000	Option 1B reservoirs and roads
460	NIEUW KARREEFONTEIN	945	0	29°17'39.63S	26°24'10.09E	Farm	F00300000000094500000	Option 1B reservoirs and roads
461	LOVEDALE	1888	0	29°18'5.77S	26°23'8.46E	Farm	F00300000000188800000	Option 1B reservoirs and roads
462	VAALPLAAT	2237	0	29°22'5.81S	26°23'4.72E	Farm	F00300000000223700000	Option 1B reservoirs and roads
463	DE HEK	296	0	29°18'18.31S	26°24'56.11E	Farm	F00300000000029600000	Option 1B reservoirs and roads
464	ATLEHANG	3001	6	29°19'18.26S	26°25'50.85E	Farm Portion	F00300000000300100006	Option 1B reservoirs and roads
465	ATLEHANG	3001	24	29°20'46.96S	26°24'32.84E	Farm Portion	F00300000000300100024	Option 1B reservoirs and roads

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
466	LIEUW KOP	105	0	29°20'19.87S	26°22'51.35E	Farm Portion	F00300000000010500000	Option 1B reservoirs and roads
467	CICILIA	1641	1	29°21'3.28S	26°23'51.9E	Farm Portion	F00300000000164100001	Option 1B reservoirs and roads
468	ATLEHANG	3001	8	29°19'41.9S	26°25'16.45E	Farm Portion	F00300000000300100008	Option 1B reservoirs and roads
469	CICILIA	1641	2	29°21'15.1S	26°23'50.87E	Farm Portion	F00300000000164100002	Option 1B reservoirs and roads
470	ATLEHANG	3001	0	29°19'46.02S	26°25'51.67E	Farm Portion	F00300000000300100000	Option 1B reservoirs and roads
471	VAALPLAAT	2237	0	29°22'5.81S	26°23'4.72E	Farm Portion	F00300000000223700000	Option 1B reservoirs and roads
472	ATLEHANG	3001	20	29°20'10.56S	26°25'27.13E	Farm Portion	F00300000000300100020	Option 1B reservoirs and roads
473	NIEUW KARREEFONTEIN	945	0	29°17'39.63S	26°24'10.09E	Farm Portion	F00300000000094500000	Option 1B reservoirs and roads
474	ATLEHANG	3001	12	29°19'50.11S	26°26'19.26E	Farm Portion	F00300000000300100012	Option 1B reservoirs and roads
475	LOVEDALE	1888	0	29°18'7.29S	26°23'12.65E	Farm Portion	F00300000000188800000	Option 1B reservoirs and roads
476	DE HEK	296	0	29°18'18.31S	26°24'56.11E	Farm Portion	F00300000000029600000	Option 1B reservoirs and roads
477	ATLEHANG	3001	18	29°20'52.73S	26°25'29.06E	Farm Portion	F00300000000300100018	Option 1B reservoirs and roads
478	ATLEHANG	3001	16	29°20'14.19S	26°26'1.67E	Farm Portion	F00300000000300100016	Option 1B reservoirs and roads
479	ATLEHANG	3001	23	29°20'34.82S	26°25'9.38E	Farm Portion	F00300000000300100023	Option 1B reservoirs and roads
480	ATLEHANG	3001	21	29°20'10.36S	26°25'2.48E	Farm Portion	F00300000000300100021	Option 1B reservoirs and roads
481	ATLEHANG	3001	1	29°18'38.35S	26°24'57.96E	Farm Portion	F00300000000300100001	Option 1B reservoirs and roads
482	ATLEHANG	3001	7	29°18'59.48S	26°24'36.39E	Farm Portion	F00300000000300100007	Option 1B reservoirs and roads
483	ATLEHANG	3001	22	29°20'19.7S	26°25'4.84E	Farm Portion	F00300000000300100022	Option 1B reservoirs and roads
484	ATLEHANG	3001	2	29°18'58.2S	26°25'18.73E	Farm Portion	F00300000000300100002	Option 1B reservoirs and roads
485	ATLEHANG	3001	9	29°19'44.33S	26°25'48.22E	Farm Portion	F00300000000300100009	Option 1B reservoirs and roads
486	KARREEFONTEIN	733	0	29°18'48.3S	26°21'37.91E	Farm Portion	F00300000000073300000	Option 1B reservoirs and roads
487	UITHOEK	108	0	29°31'31.76S	26°5'24.93E	Farm	F02700000000010800000	Booster pump station 1B
488	VAALKOP	2589	0	29°29'53.88S	26°4'7.16E	Farm	F00300000000258900000	Booster pump station 1B
489	UITHOEK	108	0	29°31'32.46S	26°5'25.35E	Farm Portion	F02700000000010800000	Booster pump station 1B
490	VAALKOP	2589	0	29°30'14.84S	26°4'47.68E	Farm Portion	F00300000000258900000	Booster pump station 1B
491	VAALKOP	2589	2	29°30'48.93S	26°5'19.78E	Farm Portion	F00300000000258900002	Booster pump station 1B
492	VAALKOP	2589	1	29°30'44.74S	26°5'12.2E	Farm Portion	F00300000000258900001	Booster pump station 1B
493	H.F VERWOERDDAM	523	0	30°35'58.59S	25°29'0.02E	Farm	F02600000000052300000	Low Lift pump station
494	WASCHBANK	274	0	30°37'25.03S	25°29'29.42E	Farm	F02600000000027400000	Low Lift pump station

No	Farm Name	Farm/Erf No	Portion	Latitude	Longitude	Property Type	SG Code	Infrastructure
495	WASCHBANK	274	9	30°37'35.07S	25°29'12E	Farm Portion	F02600000000027400009	Low Lift pump station
496	WASCHBANK	274	8	30°37'34.63S	25°29'5.12E	Farm Portion	F02600000000027400008	Low Lift pump station
497	H.F VERWOERDDAM	523	0	30°35'25.28S	25°28'46.69E	Farm Portion	F02600000000052300000	Low Lift pump station
498	WASCHBANK	274	1	30°37'25.87S	25°29'27.27E	Farm Portion	F02600000000027400001	Low Lift pump station
499	SPRINGFONTEIN TOWNLAND B	495	0	30°14'55.64S	25°42'10.5E	Farm	F00200000000049500000	Reservoir Site 1B
500	VILJOENSDAM	498	0	30°14'53.32S	25°44'22.37E	Farm	F00200000000049800000	Reservoir Site 1B
501	SPRINGFONTEIN TOWNLAND B	495	3	30°15'19.84S	25°43'43.11E	Farm Portion	F00200000000049500003	Reservoir Site 1B
502	VILJOENSDAM	498	0	30°14'50.02S	25°44'41.06E	Farm Portion	F00200000000049800000	Reservoir Site 1B
503	SPRINGFONTEIN TOWNLAND B	495	0	30°15'18.83S	25°43'52.89E	Farm Portion	F00200000000049500000	Reservoir Site 1B
504	VILJOENSDAM	498	1	30°14'44.64S	25°43'32.09E	Farm Portion	F00200000000049800001	Reservoir Site 1B
505	DONKERPOORT SCHOOLSITE 472	1	0	30°31'40.51S	25°29'42.52E	Farm	F02600000000000100000	WTW 1B
506	INHOEK	495	0	30°31'38.15S	25°30'15.57E	Farm	F02600000000049500000	WTW 1B
507	DONKERPOORT STATION 53	2	0	30°31'50.06S	25°29'46.31E	Farm	F02600000000000200000	WTW 1B
508	INHOEK	495	1	30°32'32.19S	25°31'49.22E	Farm Portion	F02600000000049500001	WTW 1B
509	INHOEK	495	4	30°32'50.41S	25°29'57.34E	Farm Portion	F02600000000049500004	WTW 1B
510	INHOEK	495	3	30°32'9.31S	25°31'26.92E	Farm Portion	F02600000000049500003	WTW 1B
511	INHOEK	495	0	30°33'15.91S	25°30'26.45E	Farm Portion	F02600000000049500000	WTW 1B
512	INHOEK	495	0	30°32'24.21S	25°29'55.2E	Farm Portion	F02600000000049500000	WTW 1B
513	INHOEK	495	1	30°31'1.4S	25°30'37.92E	Farm Portion	F02600000000049500001	WTW 1B

- **Landowner engagement**

Three (3) landowner engagements were conducted during the Basic Assessment (BA) process as indicated in Table 2 below. Landowner engagements were not limited to the three engagements, landowners were given an opportunity to engage and comment on the project during the 30-day Public Participation Process (PPP) for the BA and the 60-days PPP for the WULA.

Table 2: Landowner engagements

Engagement Meeting with landowners	Notification of landowners, occupiers, and other key I&APs.	Affected landowners, legal occupiers, and key I&APs were notified via email, fax, and/or SMS.	2 June 2024
	Engagement meetings	• Gariep Dam: 08:30 to 10:30: Venue: de Stijl Gariep Hotel, 2 Aasvoel Street • Trompsburg: 12:30 to 15:00: Venue: Trompsburg Primary School (Kuier & Klets Sentrum), 392 Wessels Street • Bloemfontein: 18:00 to 20:30: Venue: Protea Hotel by Marriott Bloemfontein Willow Lake, 101 Henry Street, Willows	11 June 2024

5. Administrative documents and technical reports submitted by applicants

5.1 Administrative documents

The following administrative documents will be submitted as part of the application:

- Proof of Payment of Water Use Licence Application Processing Fee.
- Copy of Identity Document of Application/Delegated Person.
- Appointment Letter for Zutari (Pty) Ltd to lodge the WULA application on behalf of the applicant.
- Title Deeds and/or Lease Agreements.

5.2 Reports and other technical documents

Table 3 below lists all the technical documents relevant to the application as per WULA Regulation.

Table 3: List of reports and other technical documents

Number	Report Title	Specialists	
1	Wetland Assessment and Risk Assessment	Darius van Rensburg	DPR Ecologists & Environmental Services
2	Aquatic Assessment	Darius van Rensburg	DPR Ecologists & Environmental Services
3	Aquatic Impact Assessment (Biodiversity)	Johannes Oren Maree	Setala Environmental (Pty) Ltd
4	Section 27 Motivation Report (included in this report)	Roshantha Kolapen Tiisetso Margaret Phiri	Zutari (Pty) Ltd
5	Public Participation Report	Roshantha Kolapen Tiisetso Margaret Phiri	Zutari (Pty) Ltd
6	Geotechnical Desktop Study	Elaine du Plooy	Zutari (Pty) Ltd

Number	Report Title	Specialists	
7	Pipeline, Pump Station and Reservoir Design*	Stephan Kleyhans	Zutari (Pty) Ltd
8	Water Treatment Works Design*	Tony Ceronio	Zutari (Pty) Ltd

Detailed design studies were not completed yet at the completion of this report. These studies will form part of the final submission to the DWS

6. Project Description

The potable water pipeline will be approximately 244 km with a minimum internal diameter of approximately 1400 mm, and a maximum of 2000 mm. The expected flow will be a maximum of 3.6 m³/s (≈3.8kl/s) in the potable pipelines. A 100 m wide corridor has been evaluated for the proposed pipeline routes. The construction corridor is likely to be 40 m wide with a final servitude width of 15 m to be registered.
The sizing and capacity of the various components are shown in Table 4. The total footprint is estimated to be 10,490,200 m² (1,049 ha), excluding the pipelines that has an estimated total footprint of 695,000 m² (70 ha).

Table 4: Sizing and capacity of the proposed infrastructure for Scheme

Component	Capacity (m³/s)	Capacity (Mℓ/d)	Estimated Footprint (m²)
Xhariep Raw Water Pump Station	3.8	328.1	10,000
Xhariep WTW	-	312	600,000
Xhariep High Lift Pump Station	3.62	312.4	(included in WTW above)
Command Reservoir (2 sites)	-	80 Mℓ	37,000 per site
Booster Pump Station and Suction Reservoir	3.62	312.4	10,000
Xhariep Raw Water Pipeline (12.1km, 1800 Ø)	3.8	328.1	484,000
Xhariep Potable Pipeline (188.99 km, 1800 Ø)	3.62	312.4	7,559,600
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

6.1 Xhariep Raw Water Pump Station

The proposed raw water (low-lift) pump station will be located close to the existing Gariep WTW and connect into one of the existing 2.1m Ø pipelines from the Gariep Dam wall as indicated in Figure 5 and Figure 6. The raw water would then be pumped to a new WTW. The site information[1] is summarised in Table 5 below and photos of the site are shown in Table 6.

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

Parameter	Information
Geometry Identifier	1612110
Parcel Type	Farm Portion
Farm Name	Waschbank No. 274
Parcel Number	1/274
Province Name	Free State
Major Region	Phillippolis
Major Code	F0260000

[1] All site information in the subsequent tables have been obtained for Chief Surveyor General website: https://csggis.drdlr.gov.za/psv/

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

- Topography is suitable.
- Overhead powerlines are in close proximity to the site.
- Site is accessible from existing roads.

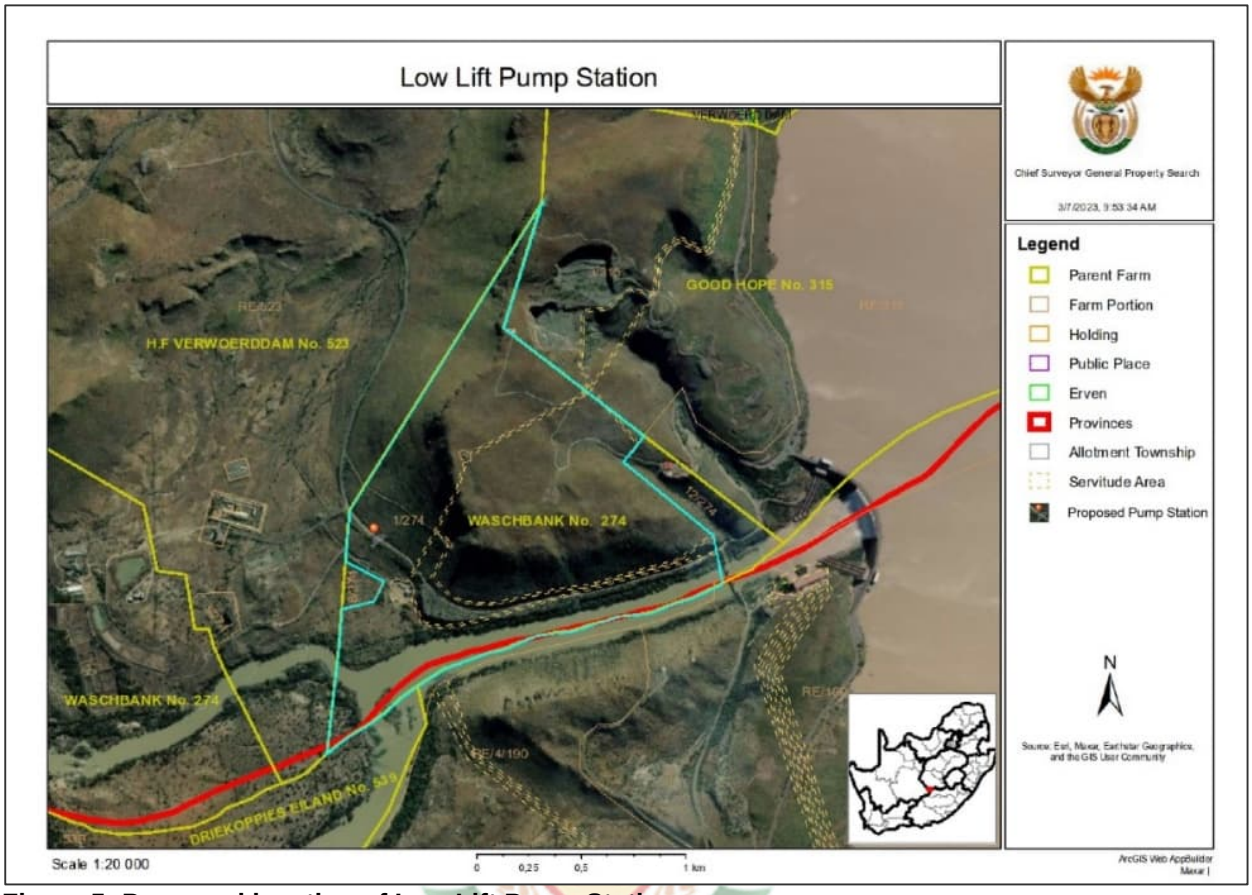


Figure 5: Proposed location of Low Lift Pump Station

Table 6: Pictures of proposed Raw Water Pump Station site

 Existing Gariep WTP	 Southern end of potential site



Middle of potential site



Alternative site at existing structure

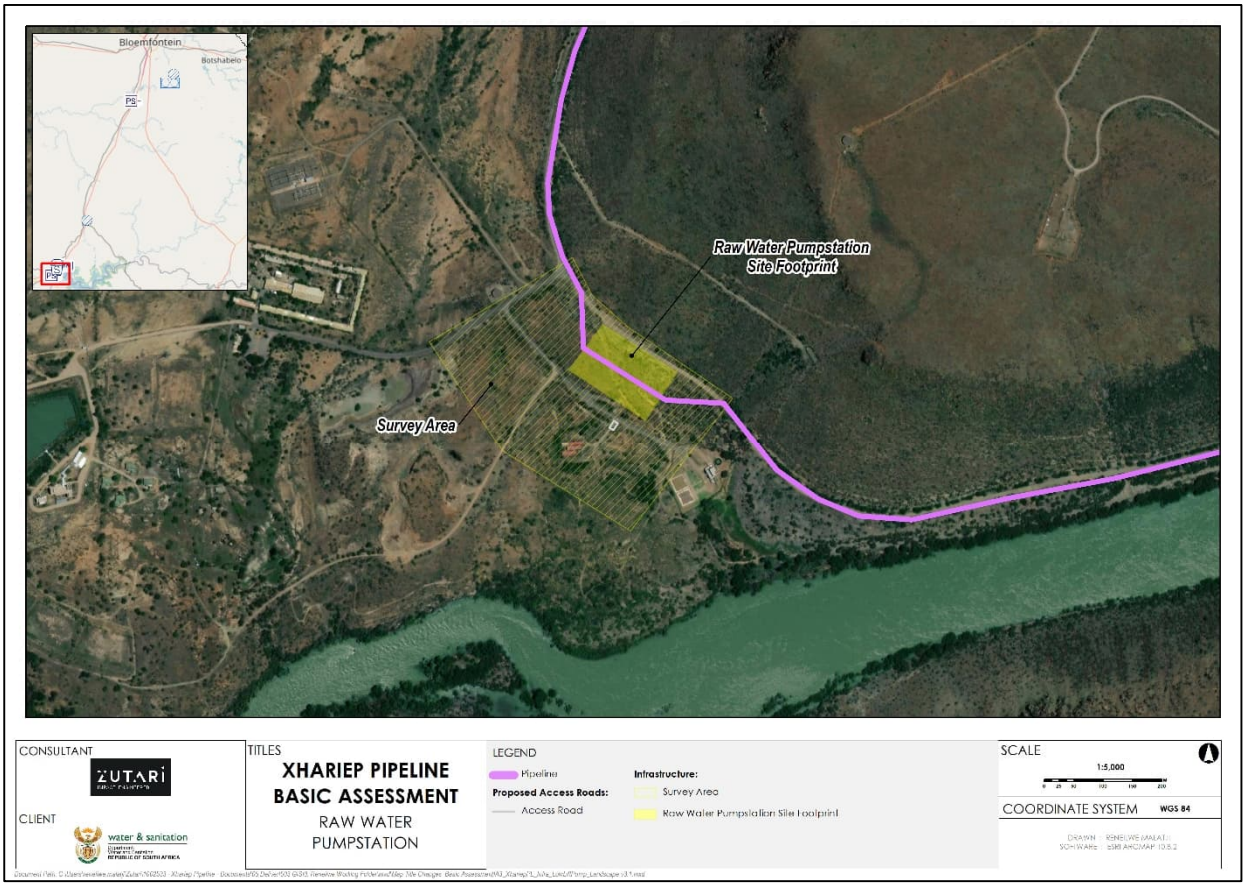


Figure 6: Layout and access for the proposed Raw Water Pump Station

6.2 Xhariep Water Treatment Works with Sludge Lagoons and High Lift Pump Station

The proposed WTW would receive raw water from the low lift pump station and is located approximately 10 km from the low lift pump station (refer to Figure 7 and Figure 8 for proposed location of WTW and High Lift Pump Station). The site information is summarised in Table 7 and photos of the site are presented in Table 8.

Table 7: 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 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.
- The site is located a long way from any watercourse and sludge lagoons would be required.
- Overhead powerlines are near the site, which must be considered in the positioning of the water treatment works.
- All hazardous chemicals (hydrocarbons) will be stored in concrete/brick rooms with a permanent roof structure. These rooms will be integrated into the WTW building.



Figure 7: Proposed location of WTW, sludge lagoons, and High Lift Pump Station

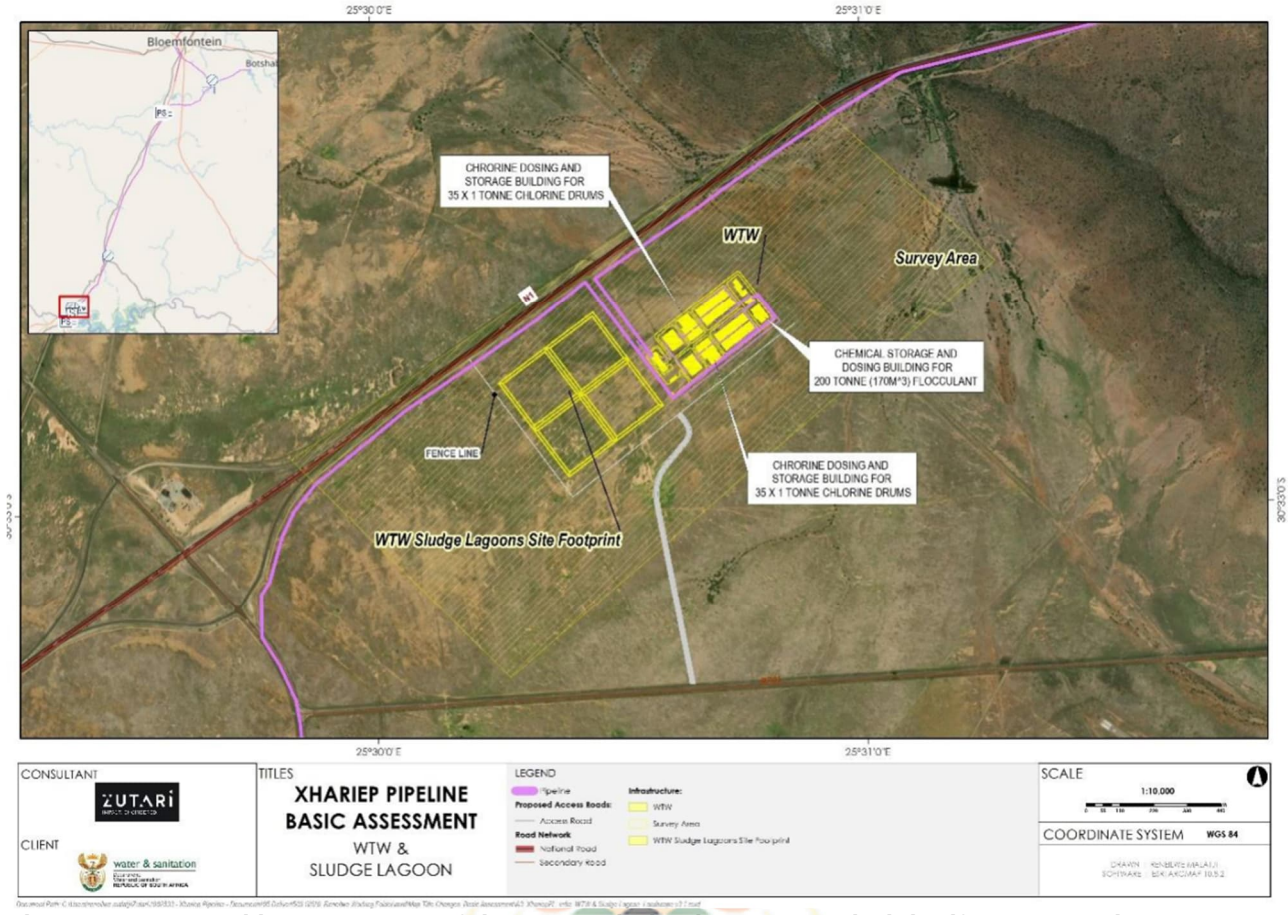


Figure 8: Proposed layout access of the WTW, sludge lagoons, and High Lift Pump Station

Table 8: Pictures of proposed WTW 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

6.3 Command Reservoir No 1

The proposed Command Reservoir No 1 will provide balancing capacity and supply the booster pump station. The Command Reservoir No 1 will be required in the vicinity of Springfontein (refer to Figure 9 for proposed location). The site information is summarised in Table 9 and photos of the site are presented in Table 10.

Figure 10 and Figure 11 indicates the proposed layout and access.

Table 9: 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 (opposite the Springfontein turn-off) highway towards the Dam and then from the existing gravel road to the reservoir site.

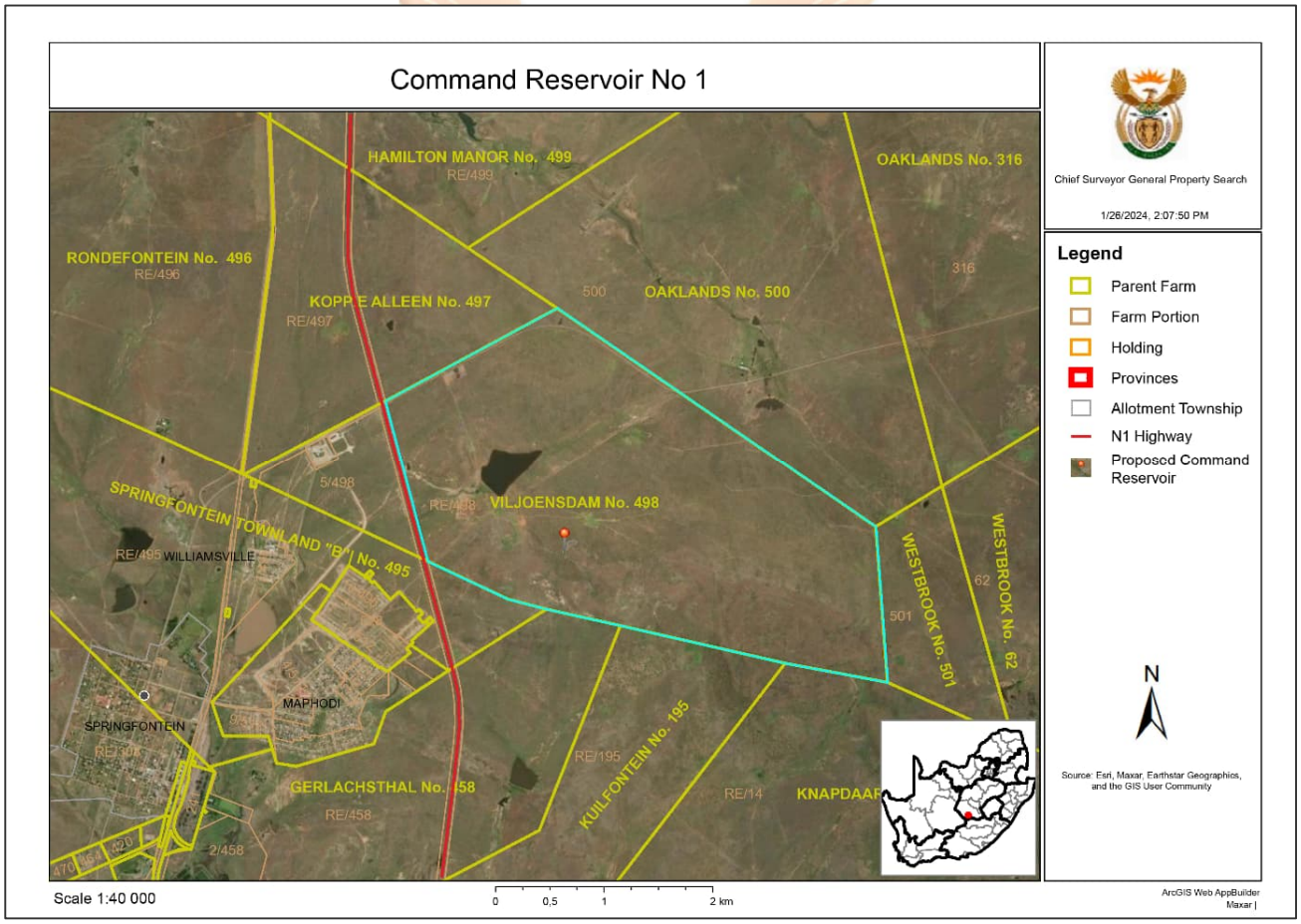


Figure 9: Proposed location of Command Reservoir No 1

Table 10: Pictures of proposed command reservoir site

 Site located before truck stop and Springfontein (site located to east)	 Middle of potential site, facing north
 Western end of potential site	 Eastern end of potential site

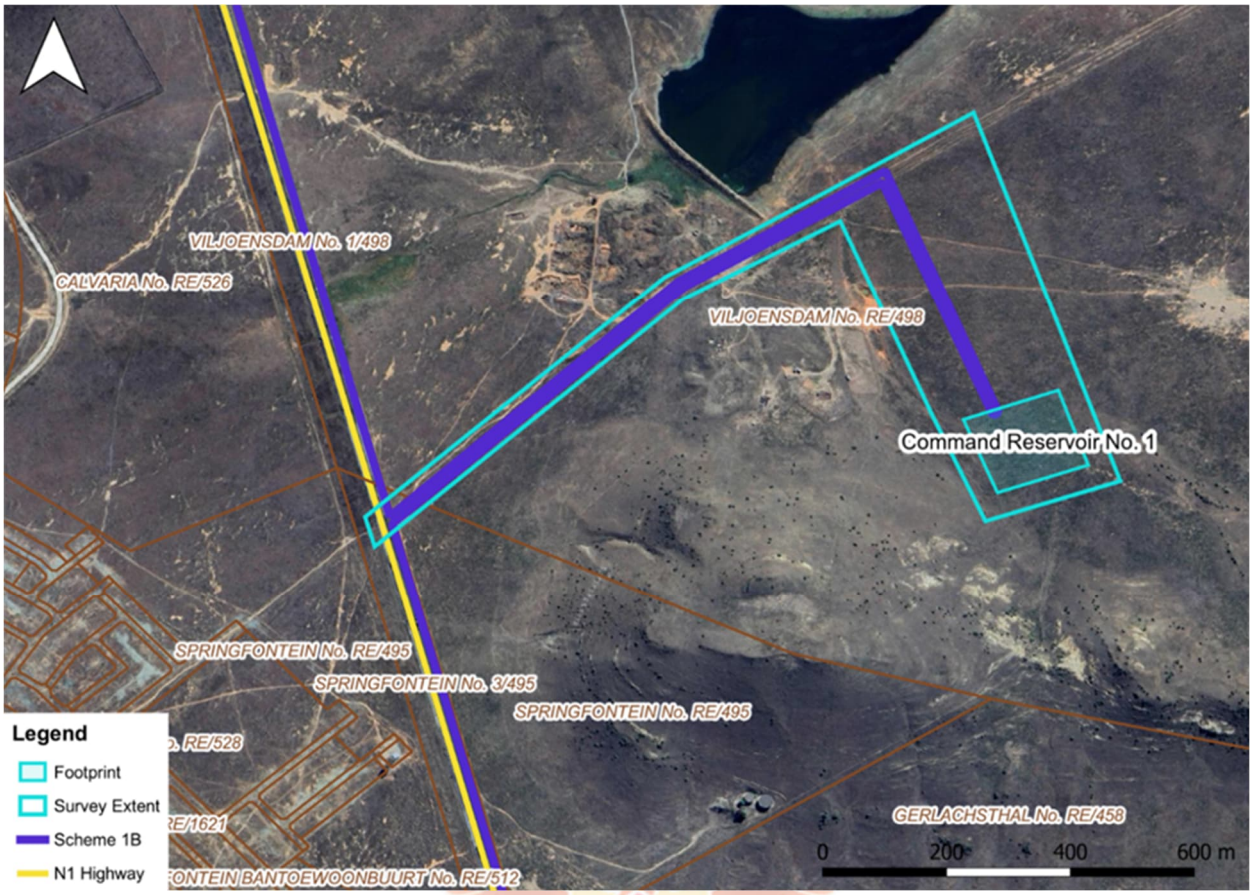


Figure 10: Layout of the proposed command reservoir no. 1

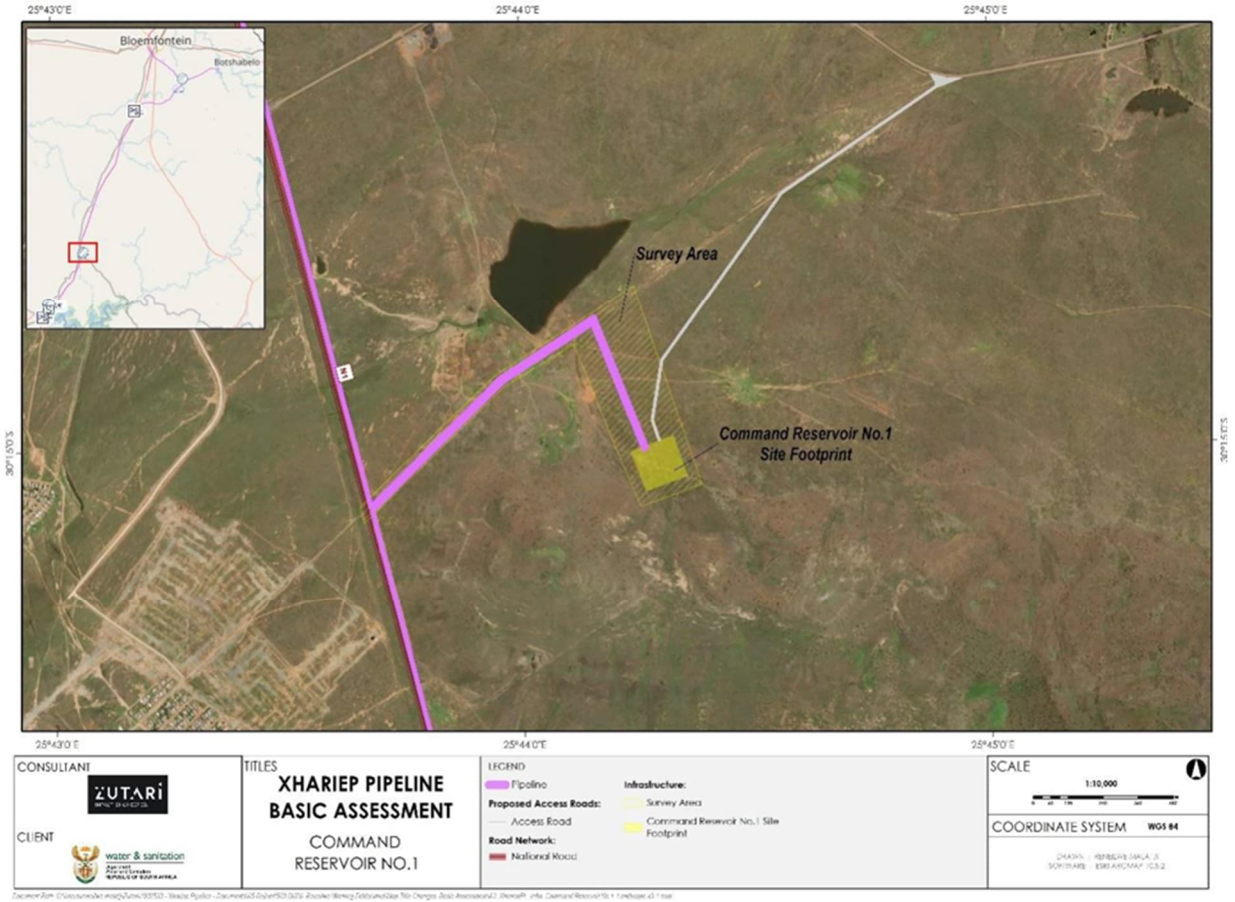


Figure 11: Layout and access of the proposed Command Reservoir No 1

6.4 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 12 for the proposed location). The site information is summarised in Table 11, Figure 13 indicates the photo and Figure 14 indicates the proposed layout and access.

Table 11: Summary of land information for proposed booster pump station site

Parameter	Information
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

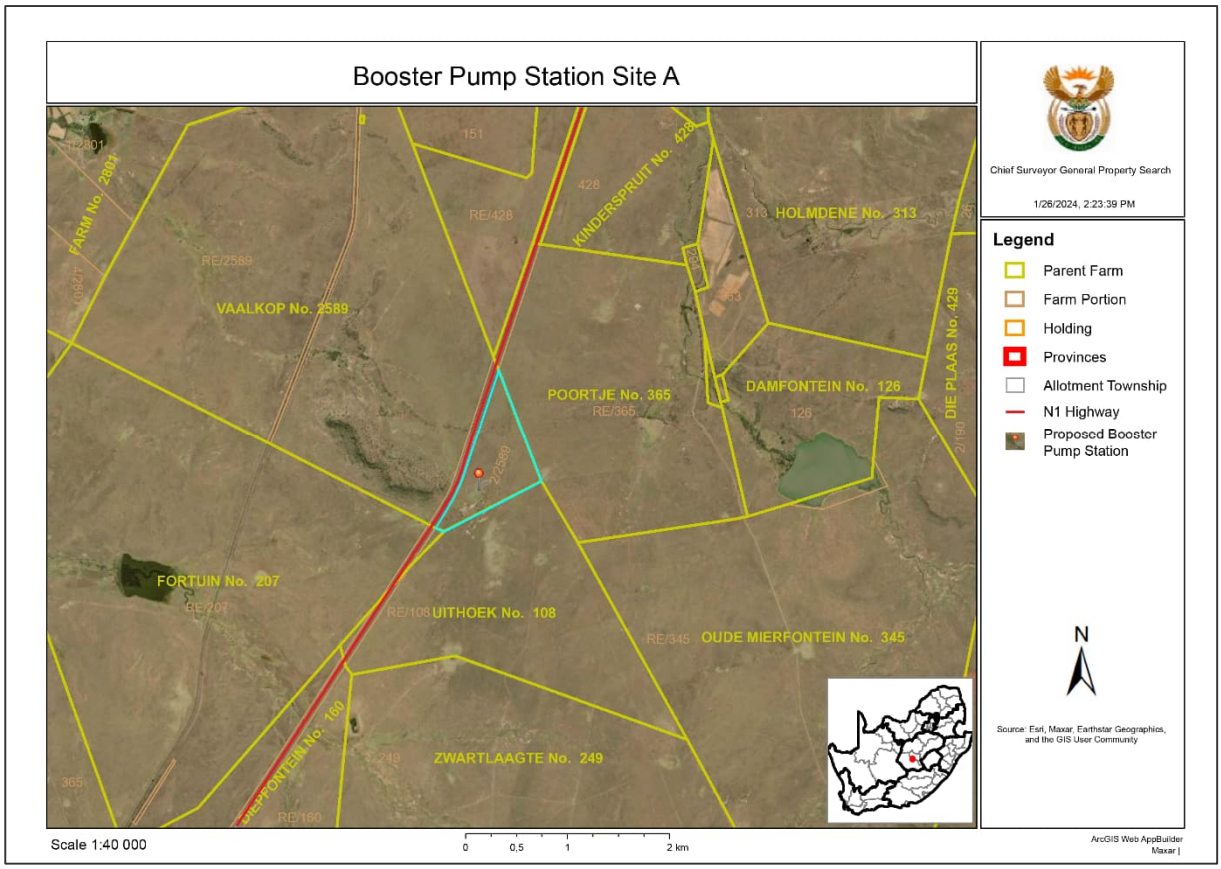


Figure 12: Proposed location booster pump station with suction reservoir



Figure 13: Photo of proposed site for booster pump station

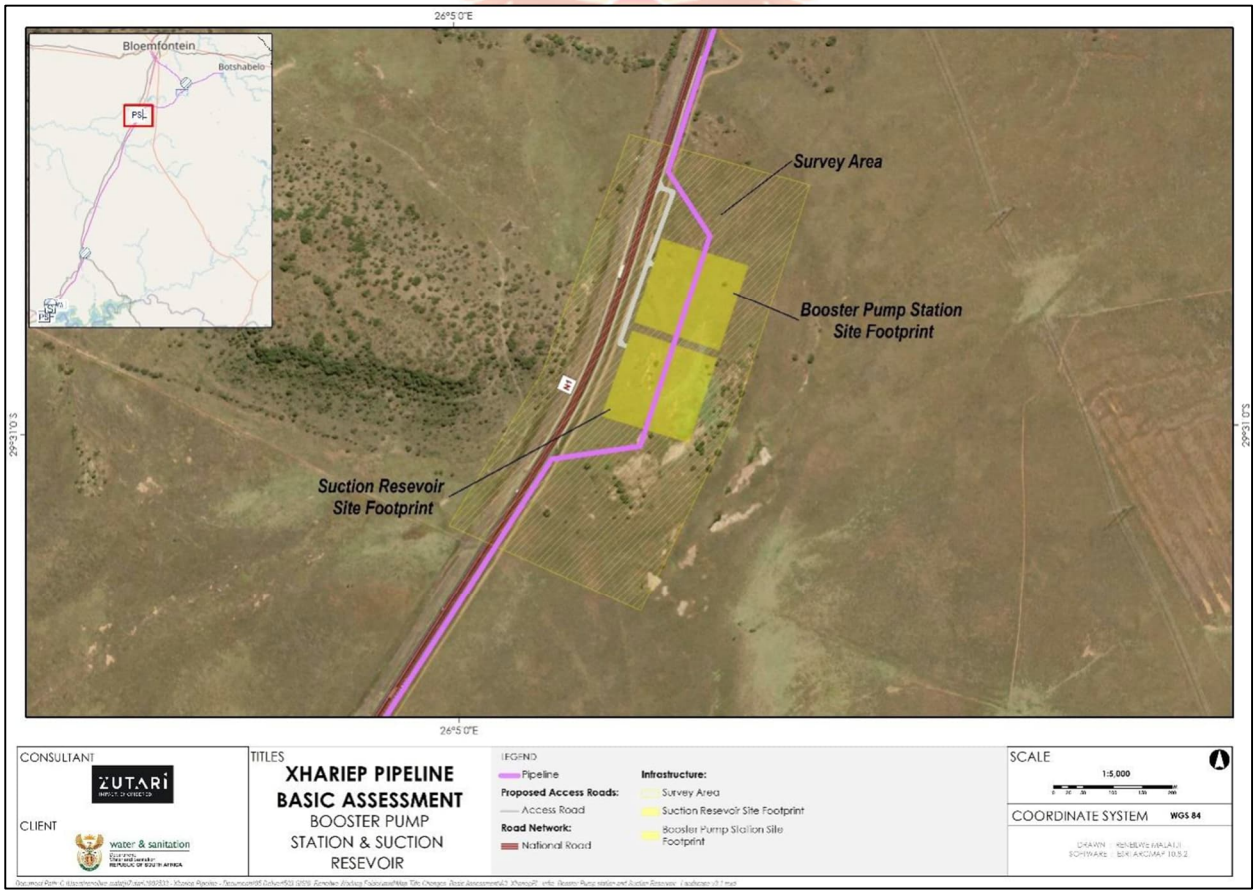


Figure 14: Proposed layout for booster pump station with suction reservoir

6.5 Command Reservoir No 2

The proposed second command reservoir would gravity feed to Rustfontein WTW and Longridge Reservoir in Bloemfontein. The site information is summarised in Table 12.

Refer to Figure 15 for proposed location, Figure 16 for a site photo and Figure 17 for the proposed layout and access.

Table 12: 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

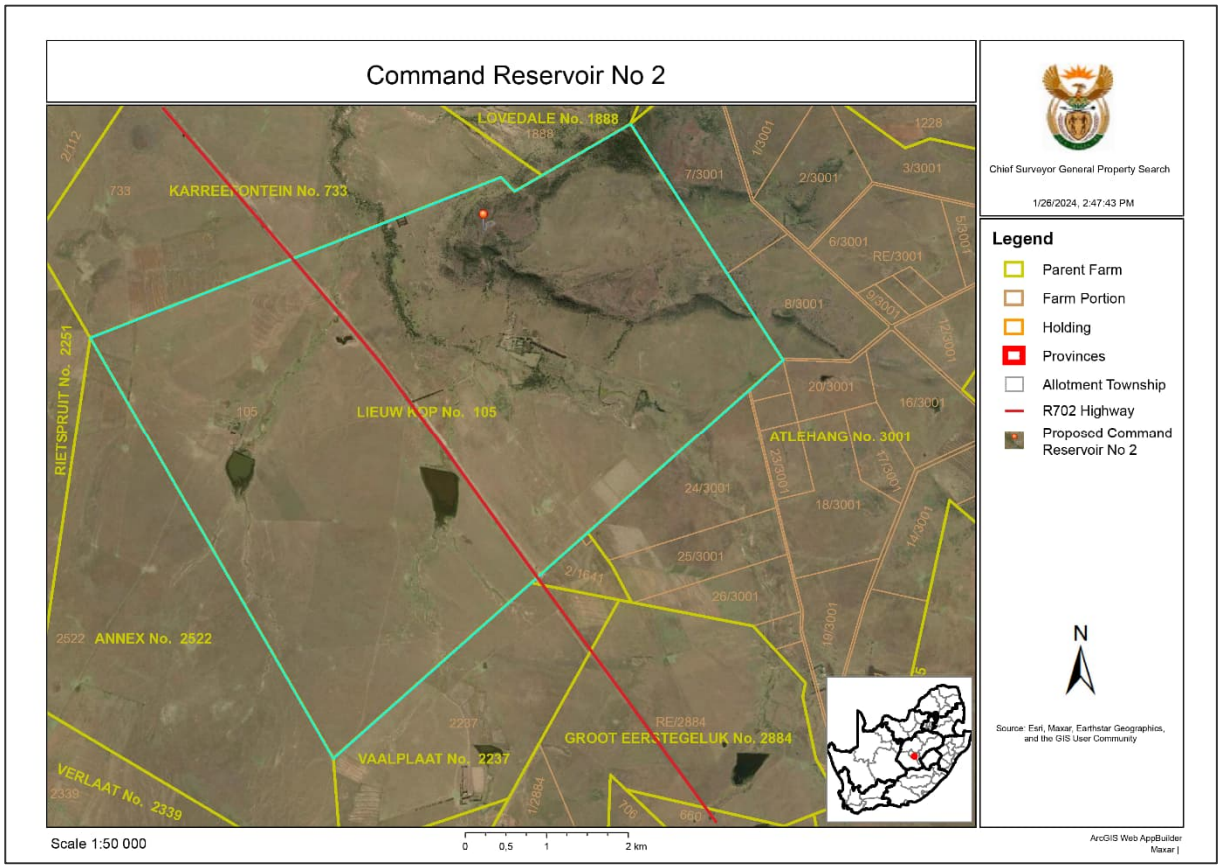


Figure 15: Proposed location of proposed 2nd command reservoir



Figure 16: Photo of the proposed site for the 2nd command reservoir

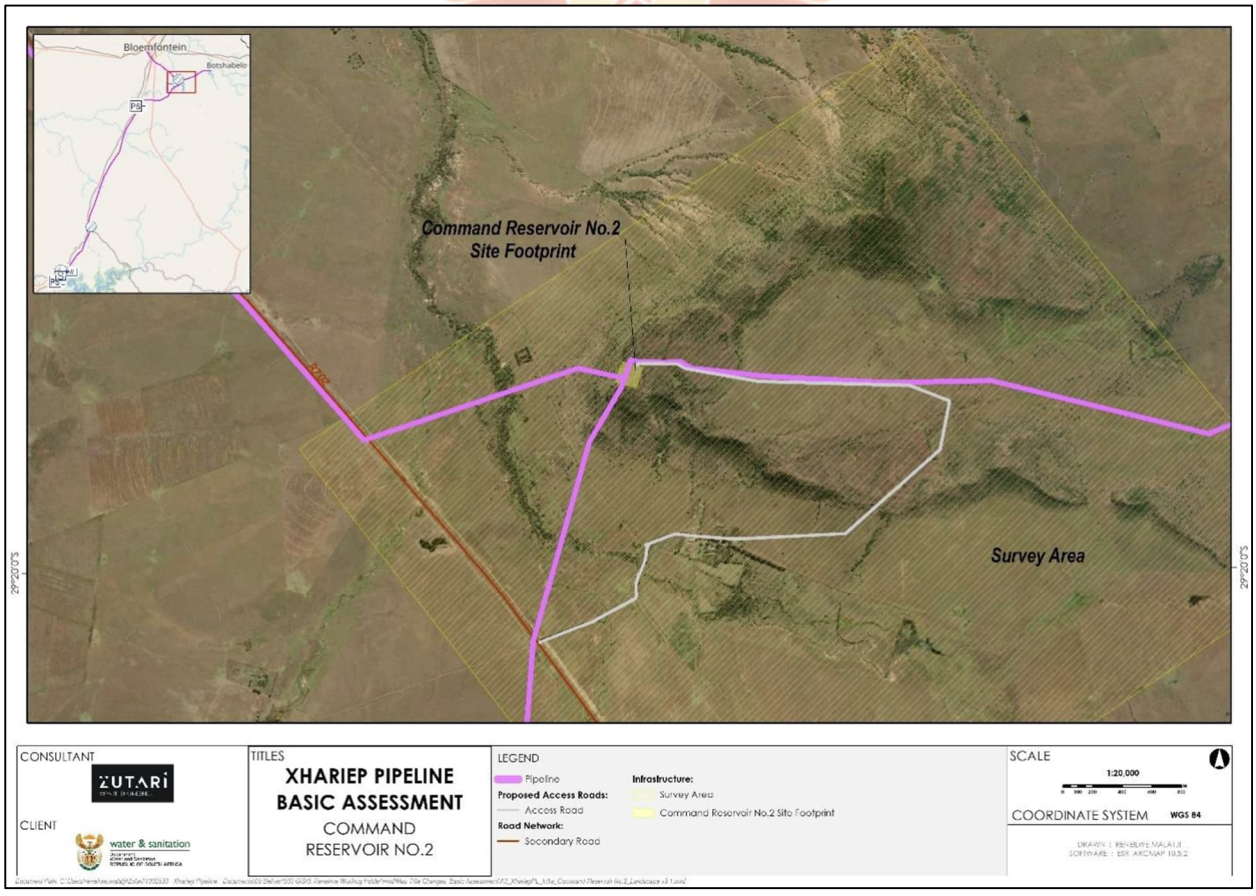


Figure 17: Proposed layout of the second command reservoir

6.6 Pipeline Route Description

The Xhariep pipeline project Scheme 1B route starts at a tie-in point to an existing 2.1m diameter pipeline downstream of the Gariep Dam wall. The 1.8m diameter raw water pipeline feeds the raw water pump station from where water is pumped to the WTW. The pipeline route goes north following an existing road, turns onto the R701 before turning northeast to follow the N1 highway. Upon reaching the WTW, the raw water is treated before being pumped by the high lift pump station on the same WTW site to command reservoir No 1. The 1800mm diameter potable water pipeline route follows the N1 highway northwards.

From the 80Mℓ command reservoir No 1, the water gravitates from command reservoir No 1, continuing north along the N1 highway, until the 10Mℓ suction reservoir and booster pump station. The booster pump station pumps the water to the 80 Mℓ command reservoir No 2. From the booster station, the 1800mm diameter pipeline initially continues along the N1 highway before turning east towards Sophiasdal and following a dirt track for just over 1 km and then it turns onto farm roads to continue northeast before crossing the R702 to reach command reservoir No 2.

From command reservoir No 2 the pipeline splits into two gravity lines, one feeding Bloemfontein (2000mm diameter), tying into the MMM bulk distribution network at the existing Longridge reservoir site, while the other pipeline (1400mm diameter) feeds Botshabelo / Thaba Nchu, tying into the Vaal Central Water Board (VCWB) bulk distribution network at the existing Rustfontein clear water pump station. The pipeline to the Longridge reservoir site follows the existing VCWB bulk supply pipeline route from Welbedacht WTW to Bloemfontein along the R702 highway before cutting across farmland to follow the M30 road, passing Bloemanda and entering the Ehrlich Park suburb in the southwest of Bloemfontein.

The pipeline to the Rustfontein pump station travels along farm roads to cross Modder River downstream of Rustfontein Dam to the tie-in point at the Rustfontein pump station. Figure 1 and Figure 2 above in the report shows the pipeline route and placement of associated structures (command reservoirs, WTW and sludge lagoons etc.)

- A 100m wide corridor was 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 will be 40m wide with a final servitude width of 15m to be registered.

6.7 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 WTWs, pump stations and command reservoirs. The access roads to the water treatment works and pump stations will be 8.6 m wide roads (two x 3.4m wide lanes) that will be asphalt surfaced or paved. The access roads to the command reservoirs will be 6 m 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.

7. Wetland and Aquatic Ecosystems

DPR Ecologists & Environmental Services was appointed to undertake the Wetland and Ecosystem Impact Assessment in 2024. The report is attached as Annexure A. The summary and findings of the study are provided below.

7.1 Watercourses

The watercourses and wetland systems were delineated by use of topography (landform and drainage pattern) and riparian vegetation with limited soil sampling. The presence of wetland

conditions was also confirmed by undertaking a sample survey within each of the watercourses and wetlands which will be affected by the pipeline route.

Due to the high number of watercourses being crossed by the pipeline, the wetland specialist conducted a determination of the Index of Habitat Integrity (IHI) only for the larger watercourses being crossed by the pipeline. These will be the Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit and Bossiespruit. This is considered to give an adequate representation of the overall condition of the watercourses being crossed by the pipeline. The IHI will be taken as representative of the Present Ecological State (PES) of these systems. In order to further improve the determination of the condition of the affected watercourses, a WET-Health determination has been undertaken for portions of a few of the larger floodplain wetlands which will be affected by the pipeline development. The entire pipeline route falls within the Upper Orange 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. 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 northeastern 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.

7.2 Index of Habitat Integrity (IHI)/Present Ecological State (PES)

Due to the high number of watercourses being crossed by the pipeline as shown in Table 13, a determination of the IHI was only conducted for the larger watercourses being crossed by the pipeline. These are the Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit and Bossiespruit. This is considered to give an adequate representation of the overall condition of the watercourses being crossed by the pipeline. The IHI has been taken as representative of the Present Ecological State (PES) of these systems.

As the entire pipeline route falls within the Upper Orange WMA, the assessed watercourses generally all form part of the same drainage system, they are largely similar in terms of their functioning and composition and their catchments affected by largely the same impacts and the impact caused by

the proposed pipeline will therefore largely affect them to the same degree and their assessment is therefore considered to give a fairly good indication of the overall condition of watercourses that will be affected by the pipeline development.

In order to further improve the determination of the condition of the affected watercourses, a WET-Health determination was also undertaken for portions of a few of the larger floodplain wetlands which will be affected by the pipeline development. The WET-Health for each assessed watercourse is attached in the Wetland Assessment Report as Appendix D (the Wetland Assessment Report is attached as Annexure A to this report).

Table *16* below refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition. The purpose of the Eco Classification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition.

Table 13: Ecological categories for Present Ecological Status

Ecological Category	Description
A	Unmodified, natural
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominately unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem function has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Table 14 refers to the Ecological Importance and Sensitivity (EIS) of wetlands. "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The EIS provides a guideline for determination of the Ecological Management Class (EMC).

Table 14: Ecological Importance and Sensitivity (EIS) of wetlands

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very High Floodplains that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	**>3 and <=4**	**A**
High Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	**>2 and <=3**	**B**
Moderate	**>1 and <=2**	**C**

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.		
Low/marginal Floodplains that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	**>0 and <=1**	**D**

The results of the assessment of the significant watercourses along the pipeline route indicate that the majority are moderately modified (Table 15). The watercourses affected by higher levels of utilisation are more modified while the proximity to urban areas (Modder and Tierpoort Rivers), also corresponds to a decrease in condition.

Table 15: Summary of Present Ecological State (PES) scores for significant watercourses assessed along the pipeline route.

Watercourse	PES	EI&S	Order
Modder River	Class D: Largely Modified	Moderate	3
Koringspruit	Class C: Moderately Modified	High	1
Tierpoort River	Class C: Moderately Modified	High	2
Riet River	Class C: Moderately Modified	Moderate	4
Vanzylspruit	Class B/C: Largely Natural to Moderately Modified	High	2
Bossiespruit	Class C: Moderately Modified	Moderate	1

8. Methods statement (only for c and i activity)

During the time of writing this report, the method statements were not available to detail the extent of construction activities.

This section will be completed once the information is available from the detailed design phase of the project.

9. Stormwater Management Plan

At the time of completion of this report, a Stormwater Management Plan (SWMP) has not been developed for the Project. The SWMP will be compiled during the detailed design phase of the project.

A SWMP is required for different sites (pipeline, WTW, command reservoir etc.). The purpose of the SWMP is to provide measures to manage stormwater flow that will minimise impacts on the environment along the newly proposed water pipeline and the other infrastructures. This shall include at a minimum the following:

- A stormwater design to attenuate the infrastructure into attenuation ponds. Other local on-site attenuation may be considered (especially within the WTW and command reservoirs areas) which includes grass-lined drains and swales, storm water infiltration systems undulations, landscaping etc. The attenuation area will be designed for a 1 in 50-year or 1 in 100-year floodline event (this information will be determined by the Engineer);

- Inlets, outlets and manholes will be designed and sized accordingly to cater for the pre and post stormwater flows;
- Stormwater reticulation pipelines, channels, energy dissipation measures etc.;
- Erosion protection where required;
- Details of the stormwater discharge tie in point; and
- Stormwater dissipation structures such as inlets and outlets, manholes, gabion structures, attenuation ponds/dams, vegetation to dissipate runoff.

During construction, a SWMP is required to address and control stormwater drainage and prevent negative impacts on the environment and infrastructure during construction and rehabilitation. This shall be implemented and maintained throughout the construction and rehabilitation period.

Since construction activities will take place within floodlines of watercourses (watercourse crossings), temporary berms must be used to ensure the construction site and disturbed soils are protected from flooding, stormflows and erosion. “Trench-breakers”, which are in-trench barriers, should be installed within any trench excavations to minimise the interception and accumulation of surface runoff water from upslope areas.

It is advised that construction takes place during drier periods (where possible), to minimise the impacts of stormwater during construction.

SWMP for the operational phase must be built into the design of the infrastructure. Once the storm water facilities along the pipeline have been completed, the maintenance and monitoring thereof will remain the sole responsibility of DWS (until the implementation agent is known), who will take financial responsibility for the operation and maintenance of the storm water infrastructure along the pipeline during the operational life of the pipeline. Management of the storm water infrastructure will include the following activities:

- Routine surveys of the pipeline by qualified Engineers to ensure the structural integrity of the pipeline,
- Routine maintenance to pipeline servitude area,
- All storm water infrastructure will be kept clear of blockages,
- Rehabilitation of vegetation (where required),
- Check inlets, outlets, manholes to ensure structural integrity, and
- Ongoing stormwater management at operation sites (WTW, pump station and reservoir areas).

10. Rehabilitation Plan

At the time of completion of this report, a Rehabilitation Plan has not been developed for the Project. The information will be completed once the plan is available.

11. Water Uses applied for

The application includes the following water uses listed in Table 16.

Table 16: Water Use Applied for

Water use(s) activities	Description	Water Course	Volumes(m3) and/or extent (m) and discharge rate	Property Description	Latitude	Longitude
Section 21 (a): Abstraction of water from a watercourse (Volume in m3 per site)						
Construction water abstraction	Unknown	No information				
Operational Abstraction	Abstraction of water from Xhariep Dam	Orange River	344.8Mℓ/day	Farm Philippolis 274 Portion 1		
Section 21 (b): Storage of water						
Storage of Water from WTW in Suction reservoir	Suction reservoir		80Mℓ	Farm Bloemfontein 2589 Portion 2	29°30'57.81"S	26° 5'12.44"E
Storage of Water from WTW in Suction reservoir	Suction reservoir		80Mℓ	Farm Bloemfontein 2522 Portion 0	29°22'7.68"S	26°21'11.64"E
Storage of Water from WTW in Command reservoir	Command Reservoir1		80 Mℓ	Farm Bethulie 498 Portion 0	30°15'3.95"S	25°44'25.09"E
Storage of Water from WTW in Command reservoir	Command Reservoir No 2		80 Mℓ	Farm Bloemfontein 105 Portion 0	29°19'10.13"S	26°23'0.51"E
Section 21(c & i): Pipeline Crossing						
Crossing of wetlands and rivers by all related infrastructure						
Low Lift Pump Station within floodline of orange river	Within the 1:100 floodline of the Orange River	Orange river	96m	Farm Philippolis 274 Portion 1	0°37'32.01"S	25°29'3.51"E
River Crossing 1	Stream	#1 Drainage line - Tributary of Orange River	27 meters	Farm Philippolis 523 Portion RE	30°36'49.50"S	25°29'11.84"E
River Crossing 2	Drainage Line	#2 Drainage line - Tributary of Orange River	78 meters	Farm Philippolis 523 Portion RE	30°35'47.72"S	25°29'8.11"E
River Crossing 3	Drainage Line & Dams	#3 Drainage line - Tributary of Orange River	70 meters	Farm Philippolis 523 Portion RE	30°33'41.97"S	25°29'46.06"E
	Drainage Line	#3 Drainage line - Tributary of Orange River	26 meters	Farm Philippolis 523 Portion RE	30°33'10.00"S	25°29'45.67"E
River Crossing 4 (Dl 3)	Stream	#4 Drainage line - Tributary of Donkerpoortspruit	41 meters	Farm Philippolis 275 Portion 1		
Drainage line crossing 4 by Access road and pipeline	Drainage line	#4 Drainage line - Tributary of Donkerpoortspruit	40m	Farm Philippolis 275 Portion 1	30°32'13.91"S	25°31'6.12"E
River Crossing 5	Drainage Line	#5 Ephemeral stream - Tributary of Donkerkloofspruit	291m	Farm Philippolis 495 Portion 3	30°33'10.00"S	25°29'45.67"E
River Crossing 6 (including access road)	Drainage Line	#7 Drainage line - Tributary of Donkerkloofspruit	214m	Farm Philippolis 495 Portion RE	30°32'4.71"S	25°31'51.42"E
River Crossing 7	Drainage line	#8 Drainage line - Tributary of Donkerkloofspruit	17.87m	Farm Philippolis 130 Portion 7	30°31'5.26"S	25°33'16.66"E
River Crossing 8	Stream	#9 Ephemeral stream - Tributary of Donkerkloofspruit	206m	Farm Philippolis 130 Portion 8	30°30'48.25"S	25°33'37.48"E
River Crossing 9	Drainage Line	Drainage Line	19.6m	Farm Philippolis 499 Portion 0/RE	30°29'24.75"S	25°35'1.84"E
River Crossing 10	Drainage Line	#10 Drainage line - Tributary of Donkerkloofspruit	141.2m	Farm Philippolis 499 Portion 0/RE	30°29'20.13"S	25°35'6.18"E
River Crossing and access road 11	Drainage Line	Drainage Line	20m	Farm Philippolis 329 Portion 1	30°28'24.26"S	25°35'51.29"E
River Crossing 12	Drainage Line	Drainage line - Tributary of Donkerkloofspruit	44.7m	Farm Philippolis 116 Portion 2	30°27'34.05"S	25°36'29.91"E
River Crossing 13	Drainage Line	Drainage line - Tributary of Donkerkloofspruit	140m	Farm Philippolis 116 Portion 2	30°27'30.70"S	25°36'32.33"E
Wetland Crossing and access road 14	Drainage Line & Dam	Modified Hillslope Seepage	232m	Farm Philippolis 260 Portion 0	30°26'43.35"S	25°37'11.51"E
River Crossing 15	Stream (Paardeplass)	#13 Ephemeral stream - Tributary of Orange River	29m	Farm Philippolis 260 Portion 2, Farm Bethulie 294 Portion 2	30°26'11.01"S	25°37'38.57"E
River Crossing 16	Pan / Dam	Drainage line-Tributary of the orange river. Pan	109m	Farm Bethulie 404 Portion 1	30°25'26.42"S	25°38'31.07"E
Drainage line Crossing 17 Including Access Road	Drainage Line	Drainage line	284m	Farm Bethulie 404 Portion 1	30°25'10.37"S	25°38'44.48"E
River Crossing 18	Stream	Stream Crossing Tributary of the Bossiespruit	65m	Farm Bethulie 267 Portion 1	30°23'13.97"S	25°40'34.23"E

River Crossing 19	Wetland Flat	Crossing of a wetland Flat	221m	Farm Bethulie 267 Portion 1	30°23'20.63"S	25°40'35.27"E
River Crossing 20	Drainage Line	Tributary of the Bossiespruit	124m	Farm Bethulie 279 Portion 1	30°21'29.91"S	25°41'16.18"E
River Crossing 21	Stream	Tributary of the Bossiespruit and flood Plain	232m	Farm Bethulie 278 Portion 1	30°20'13.53"S	25°41'55.30"E
River Crossing 22	Drainage Line	Drainage line	180m	Farm Bethulie 282 Portion 2	30°19'28.49"S	25°42'20.08"E
River Crossing 23 and Access Road	Drainage Line	Floodplain	100m	Farm Bethulie 282 Portion 2	30°19'13.26"S	25°42'28.46"E
River Crossing 24	Stream	Stream	207m	Farm Bethulie 282 Portion 2	30°19'9.14"S	25°42'30.71"E
River Crossing 25	Stream (Bossiespruit)	Bossiespruit	779m	Farm Bethulie 195 Portion 1	30°18'17.58"S	25°43'1.66"E
River Crossing 26	Drainage Line	Tributary of the Bossiespruit	431m	Farm Bethulie 195 Portion 1	30°17'6.53"S	25°43'39.32"E
River Crossing 27	Drainage Line	Drainage line	37m	Farm Bethulie 495 Portion 3	30°15'12.64"S	25°43'42.68"E
Command Reservoir No1 and associated infrastructure	Tributary of Bossiespruit and Dam	Drainage line	1500m	Farm Bethulie 495 Portion 3 Farm Bethulie 498 Portion 0		
River Crossing 28	Drainage Line & Wetland Flat	Drainage Line & Wetland Flat	165m	Farm Bethulie 498 Portion 0	30°14'53.51"S	25°43'36.92"E
River Crossing 29	Stream & Dam	Channelled valley-bottom wetland - Tributary of Vanzylspruit	162.86m	Farm Bethulie 499 Portion 1	30°13'2.18"S	25°43'18.47"E
River Crossing 30	Stream	Ephemeral Stream - Tributary of Vanzylspruit	51.82m	Farm Trompsberg 301 Portion 1	30° 9'29.52"S	25°44'24.91"E
River Crossing 31	Stream	Ephemeral Stream - Tributary of Vanzylspruit	43.81m	Farm Trompsberg 301 Portion 1	30° 9'25.09"S	25°44'27.15"E
River Crossing 32	Drainage Line	Drainage line	50m	Farm Trompsberg 109 Portion 1	30° 9'7.23"S	25°44'36.00"E
River Crossing 33	Drainage Line &Wetland Flat	Channelled valley-bottom wetland - Tributary of Vanzylspruit	152.21m	Farm Trompsberg 109 Portion 1	30° 6'49.09"S	25°45'41.20"E
River Crossing 34	Salt Pan	Within 100m of a salt pan	210m	Farm Trompsberg 152 Portion 1	30° 6'12.94"S	25°45'57.15"E
River Crossing 35	Salt Pan	Within 100m of a salt pan	136m	Farm Trompsberg 152 Portion 1	30° 6'5.53"S	25°46'0.03"E
River Crossing 36	Stream	Channelled valley-bottom wetland - Tributary of Vanzylspruit	248,89m	Farm Trompsberg 152 Portion 1	30° 4'24.48"S	25°46'42.22"E
River Crossing 37	Drainage Line	Channelled valley-bottom wetland - Tributary of Vanzylspruit	80m	Farm Trompsberg 142 Portion 1	30° 1'25.97"S	25°47'57.05"E
River Crossing 38	Stream	Channelled valley-bottom wetland - Tributary of Vanzylspruit	110m	Farm Trompsberg 35 Portion 1	30° 1'15.29"S	25°48'1.16"E
River Crossing 39	Drainage Line	Drainage Line	50m	Farm Trompsberg 142 Portion 2	30° 0'52.65"S	25°48'10.87"E
River Crossing 40	Drainage Line	Drainage Line	50m	Farm Trompsberg 342 Portion 1	30° 0'8.28"S	25°48'29.13"E
River Crossing 41	River (Vanzylspruit)	River (Vanzylspruit)	473m	Farm Trompsberg 342 Portion 1 Farm Trompsberg 186 Portion 1	29°59'46.95"S	25°48'38.04"E
River Crossing 42	Drainage Line	Tributary of the Vanzylspruit)	210m	Farm Trompsberg 186 Portion 1	29°59'36.66"S	25°48'42.33"E
River Crossing 43	Stream	Ephemeral stream - Tributary of Vanzylspruit	225.79m	Farm Trompsberg 140 Portion 2	29°55'36.94"S	25°50'29.45"E
River Crossing 44	Drainage Line	Hillslope seepage - Tributary of Vanzylspruit	165.65m	Farm Trompsberg 140 Portion 2	29°55'11.71"S	25°50'45.66"E
River Crossing 45	River	Erfdeelspruit and floodplain wetland – Tributary of Vanzylspruit	903m	Farm Edenberg 304 Portion 1	29°53'40.29"S	25°51'44.35"E
River Crossing 46	Stream	Ephemeral stream and associated tributary – Tributary of Riet River	444.13m	Farm Edenberg 501 Portion 1	29°49'35.57"S	25°54'39.14"E
River Crossing 47	Drainage Line	Ephemeral stream and associated tributary – Tributary of Riet River	196m	Farm Edenberg 527 Portion 1	29°48'39.27"S	25°55'25.73"E
Wetland	Depression /Pan	Pan	340m	Farm Edenberg 589 Portion 1	29°46'28.79"S	25°57'8.14"E
River Crossing 48	Stream	Channelled valley-bottom wetland – Tributary of Riet River	298.32	Farm Edenberg 465 Portion 1	29°47'25.99"S	25°56'25.88"E
River Crossing 49	Drainage Line & Artificial Wetland Flat	Hillslope seepage – Tributary of Riet River	183.23m	Farm Edenberg 104 Portion 14	29°45'45.57"S	25°57'21.34"E
River Crossing 50	Riet River	Riet River	93m	Farm Edenberg 610 Portion 1	29°39'48.73"S	25°59'13.73"E
River Crossing 51	Stream	Riet River	50m	Farm Edenberg 610 Portion 1	29°39'34.63"S	25°59'20.04"E
Wetland crossing	Hillslope Seep	Hillslope seepage - Tributary of Riet River	58.3m	Farm Edenberg 610 Portion 1	29°37'10.22"S	26° 0'41.22"E

River Crossing 52	Stream	Ephemeral stream – Tributary of Riet River	61.69m	Farm Edenberg 550 Portion 2	29°35'52.88"S	26° 1'35.62"E
River Crossing 53	Drainage Line	Hillslope seepage – Tributary of Riet River	107.14m	Farm Edenberg 548 Portion 1	29°34'31.19"S	26° 2'32.51"E
River Crossing 54	Drainage Line / Drainage Flat	Drainage Flat	128.47m	Farm Edenberg 546 Portion 1	29°33'55.60"S	26° 2'57.53"E
River Crossing 55	Drainage Line, Stream & Wetland Flat	Drainage Line, Stream & Wetland Flat	547.08m	Farm Reddersburg 160 Portion 1	29°32'5.92"S	26° 4'18.09"E
River Crossing 56	River (Holspruit)	Holspruit River	434.84m	Farm Reddersburg 127 Portion 1	29°28'27.88"S	26° 6'6.19"E
River Crossing 57	Drainage Line	Channelled valley-bottom wetland – Tributary of Holsloot	187.53m	Farm Bloemfontein 1548 Portion 1	29°27'55.81"S	26° 6'18.45"E
River Crossing 58	Stream & Dam	Channelled valley-bottom wetland – Tributary of Holsloot	71.63	Farm Bloemfontein 2720 Portion 3	29°27'19.34"S	26° 7'25.51"E
River Crossing 59	Stream & Valley Bottom Wetland	Stream and valley bottom wetland – Tributary of Tierpoort River	510m	Farm Bloemfontein 2083 Portion 5	29°26'54.92"S	26°10'39.53"E
River Crossing 60	Stream	Seasonal stream – Tributary of Tierpoort River	414m	Farm Reddersburg 127 Portion 1	29°27'18.16"S	26°13'6.48"E
River Crossing 61	Stream & Valley Bottom Wetland	Stream and floodplain wetland – Tributary of Tierpoort River	304m	Farm Reddersburg 215 Portion 0	29°26'15.83"S	26°16'44.32"E
River Crossing 62	River (Xspruit)	Tierpoort River		Farm Bloemfontein 43 Portion 2 & RE/0	29°25'38.98"S	26°18'26.55"E
River Crossing 63	Stream	Stream and floodplain wetland – Tributary of Tierpoort River	345m	Farm Bloemfontein 1892 Portion 0	29°24'17.46"S	26°19'21.88"E
Wetland	Floodplain wetland	Flood plain wetland	967m	Farm Bloemfontein 1892 Portion 1	29°24'17.46"S	26°19'21.88"E
River Crossing 64	Stream & Valley Bottom Wetland	Renosterspruit	544.34m	Farm Bloemfontein 105 Portion 0	29°20'2.80"S	26°22'44.65"E
River Crossing 65	Steam (Renosterspruit)	Renosterspruit	544.34m	Farm Bloemfontein 105 Portion 0	29°19'53.74"S	26°22'47.67"E
River Crossing 66	Drainage Line	Stream and floodplain wetland – Tributary of Koringspruit	50m	Farm Bloemfontein 105 Portion 0	29°19'18.33"S	26°23'52.17"E
River Crossing 67	Drainage Line	Drainage Line	50m	Farm Bloemfontein 105 Portion 1	29°19'29.78"S	26°25'24.48"E
River Crossing 68	Drainage Line	Drainage Line	50m	Farm Bloemfontein 3001 Portion 0	29°19'27.20"S	26°25'39.81"E
River Crossing 69	Drainage Line	Drainage Line	50m	Farm Bloemfontein 3001 Portion 0	29°19'25.58"S	26°25'44.33"E
River Crossing 70	Drainage Line	Drainage Line	50m	Farm Bloemfontein 3001 Portion 0	29°19'18.86"S	26°26'3.14"E
River Crossing 71	Drainage Line & Seep Wetlands	Stream and seep wetland – Tributary of Koringspruit	200m	Farm Bloemfontein 3001 Portion 4	29°19'4.67"S	26°26'44.54"E
River Crossing 72	Seep Wetland	Seep wetland	128.6m	Farm Bloemfontein 3001 Portion 4	29°18'59.99"S	26°26'58.94"E
River Crossing 73	Drainage Line & Seep Wetland	Seep wetland and drainage line	160m	Farm Bloemfontein 2083 Portion 0	29°18'51.62"S	26°27'30.23"E
River Crossing 74	Stream (Zuurfonteinspruit?)	Zuurfonteinspruit	50m	Farm Bloemfontein 266 Portion 0	29°18'46.76"S	26°27'43.59"E
River Crossing 75	Stream (Zuurfonteinspruit?)	Zuurfonteinspruit	50m	Farm Bloemfontein 266 Portion 0	29°18'45.74"S	26°27'46.43"E
River Crossing 76	River (Koringspruit)	River (Koringspruit)		Farm Bloemfontein 128 Portion 0	29°17'58.96"S	26°30'3.13"E
River Crossing 77	Dam	Dam	926.33m	Farm Bloemfontein 128 Portion 0 Farm Bloemfontein 130Portion 0	29°17'51.46"S	26°30'31.14"E
River Crossing 78	Stream	#52 Ephemeral stream – Tributary of Koringspruit	380.41m	Farm Bloemfontein 93 Portion 0	29°17'23.30"S	26°31'13.22"E
	Drainage line	Drainage line: Tributary of the Koringspruit	107.81m	Farm Bloemfontein 907 Portion 0	29°16'53.93"S	26°31'59.46"E
River Crossing 79	Drainage Line & Riparian	Drainage line – Tributary of Koringspruit	214.34m	Farm Bloemfontein 1465 Portion 0	29°16'16.87"S	26°33'10.56"E
River Crossing 80	Seep Wetland	Seep wetland	238m	Farm Bloemfontein 120 Portion 0	29°16'6.63"S	26°34'19.44"E
River Crossing 81	River (Modder) & Riparian	Modder River	308.9m	Farm Bloemfontein 864 Portion 0 Farm Bloemfontein 130Portion 0	29°16'4.76"S	26°36'56.79"E
River Crossing 82	Stream	Tributary of Renosterspruit	50m	Farm Bloemfontein 105 Portion 0	29°19'27.47"S	26°22'11.98"E
River Crossing 83	Stream	Seasonal stream - Tributary of Renosterspruit	203m	Farm Bloemfontein 112 Portion 2	29°17'38.84"S	26°20'12.31"E
River Crossing 84	Seep Wetland	Seep Wetland	95.15m	Farm Bloemfontein 112 Portion 2	29°17'28.82"S	26°20'4.57"E
River Crossing 85	Drainage Line	Drainage line	124m	Farm Bloemfontein 504 Portion 0	29°16'25.97"S	26°18'55.18"E
River Crossing 86	Valley Bottom Wetland	Channelled valley-bottom wetland – Tributary of Kaalspruit	218.89m	Farm Bloemfontein 654 Portion 0	29°12'22.72"S	26°12'28.23"E

River Crossing 87	Dam, Drainage Line, V.B. Wetland	Channelled valley-bottom wetland – Tributary of Kaalspruit	69.67m	Farm Bloemfontein 654 Portion 321	29°10'53.78"S	26°11'3.76"E
Erosion protection structures						
Scours	See separate table below)					
Energy Dissipaters	No information No information					
Section 21 (f) for scouring the pipeline during commissioning						
Scours	See separate table below)					
Discharge water containing water from sludge lagoon downstream	No information No information					
Section 21 (g):						
Storage of Water from WTW in Suction reservoir	Suction reservoir		80Mℓ	Farm Bloemfontein 2589 Portion 2	29°30'57.81"S	26° 5'12.44"E
Storage of Water from WTW in Command reservoir	Command Reservoir1		80 Mℓ	Farm Bethulie 498 Portion 0	30°15'3.95"S	25°44'25.09"E
Storage of Water from WTW in Command reservoir	Command Reservoir No 2		80 Mℓ		29°19'10.13"S	26°23'0.51"E
Sludge Lagoons X 3			232100 m3	Farm Philippolis 495 Portion RE	30°33'1.01"S	25°30'14.35"E
Sludge drying beds	WTW Sludge Lagoons		1540 m3/month or 18461m3/annum	Farm Philippolis 495 Portion RE	30°32'44.87"S	25°30'40.89"E
Batching plants with sedimentation traps Septic tanks	No information No information					
Section 21 (j): Dewatering of trenches during construction						
Dewatering of trenches	No information No information					

Please note that this table still needs to be completed and technical information has not been finalised yet.

The following Table 17 shows information for the scours valves to be authorised.

Table 17: Scours Valve (SV) information (Section 21 (c) & (i) and (f))

Point	Y	X	Farm Portion	Parent Farm
SV 1	30°37'33.26S	25°29'14.28E	1/274	WASCHBANK No. 274
SV 2	30°37'31.04S	25°29'10.32E	1/274	WASCHBANK No. 274
SV 3	30°37'21.22S	25°29'1.78E	RE/523	H.F VERWOERDDAM No. 523
SV 4	30°37'0.31S	25°29'10.45E	RE/523	H.F VERWOERDDAM No. 523
SV 5	30°36'50.3S	25°29'10.76E	RE/523	H.F VERWOERDDAM No. 523
SV 6	30°36'45.99S	25°29'5.67E	RE/523	H.F VERWOERDDAM No. 523
SV 7	30°36'15.65S	25°28'53.83E	RE/523	H.F VERWOERDDAM No. 523
SV 8	30°35'47.12S	25°29'7.77E	RE/523	H.F VERWOERDDAM No. 523
SV 9	30°35'11.16S	25°29'21.36E	RE/523	H.F VERWOERDDAM No. 523
SV 10	30°33'42.22S	25°29'44.83E	1/275	SUMMER HILL No. 275
SV 11	30°32'35.94S	25°30'27.11E	RE/495	INHOEK No. 495
SV 12	30°32'26.02S	25°30'43.95E	1/495	INHOEK No. 495
SV 13	30°32'15.21S	25°31'5.79E	1/495	INHOEK No. 495
SV 14	30°32'12.34S	25°31'19.04E	1/495	INHOEK No. 495
SV 15	30°31'53.31S	25°32'18E	6/130	DRIEKUIL No. 130
SV 16	30°30'49.1S	25°33'38.08E	6/130	DRIEKUIL No. 130
SV 17	30°30'10.94S	25°34'20.23E	6/130	DRIEKUIL No. 130
SV 18	30°29'19.1S	25°35'8.41E	RE/499	DRIEKUIL No. 499
SV 19	30°28'50.26S	25°35'35.68E	5/331	EENSGEVONDEN No. 331
SV 20	30°28'26.23S	25°35'51.68E	RE/331	EENSGEVONDEN No. 331
SV 21	30°27'53.05S	25°36'16.85E	RE/329	VEREENIGING No. 329
SV 22	30°27'27.81S	25°36'35.99E	RE/116	KLIPBANKFONTEIN No. 116
SV 23	30°26'54.56S	25°37'1.2E	RE/116	KLIPBANKFONTEIN No. 116
SV 24	30°26'42.96S	25°37'11.11E	RE/116	KLIPBANKFONTEIN No. 116
SV 25	30°26'27.99S	25°37'24.57E	RE/116	KLIPBANKFONTEIN No. 116
SV 26	30°26'11.64S	25°37'39.26E	RE/116	KLIPBANKFONTEIN No. 116
SV 28	30°25'26.53S	25°38'23.54E	RE/404	BOSCHRAND B No. 404
SV 29	30°25'12.9S	25°38'42.67E	RE/404	BOSCHRAND B No. 404
SV 30	30°24'24.97S	25°39'49.79E	RE/404	BOSCHRAND B No. 404
SV 31	30°23'21.33S	25°40'32.79E	RE/267	EXCELSIOR No. 267
SV 32	30°23'15.12S	25°40'34.96E	RE/267	EXCELSIOR No. 267
SV 33	30°22'14.74S	25°40'56.07E	RE/267	EXCELSIOR No. 267
SV 34	30°21'31.55S	25°41'16.57E	RE/279	JENNY`S PASS No. 279
SV 35	30°20'10.27S	25°42'4.96E	RE/278	MOUNT BRAND No. 278
SV 36	30°20'4.68S	25°42'11.91E	RE/278	MOUNT BRAND No. 278
SV 37	30°19'27.56S	25°42'21.86E	RE/282	PRIOR GRANGE No. 282
SV 38	30°19'5.11S	25°42'34.22E	RE/282	PRIOR GRANGE No. 282
SV 39	30°18'47.62S	25°42'43.97E	RE/195	KUILFONTEIN No. 195
SV 40	30°18'31.27S	25°42'54.19E	RE/195	KUILFONTEIN No. 195
SV 41	30°18'18.42S	25°43'2.35E	RE/195	KUILFONTEIN No. 195
SV 42	30°17'7.86S	25°43'40.24E	RE/195	KUILFONTEIN No. 195
SV 43	30°16'17.61S	25°43'47.47E	RE/458	GERLACHSTHAL No. 458
SV 44	30°15'5.19S	25°43'41.5E	RE/495	SPRINGFONTEIN TOWNLAND "B"| No. 495
SV 45	30°15'45.94S	25°43'51.65E	RE/458	GERLACHSTHAL No. 458
SV 46	30°14'54.56S	25°43'38.21E	RE/498	VILJOENSDAM No. 498
SV 47	30°12'58.2S	25°43'19.67E	RE/499	HAMILTON MANOR No. 499
SV 48	30°12'17.12S	25°43'23.72E	RE/499	HAMILTON MANOR No. 499
SV 49	30°11'59.32S	25°43'29.09E	RE/301	HILLSIDE No. 301

Point	Y	X	Farm Portion	Parent Farm
SV 50	30°11'30.5S	25°43'37.81E	RE/301	HILLSIDE No. 301
SV 51	30°10'38.72S	25°43'53.58E	RE/301	HILLSIDE No. 301
SV 52	30°9'48.59S	25°44'16.69E	RE/301	HILLSIDE No. 301
SV 53	30°9'26.94S	25°44'27.44E	RE/301	HILLSIDE No. 301
SV 54	30°9'11.54S	25°44'35.09E	1/356	VLEIPLAATS No. 356
SV 55	30°8'16.36S	25°45'2.48E	1/356	VLEIPLAATS No. 356
SV 56	30°7'51.93S	25°45'14.61E	1/356	VLEIPLAATS No. 356
SV 57	30°6'49.5S	25°45'42.08E	1/356	VLEIPLAATS No. 356
SV 58	30°6'11.26S	25°45'58.17E	1/356	VLEIPLAATS No. 356
SV 59	30°4'24.58S	25°46'44.99E	RE/142	TROMPSBURG "B" No. 142
SV 60	30°3'7.93S	25°47'15.38E	RE/141	TROMPSBURG DOPS GROUND No. 141
SV 61	30°2'22.29S	25°47'52.11E	RE/141	TROMPSBURG DOPS GROUND No. 141
SV 62	30°1'18.33S	25°48'1.34E	RE/35	GRUISFONTEIN No. 35
SV 63	30°0'57.52S	25°48'10.01E	RE/35	GRUISFONTEIN No. 35
SV 64	30°0'9S	25°48'30.21E	RE/342	LORRAINE No. 342
SV 65	29°59'47.34S	25°48'39.24E	RE/342	LORRAINE No. 342
SV 66	29°58'4.72S	25°49'21.96E	RE/186	BLOEMHOF No. 186
SV 67	29°57'47.23S	25°49'41.78E	RE/110	STOFKRAAL No. 110
SV 68	29°55'37.86S	25°50'30.64E	RE/140	TWEE- ZUSTERS No. 140
SV 69	29°55'11.92S	25°50'46.91E	RE/140	TWEE- ZUSTERS No. 140
SV 70	29°54'51.96S	25°50'59.72E	RE/140	TWEE- ZUSTERS No. 140
SV 71	29°54'28.36S	25°51'14.86E	RE/140	TWEE- ZUSTERS No. 140
SV 72	29°53'39.94S	25°51'45.92E	RE/304	ROOIRANTJES No. 304
SV 73	29°51'4.45S	25°53'29.36E	623	AASVOGEL KNOP No. 623
SV 74	29°49'36.18S	25°54'40.19E	RE/501	MEADOWS A No. 501
SV 75	29°49'19.14S	25°54'54.81E	RE/501	MEADOWS A No. 501
SV 76	29°49'12.05S	25°55'0.92E	RE/501	MEADOWS A No. 501
SV 77	29°48'39.49S	25°55'27.08E	RE/527	COURLAND No. 527
SV 78	29°48'19.27S	25°55'47.59E	MEADOWS B No. 503	MEADOWS B No. 503
SV 79	29°48'15.89S	25°55'59E	MEADOWS B No. 503	MEADOWS B No. 503
SV 80	29°47'27.99S	25°56'25.62E	RE/465	NIET ZO GROOT No. 465
SV 81	29°46'51.63S	25°56'55.98E	RE/166	BELLEVUE No. 166
SV 82	29°45'46.62S	25°57'22.1E	RE/104	DORPS GROND VAN EDENBURG No. 104
SV 83	29°45'1.37S	25°57'35.58E	RE/104	DORPS GROND VAN EDENBURG No. 104
SV 84	29°44'12.18S	25°57'50.17E	RE/104	DORPS GROND VAN EDENBURG No. 104
SV 85	29°43'42.12S	25°57'59.32E	RE/612	WELGELUK No. 612
SV 86	29°43'18.1S	25°58'6.59E	RE/612	WELGELUK No. 612
SV 87	29°42'54.46S	25°58'13.39E	RE/612	WELGELUK No. 612
SV 88	29°41'35.06S	25°58'36.9E	2/211	GOEDEHOOP No. 211
SV 89	29°41'23.01S	25°58'40.5E	2/211	GOEDEHOOP No. 211
SV 90	29°41'1.84S	25°58'46.81E	2/211	GOEDEHOOP No. 211
SV 91	29°40'20.45S	25°59'1.71E	2/211	GOEDEHOOP No. 211
SV 92	29°39'49.68S	25°59'15.17E	2/211	GOEDEHOOP No. 211
SV 93	29°39'33.72S	25°59'22.18E	RE/610	BETHANY No. 610

Point	Y	X	Farm Portion	Parent Farm
SV 94	29°39'23.6S	25°59'26.63E	RE/610	BETHANY No. 610
SV 95	29°38'17.38S	25°59'57.38E	RE/610	BETHANY No. 610
SV 96	29°38'13.45S	25°59'59.7E	RE/610	BETHANY No. 610
SV 97	29°37'58.81S	26°0'8.62E	RE/610	BETHANY No. 610
SV 98	29°37'11.71S	26°0'41.58E	RE/610	BETHANY No. 610
SV 99	29°36'22.48S	26°1'32.1E	615	OVERSCHOT No. 615
SV 100	29°36'2.51S	26°1'30.42E	RE/550	ELIM No. 550
SV 101	29°35'52.85S	26°1'36.73E	RE/550	ELIM No. 550
SV 102	29°35'3.35S	26°2'11.34E	RE/551	GELUKSDAM No. 551
SV 103	29°34'54.55S	26°2'17.49E	RE/548	DE HOOP No. 548
SV 104	29°34'30.95S	26°2'33.98E	RE/548	DE HOOP No. 548
SV 105	29°33'57.14S	26°2'57.61E	2/546	FAIRVIEW No. 546
SV 106	29°32'55.86S	26°3'42.57E	RE/160	DIEPFONTEIN No. 160
SV 107	29°32'48.22S	26°4'3.89E	RE/160	DIEPFONTEIN No. 160
SV 108	29°32'2.07S	26°4'22.26E	RE/160	DIEPFONTEIN No. 160
SV 109	29°28'29.43S	26°6'6.82E	RE/127	VAALBANK No. 127
SV 110	29°27'55.96S	26°6'19.62E	2/1548	GALIPPOLI No. 1548
SV 111	29°27'11.24S	26°6'37.15E	2/2720	KRAPFONTEIN No. 2720
SV 112	29°27'12.31S	26°7'9.46E	2/2720	KRAPFONTEIN No. 2720
SV 113	29°27'18.56S	26°7'25.11E	RE/2720	KRAPFONTEIN No. 2720
SV 114	29°27'0.14S	26°8'10.03E	RE/2720	KRAPFONTEIN No. 2720
SV 115	29°27'1.99S	26°9'37.04E	-	TYGERPOORT No. 1636
SV 116	29°26'52S	26°10'42.27E	1/2944	GRAYSHAVEN No. 2995
SV 117	29°27'16.01S	26°12'38.57E	1/407	KOPPIESKRAAL No. 407
SV 118	29°27'18.98S	26°12'57.62E	136	VEELGELUK No. 136
SV 119	29°27'17.19S	26°13'5.25E	136	VEELGELUK No. 136
SV 120	29°26'57.39S	26°15'32.08E	215	KLIP KUIL No. 215
SV 121	29°26'42.37S	26°16'8.41E	215	KLIP KUIL No. 215
SV 122	29°26'14.36S	26°16'44.49E	215	KLIP KUIL No. 215
SV 123	29°26'10.62S	26°17'17.49E	215	KLIP KUIL No. 215
SV 124	29°26'3.91S	26°17'32.27E	215	KLIP KUIL No. 215
SV 125	29°25'56.57S	26°17'48.65E	125	WILGE DRAAI No. 125
SV 126	29°25'38.68S	26°18'26.73E	RE/43	MOOIVLEY No. 43
SV 127	29°25'11.35S	26°18'39.33E	2/43	MOOIVLEY No. 43
SV 128	29°24'39.23S	26°19'1.3E	1/43	MOOIVLEY No. 43
SV 129	29°24'19.44S	26°19'18.72E	1892	CYPRESHOEK No. 1892
SV 130	29°23'49.04S	26°19'39.21E	478	VAALBANK No. 478
SV 131	29°19'52.79S	26°22'47.21E	-	LIEUW KOP No. 105
SV 132	29°19'25.72S	26°23'12.04E	-	LIEUW KOP No. 105
SV 133	29°19'20.35S	26°23'5.35E	-	LIEUW KOP No. 105
SV 134	29°19'17.23S	26°23'53.17E	-	LIEUW KOP No. 105
SV 135	29°19'24.5S	26°25'43.51E	6/3001	ATLEHANG No. 3001
SV 136	29°19'17.21S	26°26'3.86E	6/3001	ATLEHANG No. 3001
SV 137	29°18'44.41S	26°27'46.43E	266	ZUURFONTEIN No. 266
SV 138	29°18'42.89S	26°27'52.35E	266	ZUURFONTEIN No. 266
SV 139	29°18'37.81S	26°28'11.81E	266	ZUURFONTEIN No. 266
SV 140	29°17'53.11S	26°30'6.91E	128	DONKERPOORT No. 128
SV 141	29°17'24.19S	26°31'9.4E	93	BEWEE No. 93
SV 142	29°17'3.01S	26°31'40.68E	RE/907	HELDERPOORT No. 907

Point	Y	X	Farm Portion	Parent Farm
SV 143	29°16'53.76S	26°31'57.82E	RE/907	HELDERPOORT No. 907
SV 144	29°16'29.99S	26°32'42.6E	1465	ERFPOS No. 1465
SV 145	29°16'16.1S	26°33'9.3E	1465	ERFPOS No. 1465
SV 146	29°16'5.47S	26°34'17.09E	RE/120	RUSTFONTEIN No. 120
SV 147	29°16'3.67S	26°34'56.8E	RE/120	RUSTFONTEIN No. 120
SV 148	29°16'3.01S	26°35'13.92E	RE/120	RUSTFONTEIN No. 120
SV 149	29°16'1.94S	26°35'41.39E	RE/120	RUSTFONTEIN No. 120
SV 150	29°16'3.32S	26°36'40.44E	1/864	LANGVERWACHT No. 864
SV 151	29°16'2.66S	26°36'49.18E	1/864	LANGVERWACHT No. 864
SV 152	29°16'3.36S	26°36'56.52E	1/864	LANGVERWACHT No. 864
SV 153	29°16'3.9S	26°37'1.74E	RE/67	PALMIETFONTEIN No. 67
SV 154	29°19'26.43S	26°23'12.46E	-	LIEUW KOP No. 105
SV 155	29°19'20.77S	26°22'34.72E	-	LIEUW KOP No. 105
SV 156	29°19'27.36S	26°22'11.97E	-	LIEUW KOP No. 105
SV 157	29°18'36.98S	26°21'4.58E	733	KARREEFONTEIN No. 733
SV 158	29°17'46.59S	26°20'19.82E	2/112	WELGEVONDEN No. 112
SV 159	29°17'37.2S	26°20'12.02E	2/112	WELGEVONDEN No. 112
SV 160	29°17'29.97S	26°20'8.81E	3/112	WELGEVONDEN No. 112
SV 161	29°16'27.24S	26°18'55.52E	RE/504	BLYDSCHAP No. 504
SV 162	29°14'35.92S	26°16'18.41E	1611	RAVENSWOOD No. 1611
SV 163	29°14'6.4S	26°15'36.61E	1611	RAVENSWOOD No. 1611
SV 164	29°13'58.36S	26°15'24.96E	1611	RAVENSWOOD No. 1611
SV 165	29°13'49.67S	26°15'10.37E	RE/716	KLIPFONTEIN No. 716
SV 166	29°13'41.54S	26°14'54.65E	RE/716	KLIPFONTEIN No. 716
SV 167	29°12'58S	26°13'20.99E	717	DANIELSRUST No. 717
SV 168	29°12'21.59S	26°12'24.36E	RE/445	SYDENHAM No. 445
SV 169	29°11'19.65S	26°11'45.49E	RE/654	BLOEMFONTEIN No. 654

Scour discharge rates will be variable with a maximum discharge rate expected of 1.3 m^3/s. Detailed information on scours will be provided during the detailed design stage of the project once the horizontal and vertical alignments have been finalised.

Typically, in a water distribution network (pipeline), scour valves are used to flush out the sediments and contaminants accumulated over a period of time. The scours also assist with draining water from pipes for maintenance and repair and during periods water when it becomes contaminated. The process is called scouring. Scour valves are necessary for the efficient operation of a water distribution network.

The following Figure 18 and Figure 19 indicates watercourses and the pipeline and associate infrastructures.

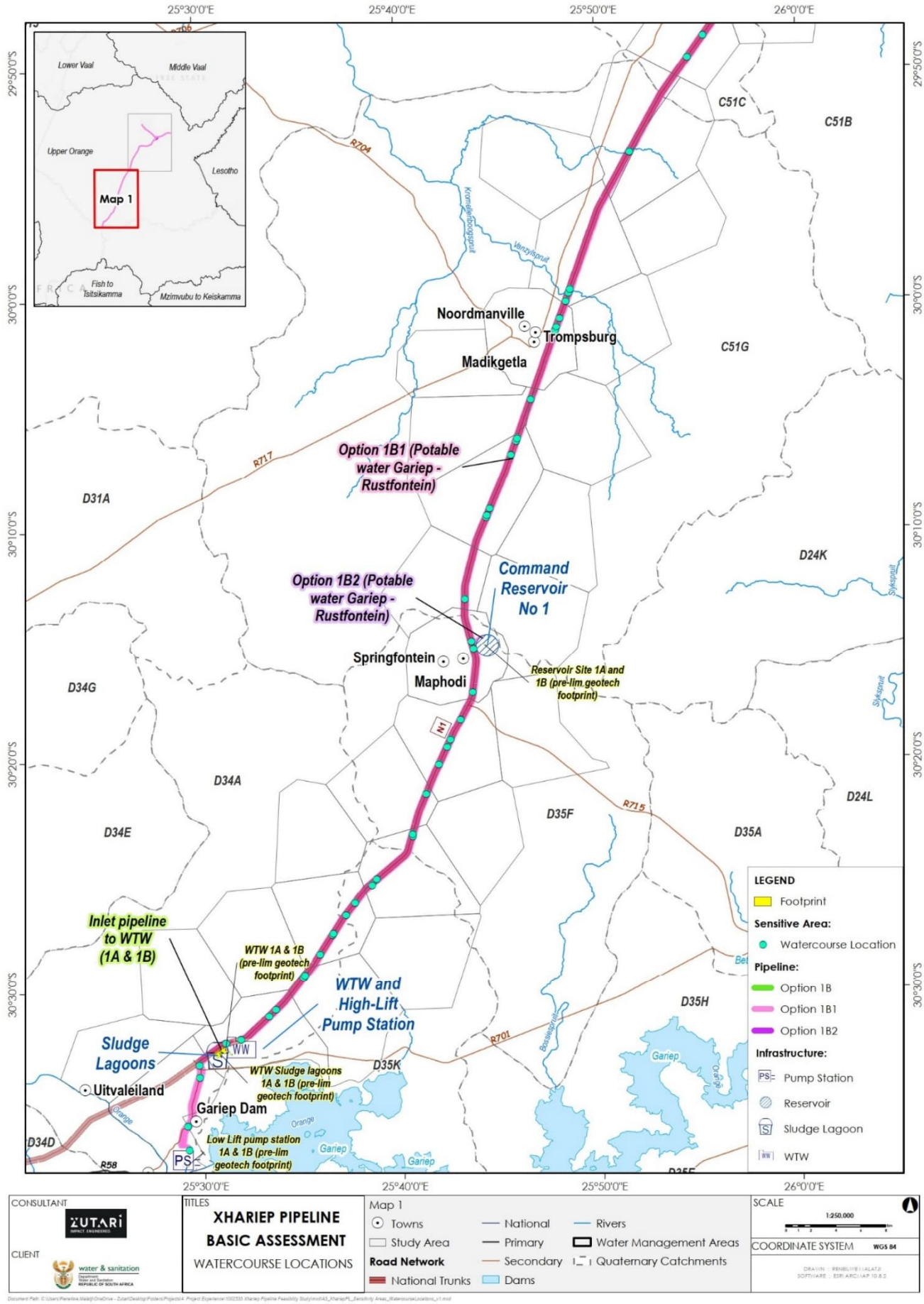


Figure 18: Watercourse map 1

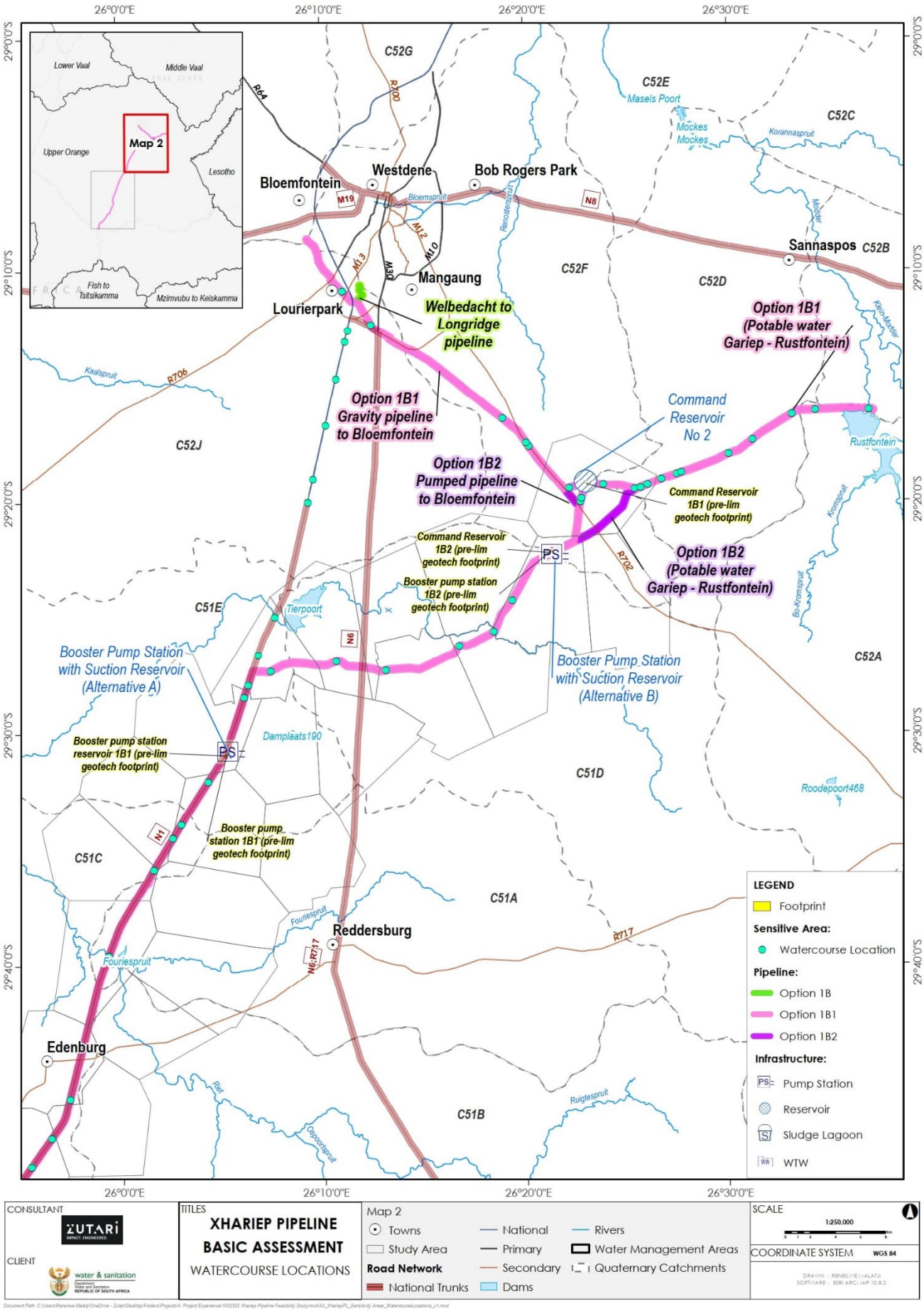


Figure 19: Watercourse map 2

The following Figure 20 to Figure 24 indicates the positions of the scour valves.

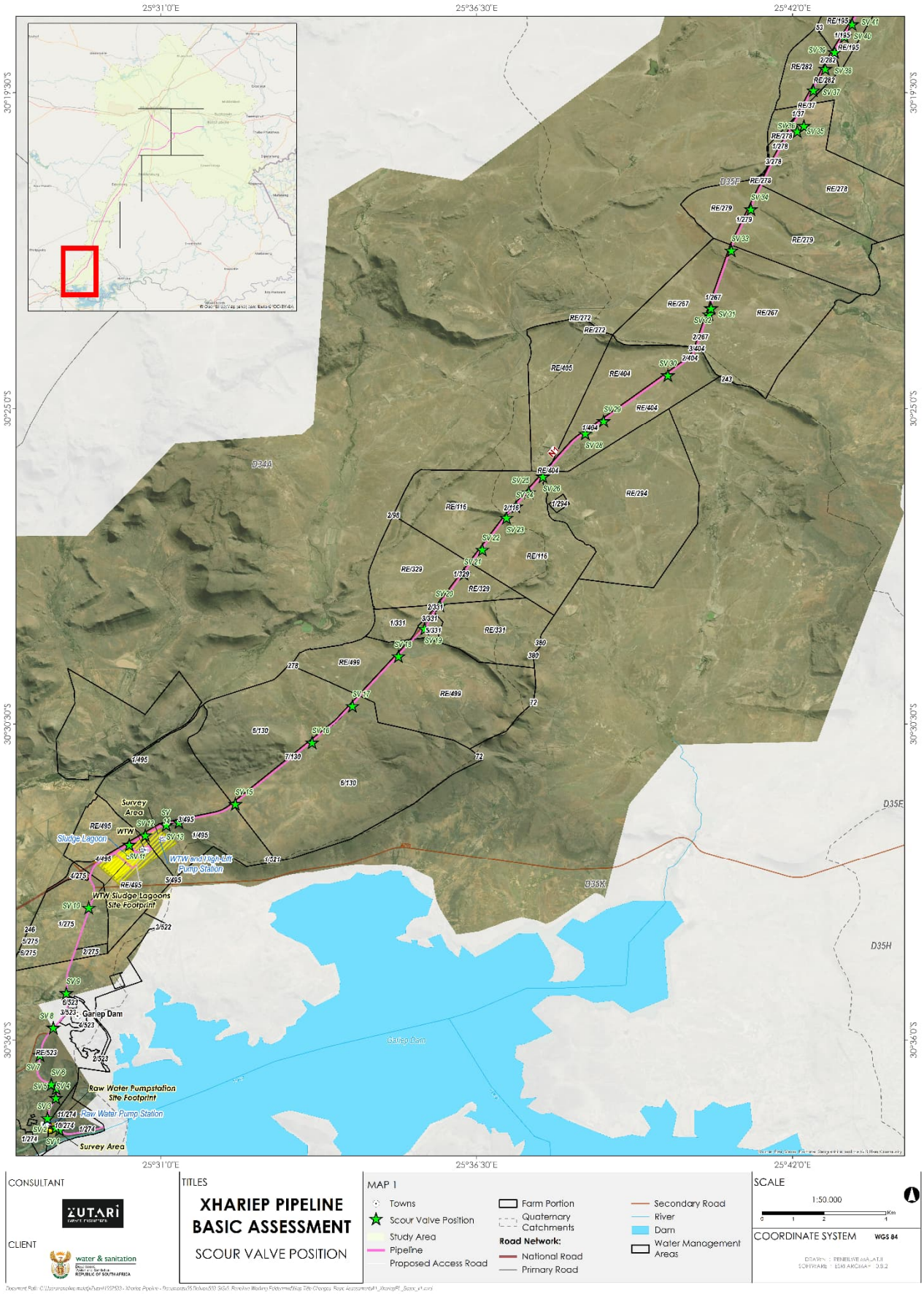


Figure 20: Scour valve position (map 1)

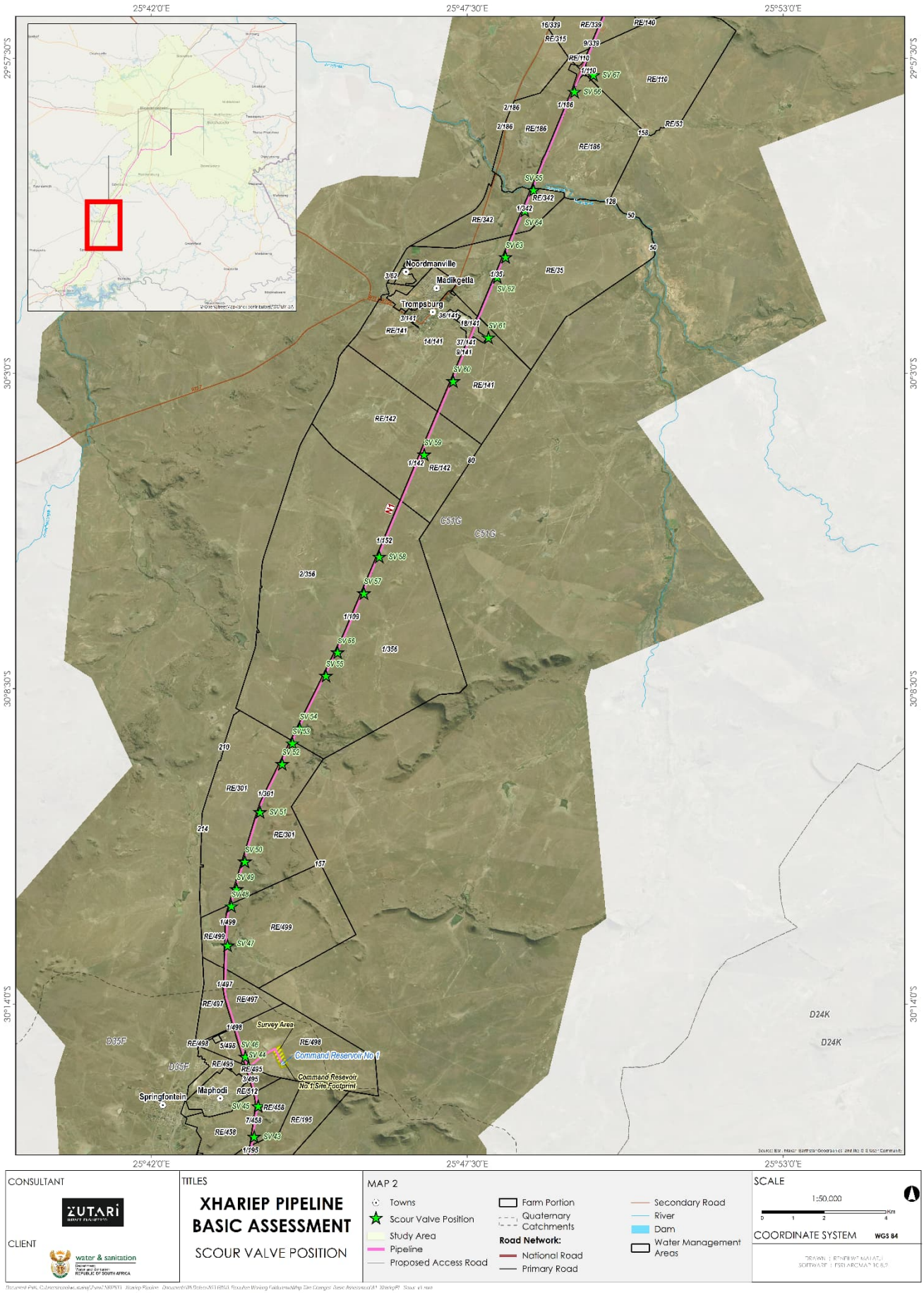


Figure 21: Scour valve position (map 2)

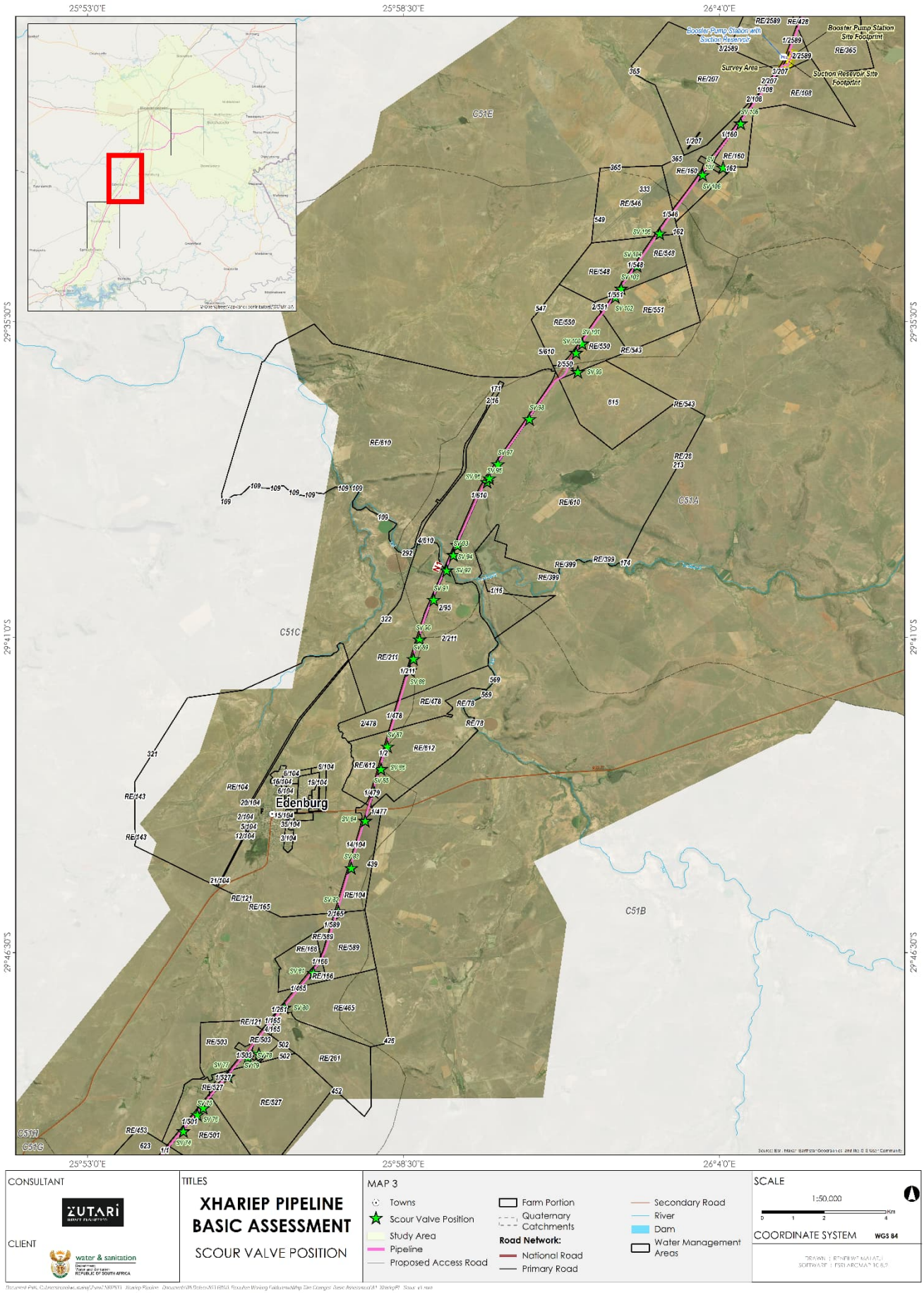


Figure 22: Scour valve position (map 3)

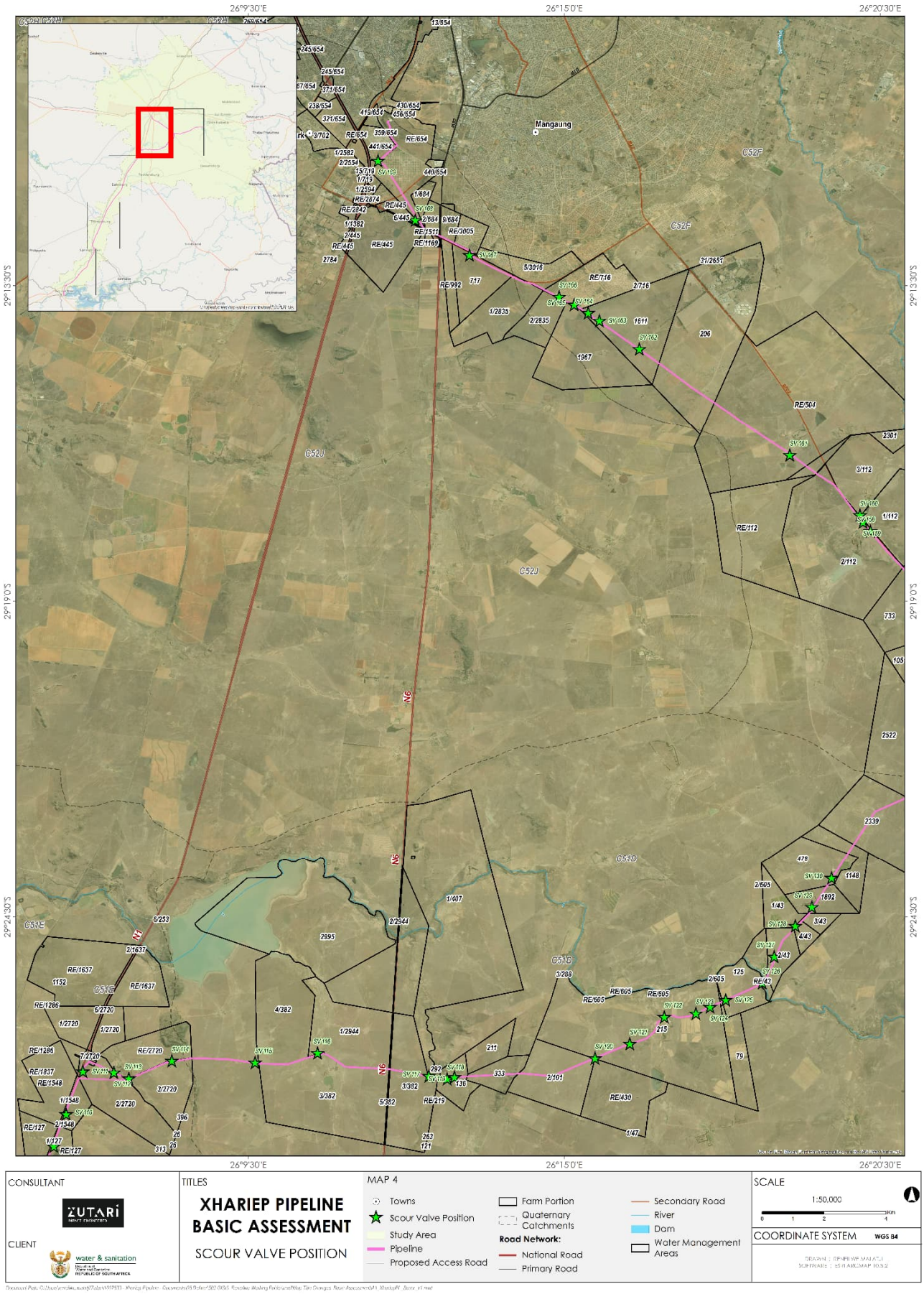


Figure 23: Scour valve position (map 4)

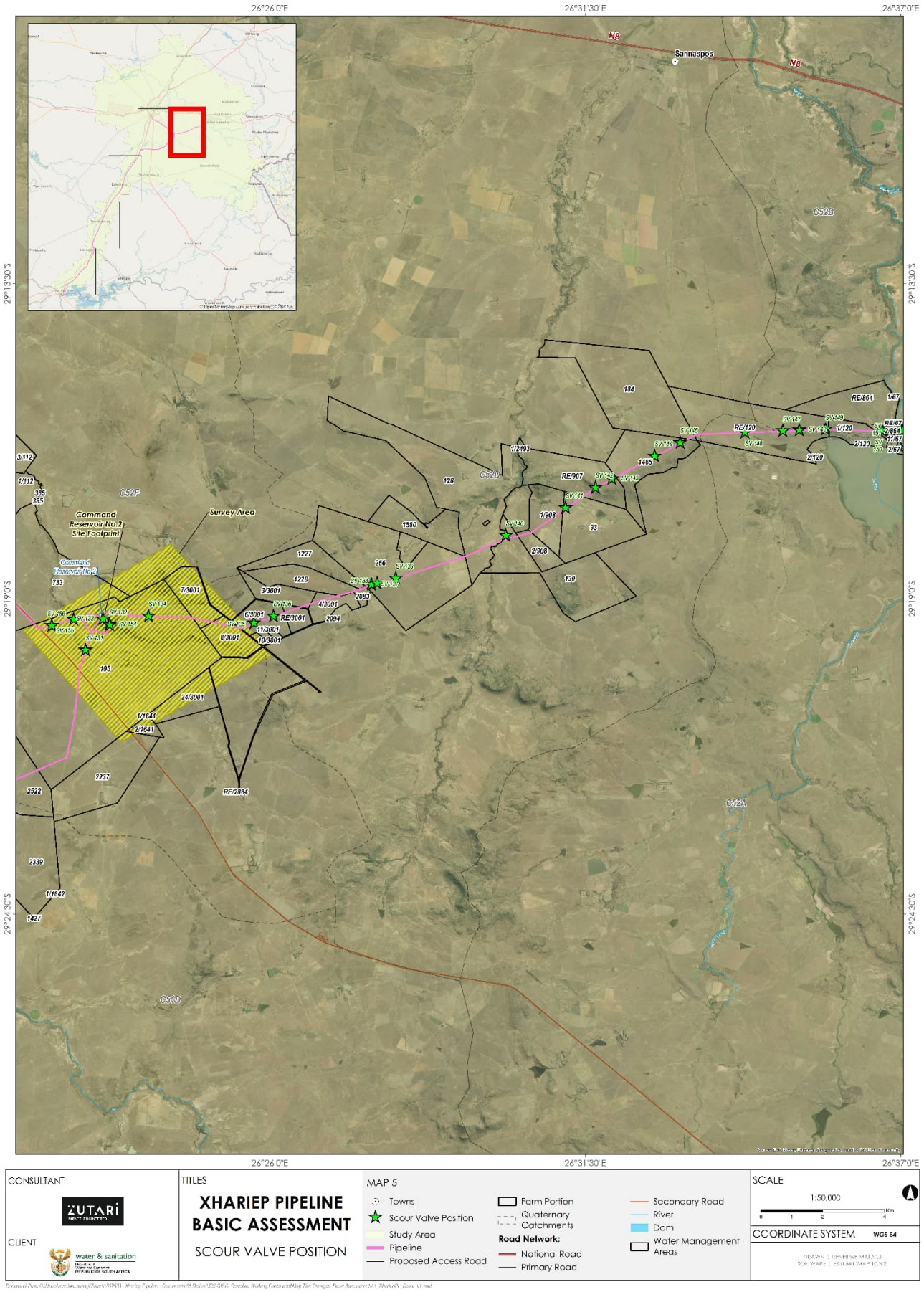


Figure 24: Scour valve position (map 5)

12. Impacts and mitigation measures

The potential impacts and mitigation measures that are expected from the proposed activities are presented in Table 18.

Table 18: Summary of impacts and mitigation measures

Water Use activity	Possible causes of the impacts of the activities Impacts to the water resources	Possible Impacts to the water resource and other water users	Mitigation Measures
Section 21 (a)	Over-abstraction of water from Gariep Dam is likely to lead to depletion of the water levels in the area over time. This can have significant impact to the surface water resource and might impact on upstream and downstream water users that are reliant on the same source of water.	Reduced availability of water for other users. Impact of water quality and quantity.	• SCADA monitoring to ensure sustainable (i.e. long term and safe) yields. • Do not exceed calculated sustainable yields. • Quality and quantity monitoring. • Reduce abstraction in the event of anomalous lowering of dam levels.
Section (b)	Risk of contamination	May cause odour and nuisance to neighbouring environments.	Water storage structures are in good condition and are sufficiently built for the capacity of water to be stored.
	Risk on water quality (extended storage)	The project is aimed at providing potable water to the large areas in Bloemfontein. Impacts on water quality will affect the millions of water users.	• Water quality monitoring. • Emergency preparedness plans in case of water quality is compromised.
Section 21(c & i)	Diversion of water along water crossings	Reduced availability of water for other users. Impact of water quality and quantity. High Turbidity on water due to erosion, sedimentation and other pollution.	• If possible, construction should be conducted during dry periods to avoid impacts of heavy rainfall and runoffs. • Water quality monitoring. • Erosion preventions measures during construction.
	Water quality impacts		
	Erosion		
	Sedimentation	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.	• Minimise disturbance footprint and removal of vegetation, • Reinstate bank and bed geomorphology to natural state.

Water Use activity	Possible causes of the impacts of the activities Impacts to the water resources	Possible Impacts to the water resource and other water users	Mitigation Measures
		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.	• Implement comprehensive rehabilitation of wetland and riparian vegetation. • Implement erosion management structures where necessary.
	Loss of vegetation due to excavation of the trench for the water pipeline.	This may lead to sedimentation for downstream users. Erosion to downstream users	• Repurpose topsoil (where possible), that still has indigenous vegetation intact.
	Alien Invasive Weeds	Construction activities may lead to introduction of alien invasive weeds through human mobility, construction plant and other movement. This may lead to proliferation of invasive plants that were not part in the area before. This will impact the vegetative state of the area.	• Rehabilitation with indigenous vegetation. • No alien species allowed to be used in landscaping and/or rehabilitation. • An alien weed control plan is required and must be implemented during the construction phase as well.
Section 21 (f)	Discharge of untreated effluent from sludge lagoon	Deterioration of water quality downstream unfit to use	The sludge will meet the quality standards as required. The effluent parameters (TSS, Ammonia etc.) will not be exceeded.
	Capacity and integrity of sludge lagoons	The sludge lagoons can hold the sludge and will not lead to overflows.	Regular maintenance and inspection to infrastructure.
	Sludge Lagoons Pollution	If left unchecked, sludge can lead to higher effluent levels of BOD, TSS and ammonia on water that other users rely on for their livelihoods. Odors and nuisance to neighbouring farmers.	• The sludge will be treated to meet the standards. • Monitoring to check the quality of sludge. • Odour management through biological methods such as aeration, biocover and biofiltration.
Section 21 (g)	Discharge of untreated effluent from WTW	Deterioration of water quality downstream unfit to use	The water will be treated to meet the water quality objectives prior to discharge.
	Capacity and integrity of sludge lagoons, drying beds and septic tanks	The sludge lagoons can hold the sludge and will not lead to overflows.	Regular maintenance and inspection to infrastructure.

Water Use activity	Possible causes of the impacts of the activities Impacts to the water resources	Possible Impacts to the water resource and other water users	Mitigation Measures
	Sludge Lagoons Pollution	• If left unchecked, sludge can lead to higher effluent levels of BOD, TSS and ammonia on water that other users rely on for their livelihoods. • Odors and nuisance to neighbouring farmers.	• The sludge will be treated to meet the standards. • Monitoring to check the quality of sludge. • Odour management through biological methods such as aeration, biocover and biofiltration.
	Integrity of the suction and command reservoirs and septic tanks.	Overtime deteriorating infrastructure that may lead to leakages and contamination of stored water.	• The infrastructure will be maintained and inspected at regular intervals for possible leakages and contamination.
	Erosion protection structures can sufficiently manage erosion.	Erosion impacts to downstream water users.	• Management and maintenance of erosion structures. • Replace erosion measures regularly to ensure integrity. • Check the if erosion structures are still intact after heavy rainfall events.
Section 21 (j)	Dewatering of trenches may lead to saline intrusion and contaminant migration.	Sedimentation and contamination for other downstream users.	• Erosion and sedimentation measures put in place during construction.
	In severe cases, dewatering can cause the ground to lose structural integrity, which causes ground settling.	Damage to nearby buildings and structures.	• Dewatering should be phased, to ensure large trenches are not excavated.

13. Water demand and water supply

Water demand

There is no water balance compiled at this stage of the project for the construction phase, except for the estimate detailed below.

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 water demand for the project will be determined during the detailed design phase of the project.

Water supply (Potable water)

The water supply analysis was conducted as part of the 2012 Reconciliation Strategy which identified various options (routes, also called schemes) that will be feasible for the required augmentation

scheme to be considered to supply the GBWSS. The MMM and VCWB both investigation the transfer of water from Gariep Dam and came to different conclusions on the preferred option. MMM concluded that a direct pipeline from Gariep Dam to Bloemfontein conveying potable water will be the optimal solution. VCWB concluded that a pipeline from Gariep Dam to Knellpoort Dam conveying raw water will be the optimal solution. DWS initiated this study to appraise, at a pre-feasibility level of detail, the most promising previously identified development options (routes) for the Xhariep Pipeline Project, and to recommend the optimal system size (including phasing) and the best water conveyance route from a regional and national perspective that should be taken forward to the feasibility stages of study.

The three most feasible pipeline route options identified from previous studies were:

- Scheme 1: Direct potable pipeline from Gariep Dam to Bloemfontein
- Scheme 2: Raw water pipeline from Gariep Dam to Knellpoort Dam, and,
- Scheme 3: Raw water pipeline from Gariep Dam to the Novo Outfall Structure.

A fourth scheme, referred to as Scheme 4, was identified at the commencement of this study. Scheme 4 is a raw water pipeline from Gariep Dam to Rustfontein Dam, which aims to reduce the losses associated with Schemes 2 and 3 where water will be conveyed along the upper reaches of the Modder River before discharging into Rustfontein Dam. These four routes are shown in Figure 25.

Feasibility studies are iterative in nature, as interventions/schemes are required such that the water resources yield matches the forecasted water demands, followed by infrastructure option identification, refinement of the yield modelling, refinement of infrastructure sizing, etc. The iterative process and the steps followed for this study is shown in the flowchart of Figure 26.

During the first phase of this study, the water resources yield modelling was based on transferring a maximum volume of 60 million m^3/a from Gariep Dam. Demand projections for 2050 were calculated for the GBWSS. The historic firm yield (HFY) was determined for each of the four schemes as well as the percentage of the 2050 demands that can be met by each scheme for the major demand centres (Bloemfontein and Botshabelo & Thaba Nchu). From the modelling it was clear, that the HFY differs from scheme to scheme, the HFY was considerably lower than the 2050 demand, and a higher volume would need to be transferred from Gariep Dam to satisfy the 2050 demand.

The infrastructure required for each of the four schemes, based on the 60 million m^3/a transfer volume, was determined, and costed to compare the schemes. Multiple sub-options were determined for each scheme where different pipeline diameters and pump station positions were evaluated. These sub-options optimised the infrastructure required for each scheme.

The operating and maintenance costs were converted to a Net Present Value (NPV). The yields for each scheme were also converted to NPVs which allowed Unit Reference Values (URVs) to be calculated. From this cost comparison, it was determined that Scheme 4 was the most economical raw water scheme (compared to Schemes 2 and 3) and Scheme 1 was 7.5% more expensive than Scheme 4.

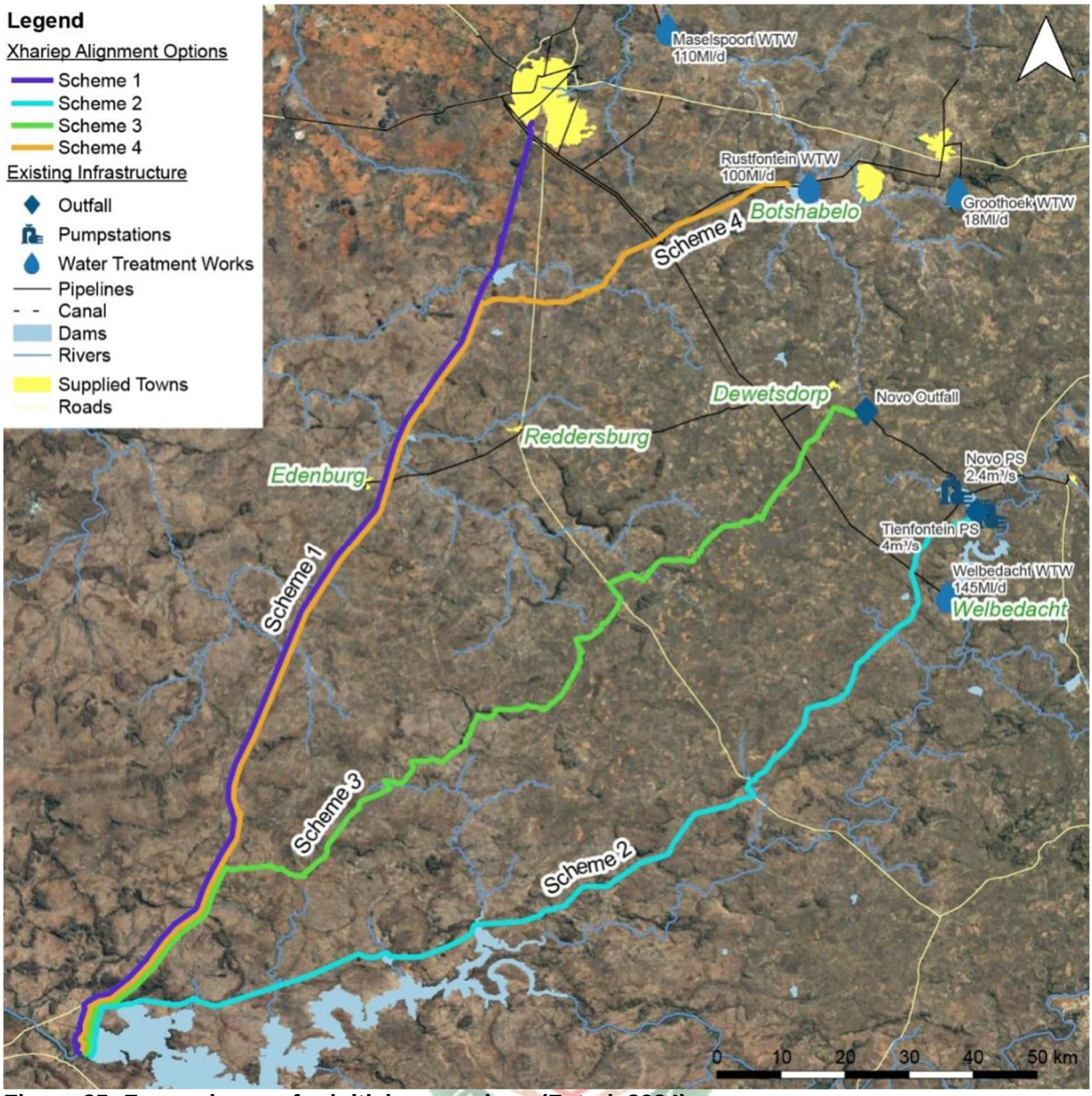


Figure 25: Four schemes for initial comparison (Zutari, 2024)

A stakeholder engagement meeting with DWS, MMM and VCWB took place on 2 November 2023 where feedback was provided on the progress to date and where operational matters could be discussed. The following specific matters were raised at the meeting:

- Botshabelo and Thaba Nchu were experiencing higher levels of restriction compared to other towns within the GBWSS, mainly as these two towns only have Rustfontein WTW as supply whereas Bloemfontein can receive water from Welbedacht, Rustfontein and Maselspoort WTWs.
- VCWB preferred Scheme 2 (raw water supply to Knellpoort Dam) due to greater operational flexibility, e.g. raw water can be supplied from Knellpoort Dam to Welbedacht Dam as well as to Rustfontein and Maselspoort WTWs.
- The supply of potable water to towns located along the proposed pipeline route remains a priority from a regional water supply perspective.
- Scheme 1 is the only potable scheme under consideration but can only supply Bloemfontein and the towns along the pipeline route, i.e. it would not resolve the challenges experienced at Botshabelo and Thaba Nchu.

All parties agreed that Scheme 1 and Scheme 4 had limitations in terms of overall flexibility and improving the resilience of the GBWSS.

These matters led to the development of Scheme 1B (the Scheme for which this application is being submitted). Scheme 1B is a combination of Schemes 1 and 4, where potable water is supplied from Gariep Dam to a command reservoir located between Bloemfontein and Rustfontein WTW. Water from the command reservoir could then gravitate to Bloemfontein and Rustfontein pump station.

A second phase of water resource yield modelling was undertaken for Schemes 1 (referred to as 1A to avoid confusion), 1B and 4 to determine the transfer volume required from Gariep Dam to satisfy 2050 demands.

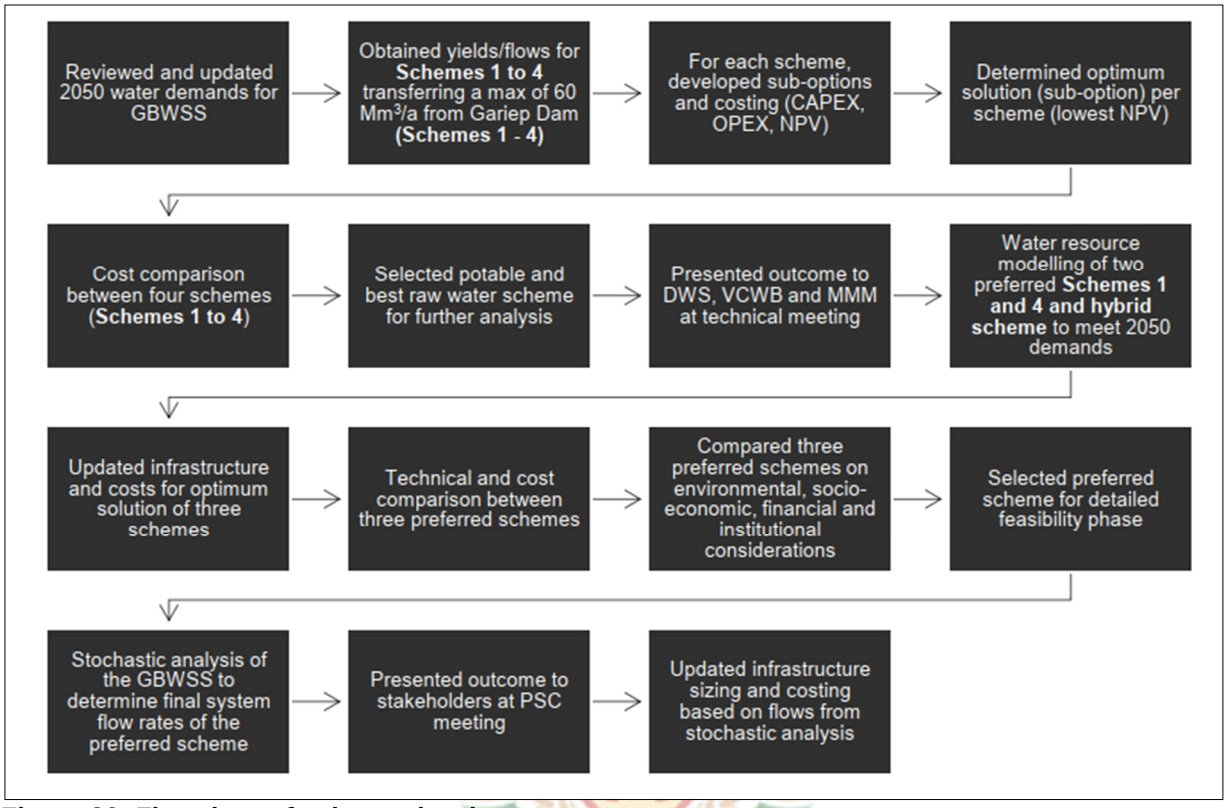


Figure 26: Flowchart of scheme development process

The three schemes were evaluated to identify if each could supply the major demand centres. It was found that Schemes 1A and 4 would not be able to supply 100% of the demands for Botshabelo and Thaba Nchu, mainly due to bottlenecks in the existing GBWSS infrastructure.

The infrastructure sizing and cost estimates were updated for each scheme and the NPV and URV calculated. Comparing the URVs, it was found that the schemes were within 3% of each other and therefore from a financial perspective are comparable. However, given that Scheme 1A cannot supply 100% of the water demands of Botshabelo and Thaba Nchu and Scheme 4 (a raw water scheme) cannot supply towns along the route, it was proposed that Scheme 1B be considered for implementation.

Further optimisation took place of Scheme 1B, by testing operating rules, maximising the utilisation of existing and proposed infrastructure and the positioning of pump stations. Three alternative configurations of Scheme 1B were considered as part of the design optimisation process and when comparing the URVs the iterations differed by less than 2%.

A site visit was undertaken in January 2024, to evaluate the various infrastructure sites in terms of topography, impact on farming activities, location relative to existing access roads and powerlines as well as any other observations that could impact the feasibility of the sites. Operational aspects were also considered, e.g. preference will be given to configurations where demands can be met under gravity flow, rather than being pumped. Based on the findings of the site visit and accounting for

operational considerations, it was decided that configuration 1B1 (A) (Scheme 1B) is the current feasible potable water supply scheme for implementation.

14. Public participation

Consultation with the public forms an integral component of the IWULA process. This process enables IA&Ps (e.g., directly affected landowners, national, provincial and local authorities, local communities), to raise concerns and comment on the proposed activity.

Zutari undertook an integrated Public Participation Process (PPP) for the EA in terms of the EIA Regulations, 2014, under the NEMA, and WULA in terms of Section 41(4) of the NWA. PPP took place from 3 June 2024 to 5 August 2024 (60 days).

The following methods of notification were used (details are in the below sections):

- Written Notifications:
    - Written notifications were sent to all registered and identified I&APs as well as to all the I&APs on the database which has been obtained from GladAfrica (for the previous EA).
- Distribution of Background Information Document (BID):
    - A BID was 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 landowners.
- Newspaper advertisement:
    - The availability of the Draft BAR was advertised in the 'The City Press and the "Rapport" newspapers on 2 June 2024 and informed the public of the public participation opportunities and the availability of the Draft BAR for comment.
- Site Notices:
    - Site notices were made available at strategic locations (public libraries, farm stall, holiday Inn and fuel station) the following areas: (i) Gariep Dam, (ii) Trompsburg, (iii) Edenburg and (iv) Bloemfontein.
- Distribution of hard copies of reports (BAR):
    - Hard copies of the draft BAR and Annexures (which also includes water-related information for the project) was distributed. Four hard copies were made available at the (i) Gariep Dam, (ii) Trompsburg, (iii) Edenburg and (iv) Bloemfontein.
- Website Uploads:
    - The BAR and Annexures were uploaded on the DWS website: https://www.dws.gov.za/projects.aspx, Zutari website: https://geoverse.zutari.com/portal/apps/experiencebuilder/experience/?id=2f48681c19a24836bcfc03da3c653c3a and South African Heritage Resources Information System (SAHRIS) website (case number 22474).
- Engagement Meetings:
    - Three engagements took place at Gariep Dam, Trompsburg and Bloemfontein on 11 June 2024 at the following Gariep Dam, Trompsburg and Bloemfontein.

Due to the number of comments received on the project, the Comments and Response Report (CRR) is attached as Annexure B.

15. Other authorisations applicable to the activity

Environmental Authorisations (Reference: 14/12/16/3/3/1/2996) issued on 26 September 2024.

16. Section 27 (1)

The requirements contained in Section 27(1) of the National Water Act, 1998 (Act 36 of 1998) have been considered and are discussed further below.

a) Existing lawful water uses

- An existing lawful water use (ELWU) is a water use which has taken place any time during a period of two years before the date of the commencement of the NWA, 1998. This allows any water use that lawfully took place to continue until such time as it can be converted into a license.
- Zutari is not aware of any ELWUs that exist for the proposed project. The Project is for a Government Water Scheme (GWS) for augmentation of potable water supply to the Greater Mangaung Metropolitan area and surrounding smaller urban centres. The potable water pipeline will be approximately 244 km and will traverse numerous existing farm land. It may be possible that some properties to which the project traverses have ELWUs.

Unlawful water Use

- Zutari is not aware of any unlawful water uses that exist for the proposed project.

New Water Uses

- The Project includes various water uses that triggers Section 21 (a), (b), (c) & (i), (f), (g) and (j) water uses. These are summarised in Table 19 below.

Table 19: Summary of water uses

Section 21 water uses (NWA)		
Water use	**Purpose**	**Details**
Section 21 (a): Taking water from a water resource	The project activities will include abstraction of water from the dam and rivers.	Potable bulk water pipeline from Gariep Dam consisting of the following: • Xhariep Raw Water Pump Station • Xhariep WTW • Xhariep High Lift Pump Station • Command Reservoir (2 sites) • Booster Pump Station and Suction Reservoir • Xhariep Raw Water Pipeline • Xhariep Potable Pipeline • Gravity Pipeline to Brandkop • Gravity Pipeline to Rustfontein Pump Station
Section 21 (b): Storage of water	The project includes storage of water.	
Section 21 (c): Impeding or diverting the flow of water in a watercourse	The proposed activities will include construction of structures/facilities (pipeline, weirs, bridges, stormwater measures) within surface water resources. The proposed activities will be within the watercourse, the extent of a watercourse, i.e. the 1: 100-year floodline, or riparian habitat, whichever is the greatest, and or within a 500m radius from the boundary of a wetland.	
Section 21 (f): Discharging waste or water containing waste into a water resource.	The proposed project activity will include discharge of water containing waste from sludge lagoon into a river or a wetland.	

Section 21 (g): Disposing of waste in a manner which may detrimentally impact on a water resource.	The proposed project activity will include disposal of waste water/effluent into the sludge lagoon, storage of water from WTW in suction reservoir, command reservoirs and septic tanks. The project also includes batching plants with sedimentation traps.	
Section 21 (i): Altering the bed, banks, course, or characteristics of a watercourse	The proposed activities will include construction of structures/facilities (pipeline, weirs, bridges, stormwater measures) within surface water resources. The proposed activities will be within the watercourse, the extent of a watercourse, i.e. the 1: 100-year floodline, or riparian habitat, whichever is the greatest, and or within a 500m radius from the boundary of a wetland.	
Section 21 (j): Removing, discharging or disposing of water found underground if it is necessary of the efficient continuation of an activity or for the safety of the people.	The project activities will include dewatering of trenches for safe continuation of construction activities.	

b) Section 27 (1)(b) – Redressing the results of past and gender discrimination

During the construction phase of the pipeline employment opportunities will be provided to the nearby marginalised communities and furthermore attend to the need for water in and around the MMM area. The project will have both local and regional economic benefits during construction and operational phase. This is directly having capital investment into the local economy, procurement of local goods and services, as well as direct and indirect employment creation.
It is recommended that during project planning phase (appointment of service provides, project manager, appointment of consultant and sub-consultant etc.) the applicant ensure:

- Equal access to opportunities.
- Where possible, empower the previously marginalised groups through employment. Especially for unskilled labour force.
- Compliance with the legal requirements such as the Employment Equity Act, 1998 (Act No. 55 of 1998).
- Involve local businesses in the procurement of local goods and services; maximise the employment of local labour, where skills are available.

Equity status information for the project is not available.

c) Section 27 (1)(c) – Efficient and beneficial use of water in the public interest

As public trustee of the water resources, the DWS must ensure that water is protected, used, developed, conserved, managed and controlled in a sustainable and equitable manner for the benefit

of all users. The Minister, through the Department, has to ensure that the water is allocated equitably and used beneficially in the public interest, while promoting environmental values.

It has been reported that the existing GBWSS has experienced water restrictions since 2014 due to the inability of the existing infrastructure to supply the growth in water demand. The aim of this project is to ensure a sustainable flow of potable water to the population of the MMM area. Furthermore, there is a focus on eradicating the bucket system in Mangaung, Botshabelo and Thaba Nchu. This will result in an increase in the need for water within the municipal area.

It is the intention of the DWS and collaborative parties (e.g. MMM) to improve water supply through the construction of the water pipeline to address the current and expected water demand issues as outlined in the municipal Spatial Development Framework (SDF) and the Integrated Development Plan (IDP). The proposed water use will be to the benefit of the public.

d) Section 27 (1)(d) – Socio-economic impact

The provision of potable water has been identified as an urgent need in both the MMM and the Kopanong Local Municipality's IDPs. As highlighted, it is the intention of the MMM 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.

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

The delivery of potable water to the MMM 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. Furthermore, 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.

I. **If the water uses are authorised, the following socio-economic benefits will be realised:**

- More efficient and optimisation of bulk water provision, ensuring water security to the MMM area.
- The upgrade of infrastructure and improvement of services in the area.
- Job creation.
- Respond to the current backlog of adequate water supply in and around the MMM area.
- Improve the quality of life for stakeholders, especially for the poor.
- Strategic need and desirability of the proposed project.
- Sustainable Development.
- The proposed activities will be in line with the international, national, provincial and local legislation, planning frameworks, guidelines, policies etc.

II. **Failure to authorise the water use or water uses:**

- The current status quo being maintained as far as water insecurity is concerned.
- Inability for the DWS and MMM to realise the objectives of sustainable development to meet the water provision needs of the community and developments.

- Prevent the DWS and MMM from 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.
- As mentioned before, there is a 10-year plan to address the estimated backlog of adequate water supply to 1.4 million households and basic sanitation to 2.1 million households. Failure to authorise the project will result in the current and additonal backlog of adequate water.
- Inability of sustainable supply of water to meet social needs and support economic growth.
- Inability to provide new bulk water and wastewater infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of infrastructure.

e) Section 27 (1)(e) – Applicable catchment management strategy applicable to the relevant water resources

In accordance with Chapter 2 of the NWA, Part 2 requires every CMA to develop a Catchment Management Strategy (CMS) for the water resources within its water management area. The CMS set the principles for allocating water to existing and prospective users, considering all matters relevant to the protection, use, development, conservation, management and control of water resources at the catchment and WMA scale (DWA, 2009). The project site is administered by the Orange River CMA in the Upper Orange WMA.

To the EAP's knowledge the class and resource quality objectives for the affected rivers has not been developed yet. It is assumed that the DWS official responsible for the area will know whether the water resources form part of any CMS. Although the CMS has not been gazetted for the WMA, it is important to note that the northern section of the pipeline is within the Central Pan Belt Strategic Water Source Area (SWSA) (Figure 27). Strategic Water Source Areas (SWSAs) are areas of land that either: (a) supply a disproportionate (i.e. relatively large) volume of mean annual surface water runoff (i.e. water in streams, rivers and wetlands) in relation to their size and so are considered nationally important; or (b) have relatively high groundwater recharge and groundwater forms a nationally important resource (has high levels of use or settlements depend on it); or (c) areas that meet both criteria (a) and (b) (WRC, 2019). Therefore, the Central Pan Belt, that is affected in the northern section of the pipeline, is an important SWSA in terms of groundwater.

It has been reported that the current water scarcity reality in South Africa provides strong motivation for protecting SWSAs to ensure a sustainable and equitable water supply. According to Le Maitre *et al*. (2018) there is currently no specific policy, legislation, or regulation that specifically protects SWSAs, including their groundwater counterparts. Due the strategic importance of the proposed project; it is motivated that the DWS approved with mitigation measures as detailed in the environmental reports and specialist assessment reports.

The freshwater specialists assessed that the risk for the watercourses and wetlands along the pipeline route varies from a "Low to Moderate" risk. 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. Impacts are however still anticipated to be significant, and interventions and mitigation measures as recommended in the report should be implemented.

It is assumed that the conditions of the licence (once issued) will align with the management agencies planning tools in terms of groundwater status, water allocation and where available, Resources Water Quality Objectives (RWQO) and Resource Quality Objectives. This effectively should ensure coherent management and sustainable use of the country's water resources.

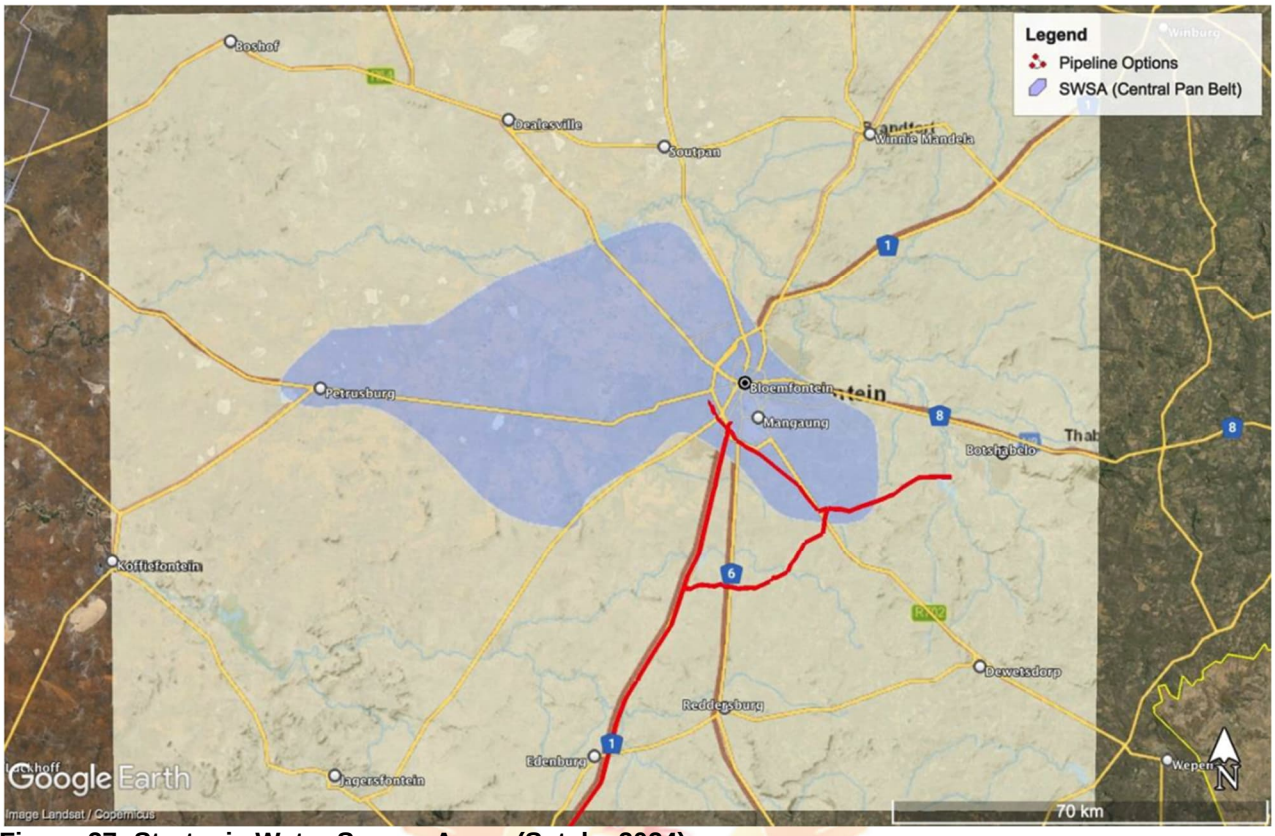


Figure 27: Strategic Water Source Areas (Setala, 2024)

f) Section 27 (1)(f) – Likely effect of water use to be authorised on the water resource and on other water users

As mentioned before, the project will affect numerous watercourses and wetlands. It is, therefore, likely that the project, comprising a large diameter pipeline that requires extensive trench excavation and associated construction footprint, will result in significant impacts on the affected watercourses and wetlands.

The following impacts have been identified and associated mitigation measures are recommended to minimise the risk to watercourses:

1. Loss of riparian and wetland vegetation, including protected and rare species

- Transplanting of affected species of conservation concern (SCC).
- Rehabilitation of the wetland areas that may include transplanting affected specimens.
- Topsoil management and rehabilitation should be undertaken to allow the affected areas to re-establish a vegetation composition that is fairly similar to the natural condition.
- Retain the construction footprint and limiting construction activities within the proposed footprint.

2. Disturbing the bed and banks of watercourses and the associated erosion and sedimentation

- Removal of vegetation should be kept to a minimum.
- Stabilise the bed and banks, and erosion to be prevented.
- Monitoring and remedial action be maintained for a period of two years (as recommended by DPR) after construction has been completed.

3. Topsoil and sub-soil management

- 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.
- Re-instate the watercourse bed and bank morphology as far as possible.

- Consider backfilling with resistant material up to the watercourse bedrock surface.
- Use geotextiles to stabilise soils where steep banks occur, and erosion is evidently problematic. Available options include contouring, berms, gabions and geotextile netting (DPR, 2024).

4. Erosion and Sedimentation

- Discharge of runoff into the river system to make use of energy dissipating structures to prevent erosion;
- Adequate storm water management should be incorporated into the design of the proposed activities, along with the existing storm water, in order to prevent erosion and associated sedimentation of the riparian zones;
- Re-instate the watercourse bed and bank morphology as far as possible.

5. Establishment of exotic weeds and invaders

- Alien invasive monitoring, control and eradication should be undertaken, especially along important watercourses and wetlands.

6. Altering the flow and flooding regime of watercourses

- Construction through ephemeral systems should be completed in the shortest timeframe to minimise the likelihood of flooding taking place.
- No open trenches through ephemeral systems to be left for any extended period.
- Where trenches are being excavated through seasonal watercourses this should preferably be done during the winter months when base flow will be lowest, and flooding is unlikely to take place.
- If possible, construction especially along the larger seasonal watercourses, should be completed during the winter months (July to September).
- Construction of a berm and diverting the flow to minimise the diversion of watercourse.
- 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.

7. Ecological services of watercourses

- The connectivity of the riparian areas will be maintained between the areas upstream and downstream of the proposed activities.
- Ensure that permanent, seasonal and temporary wetland zones functionality is maintained through the provision of measures ensuring that soil wetting conditions are maintained.
- Ensure the ongoing functioning of the river areas in the vicinity of the proposed development; Rehabilitation of the wetland areas will be implemented to ensure continued functionality.

8. Maintenance and repair of pipeline and associated infrastructure

- 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.

9. Implications of downstream water uses of the Gariep Dam

- Abstraction of water from the Gariep Dam may cause change in flow, quality and quantity of the water resource, which may impact on the downstream users.
    - Over-abstraction of water resources often leads to lowered water levels and water scarcity. This may reduce the water quantity for end user such as farmers relying on Gariep Dam for irrigation and other farming practises.
    - The project may also lead to reductions in water quality as pollutant concentrations are increased, this may affect subsistent fisheries and other ecological goods and services for downstream users.
- It is however, stressed that the end-user/applicant should ensure that no over-abstraction occurs and abstraction volumes are as prescribed in the WUL, once issued. Furthermore, it is recommended that surface water monitoring of upstream and downstream of Gariep Dam is undertaken to directly measure the change in the water quality and quantity.

The risk for the watercourses and wetlands along the pipeline route varies from a “Low to Moderate” risk with mitigation. However, none of the affected watercourses and wetlands are anticipated to entail a “High Risk”.

In spite of the abovementioned negative impacts, the project has positive impacts. The project has a strategic importance in improving the water supply to address the current and expected water demand issues as outlined in the MMM’s SDF and the IDP. Furthermore, the project falls into the ambit of SIPS 18 and 19 – Water and Sanitation Infrastructure aimed to address the estimated backlog of adequate water supply to numerous household and basic sanitation. The project will ensure provision of sustainable supply of water to meet social needs and support economic growth. Additionally, the projects will provide new infrastructure, rehabilitation and upgrading of existing infrastructure, as well as improve management of infrastructure.

g) Section 27 (1)(g) – Class and resource quality objectives of the water resource

Under Part 2 of the NWA, the Minister is required to use the classification system established in Part 1 of the Act to determine the class and resource quality objectives of all or part of water resources considered to be significant. The purpose of the resource quality objectives is to establish clear goals relating to the quality of the relevant water resources. RWQOs provide the numeric or descriptive goals, within which the water resource must be managed. These water quality ‘limits’ can also assist the DWS in assessing the extent of the remaining allocatable water quality within a water resource management unit, and how a possible license application may impact upon this allocatable resource.

The DWAF (2009) made recommendations on a preliminary set of RWQOs on potential RWQO sites along the Orange River and tributaries in Lower Orange WMA. It was recommended that the DWS as the custodian of the RWQOs ensure implementation thereof, by ensuring that the RWQOs form a basis for water quality management in the catchment areas of the Orange River, and should be included in the water use authorisations. The following recommendations have been made for the Gariep Dam.

Variable group	Variable	Units	Present State	Ref. value	RWQO Model	User	RWQO Rec	Reason	Alloc Value
Physical variables	Hard-Tot	mg/ℓ	**90**	–	175	AAq-A	**175**	–	85
	EC	mS/m	**23.9**	19.7	70	Dom-I In3	**40**	Alr-I; d/s	16.1
	pH 5th	Unit	**7.3**	–	6.5	Alr In3	**6.9**	5 % dev	0.4
	pH 95th	Unit	**8.3**	–	8.0	In3	**8.4**	Alr Nat.	0.1
Chemical variables	Alkalinity	mg/ℓ	**89.6**	84.5	97.5	AAq	**175**	AAq-T	85.4
	Ammonia	µg/ℓ	**10**	–	15	AAq	**15**	–	5
	Calcium	mg/ℓ	**22.7**	19.2	10	Dom	**60**	2x d/s	37.3
	Chloride	mg/ℓ	**8.4**	5.50	100	Dom Alr	**40**	5x, d/s	31.6
	Fluoride	mg/ℓ	**0.21**	0.27	0.70	Dom-I	**0.70**	–	0.49
	Magnesium	mg/ℓ	**8.3**	7.9	70	Dom	**30**	–	21.7
	Potassium	mg/ℓ	**2.1**	2.7	25	Dom–I	**25**	Dom-I, d/s	22.9
	SAR	mmol/ℓ	**0.38**	0.41	2.0	Alr	**1.5**	Alr-soil	1.12
	Sodium	mg/ℓ	**8.1**	8.1	70	Alr	**40**	5x, d/s	41.9
	Sulphate	mg/ℓ	**15.8**	10.1	200	Dom In3	**60**	4x d/s	44.2
	TDS	mg/ℓ	**168**	–	260	Alr	**260**	–	92
Nutrients	PO_4-P	µg/ℓ	**29**	25	10	AAq	**40**	Eco-Rec	11
	NO_3&NO_2-N	mg/ℓ	**0.28**	0.81	6.0	Dom	**0.40**	Eco-Rec	0.12
	DIN	mg/ℓ	**0.37**	–	0.25	Eco-I	**0.50**	Eco-Rec	0.13
	Si	mg/ℓ	**9.0**	–	20	In3	**20**	Eco	11
Response variable	Chl-a*	µg/ℓ	**4.9**	–	15	RFull	**10**	Eco-I	5.1
	Diatoms*	SPI	**7.8**	–	–	–	**13– 17**	Good qual	-5.2
	*E. coli**	/100mℓ	**12**	–	–	–	**130**	RFull	118

* Snapshot mean values; **AAq**: Agriculture – Aquaculture; **A**: Acceptable; **Alloc**: Allocatable; **Alr**: Agriculture – Irrigation; **ASw**: Agriculture – Stock watering; **BHN**: Basic Human Needs; **Dom:** Domestic; **d/s:** downstream users; **Eco:** Ecosystem requirement; **I:** Ideal; **In3:** Industrial – Category 3; **Nat:** Natural; **Rec:** recommended value; **Ref**: Reference value; **RFull:** Recreation – Full contact; **T:** Tolerable.

Figure 28: Present state, Reference values and preliminary RWQOs for Gariep Dam (DWAF, 2009)

The pipeline will cross over numerous watercourses and/or tributaries (Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit, Bossiespruit Paardeplass, Erfdeel, Edenburg, Holspruit, Xspruit, Renostersprui, Koringspruit, Klein Kaalspruit and Kaalspruit). It is not known that RWQOs have been determined for the other rivers affected by the project.

It is recommended that where possible the current ecological state of the water resources affected by the project should be maintained and where possible, improved.

h) Section 27 (1)(h) – Investments already made and to be made by the water user in respect of the water use in question

As mentioned before, the project is a SIP 18 and 19 identified to meet water requirements of the areas in and round the MMM, as well as to meet the desired assurance of supply for both urban and agricultural water requirements.

The DWS has made large investments in terms of professional fees (consultants, engineers, specialists). The development of the pipeline will be a massive capital expense on the account of the MMM and other local municipalities.

Further investments will be made as and when the project progresses. Due to the scale of the project, it can be assumed that this is a multi-million-rand project.

i) Section 27 (1)(i) – The strategic importance of the water use to be authorised

The project has been identified as part of the 2012 Reconciliation Strategy as part of the GBWSS to secure a sustainable water supply for the future water demands in the MMM area. The project is strategically important for the safe guiding of water supply and as a water augmentation scheme option.
The construction phase of the development will create many temporary employment opportunities for the local residents of the nearby and surrounding areas. This will promote the transfer of skills which these employees can use in the future.
The proposed bulk water supply pipeline is also addressing the greater needs of the area by addressing the infrastructure need and improving upon service delivery. The bulk water supply will facilitate future developments in the surrounding area, thus increasing the Municipal tax base.
The overall project will ensure the following benefits:

- To protect water resources.
- To promote equitable access to water.
- To facilitate social and economic development.
- To meet sustainability goals in line with the international, national, provincial and local legislation, planning frameworks, guidelines, policies etc.

j) Section 27 (1)(j) – The quality and quantity of water in the water resource which may be required for the reserve and for meeting international obligations

As mentioned in (g) above, the DWAF (2009) published RWQO recommendations on various sites along the Orange River and tributaries in Lower Orange WMA. The recommended RWQO for the Gariep Dam are indicated in Figure 28 above. However, it is not known if RWQO has been developed for the other rivers and tributaries affected by the project. Therefore, it is requested that the DWS considers the RWQO, and other water allocation plans of the WMA when specifying the water quality and quantity monitoring conditions in the WUL.

It is further recommended that activities (once authorised) should be conducted in line with recommendations and mitigation measures as set out in the WULA summary report, Integrated Water and Waste Management Plan (IWWMP), Specialists Assessment reports, Engineering Designs and Reports, and other relevant advisory documentation for the project.

Where possible the current ecological state of the water resources affected by the porject should be maintained and where possible, improved.

k) Probable duration of any undertaking for which a water use is to be authorised

This is a new activity therefore all water uses are new and there are no existing water uses relevant to the development.

As the investment is significant and the project is a bulk project and will continue through to the operational phase (rehabilitation and maintenance), it is proposed that the licence be issued for the upper limit period of 40 years.

17. Declaration by the applicant with signature confirming that the information submitted is correct

Approval			
Author signature		Approver signature	
Name	Tiisetso Margaret Phiri	Name	Roshantha Kolapen
Title	Environmental Consultant *Pr. Sci. Nat (123524)*	Title	Senior Environmental Consultant *Pr. Sci. Nat* (114421)

[END OF WATER USE LICENCE APPLICATION SUMMARY]

Appendix A:

Xhariep pipeline wetland assessment

Wetland Assessment for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.

March 2024

Prepared by:

Darius van Rensburg
Pr.Sci.Nat. 400284/13
T 083 410 0770
darius@dprecologists.co.za
P.O. Box 12726 | 61 Topsy Smith Street
Brandhof | Langenhovenpark
9324 | 9300

Prepared for:
Zutari
1 Century City Drive
Waterford Precinct
Century City
Cape Town

DECLARATION OF INDEPENDENCE

DPR Ecologists and Environmental Services is an independent company and has no financial, personal or other interest in the proposed project, apart from fair remuneration for work performed in the delivery of ecological services. There are no circumstances that compromise the objectivity of the study.

Report Version	**Final 1.1**		
Title	**Wetland Assessment for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.**		
Author	**DP van Rensburg (Pr.Sci.Nat)**		**Mar'24**

Executive Summary

The development entails the proposed construction of a potable water transfer pipeline in order to augment the requirements of the Mangaung Metropolitan Municipality. The pipeline will be constructed from the Gariep Dam to the city of Bloemfontein and will roughly follow the layout of the N1 National Road situated alongside this road (Appendix A: Map 1 & 2). The pipeline will then veer away from the N1 National Road just to the south of the Tierpooort Dam from where it will cross over natural areas and along gravel roads. Where the pipeline meets the R702 tarred road, it will split off into two lines, one being a gravity/pumped pipeline to Bloemfontein (Alternative 1B1/2 – Gravity/Pumped line to Bloemfontein) and the other connecting to the Rustfontein Dam (Alternative 1B – Gariep – Rustfontein) (Figure 1 & 2). The pipeline will have a diameter of 1.2 meters and will require a footprint width of approximately 40 meters. In general, the catchment of the watercourses and wetlands in the Southern Free State are still natural with limited transformation and as a result, these systems are also still functioning largely naturally. Impacts that may still affect these systems include infrastructure such as the N1 National Road and an extensive gravel road network, limited transformation for small crop fields and some irrigated fields and farm dams and weirs acting as containment structures. A large number of watercourses and wetlands will be affected by the pipeline construction though almost all of these are seasonal systems and will only contain active flow after rainfall occurs.

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 (Appendix A: Map 1). 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 (Appendix A: Map 2). 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 (Appendix A: Map 1 - 7).

The entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and RietModder Sub WMA (Appendix A: Map 2). 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.

The watercourses and wetland systems were delineated by use of topography (land form and drainage pattern) and riparian vegetation with limited soil sampling (Appendix C). The presence of wetland conditions was also confirmed by undertaking a sample survey within each of the watercourses and wetlands which will be affected by the pipeline route (Section 4.2.7: Table 9).

Due to the high amount of watercourses being crossed by the pipeline a determination of the Index of Habitat Integrity (IHI) will only be conducted for the larger watercourses being crossed by the pipeline (Appendix D). These will be the Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit and Bossiespruit. This is considered to give an adequate representation of the overall condition of the watercourses being crossed by the pipeline. The IHI will be taken as representative of the Present Ecological State (PES) of these systems. As previously indicated, the entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and Riet-Modder Rivers 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 and their catchments affected by largely the same impacts and the impact caused by the proposed pipeline will therefore largely affect them to the same degree and their assessment is therefore considered to give a fairly good indication of the overall condition of watercourses that will be affected by the pipeline development. In order to further improve the determination of the condition of the affected watercourses, a WET-Health determination will also be undertaken for portions of a few of the larger floodplain wetlands which will be affected by the pipeline development (Appendix D).

Table: Summary of Present Ecological State (PES) scores for significant watercourses assessed along the pipeline route.

Watercourse	PES	EI&S	Order
Modder River	Class D: Largely Modified	Moderate	3
Koringspruit	Class C: Moderately Modified	High	1
Tierpoort River	Class C: Moderately Modified	High	2
Riet River	Class C: Moderately Modified	Moderate	4
Vanzylspruit	Class B/C: Largely Natural to Moderately Modified	High	2
Bossiespruit	Class C: Moderately Modified	Moderate	1

The results of the assessment of the significant watercourses along the pipeline route indicate that the majority are still natural to a large extent and only moderately modified (Table 12). It is also evident that the larger watercourses affected by higher levels of utilisation are more modified while the proximity to urban areas (Modder and Tierpoort Rivers), also corresponds to a decrease in condition.

The proposed pipeline route will cross over and affect a large number of watercourses and wetlands (Appendix A: Map 2 - 7). A short description of these watercourses and wetland, their vegetation composition and functioning has been provided (Section 4.2.7: Table 9). Where several tributaries are situated adjacent to each other, or where a watercourse is crossed at more than one point, they may be combined in one sample site to serve as representative for all affected sections.

A Risk Assessment for the proposed Xhariep Bulk Water Pipeline from the Gariep Dam to Bloemfontein and the Rustfontein Dam has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment

Matrix for Section 21(c) & (i) water use (Appendix E). Having a large diameter and therefore requiring extensive trench excavation and construction footprint will result in significant impacts on the affected watercourses and wetlands. The following 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 (Appendix E):

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.

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 (Appendix E). 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. Impacts are however still anticipated to be significant and the following interventions and mitigation is therefore recommended:

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Wetland Assessment

1. Introduction

Natural vegetation is an important component of ecosystems. Some of the vegetation units in a region can be more sensitive than others, usually as a result of a variety of environmental factors and species composition. These units are often associated with water bodies, water transferring bodies or moisture sinks. These systems are always connected to each other through a complex pattern. Degradation of a link in this larger system, e.g. tributary, pan, wetland, usually leads to the degradation of the larger system. Therefore, degradation of such a water related system should be prevented.

Though vegetation may seem to be uniform and low in diversity it may still contain species that are rare and endangered. The occurrence of such a species may render the development unviable. Should such a species be encountered the development should be moved to another location or cease altogether.

South Africa has a large amount of endemic species and in terms of biological diversity ranks as one the ten highest in the world. This has the result that many of the species are rare, highly localised and consequently endangered. It is our duty to protect our diverse natural resources.

South Africa's water resources have become a major concern in recent times. As a water scarce country we need to manage our water resources sustainably in order to maintain a viable resource for the community as well as to preserve the biodiversity of the system. Thus, it should be clear that we need to protect our water resources so that we may be able to utilise this renewable resource sustainably. Areas that are regarded as crucial to maintain healthy water resources include wetlands, streams as well as the overall catchment of a river system.

Water is essential and crucial to the survival of all living organisms as well as ecosystem processes. This also applies to the survival of humans as we need daily intake of water. We, as humans, also utilise water for a range of other daily tasks and it is considered an essential component of our daily lives. It is therefore necessary for a community to have easy access to a potable water supply. The provision of water to a community must therefore take priority.

The development entails the proposed construction of a potable water transfer pipeline in order to augment the requirements of the Mangaung Metropolitan Municipality. The pipeline will be constructed from the Gariep Dam to the city of Bloemfontein and will roughly follow the layout of the N1 National Road situated alongside this road (Appendix A: Map 1 & 2). The pipeline will then veer away from the N1 National Road just to the south of the Tierpooort Dam from where it will cross over natural areas and along gravel roads. Where the pipeline meets the R702 tarred road, it will split off into two lines, one being a gravity/pumped pipeline to Bloemfontein (Alternative 1B1/2 – Gravity/Pumped line to Bloemfontein) and the other connecting to the Rustfontein Dam (Alternative 1B – Gariep – Rustfontein) (Figure 1 & 2). The pipeline will have a diameter of 1.2 meters and will require a footprint width of approximately 40 meters. Large sections of the pipeline will be situated within the road reserve of the N1 National Road though large portions will also be situated in natural areas. In general, the catchment of the watercourses and wetlands in the Southern Free State are still natural with limited transformation and as a result, these systems are also still functioning largely naturally. Impacts that may still affect these systems include infrastructure such as the N1 National Road and an extensive gravel road network, limited transformation for small crop fields and some irrigated fields and farm dams and

weirs acting as containment structures. A large number of watercourses and wetlands will be affected by the pipeline construction though almost all of these are seasonal systems and will only contain active flow after rainfall occurs. Due to the current drought in the area, the majority of these also did not contain any flow or surface water during the survey, though soils were still saturated and contains prominent wetland indicators in almost all affected systems.

A site visit was conducted between 26 February 2024 and 06 March 2024. The study area consisted of the pipeline layout which stretches from the Gariep Dam to the Tierpoort Dam, from there connecting to Bloemfontein (Alternative 1B1 – Gravity line to Bloemfontein) and the Rustfontein Dam (Alternative 1B2 – Gariep – Rustfontein) (Figure 1 & 2). All watercourses and wetlands being directly affected (crossed) by the pipeline were surveyed by means of a sample survey site within the main channel. Where several tributaries or wetlands are situated in close proximity and forms part of the same affected system, only one may have been surveyed to serve as representative of all. The survey was undertaken during summer and though the area is currently being affected by a drought, the vegetation and hydrological regime within wetlands and watercourses still provided for accurate assessment.

For the above reasons it is necessary to conduct an ecological assessment of watercourses and wetlands being crossed by the proposed pipeline.

The report together with its recommendations and mitigation measures should be used to minimise the impact of the proposed pipeline construction on wetland areas.

1.1 Background of the development

The following provides a short description of the development as provided by Zutari (2023).

The Xhariep Pipeline Project was previously identified for the Greater Bloemfontein Water Supply System (GBWSS) as a future augmentation project to supply the area's water demands. This project entails the Xhariep Pipeline from Gariep Dam tying into the bulk water network of the GBWSS.

Mangaung Metropolitan Municipality (MMM) has previously applied for Environmental Authorisation for a similar project but 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 infrastructure is similar to the previous application as it includes a low lift pump station from Gariep Dam, a pipeline to a water treatment plant (WTP), the WTP, a high lift pump station, conveyance pipeline and a command reservoir. However, unlike the previously authorised option, the proposed infrastructure also includes a booster pump station and a 2nd command reservoir, as well as two gravity pipelines to feed Bloemfontein and Botshabelo / Thaba Nchu. Ancillary infrastructure is also required and must be included in the environmental authorisation application which includes access roads and borrow pits (if applicable, to be determined during the geotechnical investigation).

The Scheme for consideration of this project is known as Alternative 1B1 and 1B2 shown as the light purple lines in Figure 1 & 2. The Alternative 1B1 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 MMM bulk network, while the other feeds Botshabelo / Thaba Nchu, tying into VCWB bulk network. Alternative 1B1 and 1B2 are potable water to be treated at a new WTP.

Alternative 1B1 and 1B2 is a potable pipeline from Gariep Dam to Bloemfontein and Botshabelo / Thaba Nchu and consists of the following main components:

- Tie-in at existing pipeline downstream of Gariep Dam
- The low lift pump station at or near the connection to the Gariep Dam,
- A WTP with a high lift pump station,
- A command reservoir,
- A booster pump station,
- 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).

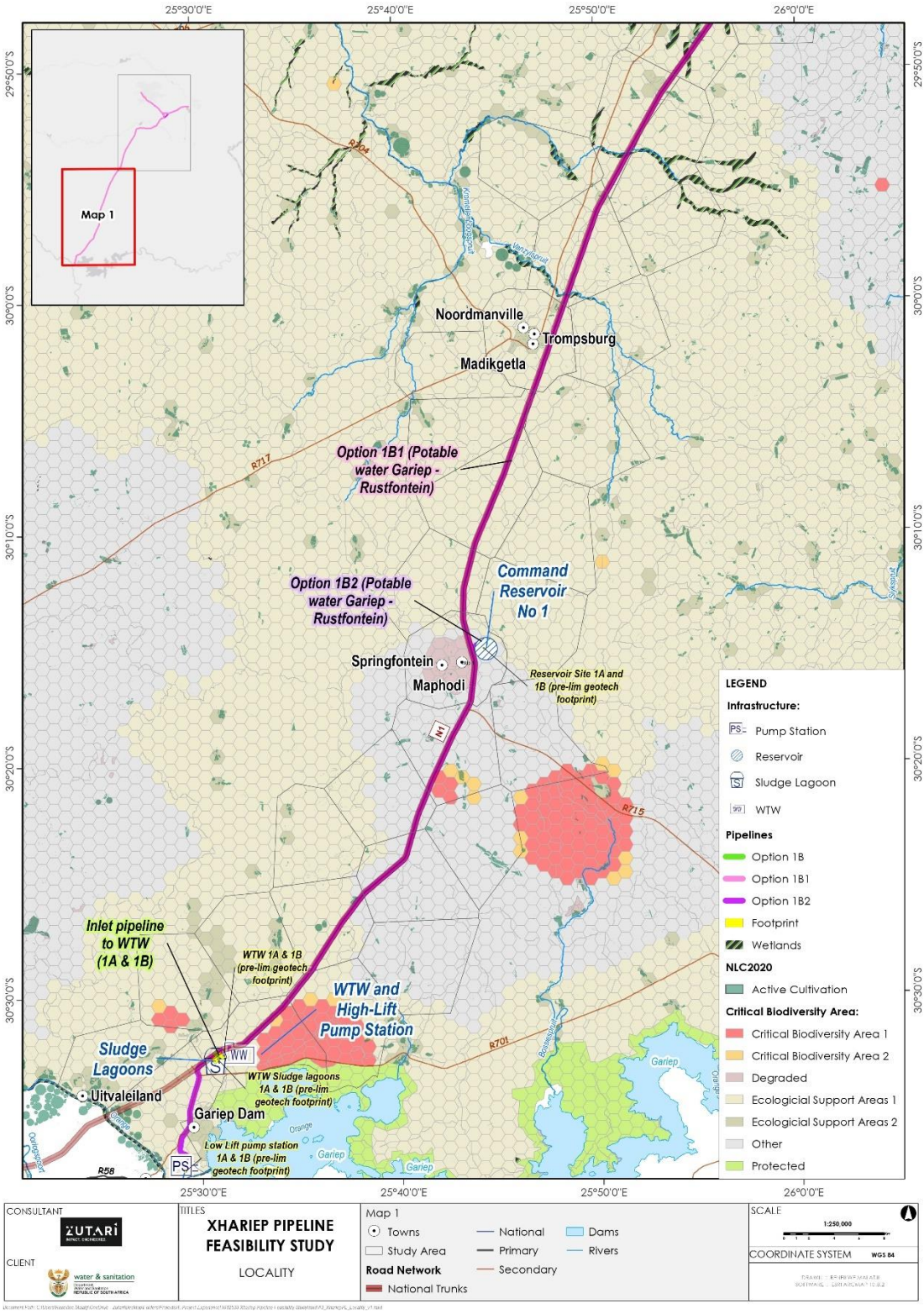


Figure 1: Layout of the pipeline route indicating the connection from the Gariep Dam and following the N1 National Road northwards in the direction of Bloemfontein.

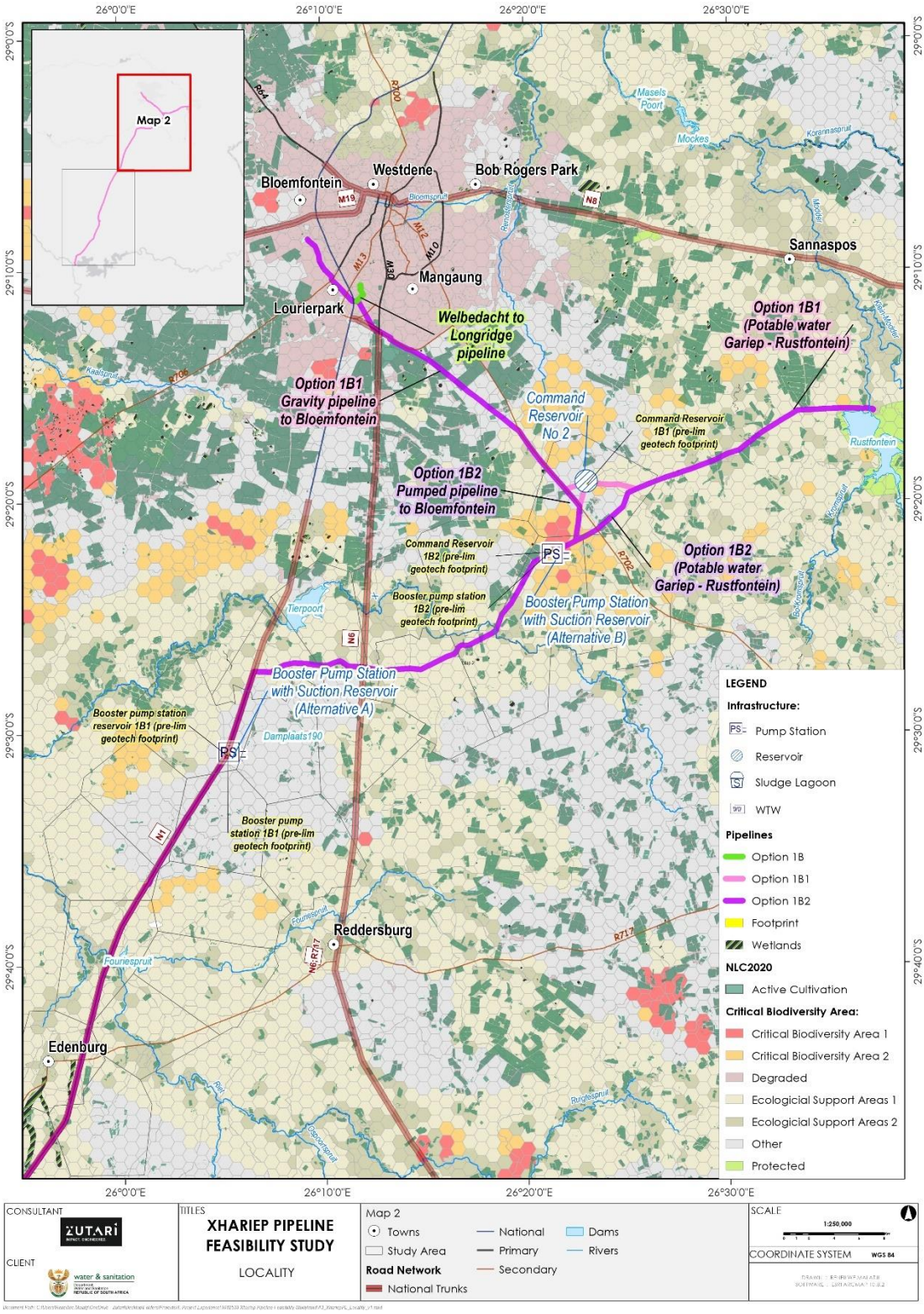


Figure 2: Layout of the pipeline route as it follows the N1 National Road toward Bloemfontein and also illustrating where the route splits off and connects to both Bloemfontein and the Rustfontein Dam.

1.2 Value of wetlands and watercourses

Freshwater ecosystems provide valuable natural resources, which contributes toward economic, aesthetic, spiritual, cultural and many recreational values. Yet the integrity of freshwater

ecosystems in South Africa is rapidly declining in recent times. This crisis is largely a consequence of a variety of challenges that are practical (managing vast areas of land to maintain connectivity between freshwater ecosystems), socio-economic (the need to utilise these recourses between different stakeholders, i.e. individuals, communities, corporate and industrial) and institutional (Implementing appropriate governance and management). Water affects every activity and aspiration of human society and sustains all ecosystems.

Freshwater ecosystems provide many of our fundamental needs, enable important regulating ecosystem services, supports functional faunal and floral communities:

- Water for drinking and irrigation
- Food such as fish and water plants.
- Building material such as clay and reeds.
- Preventing floods and easing the impacts of droughts.
- Remove excess nutrients and toxic substances from water
- Rivers, wetlands and groundwater systems maintain water supplies and buffer the effects of storms, reducing the loss of life and property to floods.
- Riverbanks help to trap sediments, stabilise
- river banks and break down pollutants draining from the surrounding land.

1.3 Details and expertise of specialist

DPR Ecologists and Environmental Services (Pty) Ltd.
Darius van Rensburg *Pr. Sci. Nat.*
61 Topsy Smith
Langenhoven Park
Bloemfontein
9300
Tel: 083 410 0770
darius@dprecologists.co.za

Professional registration:
South African Council for Natural Scientific Professions No. (400284/13) (Ecological Science).

Membership with relevant societies and associations:

- South African Society of Aquatic Scientists (SASAQS0091)
- South African Association of Botanists
- South African Wetlands Society (3SLY4IG4)

Expertise:

- Qualifications: B.Sc. (Hons) Botany (2008), M.Sc. in Vegetation Ecology (2012) with focus on ephemeral watercourses.
- Vegetation ecologist with over 10 years experience of conducting ecological assessments.
- Founded DPR Ecologists & Environmental Services (Pty) Ltd in 2016.
- Has conducted over 200 ecological and wetland assessments for various developments.
- Regularly attend conferences and courses in order to stay up to date with current methods and trends:

2017: Kimberley Biodiversity Symposium.
2018: South African Association of Botanists annual conference.
2018: National Wetland Indaba Conference.
2019: SASS5 Aquatic Biomonitoring Training.
2019: Society for Ecological Restoration World Congress 2019.
2019: Wetland rehabilitation: SER 2019 training course.
2020: Tools For Wetlands (TFW) training course.
2022: National Wetland Indaba Conference.

2. Scope and limitations

- To provide a description of watercourses, wetlands and riparian vegetation included within the study area.
- Identify watercourses including rivers, streams, pans and wetlands and determine the presence of wetland conditions within these systems.
- Where wetland conditions have been identified the classification of the wetland system will be given.
- To identify possible negative impacts that could be caused by the pipeline construction.
- To evaluate the present state of the wetlands and riparian vegetation in close proximity to the development. The importance of the ecological function and condition will also be assessed.
- Determine the Present Ecological State (PES) and Ecological Importance & Sensitivity (EIS) for the watercourses in close proximity to development.
- Conduct a risk assessment and determine the likelihood that watercourses and wetlands will be adversely affected by the development.

2.1 Riparian Vegetation

Aspects of the riparian vegetation that will be assessed include:

- The vegetation types of the region with their relevance to the study area.
- The overall status of the riparian vegetation along the wetlands and watercourses in the study area.
- Species composition with the emphasis on dominant-, rare- and endangered species.
- Presence of wetland conditions and riparian vegetation using obligate wetland and riparian species.

The amount of disturbance present on the study area assessed according to:

- The amount of grazing impacts.
- Disturbance caused by human impacts.
- Other disturbances.

2.2 Wetlands and watercourses

Aspects of the wetlands and watercourses that will be assessed include:

- Identification of watercourses including rivers, streams, pans and wetlands.
- Determine the presence of wetland conditions and riparian vegetation using obligate wetland and riparian species.
- Describe watercourses and wetlands and importance relative to the larger system.
- Conduct habitat integrity assessment of watercourses to inform the condition and status of these systems.

2.4 Limitations

- Some geophytic or succulent species may have been overlooked due to a specific flowering time or cryptic nature.
- Although a comprehensive survey of the site was done it is still likely that several species were overlooked.
- Due to time constraints only limited soil sampling could be done.

- Smaller drainage lines or wetlands may have been overlooked where a distinct channel or riparian vegetation is absent.
- The majority of watercourses are strictly seasonal and does not contain connected main channel flow, while very few of the affected watercourses contained any surface water due to the current drought. Consequently assessment is largely limited to wetland indices while aquatic assessment was only undertaken for a few of the larger watercourses where surface flow or at least sufficient pools were still present.
- The sample survey point and the actual point of crossing by the pipeline may differ in instances where the site is not easily accessible and will then be placed upstream or downstream of the site.
- Due to game fences, electrified fences and grates, some site were not accessible, in which case a sample site upstream or downstream of the pipeline crossing was surveyed.

3. Methodology

3.1 Several literature works were used for additional information.

General ecology:

- Red Data List (Raymondo *et al.* 2009).
- Vegetation types (Mucina & Rutherford 2006).
- NBA 2018: South African Inventory of Inland Aquatic Ecosystems (SAIIAE).
- NBA 2018 Technical Report: Inland Aquatic (Freshwater) Realm.
- NEM:BA: List of threatened ecosystems and Threatened Or Protected Species (TOPS).
- National Freshwater Ecosystem Priority Areas 2011 (NFEPA).
- Strategic Water Source Areas 2018 (SWSA).
- SANBI (2011): List of threatened ecosystems.
- North West Province Biodiversity Sector Plan (2015).

Vegetation:

- Red Data List (Raymondo *et al.* 2009)
- Vegetation types (Mucina & Rutherford 2006)
- Field guides used for species identification (Bromilow 1995, 2010, Coates-Palgrave 2002, Court 2010, Fish *et al* 2015, Gerber *et al* 2004, Gibbs-Russell *et al* 1990, Griffiths & Picker 2015, Hartmann 2001, Manning 2009, Pooley 1998, Roberts & Fourie 1975, Shearing & Van Heerden 2008, Smith *et al* 1998, Smith & Crouch 2009, Van Ginkel & Cilliers 2020, Van Ginkel *et al* 2011, Van Oudtshoorn 2004, Van Wyk & Malan 1998, Van Wyk & Van Wyk 1997, Venter & Joubert 1985).

Wetland methodology, delineation and identification:

- Department of Water Affairs and Forestry 2004, 2005, 2008, Collins 2006, Duthie 1999, Kleynhans *et al* 2008, Marnewecke & Kotze 1999, Nel *et al* 2011, SANBI 2009.

3.2 Survey

The site was assessed by means of transects and sample plots. Observation w.r.t. the general ecology of the area includes:

- Noted species include rare and dominant species.
- The broad vegetation types present at the site were determined.
- The state of the environment was assessed in terms of condition, grazing impacts, disturbance by humans, erosion and presence of invader and exotic species.
- The state of the habitat was also assessed.

All rivers, streams, pans and wetlands were identified and surveyed where they occurred in the study area. These systems were determined by use of topography (land form and drainage pattern) and riparian vegetation with limited soil sampling (Appendix B & C). The following outlines the process applied during the on-site survey in order to obtain all required data:

- Perform desktop overview of the study area utilising available resources (Section 3.1). From the desktop overview identify the different landscape forms, possible wetland areas, watercourses and their relative flow patterns. Using this information, identify transects and sample plots for possible on-site survey. This should be both

representative of the wetland or watercourse as a whole but should also include any prominent or significantly unique features.

- Possible sites identified during the desktop overview should be surveyed on-site. Where access is not possible or where desktop features are considered poor representatives of the wetland or watercourse the survey site or transect should be moved to another location, without compromising a comprehensive overview of the system.
- Where a lateral transect is taken of a watercourse this is done from the water's edge, across the marginal, lower and upper zones and extended across the floodplain until the edge of the riparian zone is reached.
- Where a transect is taken of a wetland system, this should preferably be taken across the entire wetland at its widest part or where it is most relevant to the proposed development, from the terrestrial surroundings, across the temporary, seasonal and perennial zones across the wetland.
- Soil samples are taken at 10 meter intervals along the survey transect, or where a distinct transition into a different zone is observed.
- A survey of the plant species within each distinct riparian or wetland zone is undertaken and includes the identification of obligate wetland species, riparian species, terrestrial species, exotic species and the general species composition and vegetation structure which allows for an accurate description of the watercourse or wetland.
- Visual survey of the general topography which substantiates the presence of riparian zones and wetland forms.
- Other general observations include any impacts observed, the overall ecosystem function, presence of fauna, surrounding land uses and the overall condition of the watercourse or wetland.
- Data is recorded by means of photographs with GPS coordinates taken at all relevant soil sampling sites and borders of riparian and wetland zones.

Data obtained during the on-site survey is utilised to provide the following information on the system:

- Desktop overview and assimilation of information on the likely impacts and functioning of the wetland system.
    - Review all available spatial data and resources in order to provide an estimate of the likely impacts and condition of the wetland or watercourse system.
- Confirm the presence of the wetland or watercourse system and provide an estimate of its borders.
    - The border of wetland conditions or the edge of the riparian zone will be confirmed by using soil sampling, obligate wetland vegetation and topography. This will also include the delineation of any temporary, seasonal or perennial zones of wetness along wetlands and the marginal, lower, upper and riparian zones along watercourses.
- Provide a description of the wetland or watercourse.
    - Provide the hydrogeomorphic setting of the wetland, a longitudinal profile which will aid in determining the erodibility of the wetland and provide an overall description of the wetland and impacts affecting it.
    - Provide a general description of the lateral zonation of the watercourse banks including the marginal, lower, upper and riparian zones and a description of the riparian vegetation along the banks of the watercourse. This will also include the description of any impacts or modification of the watercourse.

- Assess the current condition of the wetland or watercourse.
    - Utilising information obtained from the assessments listed above, determine the condition of this portion of the wetland by applying the WET-Health 2 tool.
    - Utilising information obtained from the assessments listed above, determine the condition of the relevant section of the watercourse by applying the Index of Habitat Integrity (IHI) tool.
- Utilising all of the information obtained from the assessment, provide recommendations to mitigate anticipated impacts that the development will have.

The following guidelines and frameworks were also used to determine the presence of the rivers, streams, pans and wetlands in the study area:

- Department of Water Affairs and Forestry. 2005. A practical field procedure for identification and delineation of wetlands and riparian areas. Edition 1. Department of Water Affairs and Forestry, Pretoria.
- Marnewecke & Kotze 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

The following guidelines and frameworks were used to determine the sensitivity or importance of these identified watercourses or wetlands in the study area:

- Nel *et al.* (2011). Technical Report for the National Freshwater Ecosystem Priority Areas project. WRC Report No. K5/1801.

- Government of South Africa. 2008. National Protected Area Expansion Strategy for South Africa 2008: Priorities for expanding the protected area network for ecological sustainability and climate change adaptation. Government of South Africa, Pretoria.

- Duthie, A. 1999. Appendix W5: IER (floodplain and wetlands) determining the Ecological Importance and Sensitivity (EIS) and Ecological Management Class (EMC). In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

These guidelines provide the characteristics which can be utilised to determine if a wetland or watercourse is present and also aids in determining the boundary of these systems.

The following were utilised to inform the condition and status of watercourses:

- Kleynhans, C.J., Louw, M.D. & Graham, M. 2008. Module G: EcoClassification and EcoStatus determination in River EcoClassification: Index of Habitat Integrity. Joint Water Research Commission and Department of Water Affairs and Forestry report. WRC Report No. TT 377-08.

The following were utilised to inform the condition and status of wetlands:

- Macfarlane, D.M., Ollis, D.J. & Kotze, D.C. 2020. WET-Health (Version 2.0): a refined suite of tools for assessing the present ecological state of wetland ecosystems. WRC Report No. TT 820/20.

A Risk Assessment will be conducted for the proposed development in or near watercourses and wetlands in accordance with the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use.

3.3 Criteria used to assess sites

Several criteria were used to assess the study area and determine the overall status of the environment.

3.3.1 Vegetation characteristics

Characteristics of the vegetation in its current state. The diversity of species, sensitivity of habitats and importance of the ecology as a whole.

Habitat diversity and species richness: normally a function of locality, habitat diversity and climatic conditions.
Scoring: Wide variety of species occupying a variety of niches – 1, Variety of species occupying a single nich – 2, Single species dominance over a large area containing a low diversity of species – 3.

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely – 3.

Ecological function: All plant communities play a role in the ecosystem. The ecological importance of all areas though, can vary significantly e.g. wetlands, drainage lines, ecotones, etc.
Scoring: Ecological function critical for greater system – 1, Ecological function of medium importance – 2, No special ecological function (system will not fail if absent) – 3.

Degree of rarity/conservation value:
Scoring: Very rare and/or in pristine condition – 1, Fair to good condition and/or relatively rare – 2, Not rare, degraded and/or poorly conserved – 3.

3.3.2 Vegetation condition

The sites are compared to a benchmark site in a good to excellent condition. Vegetation management practises (e.g. grazing regime, fire, management, etc.) can have a marked impact on the condition of the vegetation.

Percentage ground cover: Ground cover is under normal and natural conditions a function of climate and biophysical characteristics. Under poor grazing management, ground cover is one of the first signs of vegetation degradation.
Scoring: Good to excellent – 1, Fair – 2, Poor – 3.

Vegetation structure: This is the ratio between tree, shrub, sub-shrubs and grass layers. The ratio could be affected by grazing and browsing by animals.

Scoring: All layers still intact and showing specimens of all age classes – 1, Sub-shrubs and/or grass layers highly grazed while tree layer still fairly intact (bush partly opened up) – 2, Mono-layered structure often dominated by a few unpalatable species (presence of barren patches notable) – 3.

Infestation with exotic weeds and invader plants or encroachers:
Scoring: No or very slight infestation levels by weeds and invaders – 1, Medium infestation by one or more species – 2, Several weed and invader species present and high occurrence of one or more species – 3.

Degree of grazing/browsing impact:
Scoring: No or very slight notable signs of browsing and/or grazing – 1, Some browse lines evident, shrubs shows signs of browsing, grass layer grazed though still intact – 2, Clear browse line on trees, shrubs heavily pruned and grass layer almost absent – 3.

Signs of erosion: The formation of erosion scars can often give an indication of the severity and/or duration of vegetation degradation.
Scoring: No or very little signs of soil erosion – 1, Small erosion gullies present and/or evidence of slight sheet erosion – 2, Gully erosion well developed (medium to large dongas) and/or sheet erosion removed the topsoil over large areas – 3.

3.3.3 Faunal characteristics

Presence of rare and endangered species: The actual occurrence or potential occurrence of rare or endangered species on a proposed site plays a large role on the feasibility of a development. Depending on the status and provincial conservation policy, presence of a Red Data species or very unique and sensitive habitats can potentially be a fatal flaw.
Scoring: Occurrence actual or highly likely – 1, Occurrence possible – 2, Occurrence highly unlikely.

3.4 Biodiversity sensitivity rating (BSR)

The total scores for the criteria discussed in section 3.3 were used to determine the biodiversity sensitivity ranking for the sites. On a scale of 0 – 30, five different classes are described to assess the biodiversity of the study area. The different classes are described in the Table 1:

Table 1: Biodiversity sensitivity ranking

BSR	BSR general floral description	Floral score equating to BSR class
Totally transformed (5)	Vegetation is totally transformed or in a highly degraded state, generally has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area has lost its inherent ecological function. The area has no conservation value and potential for successful rehabilitation is very low.	29 – 30
Advanced Degraded (4)	Vegetation is in an advanced state of degradation, has a low level of species diversity, no species of concern and/or has a high level of invasive plants. The area's ecological function is seriously hampered, has a very low conservation value and the potential for successful rehabilitation is low.	26 – 28
Degraded (3)	Vegetation is notably degraded, has a medium level of species diversity although no species of concern are present. Invasive plants are present but are still controllable. The area's ecological function is still intact but may be hampered by the current levels of degradation. Successful rehabilitation of the area is possible. The conservation value is regarded as low.	21 – 25
Good Condition (2)	The area is in a good condition although signs of disturbance are present. Species diversity is high and species of concern may be present. The ecological function is intact and very little rehabilitation is needed. The area is of medium conservation importance.	11 – 20
Sensitive/Pristine (1)	The vegetation is in a pristine or near pristine condition. Very little signs of disturbance other than those needed for successful management are present. The species diversity is very high with several species of concern known to be present. Ecological functioning is intact and the conservation importance is high.	0 - 10

4. Wetland Assessment

For the purpose of this report the general ecology of the study area will first be discussed followed by a discussion of the watercourses and wetland systems.

4.1 Ecology and description of the study area

Refer to the list of species encountered on the site in Appendix B.

The development entails the proposed construction of a potable water transfer pipeline in order to augment the requirements of the Mangaung Metropolitan Municipality. The pipeline will be constructed from the Gariep Dam to the city of Bloemfontein and will roughly follow the layout of the N1 National Road situated alongside this road (Appendix A: Map 1 & 2). The pipeline will then veer away from the N1 National Road just to the south of the Tierpooort Dam from where it will cross over natural areas and along gravel roads. Where the pipeline meets the R702 tarred road, it will split off into two lines, one being a gravity/pumped pipeline to Bloemfontein (Alternative 1B1/2 – Gravity/Pumped line to Bloemfontein) and the other connecting to the Rustfontein Dam (Alternative 1B – Gariep – Rustfontein) (Figure 1 & 2). The pipeline will have a diameter of 1.2 meters and will require a footprint width of approximately 40 meters. Large sections of the pipeline will be situated within the road reserve of the N1 National Road though large portions will also be situated in natural areas. In general, the catchment of the watercourses and wetlands in the Southern Free State are still natural with limited transformation and as a result, these systems are also still functioning largely naturally. Impacts that may still affect these systems include infrastructure such as the N1 National Road and an extensive gravel road network, limited transformation for small crop fields and some irrigated fields and farm dams and weirs acting as containment structures. A large number of watercourses and wetlands will be affected by the pipeline construction though almost all of these are seasonal systems and will only contain active flow after rainfall occurs. Due to the current drought in the area, the majority of these also did not contain any flow or surface water during the survey, though soils were still saturated and contains prominent wetland indicators in almost all affected systems.

According to Mucina & Rutherford (2006) the pipeline route will be situated within the Central Free State Grassland (Gh 6), Winburg Grassy Shrubland (Gh 7), Bloemfontein Dry Grassland (Gh 5), Xhariep Karroid Grassland (Gh 3) and Besemkaree Koppies Shrubland (Gh 4). All of these are listed as being of Least Concern (LC) except for the Bloemfontein Dry Grassland which is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Appendix A: Map 1). Large portions of this grassland has been transformed by dryland crop cultivation and urbanisation.

The Free State Province Biodiversity Management Plan (2015) has been published and has identified areas which are essential to meeting conservation targets for specific vegetation types, i.e. Critical Biodiversity Areas. The majority of the pipeline route is situated within an Ecological Support Area 1 (ESA 1) which are natural areas forming the catchment and supporting the functioning of important wetland and watercourse systems and which will also be relevant to this pipeline project. Other significant portions also consist of Other Natural Areas (ONA) while Critical Biodiversity Areas (CBA) are rare with the most prominent such area occurring along the northern sections of the pipeline route where intact and natural portions of the threatened Bloemfontein Dry Grassland vegetation type remains and require preservation.

The majority of the pipeline route consists of natural vegetation except in the north of the route and within the Bloemfontein Dry Grassland where portions has been transformed for crop cultivation (Appendix A: Map 1). The natural vegetation structure is largely intact but may be degraded to a significant extent where the pipeline route occurs in or close to road reserves (particularly the N1 National Road). Where the route occurs near small towns the natural vegetation is also degraded to some extent. The most significant impact along the majority of the pipeline route is grazing by domestic stock which is considered a relatively low impact. Scattered small crop fields and irrigated fields occur, especially along the larger rivers (Riet River, Vanzylspruit, Tierpoort River), though are normally localised and does not entail a high impact.

Topography

Due to the large extent of the urban area it contains a moderate variety in terms of topography though overall it is a relatively flat area. Overall, the region is dominated by undulating plains broken by numerous dolerite capped hills, ridges and plateaus scattered along the route. These form prominent features in the landscape. Though the majority consist of dolerite hills and ridges, the survey also indicates the presence of exposed sandstone and shale outcrops. Hills and ridges are most abundant in the south as the route near the Orange River as well as in the north east as the route approaches the mountainous eastern Free State near the Rustfontein Dam. Most of these hills and ridges will be avoided by the pipeline route. These also provide significantly different habitats and the vegetation composition is also clearly different from the surrounding plains. As mentioned, many significant watercourses as well as smaller drainage lines and numerous wetland systems are also incised into the terrain and these also contribute to the varied topography (Appendix A: Map 2). These areas will again represent a different topographical unit with a differing vegetation composition and habitat. The elevation over the pipeline route varies considerably due to the extent but generally decreases from north to south from approximately 1420 m to 1340 m. This also indicates the general drainage direction from north to east/south and toward the Orange River.

As indicated, the topography becomes more pronounced toward the south and north east of the pipeline route, with undulating terrain sloping towards the larger watercourses, while prominent hills and ridge systems are abundant. These also provide significantly different habitats and the vegetation composition is also clearly different from the surrounding plains. This varied topography also increase the presence of watercourses and wetlands, especially in the north eastern sections of the pipeline route, where a higher annual rainfall also occurs.



Figure 3: Panorama of the regional landscape which consists of plains with many ridges and hills in the surrounding areas.

Climate

Due to the large extent of the proposed pipeline route, the climate along it also varies considerably, The central portion of the pipeline route, roughly in the region of the town of Trompsburg receives most of its rainfall from October to March. Temperatures also fluctuate

accordingly with December being the hottest month at a mean temperature of 22.6˚C and July being the coldest at a mean temperature of 7.2˚C.

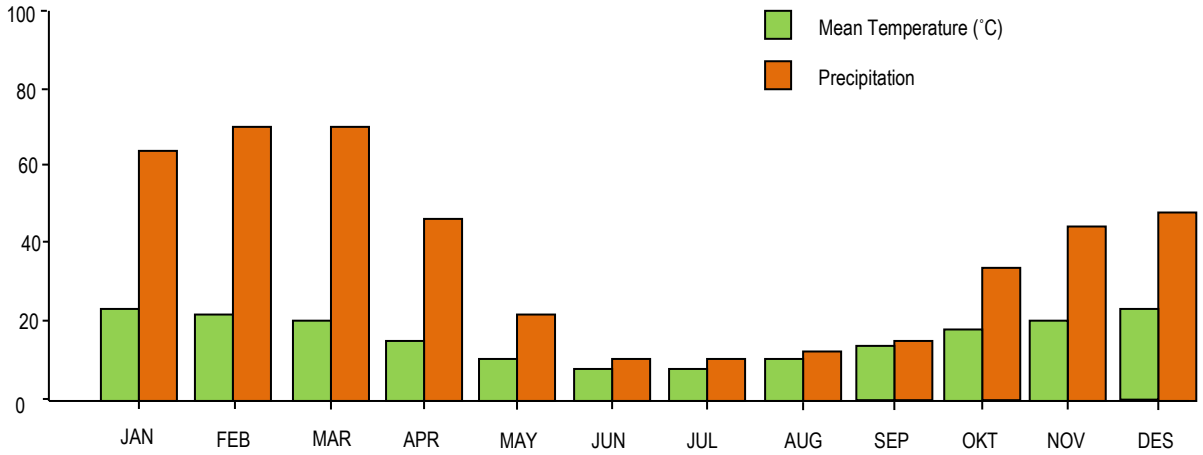


Figure 4: Climate diagram for Trompsburg illustrating the monthly mean temperatures and precipitation.

As can be seen from the climate diagram February and March have the highest rainfall. The temperature trend follows the rainfall pattern to a large extent.

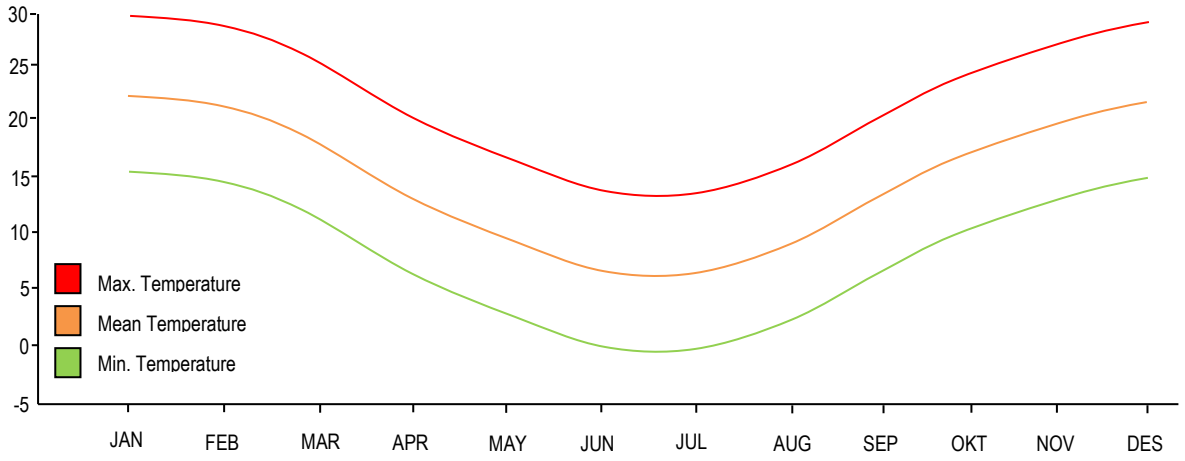


Figure 5: Graph illustrating the monthly maximum and minimum temperatures.

Toward the northern sections of the pipeline route, Bloemfontein experiences a more moderate rainfall, with cold, dry winters and warm summers. According to the climate statistics from the South African Weather Service, the annual mean maximum and minimum temperatures are 24.6 °C and 7.6 °C, respectively. Climate for the northern sections of the pipeline route can be relatively accurately represented by rainfall and evaporation data from the weather station D5E003 (Maselspoort). Bloemfontein receives an average of 548 mm per year. Precipitation occurs mainly during summer, with most rainfall received during January to March, much the same as for the more southern sections. This is considered a moderate rainfall though the area is still considered to form part of a semi-arid region of South Africa. The mean annual evaporation is 1676 mm. Evaporation is highest during summer. As a result, surface runoff in the area is not significant and relatively low, occurs mostly during summer and results in an estimated mean

annual runoff for the area between 10 – 20 mm according to a study by the Water Research Commission (WRC REPORT NO. TT 685/16, 2016).

Towards the southern sections of the pipeline route, the mean annual rainfall does show a marked decrease, being 548 mm per year at Bloemfontein in the north and decreasing to 412 mm around Gariep in the south.

Geology

The entire pipeline route is situated within the Adelaide Subgroup of the Beaufort Series of the Karoo System consisting of imbedded mudstone, siltstone and occasional sandstone that have been intruded by numerous narrow dolerite dykes and sills. The stratigraphy of the region shows how the local hills preserve the remnants of the dolerite sills.

Regional Vegetation

The route is situated exclusively within the Grassland Biome and consequently the vegetation structure is dominated by a grass layer (Appendix A: Map 1). The pipeline route is also situated within a transition area between the Grassland- and Karoo Biomes as rainfall decrease from north to south. Although the entire pipeline route falls within the Grassland Biome a gradual increase in Karoo vegetation, especially dwarf karroid shrubs, is evident from north to south. Where hills and ridges occur a significant shrub component occurs which is characteristic of the Winburg Grassy Shrubland and Besemkaree Koppies Shrubland vegetation types (Appendix A: Map 1). Furthermore, along significant watercourses a prominent shrub and tree riparian layer may occur. The vegetation structure along watercourses will also differ from the surrounding grassland.

Xhariep Karroid Grassland (Gh 3) dominated the central and southern sections if the pipeline route and is confined to the plains habitats (Appendix A: Map 1). The plains are characterised by a strong dominance of grass species with dwarf karroid shrubs common. The plains are usually devoid of shrubs and trees and this should be the natural condition of the plains. The plains generally occur on deep soils with surface rock absent. This is due to the sediment eroded from the surrounding hills being deposited on the plains. The grass dominated vegetation has also adapted to these deep soils devoid of any surface rock.

Dominant grasses on the plains include *Themeda triandra, Tragus koeleioides, Eragrostis lehmanniana, Cynodon dactylon, Chloris virgata, Aristida congesta* and *Digitaria eriantha*. Although many of these species, i.e. *Tragus koeleioides, Eragrostis lehmanniana, Cynodon dactylon, Chloris virgata* and *Aristida congesta*, are pioneer species the current surveys indicate that they are largely a natural component of the vegetation and is only indicative of disturbance where they occur in high abundance.

Dwarf karroid shrubs and herbs include *Geigeria fillifolia, Rosenia humilis, Nenax microphylla, Pentzia incana, Lycium horridum, Tallinum caffrum, Hertia pallens Lotononis laxa, Conyza bonariensis, Wahlenbergia nodosa* and *Chrysocoma ciliata*.



Figure 6: Panorama of the Xhariep Karroid Grassland plains in the surrounding area. The plains are dominated by grass species with a strong dwarf karroid shrub component.

Besemkaree Koppies Shrubland (Gh 4) is confined to the dolerite capped hills and ridges in the southern sections of the pipeline route (Appendix A: Map 1). These hills often form prominent features in the landscape. Due to the topography, hydrology, soil properties, etc. these hills contain vegetation differing markedly from that of the surrounding plains. In this region these hills are often the only landscape features able to sustain trees. As a result these hills are often considered sensitive as a result of a higher diversity, distinct species composition and prominent visual landscape forms.

The vegetation consists of a strong dominance of shrubs/small trees and grasses. Dominant trees and large shrubs include *Searsia burchellii, S. erosa, S. ciliata, Olea europea* subsp. *africana, Ehretia rigida, Buddleja saligna, Osyris lanceolata, Tarchonanthus minor, Gymnosporia buxiifolia* and *Cussonia paniculata*. This assemblage of species is diverse but all these species are widespread.

Dominant grasses on the hills and rocky ridges include *Tragus koelerioides, Themeda triandra, Hyperhenia hirta, Cymbopogon plurinodis, Elionurus muticus, Aristida diffusa, Heteropogon contortus, Eustachys paspaloides* and *Pogonathria squarrosa*.

These hills and ridges also contain a high diversity of herbs and dwarf shrubs. Although these species never dominate they are common between grasses, under trees, in rock fissures and other micro habitats occurring on these hills.



Figure 7: Panorama of one of the Besemkaree Koppies Shrubland hills in the surrounding area. Note the distinct vegetation composition with a shrub/tree layer also being prominent.

Bloemfontein Dry Grassland (Gh 5) is dominated by grass species with *Themeda triandra* and *Eragrostis lehmanniana* being dominant (Appendix A: Map 1). The vegetation type consists of undulating grassland and is easily identified. The soils of which this vegetation type consists is also a major ecological driver and responsible for the species composition of this vegetation type. Soils are highly sandy and overlay a clay layer. This promotes the establishment of a variety of plants adapted to these sandy conditions. The species composition of this vegetation type is therefore also diagnostic and differentiates it from similar grassland in the surrounding region.

As indicated, a grass layer dominates and includes species such as *Themeda triandra, Eragrostis lehmanniana, E. gummiflua, Pogonarthria squarrosa, Anthephora pubescens*, *Eragrostis superba, Aristida congesta, Tragus koelerioides, Eragrostis curvula, Cynodon*

dactylon, Chloris virgata, Digitaria eriantha, Urochloa panicoides, *Melinis nerviglumis, Tragus berteronianus, Eragrostis obtusa, Eleonurus muticus, Cymbopogon pospischillii, Aristida junciformis*, Triraphis andropognoides, Hyparrhenia tamba and *Eragrostis chloromelas*. A prominent dwarf karroid shrub component is also prominent in many areas and include species such as *Nolletia jeneattae, Nolletia ciliaris, Lycium horridum, Amphiglossa triflora, Helichrysum zeyheri, Plinthus sericeus, Ruschia hamata, Menodora africana, Rosenia humilis, Nenax microphylla, Felicia muricata, Gnidia polycephala, Chrysocoma ciliata, Hertia pallens* and *Pentzia incana*. This is a natural component of the vegetation type, although high abundances of dwarf karroid shrubs are indicative of disturbance. This was observed in many areas though overall are regarded as only indicative of a moderate level of disturbance.



Figure 8: View of the Bloemfontein Dry Grassland with denser grass cover and sandy soils also clearly visible.

Winburg Grassy Shrubland (Gh 7), consisting of ridges and hills, are unfavourable for agriculture and is mostly also avoided by urban developments and as a result the majority of this vegetation type is still intact (Appendix A: Map 1). The vegetation type is, to a large extent, dominated by woodland vegetation with a shrub and tree layer prominent on the slopes of ridges and hills. Larger hills will contain plateaus where a grass layer is more prominent with a low, sparse shrub layer also present. The density of the shrub and tree layer is also often dependant on slope aspect with south facing slopes containing a dense and closed tree canopy while north facing slopes contain a much sparser tree density. Furthermore, due to the diversity of the topography and soil depth the vegetation type also supports a variety of other growth forms.

As indicated, a shrub and tree layer is characteristic of the vegetation type and these include *Ziziphus mucronata, Searsia burchellii, S. pyroides, Olea europaea* subsp. *africana, Searsia ciliata, Euclea crispa* subsp. *ovata, Diospyros lycioides, D. austro-africana, Grewia occidentalis*, *Searsia burchellii, Osyris lanceolata, Ehretia rigida, Osyris lanceolata, Celtis africana, Rhigozum obovatum, Heteromorpha arborescens, Cussonia paniculata, Clutia pulchella* and *Buddleja saligna*. It is clear that a diversity of shrubs and trees are present on these hills and ridges. They also differ in their distribution with some better adapted to shadier south facing slopes whilst others are confined to more arid north facing slopes.



Figure 9: View of the Winburg Grassy Shrubland where a dense woodland is prominent on many of the hills.

Central Free State Grassland (Gh 6) is dominated by undulating grassland and is easily identified (Appendix A: Map 1). Though there are no clear edaphic conditions which define the vegetation type it is still clearly differentiated by topographical and vegetation structure elements. These grasslands are confined to an undulating topography and dominated exclusively by grasses with shrubs and trees being completely absent.

The vegetation type or unit is also characterised by a well-developed grass layer, being dominated by only a few species and the absence of dwarf karroid shrubs and herbaceous species also being poorly represented. It is quite prominent that only a few grass species dominate in many areas. These are *Themeda triandra, Cymbopogon pospischillii* and *Eragrostis chloromelas* Other prominent grass species include *Aristida congesta, Digitaria eriantha, Heteropogon contortus, Setaria sphacelata* and *Sporobolus fimbriatus*.

An abundance of herbaceous species is present though they are always rare and do not form a prominent component of the grassland. These include *Berkheya onopordifolia. Gerbera pilloseloides, Hermannia depressa, Nenax microphylla, Hermannia coccocarpa, Berkheya macrocephala, Hibiscus pusillus* and *Selago densiflora*. This is considered a relatively natural component of this grassland.



Figure 10: View of the plains in the area consisting of Central Free State Grassland and here a dense grass layer is evident.

Along the pipeline route a high amount of watercourses are crossed (Appendix A: Map 2 - 7). These vary in size and consequently the floodplain and wetlands associated with them. They are however almost all seasonal or ephemeral in nature and only flow for short periods every year or every other year. The only perennial system is the Modder River but which has also been heavily modified, in part by the Rustfontein Dam which now regulates its flow regime. The most prominent watercourses crossed by the pipeline are: Modder River, Koringspruit, Renosterspruit, Tierpoort River, Riet River and Vanzylspruit.

4.2 Wetland and Watercourses Assessment

4.2.1 Introduction

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 (Appendix A: Map 1). 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 (Appendix A: Map 2). 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 (Appendix A: Map 1 - 7).

As indicated, the majority of watercourses and wetlands in this region which will be affected by the pipeline route, are still largely natural and has not been affected by many large impacts. The crossing by the N1 National Road as well as other smaller roads such as the R702 tarred road and numerous gravel roads are one of the main impacts on these watercourses. These roads act as flow barriers, where the natural drainage pattern is concentrated through drainage structures and this leads to retardation of flow, accumulation of surface water and sediments upstream of the culverts and concentrated flow and subsequent erosion downstream of culverts. Other significant impacts include limited dryland and irrigated cropfields (which can become more abundant in the northern sections of the pipeline route), storm water effluent from small towns and agricultural dams and weirs. The affected watercourses and wetlands have therefore been modified to some degree though are still largely functioning naturally and also provide several important ecological functions and services.

The entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and RietModder Sub WMA (Appendix A: Map 2). 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 (Appendix A: Map 2 - 7):

- 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 **(FEPA) 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 National Freshwater Ecosystem Priority Area's **(FEPA) 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 Renostersprui, Koringspruit and Modder River. Agricultural transformation due to crop cultivation is more abundant here, though the upper reaches of some watercourses such as the **Renostersprui and Koringspruit** area still largely natural and as a result these are also listed as National Freshwater Ecosystem Priority Area's **(FEPA) 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 National Freshwater Ecosystem Priority Area (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 not compromise this natural functioning to any significant degree.

The term watercourse refers to a river, stream, wetland or pan. The National Water Act (NWA, 1998) includes rivers, streams, pans and wetlands in the definition of the term watercourse. This definition follows:

Watercourse means:

- A river or spring.
- A natural channel in which water flows regularly or intermittently.
- A wetland, lake or dam into which water flows.
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

Riparian habitat is an accepted indicator of watercourses used to delineate the extent of wetlands, rivers, streams and pans (Department of Water Affairs and Forestry 2005).

The classification of stream orders from 1 to 3 can be illustrated by means of the Strahler 1952 classification (Figure 11). Due to the large extent of the pipeline route, it contains numerous watercourses ranging from small, first order systems to the largest being the Riet River, being a fourth order, lowland river system.

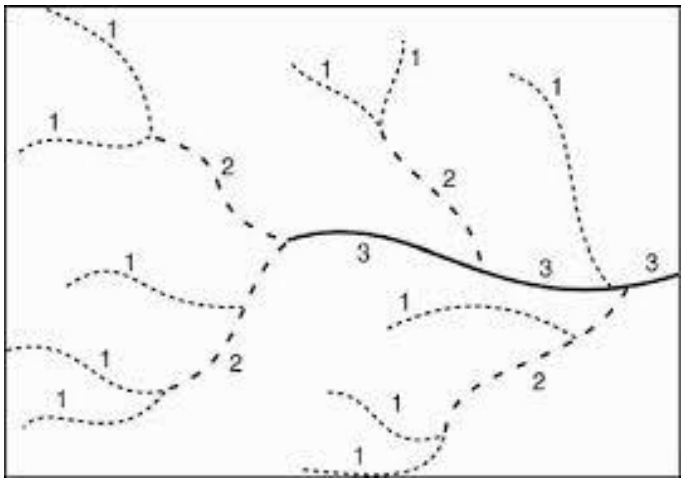


Figure 11: The classification of stream orders from 1 to 3 (Strahler 1952)

4.2.2 Overview of watercourses

As discussed, the watercourses and associated wetlands being affected by the pipeline are almost all seasonal or ephemeral in nature (Appendix A: Map 2 - 7). Seasonal, and especially ephemeral, systems are still poorly understood and their functioning is markedly different from perennial systems. This purpose of this section is to provide an overall indication of how these types of systems function which should then also aid in indicating how the pipeline development may impact on them.

Non-perennial rivers are systems in which surface flow stops and may disappear for some period of most years (Uys & Keeffe 1997). They can further be divided into seasonal and ephemeral systems where seasonal systems have a continuous channel flow during the rainy season and ephemeral systems have a highly variable frequency of connected channel flow, a high degree of natural disturbance and a lack of baseflow (Hughes 2008). Seasonal systems can be regarded as flowing between 20 % and 80 % of the year and ephemeral systems less than 20 % of the year (Kleynhans & Louw 1999). The larger watercourses along the pipeline route, including the Tierpoort River, Riet River and Vanzylspruit, are seasonal whilst the majority are almost all

ephemeral. The only exception being the Modder River, which is a perennial system but which has also been heavily modified by the Rustfontein Dam which now regulates and modifies its natural flow regime.

Precipitation in the catchments of ephemeral rivers are generally highly sporadic, localised and of short duration as is the case along the pipeline route. This can be more pronounced during periods of drought as was recently experienced. Consequently, runoff is highly variable and peak discharges may be reached within minutes. As a result of the variable climatic conditions runoff may be generated over small areas so that tributary and even mainchannel flow occurs whilst large portions of the channel system remains dry. The downstream reduction in flow after flooding events is caused by the infiltration into channel and floodplain sediments as well as evaporative losses. This accurately describes the functioning and flow of the watercourses along the pipeline route.

Floods are essential to the existence, productivity and interactions of many biotic elements in seasonal and ephemeral ecosystems. The longitudinal transfer must play a vital role where any deliverance of moisture may serve to supplement available resources. Floods transfer materials laterally and longitudinally, but more importantly, water triggers ecosystem processes. Floods activate a diverse range of terrestrial decomposer communities which otherwise are inactive during dry stages. An ephemeral system functions as a floodplain without a river where the highly variable hydrologic regime supports a terrestrial biota, dependent upon flooding (Jacobsen 1997).

Small flow events play an important role in connecting isolated pools and thus exchange of genetic material. Small flow events also recharge pools. Larger flow events influence the channel geomorphology with regard to channel size and shape and sediment dynamics (Hughes 2008). During large flood events flow occurs laterally into the floodplain and reside there, the duration of this event depends on the rainfall, but typically lasts about 4-5 days (Rassam *et al.* 2006). These floods play a critical role in regulating organic matter transport and deposition and secondary production (Kleynhans & Louw 1999).

Floods have also been shown to play an important role in structuring riparian communities. Different plant species differ in their ability to withstand or regenerate after major floods. As floods alter the species composition of a community, invariably the ecosystem functions are also altered, especially where shifts occur in plant functional types (Stromberg, Lite & Dixon 2010).

From the above it should be clear that flooding is essential to the continued and natural functioning of the watercourses along the pipeline route. It is also a real occurrence during the annual cycle of these watercourses and will occur annually in the seasonal systems but infrequently and perhaps only during years of high rainfall in the ephemeral systems. This should therefore also be taken into consideration during the construction of the pipeline when flooding may occur and when this function of the watercourses may be affected. The pipeline is unlikely to significantly impact on this function during the operational phase as long as rehabilitation was adequately undertaken.

The distribution of riparian communities in semi-arid rivers has been shown to be correlated to variation in topography. Flooding frequency and duration as well as water availability due to this variation in topography has often been cited as the reason for these distribution patterns. The catchment geology together with the hydrogeomorphic processes of a river causes a heterogeneous landscape with different morphologic units that also changes through space and

time. This heterogeneous landscape is an important factor in vegetation development and gives rise to distribution of different vegetation types (Van Coller, Rogers & Heritage 1997).

Soil salinity is a factor that significantly affects the distribution, morphology and productivity of many riparian species. Soil enrichment by soluble salts occurs where flood waters contain a significant salt load. Soils that become enriched generally occur in the lower reaches of the river where water flow is slowed and together with infiltration and evaporation, salts are deposited (Jacobson 1997). This has also been found to be the case within the study area. Several of the ephemeral watercourses contain extensive floodplains and in several cases a higher salt concentration is evident. Vegetation is also a clear indicator of higher salt concentrations and species such as *Salsola spp.* can be used as such indicators.

The watercourses in this region are also characterised by extensive floodplains which resemble Nama Karoo vegetation communities, i.e. dominated by a low, dwarf karroid vegetation layer with low percentage vegetation cover and a high degree of succulent species.

In general, the larger watercourses being affected by the pipeline development, especially the Vanzylspruit, Riet River and Tierpoort River, indicate extensive floodplain areas which also forms an intricate mosaic pattern of wetland patches, large bare areas containing significant natural erosion and extensive alluvial karroid vegetation. As indicated, these floodplains may contain significant erosion and bare areas which may be perceived as being degraded and caused by impacts in the catchment. However, these areas are largely natural and in some instances form uniquely arid habitats which also promotes the establishment of many regional endemics adapted to this arid habitat such as *Euphorbia arida, Trichodiadema pomeridianum, Mesembryanthemum rabiei, Tridentea gemmiflora* and *Nananthus sp.*



Figure 12: Extensive alluvial floodplains are associated with many of the watercourses, including the Riet River illustrate here (Google Earth 2023). Note also bare areas (light patches) which may be perceived as degraded but form natural arid habitats within the floodplain.



Figure 13: Most of the watercourses along the pipeline route contain extensive floodplains with strong affinities with karroid vegetation communities with large areas dominated by dwarf karroid shrubs.



Figure 14: In many instances the floodplain may form arid environments promoting the establishment of a variety of dwarf karroid shrubs and dwarf succulent species.



Figure 15: For the majority of the larger watercourses, the floodplain may be extensive in many areas with erosion being prominent. This is however regarded as natural erosion which is part of the natural functioning of these river systems.

As indicated, these 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.



Figure 16: The floodplain forms arid local habitats which enable the establishment of habitat specific, dwarf succulent species such as *Euphorbie arida* (left), *Nananthus sp.* (centre) and *Mesembryanthemum rabiei* (right) both which are confined to these arid floodplain habitats.

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 description should give a general idea of the functioning of the watercourses along the 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.

4.2.3 Wetland and riparian indicators

The watercourses and wetland systems were delineated by use of topography (land form and drainage pattern) and riparian vegetation with limited soil sampling (Appendix C). The presence of wetland conditions was also confirmed by undertaking a sample survey within each of the watercourses and wetlands which will be affected by the pipeline route. The following guidelines and frameworks were used to determine and delineate the watercourses and wetlands in the study area:

- Department of Water Affairs and Forestry. 2005. A practical field procedure for identification and delineation of wetlands and riparian areas. Edition 1. Department of Water Affairs and Forestry, Pretoria.
- Marnewecke & Kotze 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

Obligate wetland vegetation was utilised to determine the presence and border of wetland conditions. Due to time constraints and the length of the pipeline route soil samples were only used to confirm the presence of wetland conditions where obligate wetland vegetation indicated wetland conditions (Section 4.2.7: Table 9). Soil samples were investigated for the presence of anaerobic evidence which characterises wetland soils.

Soil samples indicated that almost all of the watercourses being crossed by the pipeline contain wetland conditions. The majority of these are also ephemeral systems, i.e. having active main channel flow only every other year. It should however be kept in mind that wetland conditions occur as a result of saturated soils and not active flow or visible surface water. As a result where soils in ephemeral systems become saturated for short periods wetland conditions may still occur.

Along ephemeral systems wetland conditions may also not occur along the entire length of the stream. This is also relevant where roads or infrastructure cross these watercourses. Such structures often cause retardation of flow and as a result may cause soil saturation for longer periods and so increase wetland conditions.

The majority of stream systems have a distinctive main channel and especially so where wetland conditions occur. As a result the topography also substantiate the occurrence of wetland conditions in these watercourses.

Obligate wetland species clearly indicate the presence of wetland conditions in these watercourses. These species are listed for each specific watercourse (Section 4.2.7). Obligate wetland species are confined to wetlands and cannot occur in conditions outside of these systems. As a result, where they occur, wetland conditions can be considered to occur. A facultative wetland species is often associated with wetlands but is also able to occur in non-wetland areas.

4.2.4 Classification of wetland systems

The watercourses and wetlands being affected by the pipeline consist mostly of a channel (stream or river) which is associated with a floodplain wetland which can also be quite extensive in many instances (Appendix A: Map 2 - 7). A description of the functioning and characteristics of these will be provided below.

As indicated above, the most common wetland type are channel wetland systems and present in the main channel of most watercourses (SANBI 2009):

"An open conduit with clearly defined margins that (i) continuously or periodically contains flowing water, or (ii) forms a connecting link between two water bodies. Dominant water sources include

concentrated surface flow from upstream channels and tributaries, diffuse surface flow or interflow, and/or groundwater flow. Water moves through the system as concentrated flow and usually exits as such but can exit as diffuse surface flow because of a sudden change in gradient. Unidirectional channel-contained horizontal flow characterises the hydrodynamic nature of these units. Note that, for purposes of the classification system, channels generally refer to rivers or streams (including those that have been canalised) that are subject to concentrated flow on a continuous basis or periodically during flooding, as opposed to being characterised by diffuse flow (see unchannelled valley-bottom wetland). As a result of the erosive forces associated with concentrated flow, channels characteristically have relatively obvious active channel banks. An active channel is a channel that is inundated at sufficiently regular intervals to maintain channel form and keep the channel free of established terrestrial vegetation. These channels are typically filled to capacity during bankfull discharge (i.e. during the annual flood, except for intermittent rivers that do not flood annually)."



Figure 17: Streams and rivers are characterised as channel systems which is clearly visible as an active channel (red) and well-defined channel banks (blue) which also aids in differentiating these from channelled valley-bottom wetlands. Flow also occurs as unidirectional flow within the channel (arrow).

This accurately describes the wetland conditions along the majority of the watercourses being crossed by the pipeline. In the majority of watercourses the wetland conditions are most prominent along the main channel and decrease in distance from the channel. However, the majority of watercourses also sustain a floodplain wetland system.

Many of the watercourses and especially the larger systems also contain a floodplain wetland system (SANBI 2009):

"The mostly flat or gently sloping wetland area adjacent to and formed by a Lowland or Upland Floodplain river, and subject to periodic inundation by overtopping of the channel bank. For purposes of the classification system, the location adjacent to a river in the Lowland or Upland Floodplain Zone is the key criterion for distinguishing a floodplain wetland from a channelled valley-bottom wetland. Water and sediment input to floodplain wetland areas is mainly via overtopping of a major channel, although there could be some overland or subsurface flow from adjacent valley side-slopes (if present). Water movement through the wetland is dominantly horizontal and bidirectional, in the form of diffuse surface flow and interflow, although there can be significant temporary containment of water in depressional areas (within which water movement is dominantly vertical and bidirectional). Water generally exits as diffuse surface flow

and/or interflow, but infiltration and evaporation of water from a floodplain wetland can also be significant, particularly if there are a number of depressional areas within the wetland."

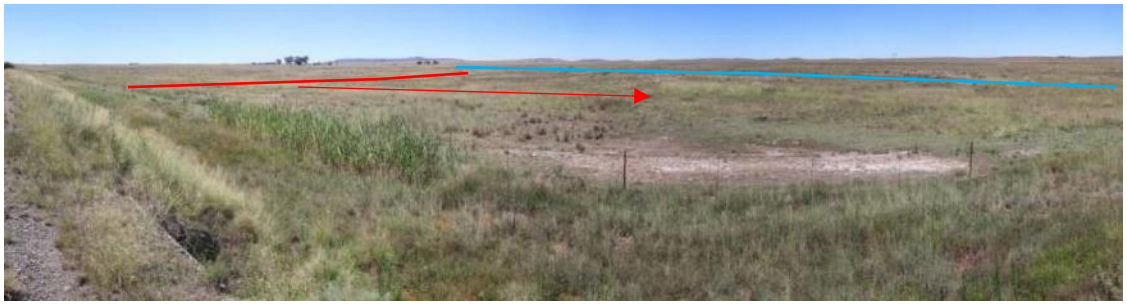


Figure 18: These floodplain wetlands can be extensive but are easily identified by the presence of backwater flooding areas and persistent wetland vegetation. Water input is mainly from the overtopping of the main channel (arrow). The floodplain (blue) here is associated with the Erfdeelspruit which is a large lowland stream system (red).

This accurately describes the wetland conditions which occurs in the floodplain of a several of the larger watercourses. Floodplain and channelled valley-bottom wetlands are easily confused and do look similar but can mainly be differentiated by a floodplain wetland being associated with a lowland watercourse while channelled valley-bottom systems are associated with the upper reaches where hills and valley-bottoms are present.

Due to the large extent of the pipeline route, a few other types of wetlands were also encountered and which included the following:

Smaller streams and drainage lines in more mountainous and hill terrain are likely to be characterised as valley bottom wetlands with a channel (SANBI 2009):

A mostly flat valley-bottom wetland dissected by and typically elevated above a channel (see channel). Dominant water inputs to these areas are typically from the channel, either as surface flow resulting from overtopping of the channel bank/s or as interflow, or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events. Small depressional areas within a channelled valley-bottom wetland can result in the temporary containment and storage of water within the wetland. Water generally exits in the form of diffuse surface flow and interflow, with the infiltration and evaporation of water from these wetlands also being potentially significant (particularly from depressional areas). The hydrodynamic nature of channelled valley-bottom wetlands is characterised by bidirectional horizontal flow, with limited vertical fluctuations in depressional areas.



Figure 19: Channelled valley-bottom wetlands are characterised by diffuse flow (arrows), while being situated within a shallow valley (red).

This wetland hydrogeomorphic type was most common along smaller streams situated along more mountainous and hill terrain as occurs in the section between the Tierpoort- and Rustfontein Dams.

Hillslope seeps and valley-head seeps are associated with the origin of several of the affected watercourses where they are associated with hills and ridges (SANBI 2009):

Hillslope seep: a wetland area located on (gently to steeply) sloping land, which is dominated by the colluvial (i.e. gravity-driven), unidirectional movement of material down-slope. Water inputs are primarily from groundwater or precipitation that that enters the wetland from an up-slope direction in the form of subsurface flow. Water movement through the wetland is mainly in the form of interflow, with diffuse overland flow ('sheetwash') often being significant during and after rainfall events. Water leaves a 'hillslope seep with channelled outflow' mostly by means of concentrated surface flow, whereas water leaves a 'hillslope seep without channelled outflow' by means of a combination of diffuse surface flow, interflow, evaporation and infiltration (as distinguished at Level 4C).
Valley-head seep: gently-sloping, typically concave wetland area located on a valley floor at the head of a drainage line, with water inputs mainly from subsurface flow (although there is usually also a convergence of diffuse overland water flow in these areas during and after rainfall events). Horizontal, unidirectional (down-slope) movement of water in the form of interflow and diffuse surface flow dominates within a valleyhead seep, while water exits at the downstream end as concentrated surface flow where the valleyhead seep becomes a channel.

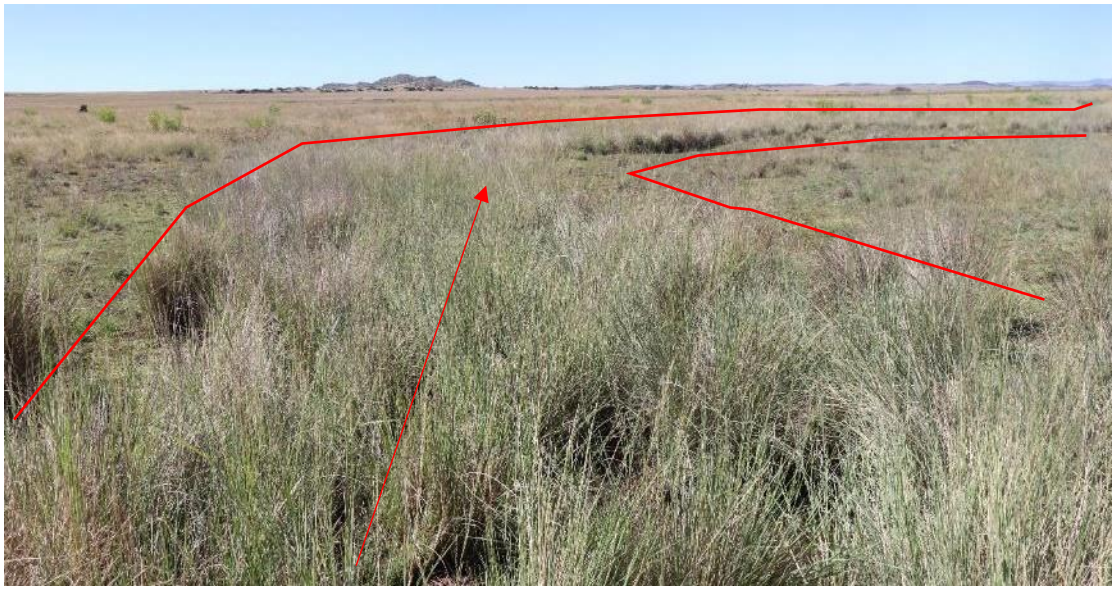


Figure 20: Only a few seepage wetlands occur near the origin of a few watercourses being crossed by the pipeline route. These are located on gentle slopes, without a channel and characterised by diffuse flow (arrow).

These wetland types were not common along the pipeline route and only occur near the origin of a few of the watercourses where they will be affected by the pipeline route.

A single pan system, which can be characterised as a depression wetland occurs along the pipeline route (SANBI 2009):

"A depression wetland is a basin shaped area with a closed elevation contour with an increase in depth from the perimeter to the central areas that allows for the accumulation of surface water (i.e. it is inward draining). It may also receive sub-surface water. An outlet is usually absent. Dominant water sources are precipitation, ground water discharge, interflow and (diffuse or concentrated) overland flow. For 'depressions with channeled inflow', concentrated overland flow is typically a major source of water for the wetland, whereas this is not the case for 'depressions without channeled inflow'. Dominant hydrodynamics are (primarily seasonal) vertical fluctuations. Depressions may be flatbottomed (in which case they are often referred to as 'pans') or round-bottomed (in which case they are often referred to as 'basins') and may have any combination of inlets and outlets or lack them completely. For 'exorheic depressions', water exits as concentrated surface flow while, for 'endorheic depressions', water exits by means of evaporation and infiltration."



Figure 21: The only depression wetland being affected by the pipeline route is situated within a relatively flat area, forming a clear depression in the landscape (red), with inflow occurring from the surrounding catchment (arrows). The pan is also heavily affected by the N1 National Road which transects a portion of it.

This is an accurate description of the pan being affected by the pipeline route. It is circular in shape, with a closed contour, and forming a shallow but clearly discernible depression in the landscape. The pan is also clearly endorheic (without outflow).

4.2.5 Water quality with emphasis on bacteriological contamination

In order to augment current baseline data for the larger seasonal watercourses along the pipeline route, additional water quality has been undertaken for these systems. This has focused on bacteriological contamination though additional chemical water parameters has also been included such as pH, Electrical Conductivity, Total Suspended Solids, etc. Watercourses sampled include the Koringspruit, Tierpoort River, Tributary of the Tierpoort River, Riet River and Vanzylspruit (Appendix A: Map 2 - 7).

These water quality results should be used to determine the risk for people working within these watercourses or coming into contact with water from them during the construction phase but should also be used as baseline values to determine if construction activities result in any deterioration of water quality. This will be particularly applicable to bacteriological contamination (chemical toilets and similar impacts), turbidity (increase erosion and sedimentation) and Total Suspended Solids (high sediment loads).

Water quality results of samples taken at each of the rivers indicate fairly low levels of bacteriological contamination, except for the Koringspruit, which is somewhat higher though still in the lower risk category. This also indicates that none of the affected watercourses exceeded the target South African Water Quality Guideline ranges used for risk-free recreational purposes while also confirming fairly good water quality within these larger river systems.

Table 2: Summary of bacteriological results of the water in the Koringspruit, Tierpoort River, Tributary of the Tierpoort River, Riet River and Vanzylspruit taken in March 2024 (counts/100ml).

	Faecal coliforms	*Escherichia coli*	Total Coliforms	Total Plate Counts (TPC)	Coordinates of sample	Location of sample
I	435	613	>2420	>1000	S 29.298458° E 26.501980°	Koringspruit
II	70	86	>2420	>1000	S 29.414961° E 26.202024°	Tierpoort River
III	58	60	>2420	>1000	S 29.454470° E 26.218583°	Tierpoort Tributary
IV	26	9	>2420	428	S 29.657372° E 25.985677°	Riet River
V	66	14	>2420	442	S 29.991560° E 26.800114°	Vanzylspruit

Table 3: Summary of chemical water quality results in the Koringspruit, Tierpoort River, Tributary of the Tierpoort River, Riet River and Vanzylspruit taken in March 2024.

	Koringspruit	Riet River	Tierpoort River	Tierpoort Tributary	Vanzylspruit
Turbidity (NTU)	15.30	2.32	2.83	0.96	24.30
pH	7.24	7.32	6.93	7.23	7.52
Electrical Conductivity (EC) (mS/m)	43.12	54.86	36.83	58.31	61.89
Chemical Oxygen Demand (COD) (mg/L)	30	22	33	29	16
Total Organic Carbon (mg/L)	16.71	9.29	15.27	15.74	9.3
Total Suspended Solids (mg/L)	37.76	19.85	32.13	<0.41	50.93
Total Dissolved Solids (mg/L)	285.86	361.32	246.13	375.25	380.28

Results indicate that the water quality contains relatively low value of bacterial contamination, which also confirms the good condition of these watercourses (Table 2). The Koringspruit does contain somewhat higher value, which may possibly be linked to concentrated livestock areas upstream though is also still within the lower risk categories. Chemical water quality results also confirms relatively good water quality for all of these major rivers (Table 3).

These baseline values should also be used for monitoring of water quality within the affected watercourses during the construction phase and should indicate if construction is resulting in any contamination or deterioration of water quality within these rivers.

During construction, these is always a risk that people in the construction process may fall in or come into full contact with the surface water in these rivers and this also poses a risk where high levels of bacteriological contamination is involved. This should be taken into account concerning the health and safety of people working within the river during construction. While the current risk of contamination remains low, this may also change during construction (Table 4). However, provided no contact with water occurs and this restriction is clearly signposted, public health risks due to possible disease transmission, as indicated by *E. coli* levels, are not of concern. Health effects should not result from rare accidental water contact, nor should bacterial populations indicated by the above micro-organisms cause adverse impacts on other aquatic organisms.

Table 4: Guideline for faecal coliforms and *E. coli* to be used for full contact recreation (counts/100ml) (DWA 1996).

Faecal coliform target guideline range	Effects
0-150	Negligible risk of gastro-intestinal effects is expected. It should, however, be noted that while the presence of faecal indicators indicates a possible risk to health, the absence of indicators does not guarantee the absence of risk. The postulated range should not be exceeded by the geometric mean or median count over a period of three months. Whenever possible, this three month period should coincide with seasons to allow detection of seasonal variation in water quality.
150-600	A slight risk of gastro-intestinal illness is indicated at faecal coliform levels which occasionally fall in this range. The risk increases if geometric mean or median levels are consistently in this range. This range should not be exceeded by the geometric mean or median of fortnightly samples collected over a three month period.
600-2000	Noticeable gastro-intestinal health effects may be expected in the population of swimmers and bathers. Some health risk exists if single samples fall in this range, particularly if such events occur frequently.
>2000	As the faecal coliform level increases above this limit, the risk of contracting gastrointestinal illness as a result of full contact recreation increases. The volume of water which needs to be ingested in order to cause adverse effects decreases as the faecal coliform density increases.
E. coli Target Water Quality Range	Effects
0 - 130	A low risk of gastrointestinal illness is indicated for contact recreational water use. This is not expected to exceed a risk of typically < 8 illnesses/1 000 swimmers.

130 - 200	A slight risk of gastrointestinal effects among swimmers and bathers may be expected. Negligible effects are expected if these levels occur in isolated instances only.
200 - 400	Some risk of gastrointestinal effects exists if geometric mean or median E. coli levels are in this range, particularly if this occurs frequently. The risk is minimal if only isolated samples fall in this range. Resampling should be conducted if individual results > 400/100 mL are recorded.
> 400	Risks of health effects associated with contact recreational water use increase as E. coli levels increase. The volume of water which needs to be ingested in order to cause ill effects decreases as the E. coli density increases. Gastrointestinal illness can be expected to increase approximately in accordance with the following relationship, based on US EPA epidemiological studies: $y = -150.5 + 423.5(\log x)$ where y = illness rate/100 000 persons x = number of E. coli/100 mL ($x \geq 3$)

4.2.6 Condition and importance of the affected watercourses

Due to the high amount of watercourses being crossed by the pipeline a determination of the Index of Habitat Integrity (IHI) will only be conducted for the larger watercourses being crossed by the pipeline (Appendix A: Map 2 - 7). These will be the Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit and Bossiespruit. This is considered to give an adequate representation of the overall condition of the watercourses being crossed by the pipeline. The IHI will be taken as representative of the Present Ecological State (PES) of these systems. As previously indicated, the entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and Riet-Modder Rivers 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 and their catchments affected by largely the same impacts and the impact caused by the proposed pipeline will therefore largely affect them to the same degree and their assessment is therefore considered to give a fairly good indication of the overall condition of watercourses that will be affected by the pipeline development.

In order to further improve the determination of the condition of the affected watercourses, a WET-Health determination will also be undertaken for portions of a few of the larger floodplain wetlands which will be affected by the pipeline development (Appendix D).

Table 5 refers to the determination and categorisation of the Present Ecological State (PES; health or integrity) of various biophysical attributes of rivers relative to the natural or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the river (Kleynhans & Louw 2007).

Table 6 refers to the Ecological Importance and Sensitivity (EIS) of wetlands. "Ecological importance" of a water resource is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales. "Ecological sensitivity" refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has

occurred. The Ecological Importance and Sensitivity (EIS) provides a guideline for determination of the Ecological Management Class (EMC).

Table 5: Ecological categories for Present Ecological Status (PES).

Ecological Category	Description
A	Unmodified, natural
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominately unchanged.
D	Largely modified. A large loss of natural habitat, biota and basic ecosystem function has occurred.
E	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	Critically/Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Table 6: Ecological importance and sensitivity categories.

Ecological Importance and Sensitivity Category (EIS)	Range of Median	Recommended Ecological Management Class
Very High Floodplains that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these floodplains is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers.	>3 and <=4	A
High Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	>2 and <=3	B
Moderate Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.	>1 and <=2	C
Low/marginal Floodplains that are not ecologically important and sensitive at any scale. The biodiversity of these floodplains is ubiquitous and not sensitive to flow and habitat modifications.	>0 and <=1	D

They play an insignificant role in moderating the quantity and quality of water of major rivers.		

Desktop assessments of the subject watercourses as well as some of the other larger watercourses was previously conducted (Kleynhans 2000) while more recent desktop assessments (Van Deventer *et al* 2018) also provides additional confirmation of their condition (Table 7). This was also utilised to inform the condition of the watercourses being affected by the pipeline development although it should be kept in mind that these desktop assessments may be inaccurate in some areas.

Table 7: Desktop summary of the Present Ecological State (PES) of larger watercourses along the pipeline route (Kleynhans 2000 & Van Deventer *et al* 2018) (NFEPA – National Freshwater Ecosystem Priority Areas).

Major catchment	Watercourse	PES (2000/2018)	Quaternary Catchment	NFEPA Status
Modder Catchment	Modder River	D: Largely Modified	C52B	Not listed
Modder Catchment	Koringspruit	C: Moderately Modified	C52D	FEPA
Modder Catchment	Renosterspruit	C: Moderately Modified	C52F	Not listed
Modder Catchment	Tributary of Renosterspruit	C: Moderately Modified	C52F	FEPA
Riet Catchment	Tierpoort River	C: Moderately Modified	C51D	Not listed
Riet Catchment	Tributary of Tierpoort River	C: Moderately Modified / B: Largely Natural	C51D	FEPA
Riet Catchment	Holspruit	C: Moderately Modified / B: Largely Natural	C51E	Not listed
Riet Catchment	Riet River	C: Moderately Modified	C51B	Not listed
Riet Catchment	Tributary of Riet River	C: Moderately Modified	C51B	FEPA Upstream
Riet Catchment	Erfdeelspruit	C: Moderately Modified	C51G	FEPA Upstream
Riet Catchment	Vanzylspruit	C: Moderately Modified / B: Largely Natural	C51G	FEPA
Riet Catchment	Tributary of Vanzylspruit	C: Moderately Modified	C51G	FEPA Upstream
Riet Catchment	Tributary of Vanzylspruit	C: Moderately Modified	C51G	FEPA Upstream
Orange Catchment	Bossiespruit	C: Moderately Modified / D:	D35F	Not listed

		Largely Modified		

Despite the condition of the watercourses being crossed by the pipeline all should be considered as sensitive and providing essential services in terms of water transportation and ecological functioning.

Modder River (Appendix A: Map 7)

The Modder River is heavily degraded but mostly modified in terms of its functioning by the upstream Novo Transfer Scheme and Rustfontein Dam. The site of the proposed pipeline crossing is situated immediately downstream of the Rustfontein Dam wall. As a result the functioning of the river here has been heavily modified, especially in terms of its flow and flooding regime. The river is now a perennial river flowing throughout the year and is heavily regulated with flooding rarely taking place. Under natural conditions the river at the site would at best have been seasonal and only have active flow after large rainfall events. This therefore indicates a large modification in terms of the flow and flooding regime. This modification is caused by two major impacts:

- Firstly, the Novo Transfer Scheme which aids in augmenting the water supply of the MMM and which was in part undertaken by constructing a pipeline from the Knellpoort Dam to the headwater of the Modder River where it discharges into the river and is allowed to flow downstream and into the Rustfontein Dam. This entails an inter-catchment transfer, i.e. the Novo Transfer Scheme. This release of large volumes of water into a naturally seasonal watercourse alters the flow regime from seasonal to perennial and also has a large impact on the fish and invertebrate population of the river. This has also been confirmed by Slabbert (2007). The modification of the flow regime is also likely to modify the geomorphology of the river and increase erosion of the banks and consequent sedimentation.

- Secondly, the Rustfontein Dam itself is also a large artificial impoundment which now regulates the flow of the river, ensure a continuous low flow, in contrast to a highly variable seasonal flow and also largely prevents the occurrence of large flooding events. Which, as has been illustrated (See Section 4.3.2), is essential to the natural functioning of these watercourses.

Other impacts occurring in the catchment of the river, include a moderate degree of dryland crop cultivation which will cause some impacts in terms of fertiliser and herbicide runoff and increased sedimentation. Concentrated livestock farming occurs in the catchment while trampling along the banks if also present and this will also contribute impacts in the form of decreasing the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. In addition, manure will increase the nutrient load within the river. The only significant urban area upstream is the town of Dewetsdorp which will contribute a limited level of pollution. Numerous small impoundments upstream will also have in impact in terms of its flow regime.

According to Kleynans (2000) a desktop assessment of the Modder River at the site is considered to have a PES of Category D: Largely Modified, which was also confirmed by Van Deventer *et al* (2018). On site observations indicate that this fairly accurate in light of the large-scale modification to the flow regime of the river. This study has determined that the Modder River has a PES of Category D: Largely Modified (Appendix D). Despite this the system still provides vital

services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The Modder River and associated wetland areas situated at the proposed pipeline crossing, has been heavily modified, largely as a result of the Novo Transfer Scheme and Rustfontein Dam. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourse has an Instream and Riparian IHI of Category D: Largely Modified. This also indicates that the most prominent modifications are concerned with the hydrology and bank structure modification of the river and is in agreement with the expected impacts of the Novo Transfer Scheme and Rustfontein Dam. A summary of these results are included in Appendix D.

The EI&S of the Modder River has been rated as being Moderate: Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

Channelled valley bottom wetland – Modder Catchment

Detailed assessment of the following wetland system upstream of the Rustfontein Dam was undertaken to provide a general indication of the condition of wetlands and smaller tributaries within the catchment of the Modder River that will also be affected by the pipeline route. The subject wetland (#55 Channelled valley-bottom wetland) is situated to the west of the Rustfontein Dam and will be crossed by the proposed pipeline route. The valley bottom wetland system is considered largely natural but with some modification caused by a few land uses associated with agriculture.

The wetland contains an artificial impoundment upstream while a significant impoundment is also situated downstream of the site. These impoundments will have a significant impact on the flow and flooding regime of the system. These impoundments result in the inundation of a portion of the wetland, concentrated outflow also promote channel formation, while the dams will also alter the occurrence of natural flooding events. The system therefore becomes regulated by these dams as opposed to an unregulated system.

Within the upstream catchment of the wetland, previously ploughed areas are also evident. These area will also affect the runoff and hydrology of the wetland. Crop cultivation requires the removal of the natural vegetation layer, which in turn promotes runoff while decreasing infiltration and this again results in higher erosion rates, which increases both the inflow into the wetland system, as well as the sediment load within the wetland.

Another smaller, though still notable impact in the upstream catchment is several dirt tracks and railway crossing over the wetland. These will have a limited impact, but will cause some retardation of flow and consequently will impact on the flow and flooding regime of the wetland.

A WET-Health determination was undertaken for the valley-bottom wetland to determine its current condition given the impacts affecting it (Appendix D). The results of the WET-Health indicated that the valley-bottom wetland system has an overall Present Ecological

State of Category C: Moderately Modified. This is mostly attributed to the modification resulting from the artificial impoundments within the wetland which alters its hydrology and vegetation. Despite the wetland system being somewhat modified, it still provides vital services including water transportation, storm water and groundwater recharge, bioremediation and flood attenuation. The entire system should therefore still be considered as sensitive and the proposed pipeline development should not lead to any further alteration to it.

Koringspruit (Appendix A: Map 7)

The Koringspruit is a tributary of the Modder River but which is not as heavily modified, as a result of lower impacts within its catchment and the absence of large, regulatory dams upstream of the site. A few impacts do however cause it to be somewhat modified. Several small agricultural dams and weirs occur in the upper reaches of the stream and will cause some alteration to the flow and flood regime of the stream system. However, these will not prevent large flooding events, while the flow regime will also remain largely seasonal to ephemeral which is still considered natural for this system. An extensive dirt road network also cross over the stream at several points and which will act as flow barriers, while also promoting erosion. This impact is however still considered relatively low. Agricultural crop production is fairly common along the stream especially along the adjacent alluvial plains and these will contribute a significant impact on the stream system. These fields decrease the natural vegetation cover, promote a higher surface runoff rate, increase surface erosion and so increases sediment within the stream system. In addition, fertiliser and herbicide runoff from these fields will also affected the water quality within the stream. Livestock farming is also the main land use in the catchment and will contribute some impacts to the stream, though should remain fairly low. This will contribute to impacts in the form of decreasing the vegetation layer, trampling will disturb the soil surface and increased runoff and sediment load will result. In addition, manure will increase the nutrient load within the river.

According to Kleynans (2000) a desktop assessment of the Koringspruit at the site is considered to have a PES of Category C: Moderately Modified, which was also confirmed by Van Deventer *et al* (2018). On site observations indicate that this fairly accurate which indicate that while the catchment is still largely intact, several significant impacts does affect its condition. This study has determined that the Koringspruit has a PES of Category C: Moderately Modified (Appendix D). Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The Koringspruit at the point of crossing is also listed a National Freshwater Ecosystems Priority Area (NFEPA) system which increases its conservation value and sensitivity further.

The Koringspruit and associated wetland areas situated at the proposed pipeline crossing, is still largely intact though modified to some degree. An Index of Habitat Integrity (IHI) was conducted and indicated that the watercourse has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D.

The EI&S of the Koringspruit has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water

of major rivers. This is also, to a large extent, as a result of the system being regarded as an NFEPA listed system.

Floodplain wetland – Koringspruit Catchment

Detailed assessment of the following wetland system forming a tributary of the Koringspruit was undertaken to provide a general indication of the condition of wetlands and smaller tributaries within the catchment of the Koringspruit that will also be affected by the pipeline route. The subject wetland (#50 Stream and floodplain wetland – Tributary of Koringspruit) forms a large tributary of the Koringspruit and is also being crossed at several points by the proposed pipeline. This wetland is quite extensive and can be confused with a valley-bottom wetland though due to the defined channel banks, gradient and being situated in lower foothills, it can with relative certainty be regarded as a floodplain wetland. This wetland system is considered to be quite natural though a few impacts will however still affect its condition.

The wetland contains a few small artificial impoundments upstream which will have a low impact in terms of the overall flooding regime of the wetland. They will contribute toward a decreased baseflow, promote channel formation and will also influence the occurrence of natural flooding events. The system is therefore still largely unregulated though small dams will still have some affected on it.

Within the upstream catchment of the wetland, previously ploughed areas are also evident. These area will also affect the runoff and hydrology of the wetland. Crop cultivation requires the removal of the natural vegetation layer, which in turn promotes runoff while decreasing infiltration and this again results in higher erosion rates, which increases both the inflow into the wetland system, as well as the sediment load within the wetland.

Another smaller, though still notable impact in the upstream catchment is several dirt tracks and low water crossings over the wetland. These will have a limited impact, but will cause some retardation of flow and consequently will impact on the flow and flooding regime of the wetland.

A WET-Health determination was undertaken for the floodplain wetland to determine its current condition given the impacts affecting it (Appendix D). The results of the WET-Health indicated that the floodplain wetland system has an overall Present Ecological State of Category B: Largely Natural. This is mostly as a result of only small artificial dams situated in the catchment, with very limited transformation for agriculture and low levels of abstraction from the system. This also seems to confirm why the Koringspruit system is currently listed as an NFEPA system, as wetlands within the catchment are still largely natural. The entire system should therefore be considered as highly sensitive and the proposed pipeline development should not lead to any alteration to it.

Tierpoort River (Appendix A: Map 7)

The site of the proposed crossing of the Tierpoort River is situated upstream of the Tierpoort Dam and consequently the impacts on it at the site is much lower compared to downstream of the dam. Upstream of the dam the river remains largely natural and unregulated, while downstream it is being regulated by the dam while increased irrigation will also affect its

condition. The catchment upstream of the site does contain a moderate degree of dryland, as well as irrigated cropfields and these will have a significant impact on the river. These fields decrease the natural vegetation cover, promote a higher surface runoff rate, increase surface erosion and so increases sediment within the river system. In addition, fertiliser and herbicide runoff from these fields will also affected the water quality within the river. Several small agricultural dams and weirs occur in the upper reaches of the river and will cause some alteration to the flow and flood regime of the river system. However, these will not prevent large flooding events, while the flow regime will also remain largely seasonal which is still considered natural for this system. An extensive dirt road network also cross over the river at several points and which will act as flow barriers, while also promoting erosion. This impact is however still considered relatively low.

According to Kleynans (2000) a desktop assessment of the Tierpoort River at the site is considered to have a PES of Category C: Moderately Modified, which was also confirmed by Van Deventer *et al* (2018). On site observations indicate that this fairly accurate which indicate that while the catchment is still largely intact, several significant impacts does affect its condition. This study has determined that the Tierpoort River has a PES of Category C: Moderately Modified (Appendix D). Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The Tierpoor River is affected by several impacts but none which are considered to cause extensive modification of it, while it is also largely unregulated (at least upstream of the site). An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D.

The EI&S of the Tierpoort River has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.

Floodplain wetland – Tierpoort Catchment

Detailed assessment of the following wetland system forming a tributary of the Tierpoort River was undertaken to provide a general indication of the condition of wetlands and smaller tributaries within the catchment of the Tierpoort River that will also be affected by the pipeline route. The subject wetland (#43 Stream and floodplain wetland – Tributary of Tierpoort River) forms an extensive wetland and tributary of the Tierpoort River and is also being crossed by the proposed pipeline. This wetland is quite extensive and can be confused with a valley-bottom wetland though due to the defined channel banks, gradient and being situated in lower foothills, it can with relative certainty be regarded as a floodplain wetland. This wetland system is considered to be largely intact though a few significant impacts will affect its condition.

A small upstream and fairly large artificial dam near the site will have a significant impact on the functioning of the wetland in terms of its flow and flooding regime. They will contribute toward a decreased baseflow, promote channel formation and will also influence the occurrence of natural flooding events. Though these dams are not large

containment dams the lower dam is quite large and is likely to still affect the system to a significant extent.

Within the upstream catchment of the wetland, previously ploughed areas are also evident. These area will also affect the runoff and hydrology of the wetland. Crop cultivation requires the removal of the natural vegetation layer, which in turn promotes runoff while decreasing infiltration and this again results in higher erosion rates, which increases both the inflow into the wetland system, as well as the sediment load within the wetland.

Another smaller, though still notable impact in the upstream catchment is several dirt tracks and low water crossings over the wetland. These will have a limited impact, but will cause some retardation of flow and consequently will impact on the flow and flooding regime of the wetland.

A WET-Health determination was undertaken for the floodplain wetland to determine its current condition given the impacts affecting it (Appendix D). The results of the WET-Health indicated that the floodplain wetland system has an overall Present Ecological State of Category C: Moderately Modified. This is mostly coupled with significant artificial dams situated within the wetland, limited transformation for agriculture and a few small flood irrigated cropfieds within the wetland system. This also seems to correspond to some degree with the overall condition of the Tierpoort system. Despite the wetland system being somewhat modified, it still provides vital services including water transportation, storm water and groundwater recharge, bioremediation and flood attenuation. The entire system should therefore still be considered as sensitive and the proposed pipeline development should not lead to any further alteration to it.

Riet River (Appendix A: Map 6)

The site of the proposed crossing of the Riet River is situated downstream of the Fouriespruit Dam, which does contribute some significant impacts on the river. This dam is situated in the Fouriespruit, a direct tributary of the Riet River will cause some alteration to the flow and flood regime of the river. This will decrease the flow volumes within the river, and coupled with abstraction for limited irrigation, this is also considered likely to decrease the baseflow of the system. The site is also situated immediately upstream of the N1 National Road and within the road reserve. The road itself will also have a substantial impact on the river whereby upstream it will contribute toward flow retardation and the accumulation of sediments while downstream of the bridge structure it will cause concentrated flow and increased scouring and erosion. The banks and riparian vegetation is also significantly affected by the road and contains significant levels of disturbance, largely localised to the road reserve itself. Irrigated cropfields at the site and upstream is still limited and will therefore only contribute limited impacts in terms of increased sediment loads and fertiliser and herbicide runoff from these fields. Several small agricultural dams and weirs occur in the upper reaches of the river and will cause some alteration to the flow and flood regime of the river system. However, these will not prevent large flooding events, while the flow regime will also remain largely seasonal which is still considered natural for this system. An extensive dirt road network also cross over the river at several points and which will act as flow barriers, while also promoting erosion. This impact is however still considered relatively low.

According to Kleynans (2000) a desktop assessment of the Riet River at the site is considered to have a PES of Category C: Moderately Modified, which was also confirmed by Van Deventer

et al (2018). On site observations indicate that this fairly accurate which indicate that while the catchment is still largely intact, several significant impacts does affect its condition. This study has determined that the Riet River has a PES of Category C: Moderately Modified (Appendix D). Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The Riet River is affected by several impacts but none which are considered to cause extensive modification of it, with the Fouriespruit Dam and limited irrigation being most prominent. An Index of Habitat Integrity (IHI) was conducted and indicated that the river has an Instream and Riparian IHI of Category C: Moderately Modified. A summary of these results are included in Appendix D.

The EI&S of the Riet River has been rated as being Moderate: Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

Vanzylspruit (Appendix A: Map 5)

The Vanzylspruit, at least at the point of the pipeline crossing, is not currently affect by a high degree of impacts. It is situated upstream of the N1 National Road as well as the downstream weir though is affected by these impacts to some extent. The road itself will also have a substantial impact on the river whereby upstream it will contribute toward flow retardation and the accumulation of sediments while downstream of the bridge structure it will cause concentrated flow and increased scouring and erosion. The banks and riparian vegetation is also significantly affected by the road and contains significant levels of disturbance, largely localised to the road reserve itself. The downstream weir also results in the formation of a deep pool or "kuil" Which is considered a modification of the natural river functioning and geomorphology. Upstream of the site, this river is not affected by any significant impacts, with only a few low impacts affecting it. These include a few small artificial dams, but which are small and not numerous and will therefore not have a large impact on the flow regime of the river. Irrigated and dryland crop cultivation is also confined to a few small areas which will not result in significant amounts of sediment in the system or pesticide/fertiliser runoff. The catchment of the Vanzylspruit upstream of the site consists almost exclusively of natural vegetation with few impacts and consequently the condition of the river is relatively good.

According to Kleynans (2000) a desktop assessment of the Vanzylspruit at the site is considered to have a PES of Category C: Moderately Modified, although more recent desktop assessment (Van Deventer *et al* 2018), indicates a more natural condition of Category B: Largely Natural. On site observations also indicate similar results which indicate that the river, upstream of the site, is largely natural and not affected by significant impacts. This study has determined that the Vanzylspruit has an Instream and Riparian IHI of Category B/C: Largely Natural to Moderately Modified. A summary of these results are included in Appendix D. Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The Vanzylspruit at the point of crossing is also listed a National Freshwater Ecosystems Priority Area (NFEPA) system which increases its conservation value and sensitivity further.

The EI&S of the Vanzylspruit has been rated as being High: Floodplains that are considered to be ecologically important and sensitive. The biodiversity of these floodplains may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers. This is mostly as a result of the river being in a good condition and listed as a NFEPA system.

Erfdeel floodplain wetland – Vanzylspruit Catchment

Detailed assessment of the following wetland system forming a tributary of the Vanzylspruit was undertaken to provide a general indication of the condition of wetlands and smaller tributaries within the catchment of the Vanzylspruit that will also be affected by the pipeline route. The subject wetland (#30 Erfdeelspruit and floodplain wetland – Tributary of Vanzylspruit) forms a large floodplain of the Erfdeelspruit which is a large tributary of the Vanzylspruit and will also be crossed by the proposed pipeline route. This floodplain wetland is extensive and can be up to 600 meters broad along the channel of the stream system. This is clearly a floodplain system which is situated adjacent to the main channel of the stream. It also contains a diverse geomorphology with backwater wetland flats, pools and semi-arid alluvial habitats. This wetland system is considered to be quite natural though a few impacts will however still affect its condition.

The wetland contains a few small artificial impoundments upstream which will have a low impact in terms of the overall flooding regime of the wetland. They will contribute toward a decreased baseflow, promote channel formation and will also influence the occurrence of natural flooding events. The system is therefore still largely unregulated though small dams will still have some affected on it.

The upstream catchment of the wetland is almost completely natural with only very small patches of dryland crop cultivation taking place. This will therefore only have a low impacts in terms of erosion and sediment load within the system.

Another smaller, though still notable impact in the upstream catchment is several dirt tracks and low water crossings over the wetland. These will have a limited impact, but will cause some retardation of flow and consequently will impact on the flow and flooding regime of the wetland.

A WET-Health determination was undertaken for the floodplain wetland to determine its current condition given the impacts affecting it (Appendix D). The results of the WET-Health indicated that the floodplain wetland system has an overall Present Ecological State of Category B: Largely Natural. This is mostly as a result of only small artificial dams situated in the catchment, with very limited transformation for agriculture and low levels of abstraction from the system. This also seems to confirm why the Vanzylspruit system is currently listed as an NFEPA system, as wetlands within the catchment are still largely natural. The entire system should therefore be considered as highly sensitive and the proposed pipeline development should not lead to any alteration to it.

Bossiespruit (Appendix A: Map 4)

The Bossiespruit is the only large watercourse situated within the Orange Catchment that will be affected by the proposed pipeline route. The site of the proposed crossing of the Bossiespruit is situated downstream of the N1 National Road and within the road reserve. Impacts upstream

that cause significant modification of the system include the small town of Springfontein and impacts associated with urban runoff while the Waste Water Treatment Works (WWTW) of the town also seeps or discharges into this stream system and which is also likely to have some impacts on the stream in terms of flow regime and water quality. The catchment of the stream also contains many small artificial dams and these are likely to still have some significant impacts in terms of containment of runoff and modification of the flow regime. Upstream of the site, the stream is also affected by numerous infrastructure crossings which include the N1 National Road, smaller tarred roads, several railway crossings and numerous dirt road crossings. These will all affect the flow regime of the stream in that they act as flow barrier, retarding natural flow and affecting flooding events. Such infrastructure also affect the stream by causing flow retardation and the accumulation of sediments upstream of the structure while causing concentrated flow and increased scouring and erosion downstream of the structure. The catchment is still largely natural with very little transformation for crop production, while irrigation is also low although the urban area of Springfontein does contribute to some significant catchment transformation.

According to Kleynans (2000) a desktop assessment of the Bossiespruit at the site is considered to have a PES of Category C: Moderately Modified, although more recent desktop assessment (Van Deventer *et al* 2018), indicates a more modified condition of Category D: Largely Modified. This may be as a result of the Bossiespruit flowing into the Gariep Dam downstream. However, the on-site survey seems to support a less modified condition and has determined that the Bossiespruit has a PES of Category C: Moderately Modified (Appendix D). Despite this the system still provides vital services including water transportation, storm water and groundwater recharge. The entire system should therefore still be considered as sensitive and pipeline development should not contribute to any further deterioration of its condition.

The EI&S of the Bossiespruit has been rated as being Moderate: Floodplains that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these floodplains is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers.

Table 8: Summary of Present Ecological State (PES) scores for significant watercourses assessed along the pipeline route (Appendix D).

Watercourse	PES	EI&S	Order
Modder River	Class D: Largely Modified	Moderate	3
Koringspruit	Class C: Moderately Modified	High	1
Tierpoort River	Class C: Moderately Modified	High	2
Riet River	Class C: Moderately Modified	Moderate	4
Vanzylspruit	Class B/C: Largely Natural to Moderately Modified	High	2
Bossiespruit	Class C: Moderately Modified	Moderate	1

The results of the assessment of the significant watercourses along the pipeline route indicate that the majority are still natural to a large extent and only moderately modified (Table 8). It is also evident that the larger watercourses affected by higher levels of utilisation are more modified while the proximity to urban areas (Modder and Tierpoort Rivers), also corresponds to a decrease in condition.

4.2.7 Overview of each watercourse crossing

The propose pipeline route will cross over and affect a large number of watercourses and wetlands (Appendix A: Map 1 - 7). A short description of these watercourses and wetland, their vegetation composition and functioning will be provided in this section. Where several tributaries are situated adjacent to each other, or where a watercourse is crossed at more than one point, they may be combined in one sample site to serve as representative for all affected sections.

Where FW or OW is indicated it refers to Facultative or Obligate Wetland species. A facultative wetland species is often associated with wetlands but is also able to occur in non-wetland areas. Obligate wetland species are confined to wetlands and are only able to occur in wetlands. They are therefore reliable indicators of wetland conditions. Field observations over time as well as the following sources were used to determine FW and OW species:

- Marnewecke, G. & Kotze, D. 1999. Appendix W6: Guidelines for delineation of wetland boundary and wetland zones. In: MacKay (Ed.), H. Resource directed measures for protection of water resources: wetland ecosystems. Department of Water Affairs and Forestry, Pretoria.

- DWAF. 2008. Updated manual for the identification and delineation of wetlands and riparian areas, prepared by M.Rountree, A.L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa.

- Van Ginkel, C.E. & Cilliers, C.J. 2020. Aquatic and wetland plants of Southern Africa. Briza Publications, Pretoria.

Table 9: Description of each watercourse crossing by the proposed pipeline (Appendix A: Map 1 - 7) (FW – Facultative wetland species, OW – Obligate wetland species, * - Exotic species).

Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#1 Drainage line – Tributary of Orange River	S 30.613697°, E 25.486644°	Ephemeral drainage line
Description of watercourse: This is a very small, but well-defined drainage line flowing from east to west and draining into the Orange River. It flows down the slope of a prominent hill to the west and originates at the edge of the plateau of this hill. The drainage line is largely natural with the most notable impact being the crossing of the tarred road. The gradient of the drainage line is quite steep and it will clearly discharge by means of high velocity flooding after heavy rainfall events. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a defined channel, but which is completely devoid of wetland conditions. However, riparian vegetation is still abundant, and it clearly functions as an ephemeral watercourse. Soil within this drainage line is devoid of wetland conditions with a grey matrix and mottling being absent. This is also substantiated by the vegetation along the drainage line which is dominated by terrestrial species but with several riparian trees also being abundant. Despite being a very small drainage line, a defined but narrow channel is present.		

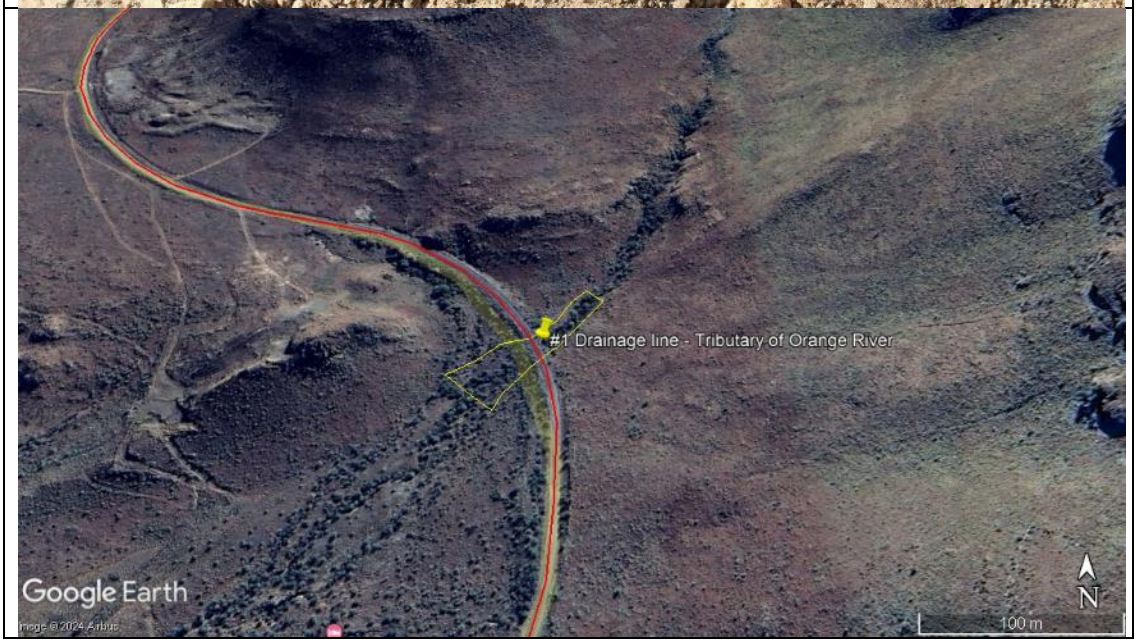
Dominant plant species:
*Eriocephalus ericoides, Themeda triandra, Heteropogon contortus, Eragrostis lehmanniana, Fingerhuthia africana, Searsia burchellii. Vachellia karroo, Diospyros lycioides, Setaria verticilata, Searsia lancea, *Argemone ochroleuca, Osteospermum sinuata*

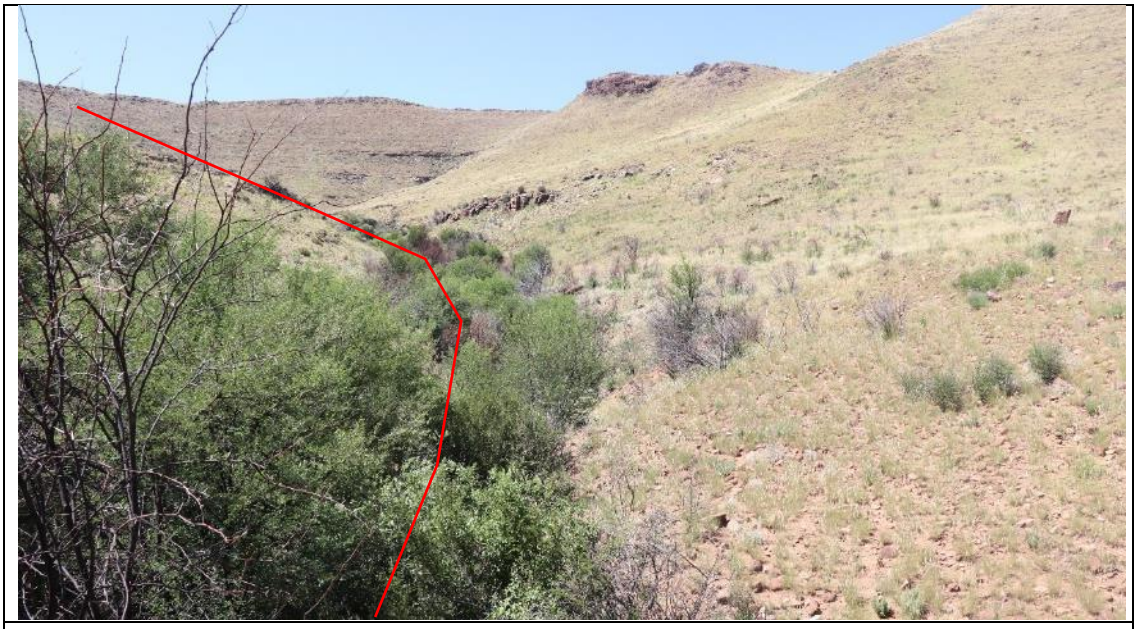
Protected plant species:
None observed

Notes:
Moderate Risk – The drainage line is small but due to steep gradient and flushing functioning, erosion may be problematic which is also likely to affect the downslope environment. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#2 Drainage line – Tributary of Orange River	S 30.596507°, E 25.485625°	Ephemeral drainage line

Description of watercourse:
A well-defined drainage line flowing from east to west and eventually into the Orange River. It flows down the slope of a prominent hill. It flows down the slope of a prominent hill to the west on the border of the urban area of the town of Gariep. It is largely natural though the origin may be modified by the urban area. It is also crossed by the tarred road which will affect it in terms of flow and flooding. The gradient of the drainage line is quite steep and it will clearly discharge by means of high velocity flooding after heavy rainfall events. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a defined channel, but which is completely devoid of wetland conditions. However, riparian vegetation is still abundant, and it clearly functions as an ephemeral watercourse.

The drainage line clearly contains no wetland conditions though does still form a defined watercourse. This is also substantiated by the vegetation along the drainage line which is dominated by terrestrial species but with several riparian trees also being abundant. Despite being a very small drainage line, a defined but narrow channel is present.

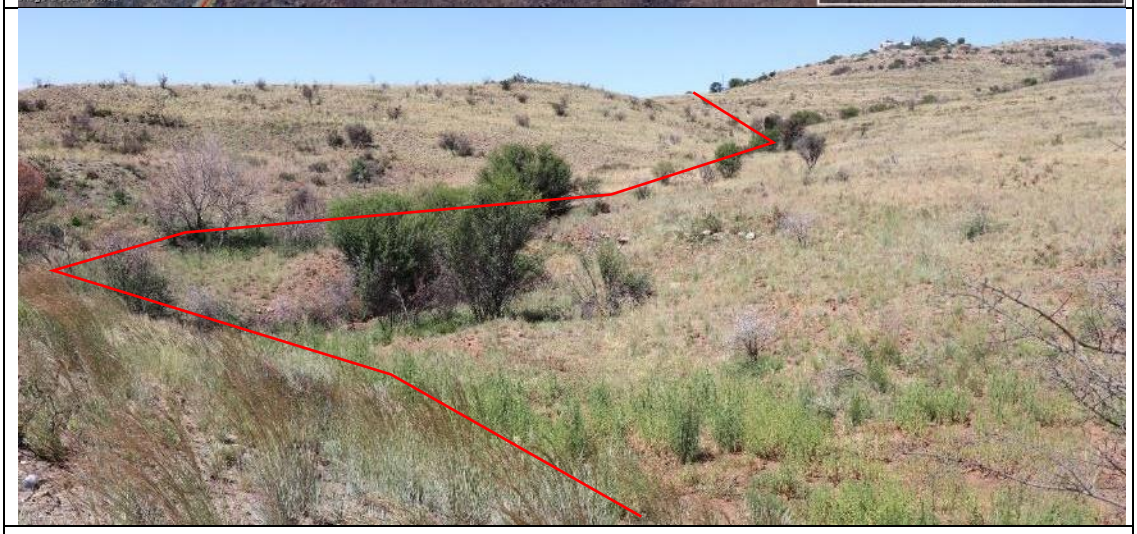
Dominant plant species:
*Vachellia karroo, Enneapogon cenchroides, Diospyros lycioides, Fingerhuthia africana, Aristida congesta, *Tagetes minuta.*

Protected plant species:
Avonia ustulata a protected succulent on the ridge south of the drainage line.

Notes:
Moderate Risk – The drainage line is small but due to steep gradient and flushing functioning, erosion may be problematic which is also likely to affect the downslope environment. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:
No soil sample taken.





Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#3 Drainage line – Tributary of Orange River	S 30.590997°, E 25.489586° S 30.586568°, E 25.489503°	Ephemeral drainage line

Description of watercourse:
Two drainage lines flowing into each other and in close proximity and therefore discussed together. They are small but fairly well-defined drainage lines which flow from east to west and eventually drain into the Orange River. They all have their origins immediately to the east of the site around the urban area of the small settlement of Gariep. The town is likely to contribute significant impacts on these drainage lines. In addition, the WWTW of the town is situated downstream and discharges into it and will likely further modify these drainage lines. These drainage lines are situated in the lower lying plains and the slope gradient is less steep. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a defined channel, but which is completely devoid

of wetland conditions. However, riparian vegetation is still abundant, and it clearly functions as an ephemeral watercourse.

They can both be identified by a clearly defined main channel although it is clear that flow occurs on an ephemeral basis. They do not contain any observed wetland species and soils do not indicate wetland conditions. The FW species is considered indicative of elevated moisture but not wetland conditions. However, riparian trees are present and they must undoubtedly be regarded as watercourses.

Dominant plant species:
Setaria sphacelata (FW), **Pyracantha angustifolia, Diospyros lycioides, Pentzia incana, Themeda triandra, Vachellia karroo, Searsia lancea, *Melia azedarach*

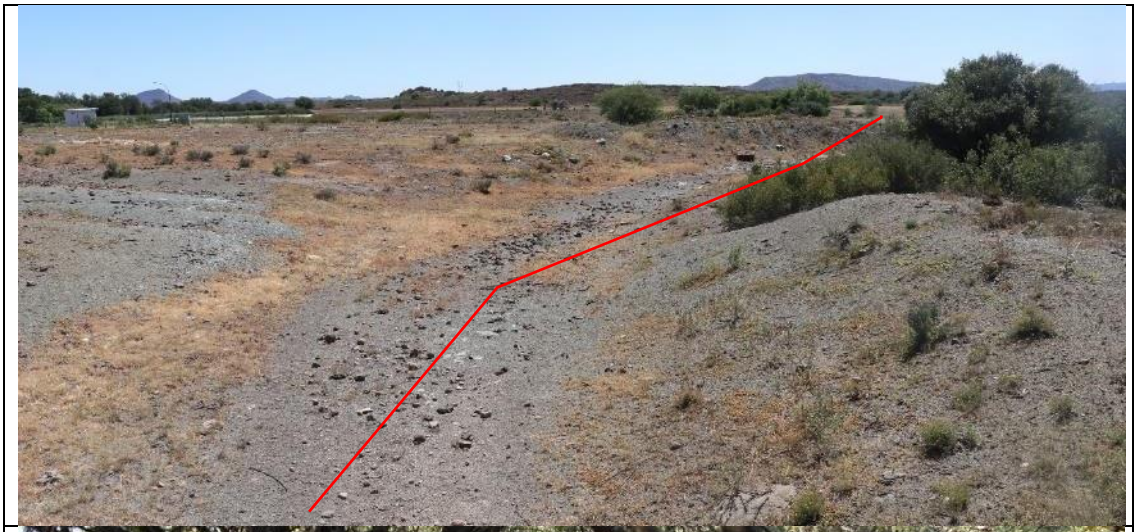
Protected plant species:
None observed

Notes:
Low Risk – The drainage lines are small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:









Watercourse name:	Coordinates of crossing:	Flow regime:
#4 Drainage line – Tributary of Donkerpoortspruit	S 30.561724°, E 25.496156°	Ephemeral drainage line

Description of watercourse:

A very small drainage line that also does not contain a well defined channel and is modified to a significant extent. The drainage line flows from east to west and forms a tributary of the Donkerpoortspruit situated some distance to the west. The drainage line has its origin a short distance to the east and in the surrounding karroid plains. A large artificial berm forming an impoundment is situated immediately to the east of the site and which has a large impact on the functioning of the drainage line. The drainage is small, situated in the low lying plains and with a very shallow gradient and flow occurring along it will be of low flow velocity. The drainage line is also clearly ephemeral and will only contain some flow after heavy rainfall events. This is also substantiated by a poorly defined channel being present. Furthermore, the functioning of the drainage line is also further modified by a livestock watering point which is causing significant leakages into the drainage line, thus causing the formation of artificial wetlands areas within the drainage line. Although modified to a significant extent and being very small, the drainage line clearly still forms an ephemeral watercourse.

The drainage line does not form a prominent watercourse, while a channel is present, it is not well defined. The channel does contain a dense stand of riparian grasses that do confirm sporadic occurrence of surface water flow. Soils show signs of periodic saturation though this has likely been influenced by water leakages from the stock watering point. Where this leakage

occurs, significant artificial wetland conditions has also formed and contains a significant proportion of obligate wetland vegetation. The drainage line is clearly modified, which is also born out in an abundance of exotic weeds, but must still be regarded as a natural watercourse.

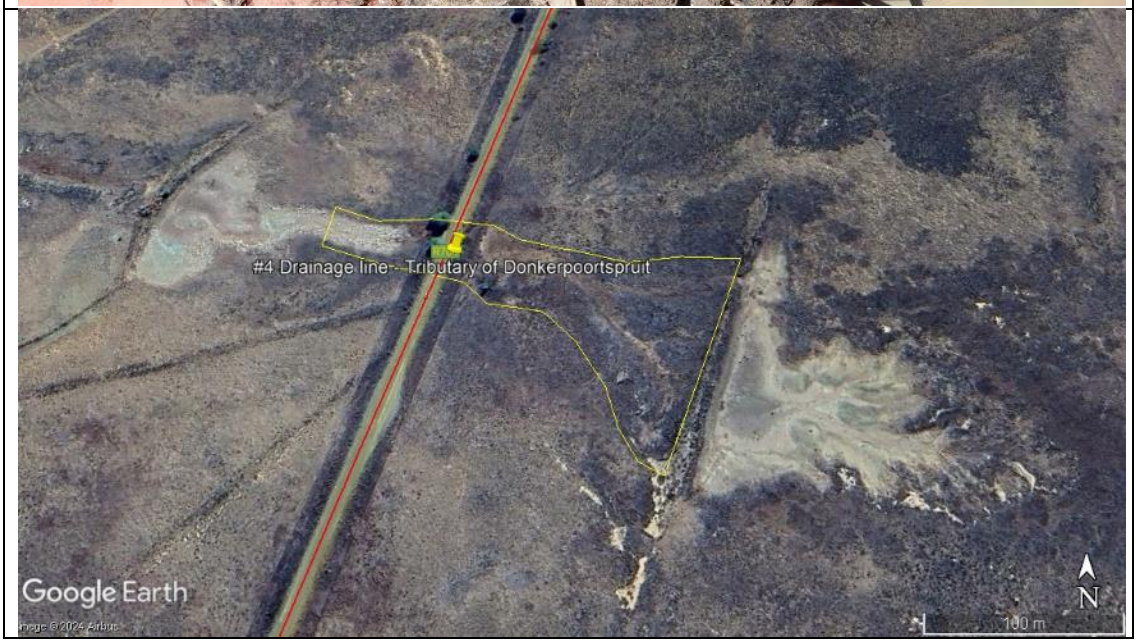
Dominant plant species:
Eragrostis bicolor (FW), **Verbena bonariensis, Gomphocarpus fruticosus, Paspalum distichum* (OW), *Persicaria lapathifolia* (OW), *Ranunculus multifidus* (OW), *Rumex crispus, *Hordeum stenostachys, Agrostis lachnantha* (OW), **Xanthium strumarium. Eleocharis dregeana, *Cirsium vulgare*

Protected plant species:
None observed

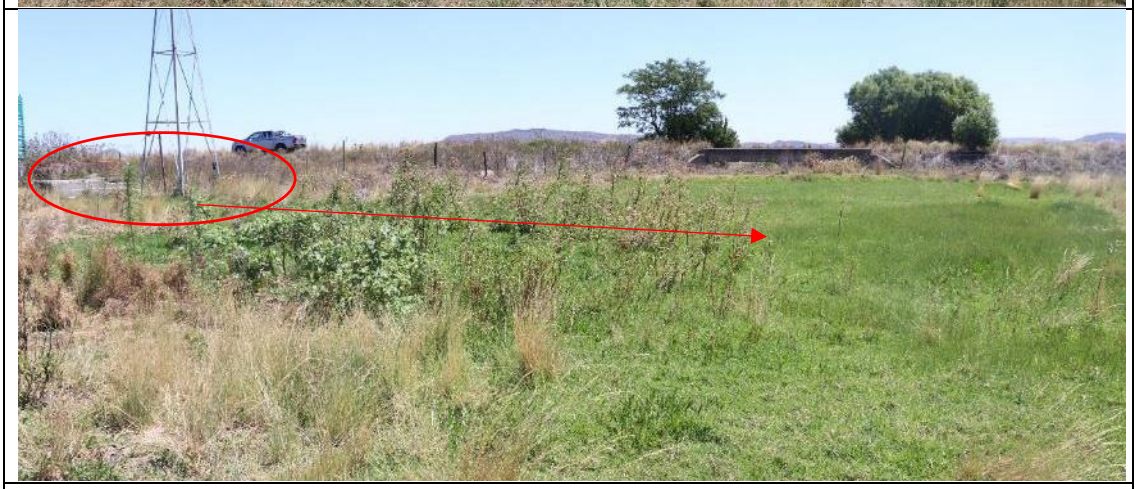
Notes:
Low Risk – The drainage lines is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:









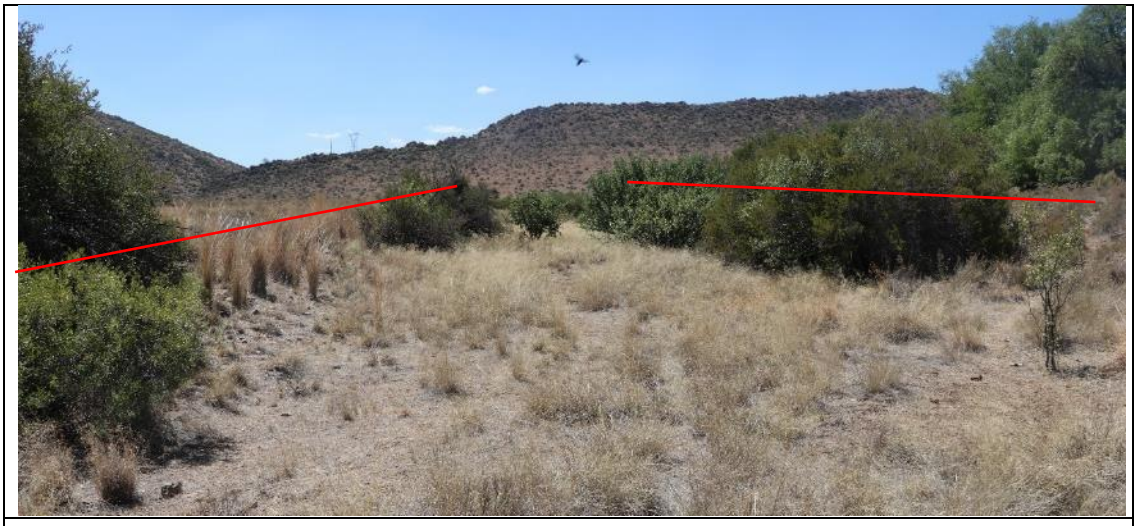
Watercourse name:	Coordinates of crossing:	Flow regime:
#5 Ephemeral stream – Tributary of Donkerkloofspruit	S 30.542886°, E 25.518938°	Ephemeral stream

Description of watercourse:

A clearly defined but small stream draining from the hills to the north flowing though the karroid plains. The stream is likely to be affected by the proposed Water Treatment Works (WTW) and the proposed layout should aim to exclude this stream system as far as possible. This is a downstream section of ephemeral stream #6 and will therefore be affected at several locations by the pipeline route. The stream flows from north to south and originates some distance to the north of the site. An artificial berm forming a small impoundment will affect it to some degree, while the N1 National Road which also utilises a cutting and filling method upstream of the site and consequently cause significant modification of it. The affected section is situated in the lower lying plains though a main channel is present and which has a width of approximately 3 meters and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Prominent wetland vegetation is absent, though the main channel contains a dense layer of riparian grasses, characteristic of the ephemeral watercourses in this region, while riparian shrubs and trees are also abundant along the banks of the stream. Soils show a significant clay content with very feint mottling

discernible and will, at best, indicate a temporary zone of wetness indicating infrequent saturation though water flow will certainly occur from time to time.
Dominant plant species: *Eragrostis bicolor* (FW), *Searsia ciliata, Searsia burchellii, Diospyros lycioides, Hyparrhenia hirta, Searsia lancea, Olea europaea* subsp. *africana, Chrysocoma ciliata, Gomphocarpus fruticosus, Asparagus capensis, Pentzia incana, Barleria rigida*
Protected plant species: Specimens of protected *Olea europaea* subsp. *africana* (Wild Olive) present along the banks of the stream.
Notes: Moderate Risk – In the event that the WTW will be unable to avoid this ephemeral stream, it will result in diversion of the stream which will have a higher impact and will also affect the downstream areas.
Soil sample: 

Watercourse name:	Coordinates of crossing:	Flow regime:
#6 Ephemeral stream – Tributary of Donkerkloofspruit	S 30.537284°, E 25.518733°	Ephemeral stream

Description of watercourse:
A clearly defined stream draining between hills in a deep ravine and draining towards a plain downstream where it may also be affected by the WTW. This is an upstream section of ephemeral stream #5 and will therefore be affected at several locations by the pipeline route. The stream flows from north to south and originates some distance to the north of the site. The crossing of the stream is situated in a deep ravine and access was not possible. However, clear characteristics of it could still be discerned to adequately assess it. It is crossed by the N1 road which also utilises a cutting and filling method of crossing the ravine and consequently cause significant modification of it. An upstream impoundment will also have a significant impact on it in terms of its flow and flooding regime. A main channel is clearly defined and incised into the ravine. It will contain significant flooding after large rainfall events which is likely to occur on an annual basis and at sufficient frequency for wetland conditions to establish, this was also confirmed by the downstream site.

The ephemeral stream will flow infrequently though has still been able to establish some wetland conditions and is nonetheless a prominent watercourse which will contain substantial flooding after heavy rainfall occurs. Some wetland vegetation is visible though the stream is dominated by riparian grasses, characteristic of the ephemeral watercourses in this region, while riparian shrubs and trees are also abundant along the banks of the stream. Soil sampling was not possible at this site though sufficient evidence is present to at least confirm temporary wetland conditions.

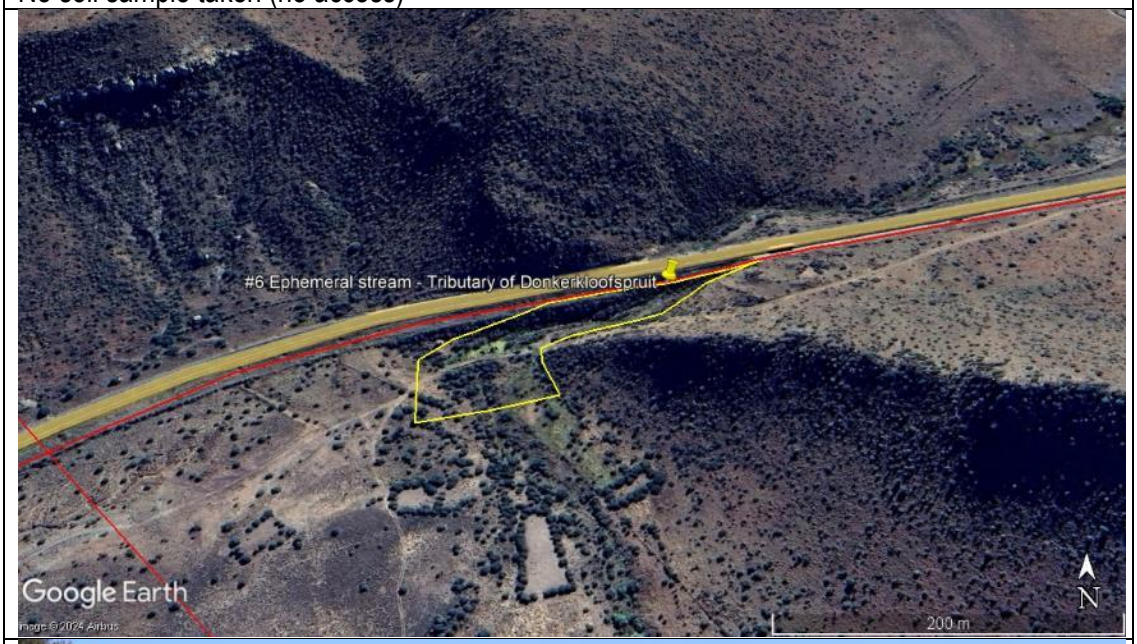
Dominant plant species:
Hyparrhenia hirta, Melianthus comosus, Searsia burchellii, Cyperus sp. (OW), *Ziziphus mucronata, Clematis brachiata.*

Protected plant species:
None observed

Notes:
Moderate Risk – The stream is situated within a deep ravine here and construction is likely to cause substantial impacts on it while the steep slopes and flushing functioning may result in increased erosion which is also likely to affect the downslope environment.

Soil sample:

No soil sample taken (no access)





Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#7 Drainage line – Tributary of Donkerkloofspruit	S 30.534630°, E 25.531488°	Ephemeral drainage line

Description of watercourse:

A very small drainage line that also does not contain a well defined channel and is modified to a significant extent. The drainage line flows from east to west and into a large artificial impoundment and also forms the upper reach of #6 ephemeral stream which is situated approximately 1 km downstream of this site. The drainage line has its origin a short distance to the east within the surrounding hills. It is being crossed by the N1 National Road near the site and contains a large impoundment downstream of the site, both of which will heavily modify its flow and flooding regime. It is consequently considered to be modified to a significant degree. The drainage line is also clearly ephemeral and will only contain some flow after heavy rainfall events. This is also substantiated by a poorly defined channel being present. Although modified

to a significant extent and being very small, the drainage line clearly still forms an ephemeral watercourse.

The drainage line does not form a prominent watercourse, while a channel is present, it is not well defined. It is clearly ephemeral and connected main channel flow occurs very seldom. Consequently wetland and riparian vegetation is absent and do not exhibit any wetland characteristics. Soil samples also does not exhibit any wetland characteristics. The drainage line is clearly modified, which is also born out in an abundance of exotic weeds, but must still be regarded as a natural watercourse.

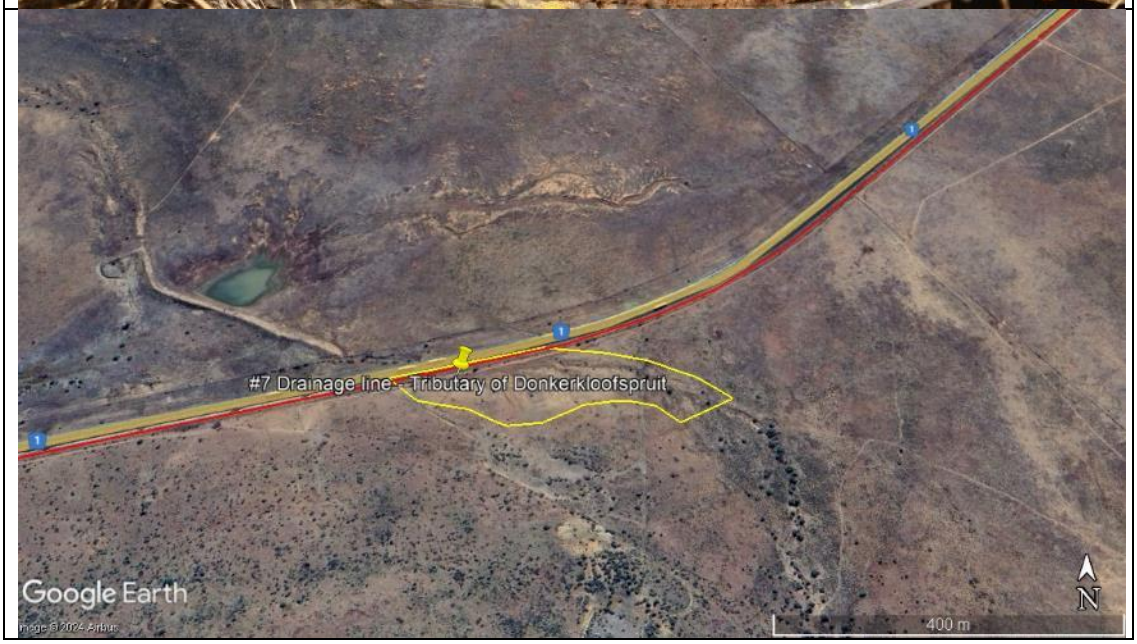
Dominant plant species:
*Themeda triandra, Brachiaria eruciformis, *Bidens bipinata, Lycium horridum, Chloris virgata, Gomphocarpus fruticosus*

Protected plant species:
None observed

Notes:
Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#8 Drainage line – Tributary of Donkerkloofspruit	S 30.518221°, E 25.554721°	Ephemeral drainage line

Description of watercourse:
A very small drainage line that drains along the slope of a hill to the west of the site. It flows from north west to south east and drains into #9 ephemeral stream which is situated approximately 700 meters to the north of this site. The drainage line has its origin on the plateau of the large hill to the west of the site. It is not affected by many impacts but is being crossed by the N1 National Road at the site which does affect its condition to some extent. A main channel is present, incised into the slope but it is clearly ephemeral and due to the slope drains quickly not allowing wetland conditions to occur. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a defined channel, but which is completely devoid of wetland conditions.

The drainage line can be identified by a clearly defined main channel although it is clear that flow occurs on an ephemeral basis. It does not contain any observed wetland species and soils do not indicate wetland conditions. However, riparian trees are present and it must undoubtedly be regarded as a watercourse.

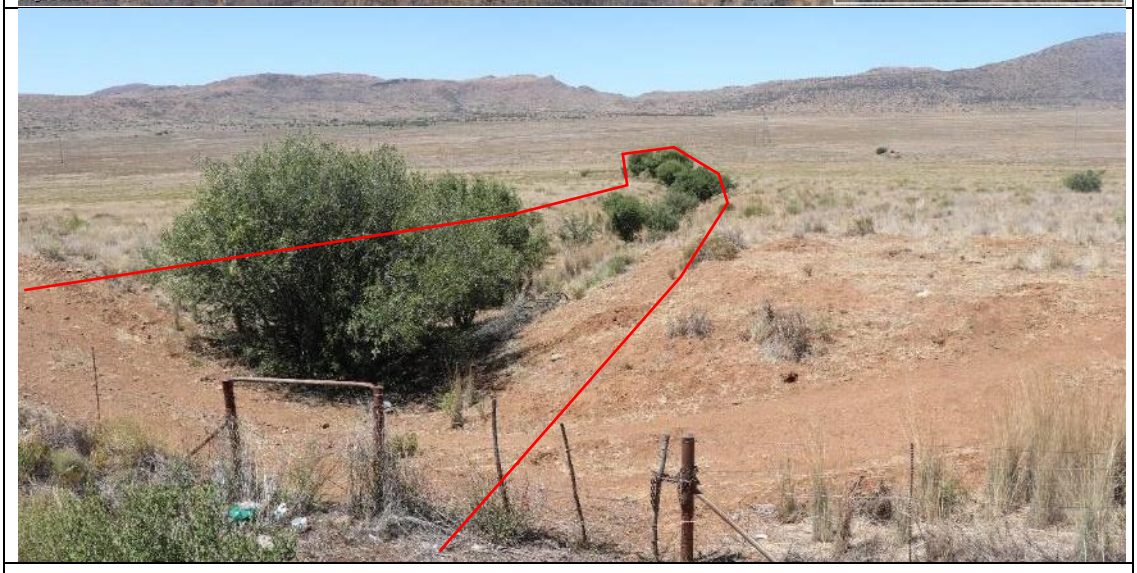
Dominant plant species:
Aristida congesta, Searsia burchellii, Searsia erosa, Hyparrhenia hirta

Protected plant species
None observed

Notes:
Moderate Risk – The drainage line is small but due to steep gradient and flushing functioning, erosion may be problematic which is also likely to affect the downslope environment. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion.

Soil sample:
No soil sample taken.





Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#9 Ephemeral stream – Tributary of Donkerkloofspruit	S 30.513468°, E 25.560391°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from south to north and draining into the Donkerpoortspruit. The stream originates some distance to the south and a large artificial impoundment is also situated immediately upstream of the site and which have a significant impact on it in term of the flow and flooding regime. The stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The affected section is situated in the lower lying plains though a main channel is present and which has a width of approximately 3 meters and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel and indicate that wetland conditions are present. These also

include patches of reedbeds which is a clear indicator of saturated conditions. Riparian shrubs and trees are also abundant along the banks of the stream. il did not present any wetland characteristics although wetland vegetation clearly confirm the presence of wetland conditions. Some exotic weeds are present and also indicate disturbance within the stream, especially within the road reserve at the site.

Dominant plant species:
Gomphocarpus fruticosus, Phragmites australis (OW), *Paspalum distichum* (OW), *Chloris virgata, Brachiaria eruciformis, Cyperus longus* (OW), **Falkia oblonga, *Argemone ochroleuca, Eragrostis bicolor* (FW)*, Scabiosa columbaria, Asparagus suaveolens, Aristida congesta*

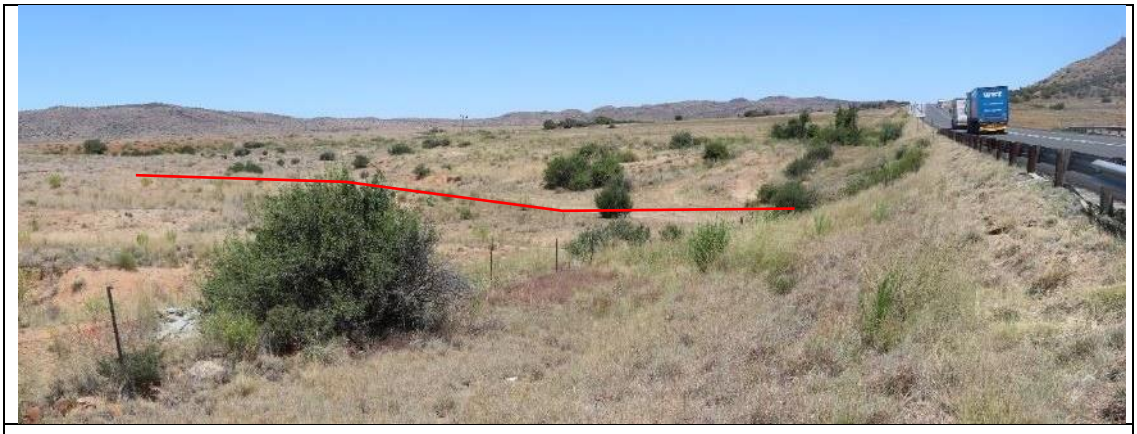
Protected plant species:
None observed

Notes:
Moderate Risk – The stream is situated in the lower plains, however, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#10 Drainage line – Tributary of Donkerkloofspruit	S 30.488850°, E 25.585172°	Ephemeral drainage line

Description of watercourse:
An indistinct drainage line that drains along the gentle slopes of the surrounding plains, draining from east to west and into the Donkerpoortspruit. The origin of the drainage area is immediately to the east of the site. It forms indistinct channels as a result of erosion. It seems to relatively devoid of any significant impacts, except for the crossing of the N1 National Road which does affect its condition to some extent. The drainage line is also clearly ephemeral and will only contain some flow after heavy rainfall events. This is also substantiated by a poorly defined channel being present. Although modified to some extent and being very small, the drainage line clearly still forms an ephemeral watercourse.

The drainage line does not form a prominent watercourse, while a channel is present, it is not well defined. It is clearly ephemeral and connected main channel flow occurs very seldom. Consequently wetland vegetation is absent and do not exhibit any wetland characteristics. Soil samples also does not exhibit any wetland characteristics. However, vegetation does indicate an increase in moisture compared to the surroundings. The drainage line is clearly modified, which is also born out in an abundance of exotic weeds, but must still be regarded as a natural watercourse.

Dominant plant species:
Aristida congesta, Themeda triandra, Salvia verbenaca, Eragrostis bicolor (FW)*, Brachiaria eruciformis, Pentzia incana, Chloris virgata, Ammocharis coranica, Paspalum dilatatum* (FW), *Vachellia karroo*

Protected plant species:
Specimens of the protected geophyte, *Ammocharis coranica* (Sandlily) occur within the road reserve.

Notes:
Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#11 Drainage line – Tributary of Donkerkloofspruit	S 30.459506°, E 25.608338°	Ephemeral drainage line

Description of watercourse:

An indistinct drainage line that drains along the gentle slopes of the surrounding plains, draining from east to west and into the Donkerpoortspruit. The origin of the drainage area is a short distance to the east of the site. It forms indistinct channels as a result of erosion. It seems to be relatively devoid of any significant impacts, except for the crossing of the N1 National Road which does affect its condition to some extent. The drainage line is also clearly ephemeral and will only contain some flow after heavy rainfall events. This is also substantiated by a poorly

defined channel being present. Although modified to some extent and being very small, the drainage line clearly still forms an ephemeral watercourse.

The drainage line does not form a prominent watercourse, while a channel is present, it is not well defined. It is clearly ephemeral and connected main channel flow occurs very seldom. Consequently wetland vegetation is absent and do not exhibit any wetland characteristics. Soil samples also does not exhibit any wetland characteristics. However, vegetation does indicate an increase in moisture compared to the surroundings. The drainage line is clearly modified, which is also born out in an abundance of exotic weeds, but must still be regarded as a natural watercourse.

Dominant plant species:
Aristida congesta, Themeda triandra, Salvia verbenaca, Eragrostis bicolor (FW)*, *Conyz bonariensis, *Bromus catcharticus, *Verbena bonariensis, Tragus keolerioides, Digitaria eriantha*

Protected plant species:
None observed.

Notes:
Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#12 Modified hillslope seepage	S 30.444915°, 25.619737°	Temporary wetland

Description of watercourse:

A small seepage area that is situated immediately adjacent to the site and N1 National Road on a higher lying area adjacent to a ridge system. This seepage wetland gives origin to a small drainage system that drains toward the south and forms a tributary of the Orange River, draining into the Gariep Dam. The seepage wetland is however modified to a significant extent. It forms to the west of the N1 National Road, which then transects and transforms the wetland whereafter it becomes impounded by a low artificial berm to the east of the road. The wetland collects runoff from the surrounding higher lying areas, which then seeps from the wetland and forms the drainage system flowing to the south. Both the N1 National Road and artificial impoundment heavily modify its functioning and its natural condition is difficult to determine, it is also likely that its size and shape has been altered by these impacts. Although modified to a significant extent and being very small, the seepage wetland clearly functions as a wetland system which will become saturated annually during the rainy season.

The wetland has been modified to a significant extent and its natural shape and size cannot be determined with certainty. However, obligate wetland vegetation is still abundant within the wetland and soil samples also still reliably indicate the presence of wetland conditions. These wetland conditions are considered to be indicative of a temporary zone of wetness whereby soils saturation will only occur for short periods during the rainy season.

Dominant plant species:

Schoenoplectus sp. (OW), **Oenothera rosea, Panicum coloratum* (FW), *Eragrostis lehmanniana, Cyperus congestus* (OW)

Protected plant species:

None observed

Notes:

Low Risk – The wetland is small and already heavily modified and consequently, impacts are anticipated to remain low. The artificial impoundment situated immediately downslope, should also enable impacts to remain localised to the site, thus decreasing the extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#13 Ephemeral stream – Tributary of Orange River	S 30.436563°, E 25.627421°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from north to south, forming a tributary of the Orange River and draining into the Gariep Dam. The stream originates some distance to the north and a large artificial impoundment is also situated immediately upstream of the site and which will have a significant impact on it in term of the flow and flooding regime. The stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The affected section is situated in the lower lying plains though a main channel is present and which has a width of approximately 5 meters and indicates that significant flows do occur after heavy rainfall events. It is however clearly an

ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel and indicate that wetland conditions are present. Riparian shrubs and trees are also abundant along the banks of the stream. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

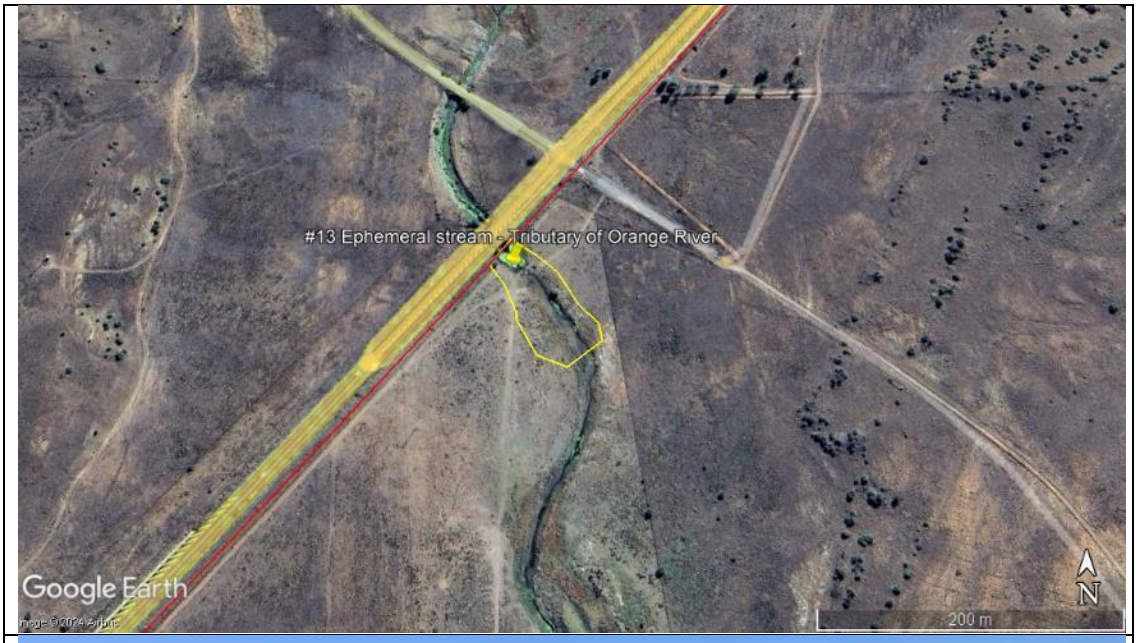
Dominant plant species:
Diospyros lycioides, Gomphocarpus fruticosus, Eucomis autumnalis, Searsia lancea, Paspalum distichum (OW), *Agrostis lachnantha* (OW), *Cyperus marginatus* (OW), *Cyperus congestus* (OW), *Marsilea sp.* (OW), *Asparagus larcinus, Nenax microphylla, Panicum coloratum* (FW), *Asparagus suaveolens, Pentzia incana, Themeda triandra, Aristida diffusa, Mestoklema tuberosum, Lycium cinerium*

Protected plant species:
Scattered specimens of the protected geophyte, *Eucomis autumnalis* (Pineapple Lily) occurring in or near the road reserve.

Notes:
Moderate Risk – The stream is situated in the lower plains, however, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion and the extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#14 Drainage line – Tributary of Orange River	S 30.424258°, E 25.639082°	Ephemeral drainage line

Description of watercourse:

A very small drainage line that also does not contain a well defined channel and is modified to a significant extent. The drainage line flows from east to west and into a large artificial impoundment and also forms the upper reach of #13 ephemeral stream which is situated approximately 1.8 km downstream of this site. The drainage line has its origin a short distance to the east within the surrounding hills. It is being crossed by the N1 National Road near the site and contains a large impoundment upstream of the site, both of which will heavily modify its flow and flooding regime. It is consequently considered to be modified to a significant degree. The drainage line is also clearly ephemeral and will only contain some flow after heavy rainfall events. This is also substantiated by a poorly defined channel being present. Although modified to a significant extent and being very small, the drainage line clearly still forms an ephemeral watercourse.

The drainage line does not form a prominent watercourse, while a channel is present, it is not well defined. It is clearly ephemeral and connected main channel flow occurs very seldom.

Consequently wetland and riparian vegetation is absent and do not exhibit any wetland characteristics. Soil sampling could not be taken, due to the presence of bedrock within the channel. The drainage line is clearly modified, which is also born out in an abundance of exotic weeds, but must still be regarded as a natural watercourse.

Dominant plant species:
Digitaria eriantha, Themeda triandra, Panicum coloratum (FW), **Bidens bipinnata, *Verbena bonariensis, Hyparrhenia hirta, *Tagetes minuta*

Protected plant species:
None observed

Notes:
Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the tarred road may decrease the anticipated extent of the impact.

Soil sample:
No soil sample taken due to the bedrock within the channel.





Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#15 Channelled valley-bottom wetland – Tributary of Bossiespruit	S 30.387264°, E 25.676157°	Seasonal wetland

Description of watercourse:
A fairly large channelled valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Bossiespruit. The origin of this wetland is situated some distance to the west of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few low berms which allow for the accumulation of surface water and retards flow within the wetland. The wetland is therefore considered only to be modified to a moderate degree and still contain fairly extensive wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated annually during the rainy season.

The wetland is still natural with only moderate levels of modification while it is also of relatively large size. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of extensive wetland areas. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

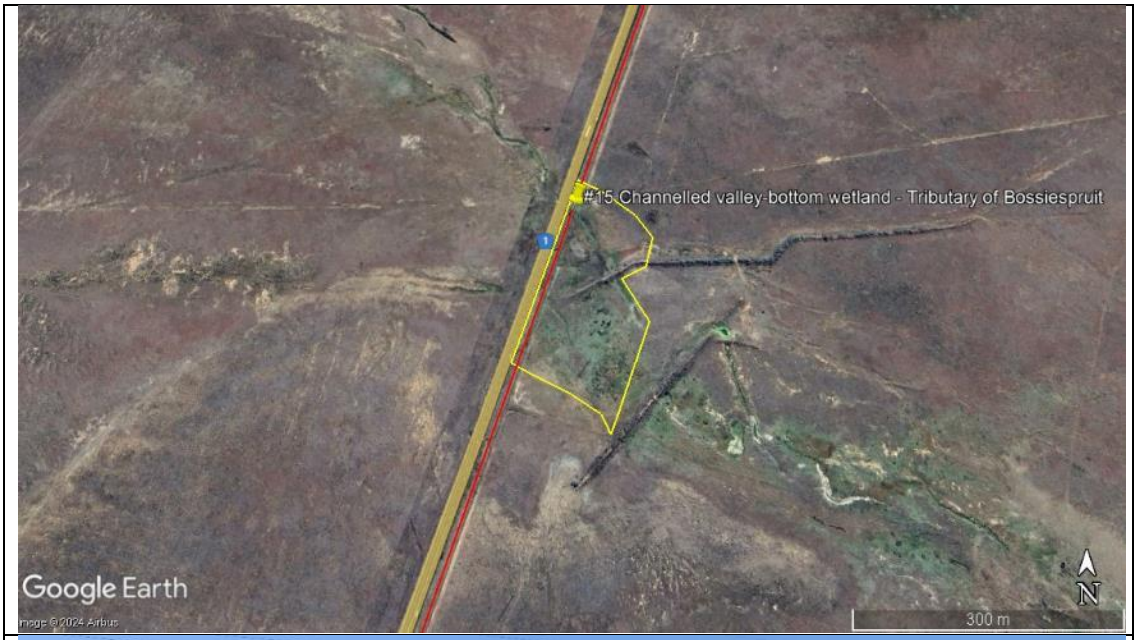
Dominant plant species:
**Populus x simonii, Panicum coloratum* (FW), *Cyperus marginatus* (OW), *Marsilea sp.* (OW), *Paspalum distichum* (OW), **Verbena bonariensis, *Plantago lanceolata, Diplachne fusca* (OW), *Agrostis lachnantha* (OW), *Schoenoplectus sp.* (OW), *Eragrostis bicolor* (FW), *Juncus rigidus* (OW), *Lobelia thermalis, *Ciclospermum leptophyllum*

Protected plant species:
None observed

Notes:
Moderate Risk – Given the large size of the wetland and seasonally saturated conditions, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion and the extent of the impact.

Soil sample:





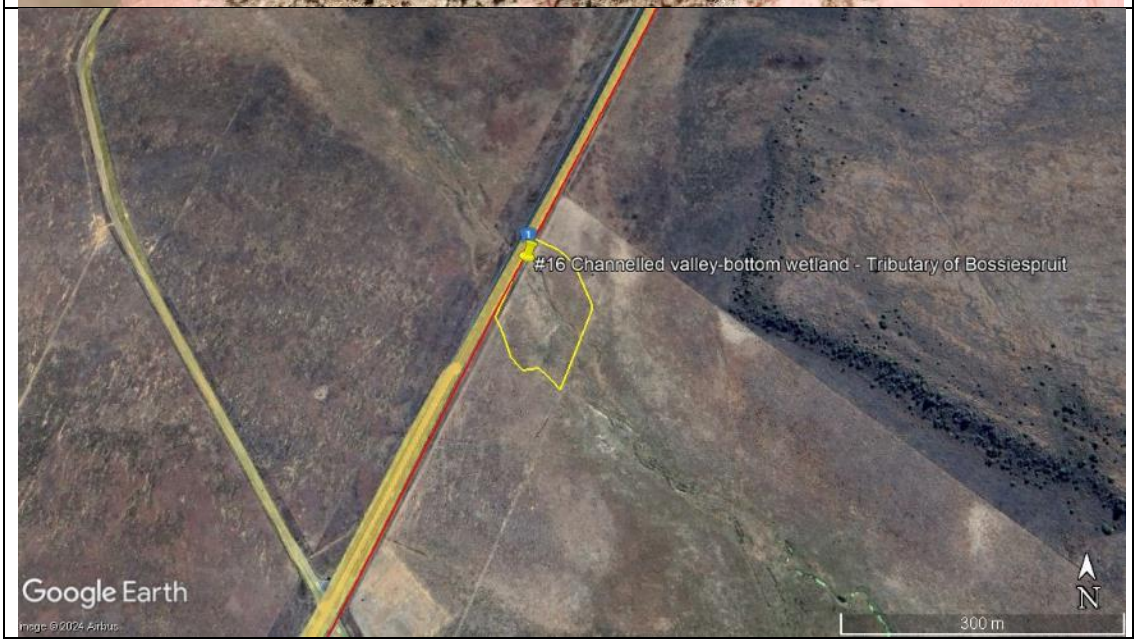


Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#16 Channelled valley-bottom wetland – Tributary of Bossiespruit	S 30.358484°, E 25.687790°	Seasonal wetland

Description of watercourse:

A small but prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Bossiespruit. The origin of this wetland is situated some distance to the west of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few gravel road crossings. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated annually during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a

seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.
Dominant plant species: **Bidens bipinnata, *Conyza bonariensis, Osteospermum muricatum, Pentzia incana, Themeda triandra, Eragrostis bicolor* (FW), *Marsilea sp.* (OW)
Protected plant species: None observed
Notes: Moderate Risk – Given the presence of clear wetland conditions, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion and the extent of the impact.
Soil sample: 




Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#17 Ephemeral stream and floodplain wetland – Tributary of Bossiespruit	S 30.337143°, E 25.698633°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream flowing from west to east and draining into the Bossiespruit and being crossed by the N1 National Road at the site. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Bossiespruit a short distance to the east. Several small artificial impoundments and irrigated cropfields are located upstream of the site and this does cause some modification and disturbance of the stream and its functioning. The stream is therefore considered to be moderately modified. The stream contains a fairly extensive and prominent floodplain wetland which also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream has a large and distinctive main channel but it is however clear that flow occurs on an ephemeral basis. A relatively extensive floodplain is present. Obligate and facultative wetland species clearly indicate that wetland conditions are present in the main channel and along large portions of the floodplain. Soil has a grey matrix and prominent mottling, indicating at least a seasonal zone of wetness. Some exotic weeds indicates some disturbance although limited.

Dominant plant species:

**Cirsium vulgare, Sporobolus ioclados* (FW), *Cyperus marginatus* (OW), *Eragrostis bicolor* (FW), *Pentzia incana, Paspalum distichum* (OW), *Leptochloa fusca* (OW), *Gomphocarpus fruticosus, Marsilea sp.* (OW), *Cynodon dactylon, Lobelia thermalis, Asparagus suaveolens, *Hordeum stenostachys, Panicum coloratum* (FW), *Eragrostis truncata, *Xanthium spinosum, Themeda triandra, Melolobium candicans*

Protected plant species:

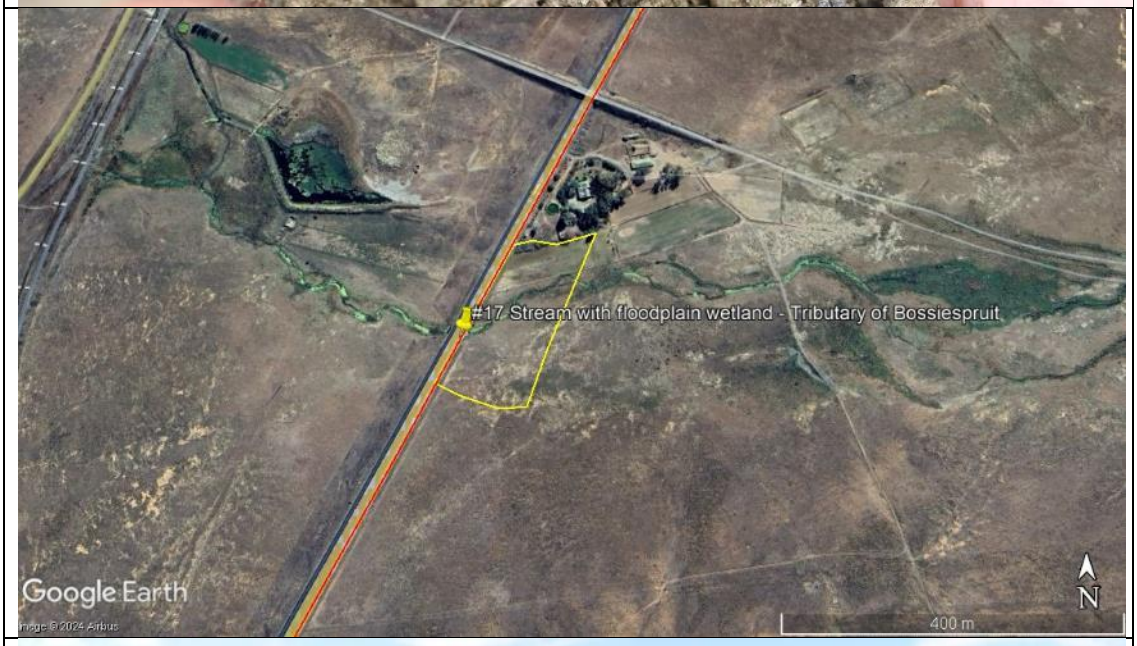
None observed

Notes:

Moderate Risk – Given the prominent channel which will experience periodic flooding and presence of clear wetland conditions, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion and the extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#18 Ephemeral stream and floodplain wetland – Tributary of Bossiespruit	S 30.319224°, E 25.708480°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from west to east and draining into the Bossiespruit and being crossed by the N1 National Road at the site. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Bossiespruit a short distance to the east. A few significant artificial impoundments has been constructed upstream and numerous irrigated cropfields are situated within the stream. These impacts are considered to have a significant impact on the stream and will consequently modify it to some degree. The stream is therefore considered to be moderately modified. The stream contains an extensive and prominent floodplain wetland which can be as broad as 800 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The main channel of the stream can be poorly defined in areas and it is clearly ephemeral in nature. However, when connected main channel flow does occur it will cover a substantive width. Obligate wetland species are present as well as a variety of other riparian species. Soil samples indicate at least seasonal wetland characteristics also being confirmed an abundance of wetland vegetation. Exotic weeds are largely absent indicating the good condition of the stream.

Dominant plant species:
Eragrostis obtusa, Scirpoides dioecus (OW)*, Kniphofia ensifolia* subsp. *ensifolia*, *Massonia jasminiflora, Asparagus suaveolens, Berkheya onopordilfolia, Juncus rigidus* (OW), *Eragrostis truncata, Lycium horridum, Pentzia globosa, Senecio reptans, Sporobolus africanus, Themeda triandra,*

Protected plant species:
Kniphofia ensifolia subsp. *ensifolia*, a protected species of conservation significance occurs as scattered clumps within the floodplain.

Notes:
Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding and presence of clear wetland conditions, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road which is also likely to increase erosion and the extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#19 Bossiespruit	S 30.304922°, E 25.717200°	Ephemeral stream

Description of watercourse:

The Bossiespruit is a large and clearly defined stream system flowing from north to south, forming a tributary of the Orange River and draining into the Gariep Dam. The stream originates a fair distance to the north where it also flows through the town Springfontein. Several impacts will alter the functioning of the stream and which includes discharge from the Waste Water Treatment Works (WWTW), general storm water runoff from the urban area and several artificial impoundments in the upper reaches of the stream. A more detailed discussion of its condition is also given in Section 4.2.6. The affected section of the stream is situated in the lower lying plains, with the main channel being prominent and which has a width of approximately 5 meters and indicates that significant flows do occur after heavy rainfall events. A section of the channel also flows parallel to the N1 National Road and which will therefore increase the extent of the anticipated impact caused by the pipeline construction. The stream is clearly ephemeral in terms of its flow regime and will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel and indicate that wetland conditions are present. Riparian shrubs and trees are also abundant along the banks of the stream. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

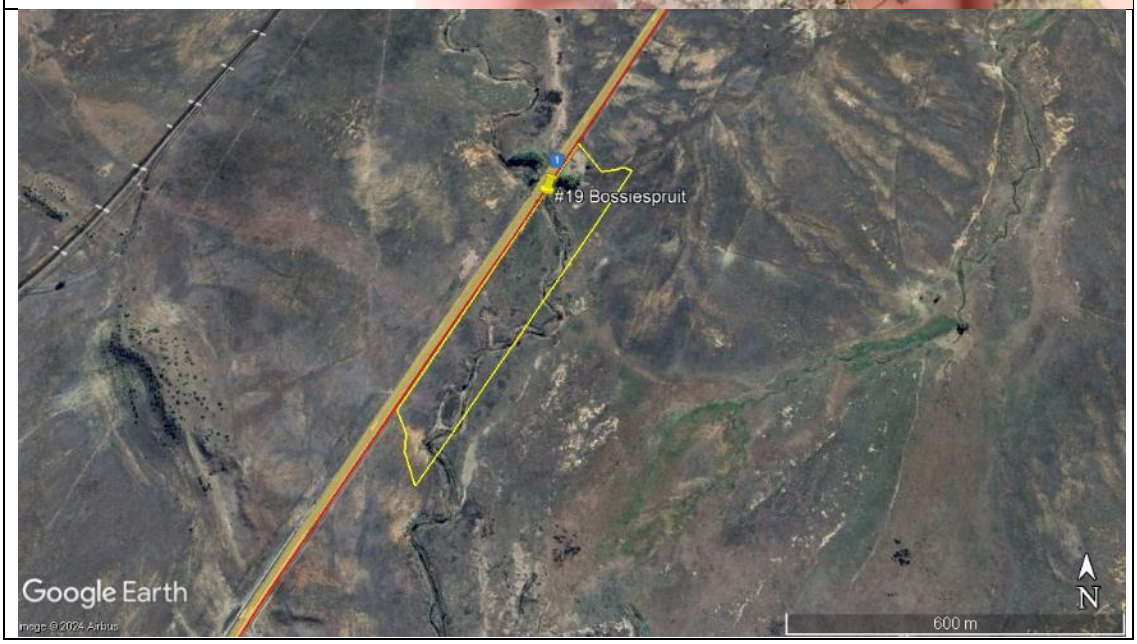
Dominant plant species:
Salvia verbenaca, Themeda triandra, Diplachne fusca (OW), *Cyperus marginatus* OW), *Artemisia afra, Typha capensis* (OW), *Berkheya onopordifolia, Pennisetum sphacelatum* (OW), *Berula erecta* (OW), *Paspalum distichum* (OW), *Cyerus longus* (OW), *Juncus oxycarpus* (OW), *Lycium cinerium, Limosella major* (OW), *Gomphocarpus fruticosus, Popuus deltoidea, Nenax microphylla, Chrysocoma ciliata*

Protected plant species:
None observed.

Notes:
Moderate Risk – The stream is situated in the lower plains, however, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. The pipeline route will also be situated on the downstream side of the N1 National Road while a section of the stream will also flow parallel to the road, which is also likely to increase erosion and the extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#20 Drainage line – Tributary of Bossiespruit	S 30.284929°, E 25.727660°	Ephemeral drainage line

Description of watercourse:

A poorly defined drainage line consisting of two indistinct channels flowing from north east to south west and being crossed by the N1 National Road. The drainage line flows into a significant artificial impoundment from where it drains into the Bossiespruit. The drainage line is small and not well defined but does contain a clear channel. It has its origin to the north east within the surrounding hills, draining toward the lower lying plain. It has been affected to a significant extent, firstly by the N1 National Road which in this case causes substantial diversion and modification of the drainage line and secondly, by a significant artificial impoundment into which it flows. Both impacts has caused significant modification of the system. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a defined channel, while wetland conditions are not prominent and considered only a temporary zone of wetness. Riparian vegetation dominates while wetland vegetation is scattered and not abundant.

The drainage line contains a clear channel although it is clear that flow occurs on an ephemeral basis. It does not contain prominent wetland conditions, though soils do contain signs of a temporary zone of wetness while scattered wetland vegetation is also present. The drainage line must therefore be regarded as containing wetland conditions but which will only become temporarily saturated during the rainy season.

Dominant plant species:

**Plantago lanceolata, *Verbena officinalis, Panicum coloratum* (FW), *Agrostis lachnantha* (OW), *Cyperus marginatus* (OW), *Themeda triandra*

Protected plant species:

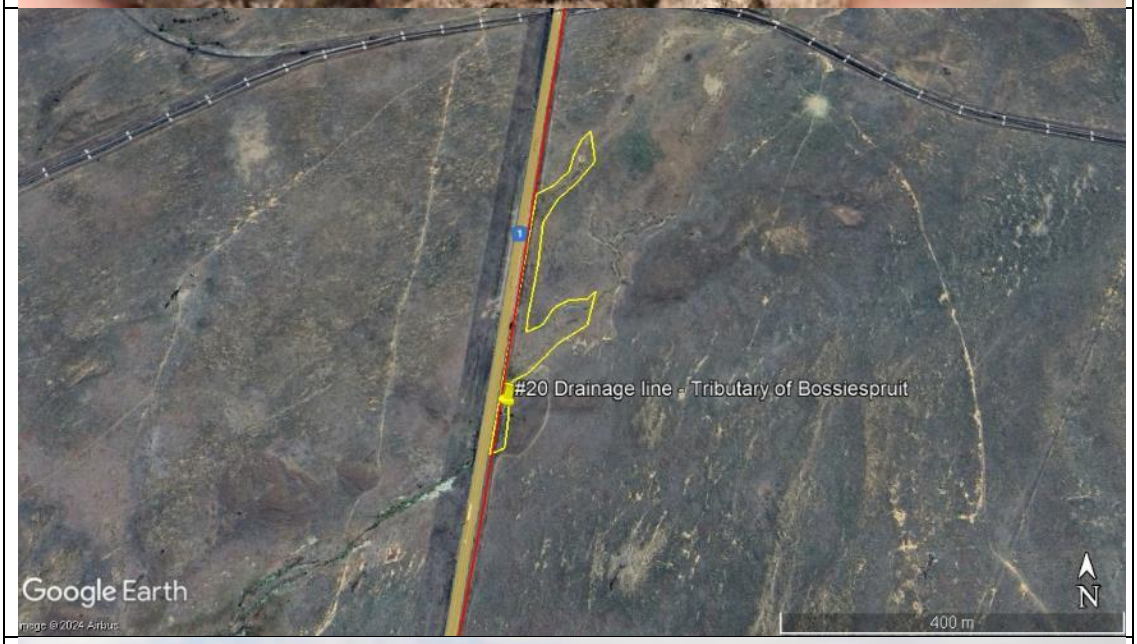
None observed

Notes:

Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:

#21 Drainage line – Tributary of Bossiespruit	S 30.248346°, E 25.726971°	Ephemeral drainage line

Description of watercourse:

A poorly defined drainage line consisting of an indistinct channel flowing from east to west and being crossed by the N1 National Road. The drainage line flows from a significant artificial impoundment upstream of site, is being crossed by the N1 National Road and also flows through the town of Springfontein from where it drains into the Bossiespruit. The drainage line is small and not well defined. It has its origin to the east within the surrounding hills, draining toward the lower lying plain. It has been affected to a significant extent, firstly by a significant artificial impoundment into which it flows and secondly, by the N1 National Road which in this case causes substantial diversion and modification of the drainage line. The proposed access road to the command reservoir No. 1 is also indicated to occur near this drainage line but should not result in any significant impacts as long as the current alignment is maintained. Given the arid environment and size of this drainage line, it will function as an ephemeral or episodic watercourse whereby continuous flow will only take place during large rainfall events and will flow for short periods, flushing rapidly through with a few hours after which no surface water will remain. As a result, the drainage line contains a poorly defined channel, while wetland conditions are not prominent and considered only a temporary zone of wetness. Riparian vegetation dominates while wetland vegetation is scattered and not abundant.

The drainage line contains a poorly defined channel and it is clear that flow occurs on an ephemeral basis. It does not contain prominent wetland conditions, though soils do contain signs of a temporary zone of wetness while scattered wetland vegetation is also present. The drainage line must therefore be regarded as containing wetland conditions but which will only become temporarily saturated during the rainy season.

Dominant plant species:

Eragrostis bicolor (FW), *Helictotrichon turgidulum* (FW), *Marsilea sp.* (OW), *Alternanthera sessilis* (OW), *Panicum coloratum* (FW), *Paspalum distichum* (OW), *Schoenoplectus sp.* (OW)

Protected plant species:

None observed

Notes:

Low Risk – The drainage line is small, situated in the lower lying plains and given the significantly modified condition, impacts are anticipated to remain low. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. The proposed access road to the command reservoir No. 1 is also indicated to occur near this drainage line but should not result in any significant impacts as long as the current alignment is maintained.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#22 Channelled valley-bottom wetland – Tributary of Vanzylspruit	S 30.217308°, E 25.721801°	Seasonal wetland

Description of watercourse:

A small but prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Vanzylspruit. The origin of this wetland is situated some distance to the east of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few artificial impoundments. The wetland is

therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:
Vachellia karroo, Panicum coloratum (FW), *Eragrostis bicolor* (FW), **Lactuca seriola, Phyla nodiflora* (OW), *Leptochloa fusca* (OW), *Schoenoplectus sp.* (OW), *Paspalum distichum* (OW), *Sonchus oleraceus, Lobelia thermalis, *Conyza bonariensis, Cyperus congestus* (OW), *Agrostis lachnantha* (OW), *Berula erecta* (OW), *Marsilea sp.* (OW), *Cyperus longus* (OW), **Veronica anagalis-aquatica, Eleocharis dregeana* (OW)

Protected plant species:
None observed

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:





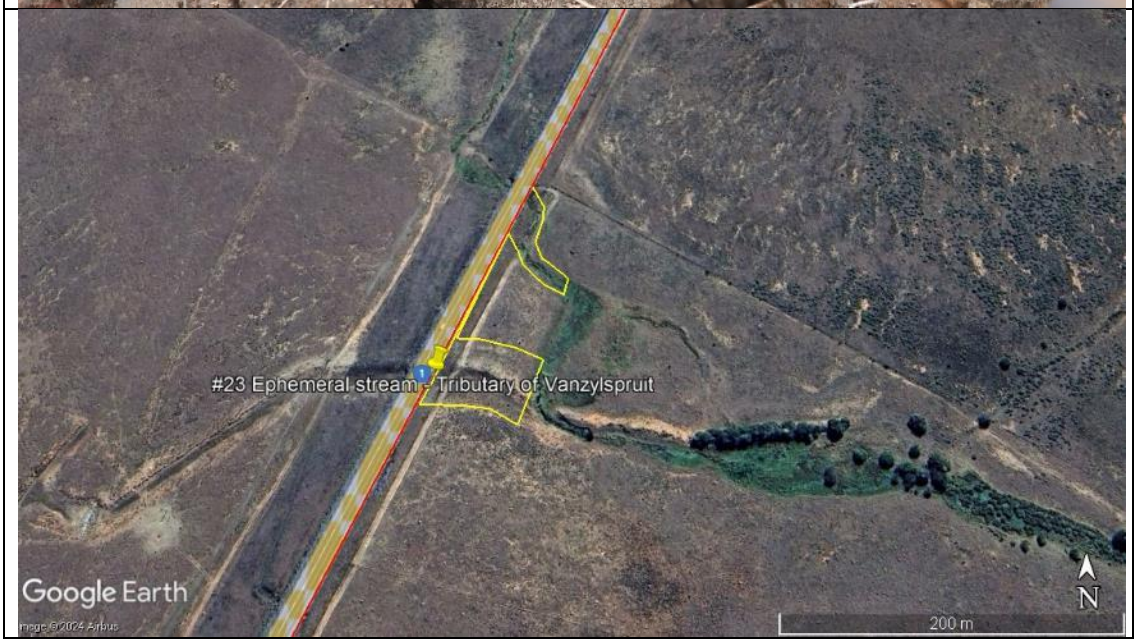


Watercourse name:	Coordinates of crossing:	Flow regime:
#23 Ephemeral stream – Tributary of Vanzylspruit	S 30.158279°, E 25.740221°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from east to west and draining into the Vanzylspruit. The stream originates some distance to the east and the catchment is largely natural with the main impacts on it being a small artificial dam and the stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The affected section is situated in the lower lying plains though a main channel is present and which has a width of approximately 3 meters and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel and indicate that wetland conditions are present. Soil has a grey matrix and mottling is present, substantiating the wetland conditions. These wetland conditions

are considered to at least indicate a seasonal zone of wetness which indicates that the stream may become saturated for longer periods during the rainy season. The absence of exotic species indicate the good condition of the stream.
Dominant plant species: *Marsilea sp.* (OW), *Pennisetum spahcelatum* (OW), *Gomphocarpus fruticosus, Kniphofia ensifolia* subsp. *ensifolia, Miscanthus capensis* (OW), *Cyperus marginatus* (OW), *Gomphostgma viragtum* (OW), *Paspalum distichum* (OW), *Eriocephalus ericoides, Cymbopogon pospischillii*
Protected plant species: *Kniphofia ensifolia* subsp. *ensifolia*, a protected species of conservation significance is present in the road reserve and adjacent areas.
Notes: Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.
Soil sample: 




Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#24 Channelled valley-bottom wetland – Tributary of Vanzylspruit	S 30.114119°, E 25.761417°	Seasonal wetland

Description of watercourse:

A fairly large and prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Vanzylspruit. The origin of this wetland is situated some distance to the east of the site within the surrounding hills. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few artificial impoundments. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:

Paspalum distichum (OW), *Cyperus marginatus* (OW), *Pennisetum sphacelatum* (OW), *Asparagus suaveolens, Eriocephalus ericoides, Cymbopogon pospischillii, Ruschia intricata, Nenax microphylla, Leptochloa fusca* (OW)

Protected plant species:

None observed

Notes:

Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name: #25 Channelled valley-bottom wetland – Tributary of Vanzylspruit	**Coordinates of crossing:** S 30.073414°, E 25.778405°	**Flow regime:** Seasonal wetland
Description of watercourse:		

A small but prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Vanzylspruit. The origin of this wetland is situated some distance to the east of the site within the surrounding hills. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:
Marsilea sp. (OW), *Aponogeton junceus* (OW), *Schoenoplectus sp.* (OW), *Paspalum distichum* (OW), *Leptochloa fusca* (OW), **Lactuca seriola, *Bidens bipinnata, Alternanthera sessilis* (OW)

Protected plant species:
None observed

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#26 Channelled valley-bottom wetland – Tributary of Vanzylspruit	S 30.023060°, E 25.799538°	Seasonal wetland

Description of watercourse:

A fairly large and prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a high lying area, forming part of the origin of a tributary of the Vanzylspruit. The origin of this wetland is situated some distance to the east of the site within the surrounding hills. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is clearly quite large with extensive wetland habitat and it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at

least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

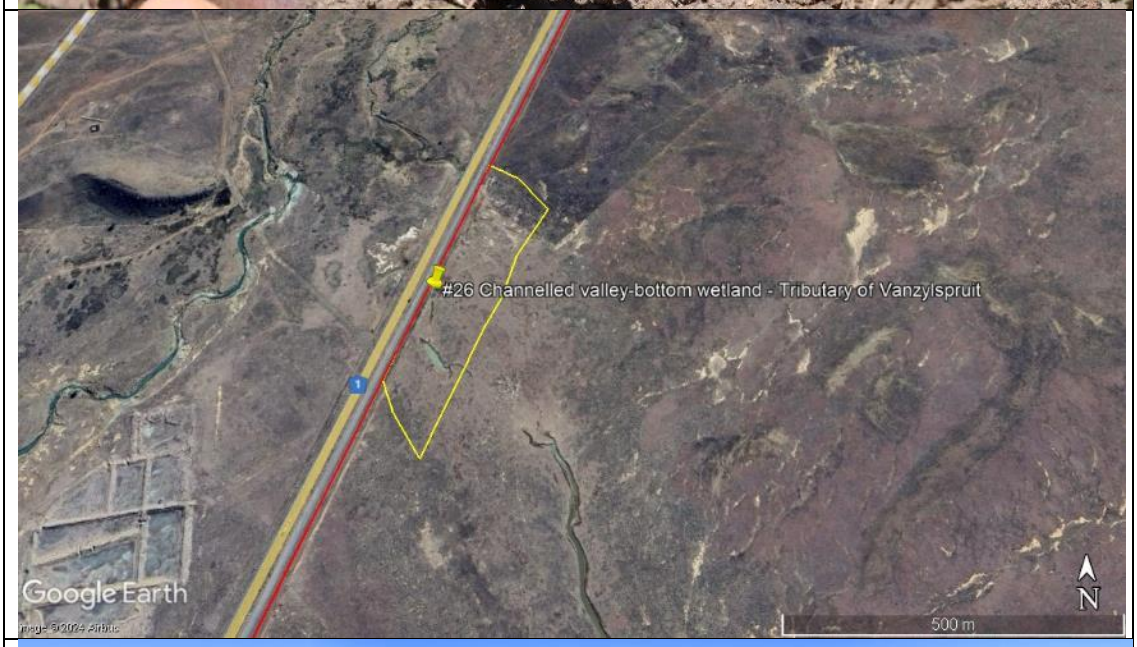
Dominant plant species:
Pennisetum sphacelatum (OW), *Juncus rigidus* (OW), *Paspalum dilatatum* (FW), *Scirpoides dioecus* (OW), *Gomphocarpus fruticosus, Leptochloa fusca* (OW), *Cyperus longus* (OW)

Protected plant species:
None observed

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#27 Vanzylspruit	S 29.996390°, E 25.810603°	Seasonal river

Description of watercourse:

A significant and large seasonal river flowing from east to west and draining into the Kromellenboogspruit. It originates a long distance to the east of the site. It is not affected by any significant impacts upstream of the site. Impacts include a few small impoundments and irrigated cropfields as well as a few road crossings. As a result it is considered still largely natural. A more detailed discussion of its condition is also given in Section 4.2.6. It contains a large and distinct main channel while the floodplain is also fairly large. Connected main channel flow is anticipated to occur on a seasonal basis during the rainy season and deep pools are clearly present. This is clearly a large river system with large channel of approximately 20 meters in width. Construction through this river will clearly be difficult, require diversion of flow, attenuation areas and permanently saturated areas.

The river will flow throughout the rainy season but may cease flowing during the winter season, when sections of the river may also run dry for some periods. It is however likely that large sections of pools or "kuile" will retain surface water on a perennial basis. Facultative and obligate wetland species are abundant along the main channel and indicate clear wetland conditions. Soil samples also indicate a grey matrix and mottling indicating wetland conditions on a perennial basis, i.e. the river will contain perennially saturated areas along its banks. Exotic species are largely absent indicating the good condition of the river.

Dominant plant species:

Vachellia karroo, Salix mucronata, Miscanthus capensis (OW), *Artemesia afra, Juncus inanus* (OW), **Azolla filiculoides, Phragmites australis* (OW), *Cyperus longus* (FW)

Protected plant species:

None observed

Moderate Risk – The river is a large lowland system which will flow throughout the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. The river is part of an NFEPA system which also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#28 Ephemeral stream – Tributary of Vanzylspruit	S 29.926944°, E 25.841493°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from east to west and draining into the Vanzylspruit. The stream originates some distance to the east and the catchment is largely natural with the main impacts on it being a small artificial dam and the stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The affected section is situated in the lower lying plains though a main channel is present and which has a width of approximately 3 meters and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system

which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel and indicate that wetland conditions are present. Soil has a grey matrix and mottling is present, substantiating the wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the stream may become saturated for longer periods during the rainy season. The absence of exotic species indicate the good condition of the stream.

Dominant plant species:
Diospyros lycioides, Themeda triandra, Panicum coloratum (FW), *Phyla nodilflora, Paspalum distichum* (OW), *Agrostis lachnantha* (OW), *Leptochloa fusca* (OW), *Helictotrichon turgidulum* (FW), *Carex glomerabilis* (OW), **Cotoneaster franchettii*

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#12 Hillslope seepage – Tributary of Vanzylspruit	S 29.920106°, E 25.845954°	Temporary wetland

Description of watercourse:

A small seepage area that is situated immediately adjacent to the site and N1 National Road on a higher lying area. This seepage wetland gives origin to a small drainage system that drains toward the west and forms a tributary of the Vanzylspruit. The seepage wetland is however modified to a significant extent. It forms to the east of the N1 National Road, which then transects and transforms the wetland whereafter it flows into a small drainage line. The wetland collects runoff from the surrounding higher lying areas, which then seeps from the wetland and forms the drainage system flowing to the west. The N1 National Road significantly modified its functioning, it is also likely that its size and shape has been altered by these impacts. Although

modified to a significant extent and being very small, the seepage wetland clearly functions as a wetland system which will become saturated annually during the rainy season.

The wetland has been modified to a significant extent and its natural shape and size cannot be determined with certainty. However, obligate wetland vegetation is still abundant within the wetland and soil samples also still reliably indicate the presence of wetland conditions. These wetland conditions are considered to be indicative of a temporary zone of wetness whereby soils saturation will only occur for short periods during the rainy season.

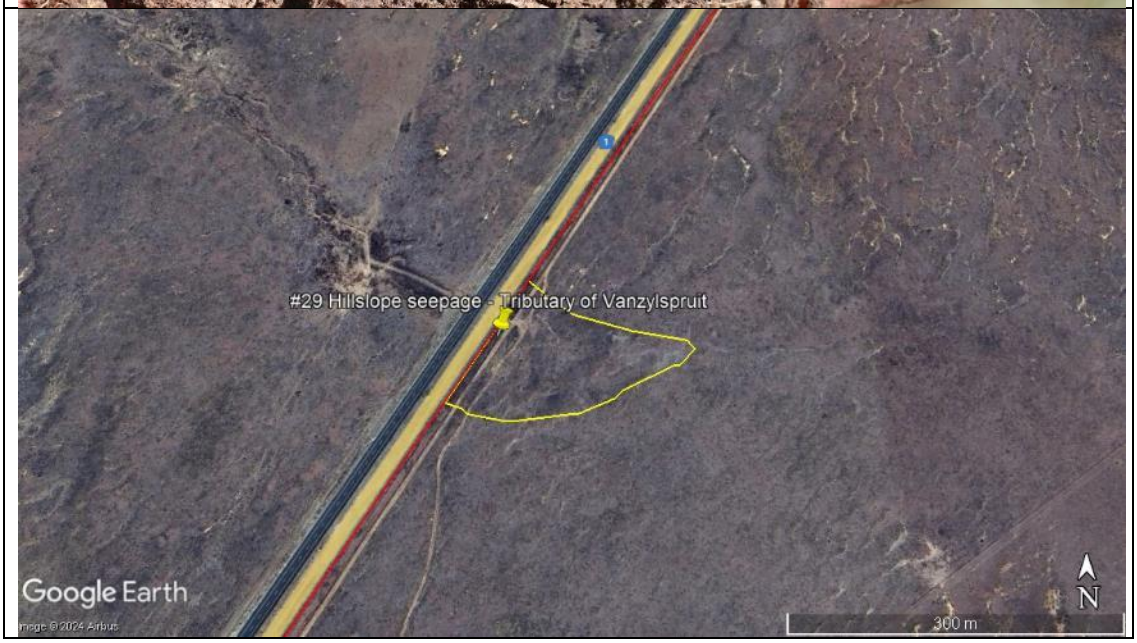
Dominant plant species:
**Tagetes minuta, *Verbena bonariensis, Eragrostis chloromelas, Leptochloa fusca* (OW)

Protected plant species:
None observed

Notes:
Moderate Risk – The wetland is small and already modified, retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. However, because the wetland forms part of an NFEPA catchment this also increases the EI&S of the system which contributes toward a higher risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#30 Erfdeelspruit and floodplain wetland – Tributary of Vanzylspruit	S 29.894688°, E 25.862355°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from east to west and draining into the Vanzylspruit and being crossed by the N1 National Road at the site. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Vanzylspruit a short distance to the west. The stream is affected by a few impacts, none which are considered significant. These include a few small impoundments and irrigated cropfields in the upper reaches and crossing by a few roads. As a result it is considered still largely natural. A more detailed discussion of its condition is also given in Section 4.2.6. Pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. The stream contains an extensive and prominent floodplain wetland which can be as broad as 900 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream contains a large and clearly defined main channel with pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

Dominant plant species:

Cyperus longus (OW), *Typha capensis* (OW), *Miscanthus capensis* (OW), **Ciclospermum leptophyllum*, **Tegetes minuta*, **Cirsium vulgare*, *Ruschia intricata, Eragrostis truncata, Lycium horridum, Sporobolus fimbriatus, Microloma armatum, Asparagus suaveolens, Cyperus marginatus* (OW)

Protected plant species:

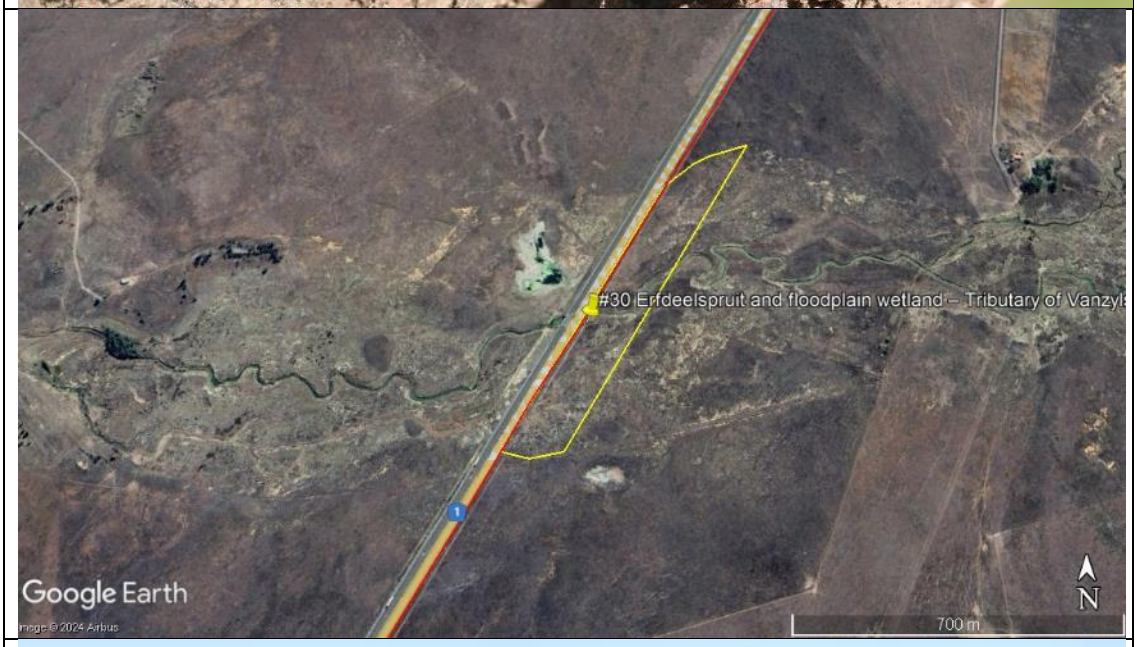
None observed.

Notes:

Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding and presence of clear wetland conditions, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact. Forming part of an NFEPA catchment also increases the EI&S of the system which contributes toward a high er risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:

#31 Ephemeral stream and associated tributary – Tributary of Riet River	S 29.826560°, E 25.910857° S 29.810884°, E 25.923850°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from east to west, forming a tributary of the Riet River. A smaller tributary of this stream is located approximately 1.5 km to the north which will also be affected by the pipeline route and both will be included here. The stream originates some distance to the east and a large artificial impoundment is also situated within the stream as well as the associated tributary and which will have a significant impact on the system in term of the flow and flooding regime. The stream and tributary are also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. Both the stream and tributary contain prominent main channels, with the stream's being fairly large at about 5 meters in width and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs. Wetland conditions were however found to be prominent and the stream and tributary is likely to contain saturated soils throughout the rainy season.

The ephemeral stream and tributary will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and tributary and indicate that prominent, seasonal wetland conditions are present. A prominent and extensive floodplain also occurs along the stream system. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

Dominant plant species:

*Crassula coralina, Lycium cinerium, Salsola rabieana, *Opuntia lindhemeri, Panicum coloratum* (FW), *Leptochloa fusca* (OW), *Pennisetum sphacelatum* (OW), **Crisium vulgare, *Falkia oblonga, Trifolium africanum, Paspalum distichum* (OW), *Cyperus marginatus* (OW), *Juncus rigidus* (OW), *Cyperus congestus* (OW), *Chloris virgata, *Solanum eleagnifolium, Typha capensis* (OW), *Schoenoplectus sp.* (OW), *Marsilea sp.* (OW), *Eleocharis dregeana*

Protected plant species:

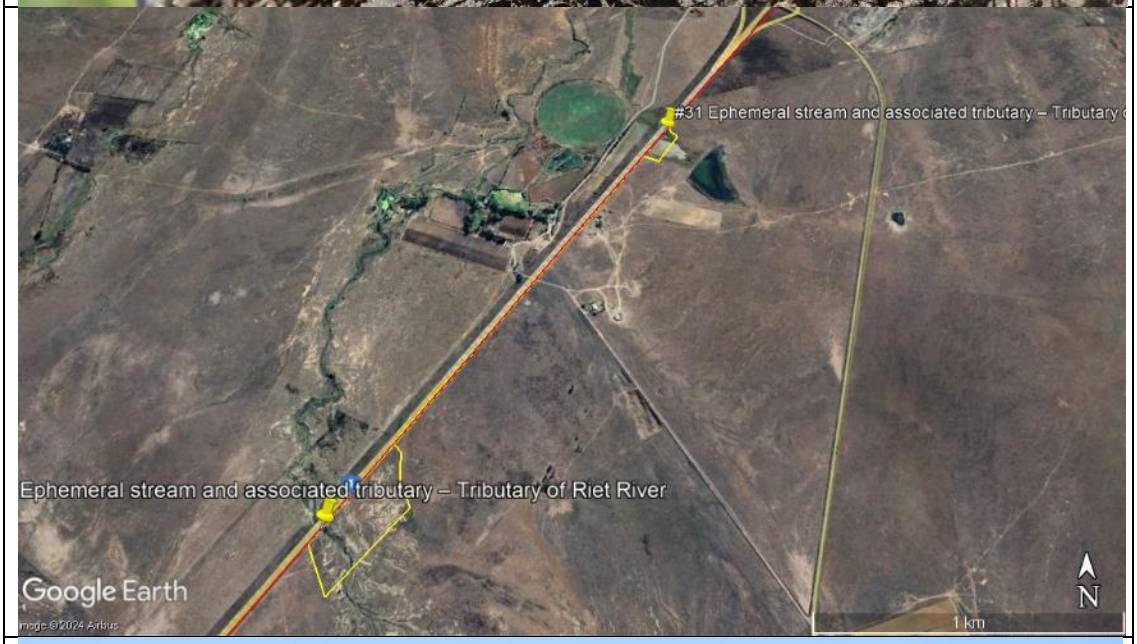
None observed.

Notes:

Low Risk – The stream and tributary is already significantly modified and the condition and EI&S is also lower. In addition, the pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:




#31 Ephemeral stream and associated tributary – Tributary
Ephemeral stream and associated tributary – Tributary of Riet River
Google Earth
N
1 km





Watercourse name:	Coordinates of crossing:	Flow regime:
#32 Channelled valley-bottom wetland – Tributary of Riet River	S 29.790753°, E 25.940476°	Seasonal wetland

Description of watercourse:
A small but prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a higher lying area, forming part of the origin of a tributary of the Riet River. The origin of this wetland is situated a short distance to the east of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few artificial impoundments. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

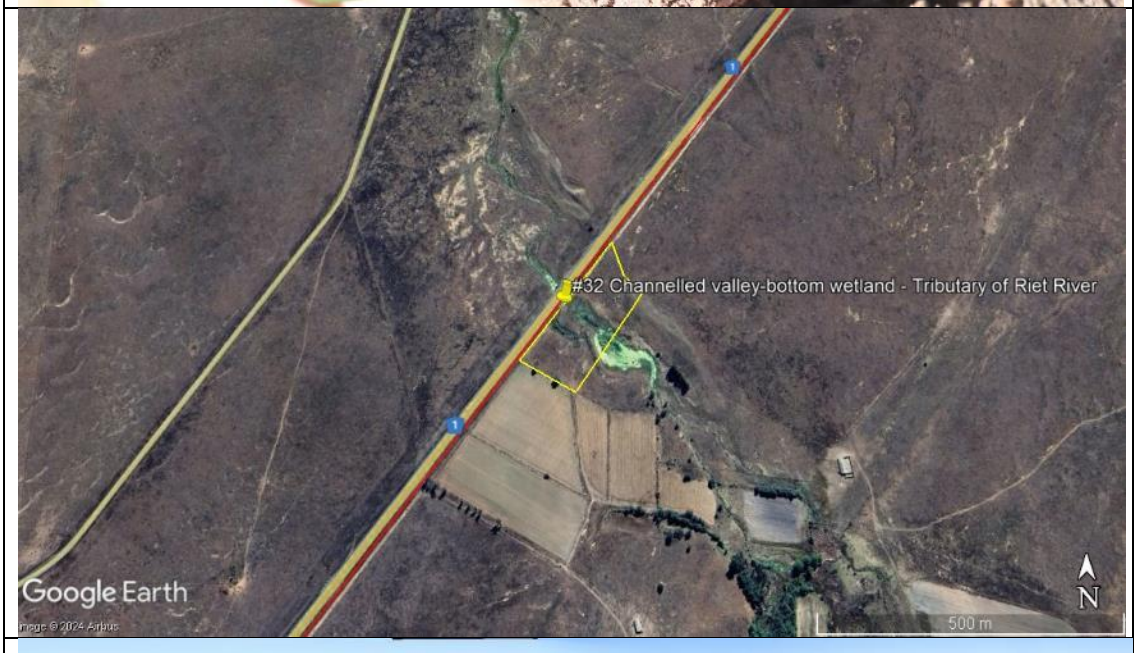
Dominant plant species:
Aponogeton junceus (OW), *Paspalum distichum* (OW), *Typha capensis* (OW), *Marsilea sp.* (OW), *Schoenoplectus sp.* (OW), *Cyperus marginatus* (OW), *Leptochloa fusca* (OW), *Lobelia thermalis, Cyperus congestus* (OW), *Cymbopogon pospischillii, *Cirsium vulgare, Eleocharis dregeana* (OW)

Protected plant species:
None observed

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods, the impacts are anticipated to be higher. The pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#33 Depression wetland	S 29.774665°, E 25.952261°	Seasonal wetland

Description of watercourse:

A small but prominent depression wetland that is being crossed by the N1 National Road. This is also the only depression wetland which will be affected by the pipeline route. Being a depression wetland it is a circular system which is not connected to any upstream or downstream systems but is fed by surrounding runoff and recharges to the local groundwater. It has an approximate diameter of 170 meters. Because this depression has been transected and divided by the road, this has caused extensive modification of its functioning and has resulted in significant degradation of the system.

The wetland is not of large size and has also been modified to a significant extent. It does however clearly become saturated annually during the rainy season. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

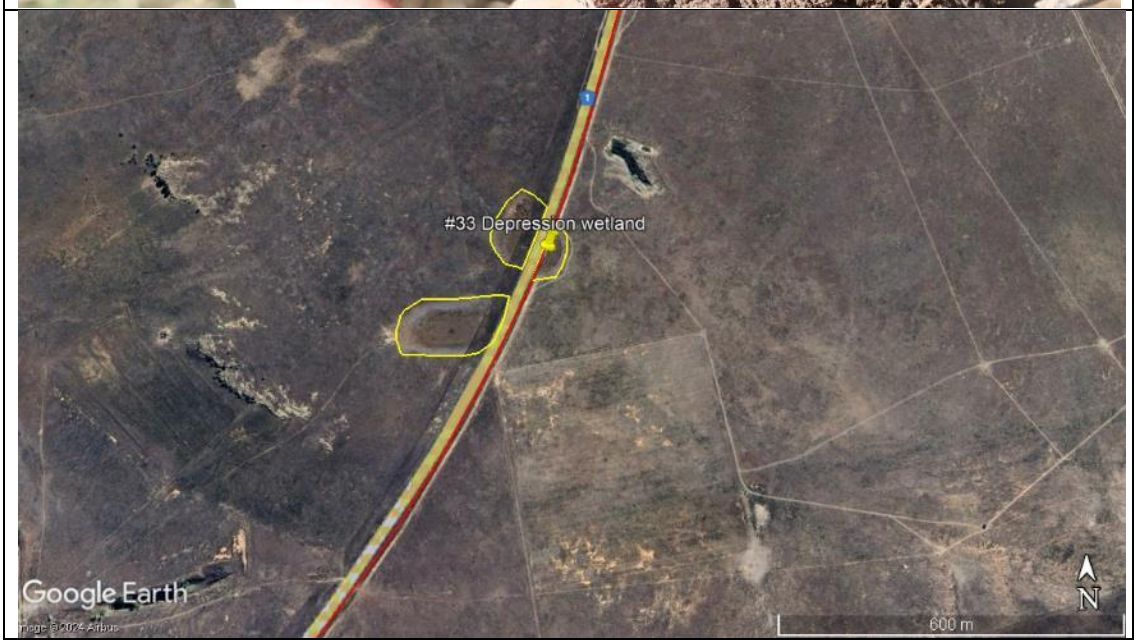
Dominant plant species:
Alternanthera sessilis (OW), *Marsilea sp.* (OW), *Schoenoplectus sp.* (OW), *Cyperus marginatus* (OW), *Leptochloa fusca* (OW), *Panicum coloratum* (FW)

Protected plant species:
None observed

Notes:
Low Risk – The depression wetland has already been modified to a large degree and EI&S is also lower.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#34 Hillslope seepage – Tributary of Riet River	S 30.444915°, 25.619737°	Seasonal wetland

Description of watercourse:

A small seepage area that is situated immediately adjacent to the site and N1 National Road on a higher lying area immediately to the east. This seepage wetland gives origin to a small drainage system that drains toward the north and forms a tributary of the Riet River. The seepage wetland is however modified to a significant extent. It forms to the east of the N1 National Road, which then transects and transforms the wetland. A large artificial impoundment at the origin of the seepage wetland will also affect its hydrology to a significant extent. The wetland collects runoff from the surrounding higher lying areas, which then seeps from the wetland and forms the drainage system flowing to the north. Both the N1 National Road and artificial impoundment heavily modify its functioning and its natural condition is difficult to determine, it is also likely that its size and shape has been altered by these impacts. Although modified to a significant extent and being very small, the seepage wetland clearly functions as a wetland system which will become saturated annually during the rainy season.

The wetland has been modified to a significant extent and its natural shape and size cannot be determined with certainty. However, obligate wetland vegetation is still abundant within the wetland and soil samples also still reliably indicate the presence of wetland conditions. These wetland conditions are considered to be indicative of a seasonal zone of wetness whereby soils saturation will occur for extended periods during the rainy season.

Dominant plant species:

**Xanthium spinosum, Paspalum dilatatum* (FW), *Leptochloa fusca* (OW), *Panicum coloratum* (FW), *Cyperus congestus* (OW), *Carex glomerabilis* (OW), **Oenothera rosea, *Ciclospermum leptophyllum, Alternanthera sessilis* (OW), *Cyperus longus* (OW), **Hordeum stenostachys, Typha capensis* (OW), **Sonchus oleraceus, *Plantago lanceolata, *Cirsium vulgare*

Protected plant species:

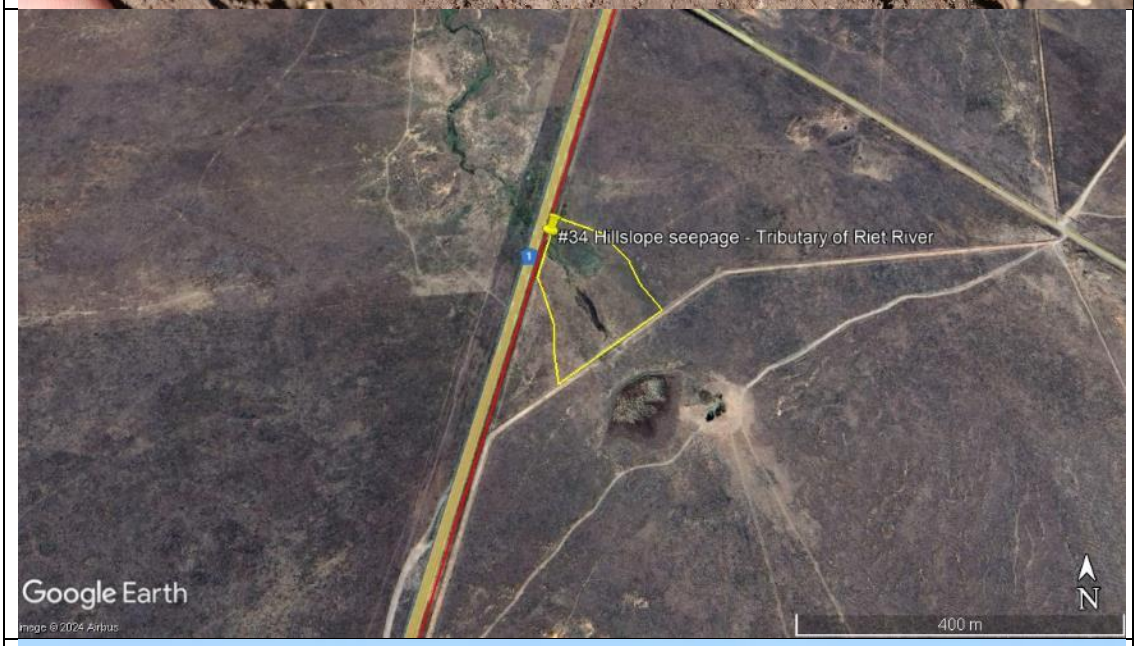
None observed

Notes:

Low Risk – The wetland is small and already heavily modified and consequently, impacts are anticipated to remain low. In addition, the pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#35 Riet River	S 29.663696°, E 25.987225°	Seasonal river

Description of watercourse:

A significant and large seasonal river flowing from east to west and forming one the main drainage systems in the region. It originates a long distance to the east of the site. It is affected

by a large artificial impoundment, Fouriespruitdam, immediately upstream which will alter the flow and flood regime of the river significantly. Road crossings will also affect it. Limited crop irrigation takes place and will have a low impact on the river. The impacts are considered to have some impact on the river but it is still considered largely natural. A more detailed discussion of its condition is also given in Section 4.2.6. It contains a large and distinct main channel while the floodplain is also fairly large. Connected main channel flow is anticipated to occur on a seasonal basis during the rainy season and deep pools are clearly present. This is clearly a large river system with large channel of approximately 20 meters in width. Construction through this river will clearly be difficult, require diversion of flow, attenuation areas and permanently saturated areas.

The river will flow throughout the rainy season but may cease flowing during the winter season, when sections of the river may also run dry for some periods. It is however likely that large sections of pools or "kuile" will retain surface water on a perennial basis. Facultative and obligate wetland species are abundant along the main channel and indicate clear wetland conditions. Soil samples also indicate a grey matrix and mottling indicating wetland conditions on a perennial basis, i.e. the river will contain perennially saturated areas along its banks. Several exotic species do indicate some disturbance of the river.

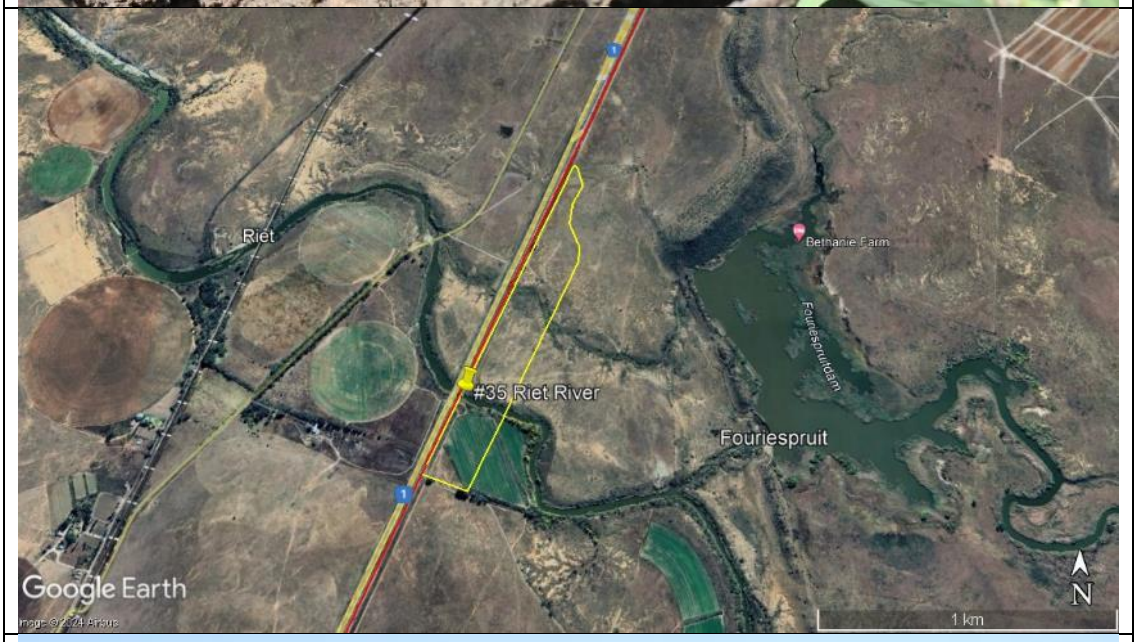
Dominant plant species:
Typha capensis (OW), *Lycium cinerium, *Conyza bonariensis, Artemisia afra, Cyphia stenopetala, Limosella major, Paspalum distichum* (OW), *Juncus exertus* (OW), *Leptochloa fusca* (OW), *Aspargaus larcinus, Phragmites australis* (OW), *Juncus rigidus* (OW), *Cyperus congestus* (OW), *Cyperus erragrostis* (OW), *Miscanthus capensis* (OW), *Echinochloa sp., Cullen tomentosum, Asparagus suaveolens, Salsola rabieana, Mestoklema tuberosum, Trichodiadema pommeridianum, *Cirsium vulgare, Panicum coloratum* (FW), **Tagetes minuta, Cyperus longus* (OW), *Paspalum dilatatum* (FW), **Verbena officinalis, Salix mucronata, Diospyros lycioides, Searsia pyroides*

Protected plant species:
None observed

Moderate Risk – The river is a large lowland system which will flow throughout the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Retaining the pipeline construction upstream of the road may decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#36 Hillslope seepage - Tributary of Riet River	S 29.619506°, E 26.011449°	Seasonal wetland

Description of watercourse:
A small seepage area that is situated immediately adjacent to the site and N1 National Road on a higher lying area. This seepage wetland gives origin to a small drainage system that drains

toward the south and forms a tributary of the Riet River. The seepage wetland is however modified to a significant extent. It forms to the west of the N1 National Road, which then transects and transforms the wetland whereafter it flows into a small drainage line. The wetland collects runoff from the surrounding higher lying areas, which then seeps from the wetland and forms the drainage system flowing to the south. The N1 National Road significantly modified its functioning, it is also likely that its size and shape has been altered by these impacts. Although modified to a significant extent and being very small, the seepage wetland clearly functions as a wetland system which will become saturated annually during the rainy season.

The wetland has been modified to a significant extent and its natural shape and size cannot be determined with certainty. However, obligate wetland vegetation is still abundant within the wetland and soil samples also still reliably indicate the presence of wetland conditions. These wetland conditions are considered to be indicative of a seasonal zone of wetness whereby soils saturation will only occur for longer periods during the rainy season.

Dominant plant species:
Paspalum distichum (OW), *Leptochloa fusca* (OW), *Marsilea sp.* (OW), *Schoenoplectus sp.* (OW), **Cirsium vulgare*

Protected plant species:
None observed

Notes:
Moderate Risk – The wetland is small and already modified, however, because the pipeline will be situated on the downstream side of the wetland, impacts are more likely to be propagated downstream and which increases the risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#37 Ephemeral stream – Tributary of Riet River	S 29.598043°, E 26.026512°	Ephemeral stream

Description of watercourse:

A significant and clearly defined ephemeral stream flowing from east to west, forming a tributary of the Riet River. The stream originates some distance to the east with fairly extensive dryland cropfields and an artificial impoundment situated near its origin and which will have a significant impact on the system in term of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The stream contains a prominent main channel which is approximately 2 meters in width and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will

only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs. Wetland conditions were however found to be prominent and the stream is likely to contain saturated soils throughout the rainy season.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and indicate that prominent, seasonal wetland conditions are present. A floodplain is present but is less extensive than most of the larger watercourses along the pipeline route. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

Dominant plant species:
**Verbena bonariensis, Diospyros lycioides, Paspalum dilatatum* (FW), *Cyperus congestus* (OW), *Leptochloa fusca* (OW), **Veronica anagalis-aquatica, Lycium cinerium, Panicum coloratum* (FW), *Searsia pyroides, Asparagus larcinus, *Tagetes minuta, Nenax microphylla*

Protected plant species:
None observed.

Notes:
Low Risk – The stream is already significantly modified and the condition and EI&S is also lower. In addition, the pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#38 Hillslope seepage – Tributary of Riet River	S 29.575464°, E 26.042354°	Seasonal wetland

Description of watercourse:

A small seepage area that is situated immediately adjacent to the site and N1 National Road on a higher lying area immediately to the east. This seepage wetland gives origin to a small drainage system that drains toward the west and forms a tributary of the Riet River. The seepage wetland is however modified to a significant extent. It forms to the east of the N1 National Road, which then transects and transforms the wetland. A large artificial impoundment situated immediately downstream of the seepage wetland will also affect its hydrology to a significant extent. The wetland collects runoff from the surrounding higher lying areas, which then seeps from the wetland and forms the drainage system flowing to the north. Both the N1 National Road and artificial impoundment heavily modify its functioning and its natural condition is difficult to determine, it is also likely that its size and shape has been altered by these impacts. Although modified to a significant extent and being very small, the seepage wetland clearly functions as a wetland system which will become saturated annually during the rainy season.

The wetland has been modified to a significant extent and its natural shape and size cannot be determined with certainty. However, obligate wetland vegetation is still abundant within the wetland and soil samples also still reliably indicate the presence of wetland conditions. These wetland conditions are considered to be indicative of a seasonal zone of wetness whereby soils saturation will occur for extended periods during the rainy season.

Dominant plant species:

**Cirsium vulgare, *Lactuca seriola, Carex glomerabilis* (OW), *Digitaria eriantha, Leptochloa fusca* (OW), *Gomphocarpus fruticosus, *Verbena bonariensis*
Protected plant species: None observed
Notes: Low Risk – The wetland is small and already heavily modified and consequently, impacts are anticipated to remain low. In addition, the pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.
Soil sample: 



Watercourse name:	**Coordinates of crossing:** S 29.533853°, E 26.072551°	**Flow regime:** Ephemeral stream

#39 Ephemeral stream – Tributary of Tierpoort River		

Description of watercourse:
A significant and clearly defined ephemeral stream flowing from east to west, forming a tributary of the Tierpoort. The stream originates some distance to the east with fairly extensive dryland cropfields and an artificial impoundment situated near its origin and which will have a significant impact on the system in term of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The stream contains a large and prominent main channel, being fairly large at about 5 meters in width and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs. Wetland conditions were however found to be prominent and the stream is likely to contain saturated soils throughout the rainy season.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and indicate that prominent, seasonal wetland conditions are present. A prominent and extensive floodplain also occurs along the stream system. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

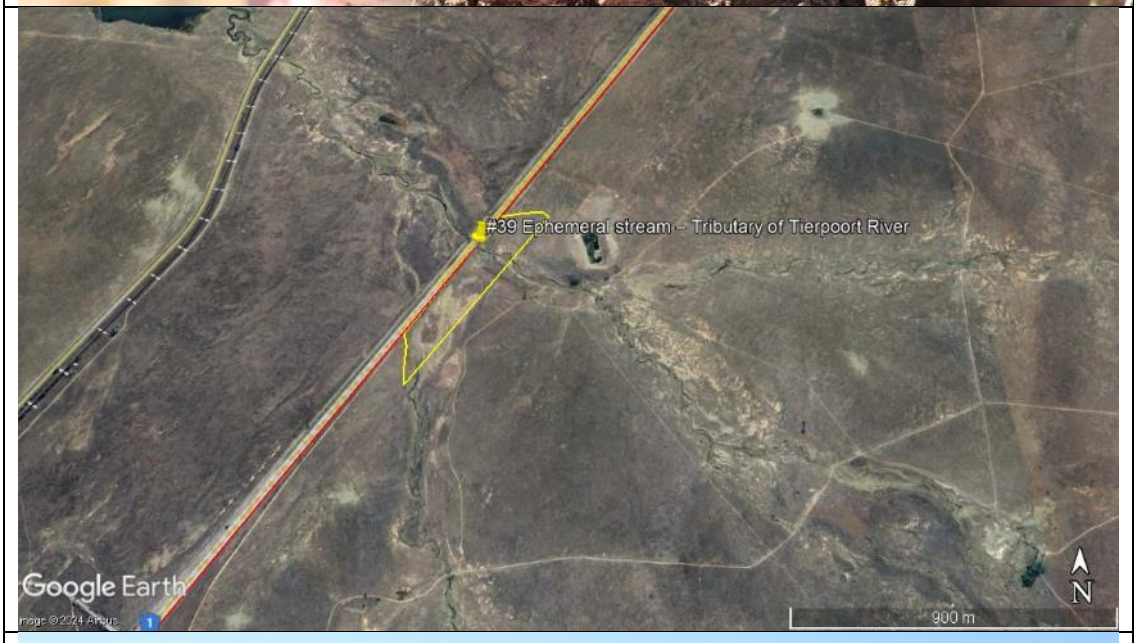
Dominant plant species:
**Cirsium vulgare, Leptochloa fusca* (OW), *Scirpoides dioecus* (OW), *Cyperus congestus* (OW), *Pennisetum spacelatum* (OW), *Paspalum distichum* (OW), *Cyperus longus* (OW), *Lycium cinerium, Cyperus marginatus* (OW), *Marsilea sp.* (OW), *Asparagus suaveolens, Cynodon dactylon, Melolobium candicans, Helictotrichon turgidulum* (FW), *Lobelia thermalis*

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. The pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#39 Holsloot – Tributary of Tierpoort River	S 29.474515°, E 26.101710°	Ephemeral stream
Description of watercourse:		

A significant and clearly defined ephemeral stream flowing from east to west, forming a tributary of the Tierpoort River. The stream originates some distance to the east with fairly extensive dryland cropfields and an artificial impoundment situated near its origin and which will have a significant impact on the system in term of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the N1 National Road at the site which will also affect it in terms of flow disruption and localised disturbance. The stream contains a large and prominent main channel, being fairly large at about 5 meters in width and indicates that significant flows do occur after heavy rainfall events. It is however clearly an ephemeral system which will only contain connected main channel flow during years of high rainfall and after heavy rainfall occurs. Wetland conditions were however found to be prominent and the stream is likely to contain saturated soils throughout the rainy season.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and indicate that prominent, seasonal wetland conditions are present. A prominent and extensive floodplain also occurs along the stream system. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

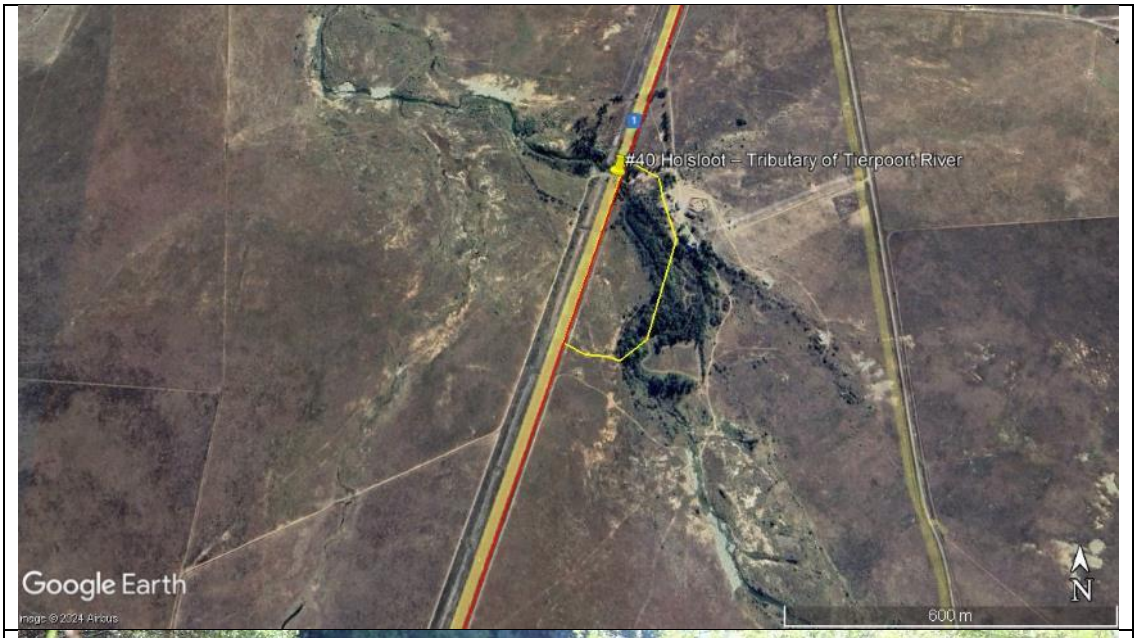
Dominant plant species:
**Populus x simonii, Searsia lancea, Searsia pyroides, Juncus rigidus* (OW), *Diospyros lycioides, Cyperus longus* (OW), **Xanthium strumarium, *Fraxinus americana, Gomphostigma virgatum* (OW)

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. The pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:









Watercourse name:	Coordinates of crossing:	Flow regime:
#41 Channelled valley-bottom wetland – Tributary of Holsloot	S 29.465430°, E 26.105024°	Seasonal wetland

Description of watercourse:

A small but prominent valley-bottom wetland that is being crossed by the N1 National Road. The wetland is situated within a shallow valley, in a higher lying area, forming part of the origin of a tributary of the Holsloot. The origin of this wetland is situated a short distance to the east of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the N1 National Road, as well as a few artificial impoundments. The wetland is therefore

considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

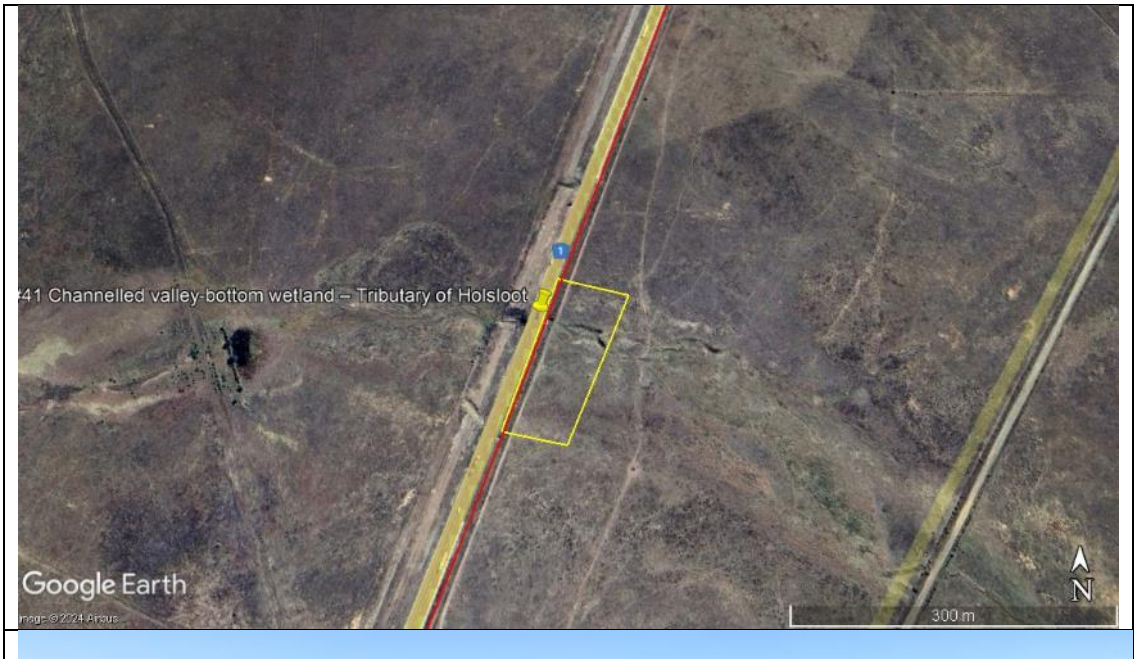
Dominant plant species:
Brunsvigia radulosa, Marsilea sp. (OW), *Leptochloa fusca* (OW), **Conyza bonariensis, *Cirsium vulgare, Panicum coloratum* (FW), *Ciclopsermum leptophyllum, Cyperus marginatus* (OW), *Pennisetum sphacelatum* (OW), *Chloris virgata*

Protected plant species:
Specimens of the protected geophyte, *Brunsvigia radulosa* noted in road reserve.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. The pipeline will be situated on the upstream side of the N1 National Road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#42 Channelled valley-bottom wetland – Tributary of Holsloot	S 29.455295°, E 26.123893°	Seasonal wetland

Description of watercourse:

A small but prominent valley-bottom wetland that is situated along the gravel road in the pipeline section between the Tierpoort and Ristfontein Dams and which is also being crossed by the gravel road. The wetland is situated within a shallow valley, in a higher lying area, forming part of the origin of a tributary of the Holsloot. The origin of this wetland is situated a short distance to the east of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of the gravel road, as well as a large artificial impoundment downstream of the site. The gravel road will have lower impact than the N1 National Road though will still act as a flow barrier. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

Although the wetland is not of large size, it is still natural with only moderate levels of modification. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

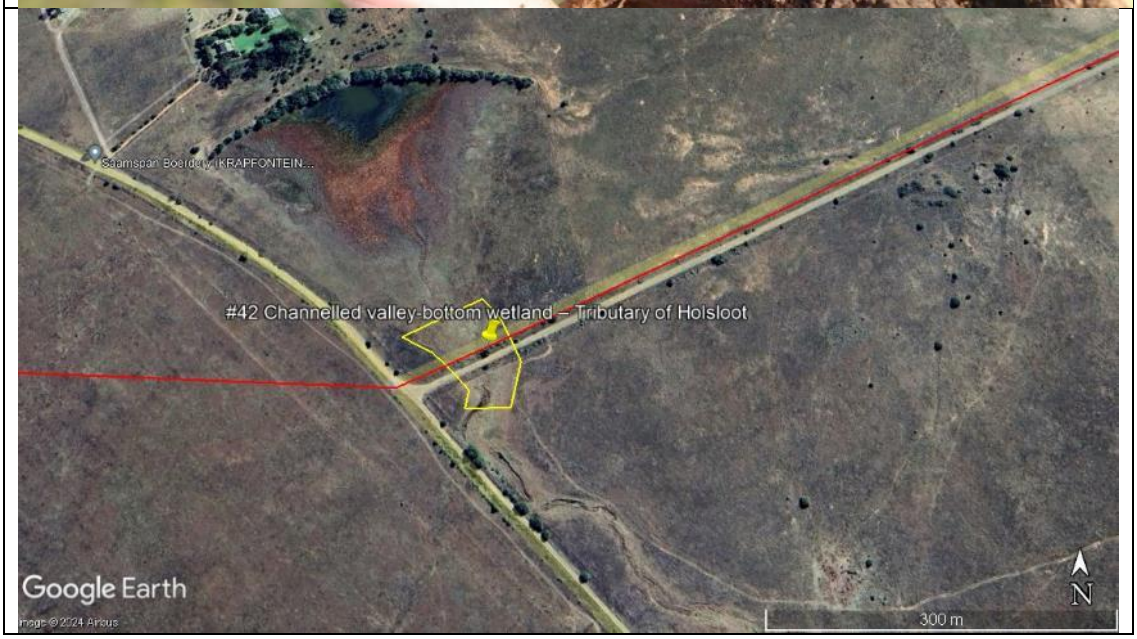
Dominant plant species:
Paspalum dilatatum (FW), **Oenothera rosea, Cynodon dactylon, *Falkia oblonga, Pennisetum sphacelatum* (OW), *Leptochloa fusca* (OW), *Panicum coloratum* (FW), *Setaria pallide-fusca* (FW), **Ciclospermum leptophyllum, Cyperus marginatus* (OW), *Diospyros lycioides, Ziziphus mucronata, Searsia lancea*

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. Furthermore, the pipeline will be situated on the downstream side of the gravel road which is likely to increase the extent of the impact to downstream areas.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#43 Stream and floodplain wetland – Tributary of Tierpoort River	S 29.448449°, E 26.178190°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from south to north, forming a tributary of the Tierpoort River and draining into the Tierpoort Dam. The stream is also being crossed by the gravel road along the Tierpoort to Rustfontein Dam section of the pipeline route. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Tierpoort Dam a short distance to the north. The stream originates some distance to the south with several dryland and irrigated cropfields and a large artificial impoundment situated just upstream of the site and which will have a significant impact on the system in term of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the gravel road at the site which will also affect it in terms of flow disruption and localised disturbance. It is therefore at least moderately modified. A more detailed discussion of its condition is also given in Section 4.2.6. Pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. The stream contains an extensive and prominent floodplain wetland which can be as broad as 800 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream contains a large and clearly defined main channel with pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

Dominant plant species:

Diospyros lycioides, Pennisetum sphacelatum (OW), *Cyperus marginatus* (OW), *Alternanthera sessilis* (OW), *Cyperus longus* (OW), *Persicaria lapathifolia* (OW), *Schoenoplectus sp.* (OW), *Leptochloa fsuca* (OW), *Paspalum distichum* (OW), *Panicum coloratum* (FW)

Protected plant species:

None observed.

Notes:

Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding, presence of clear wetland conditions and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. Furthermore, the pipeline will be situated on the downstream side of the gravel road which is likely to increase the extent of the impact to downstream areas.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#44 Seasonal stream – Tributary of Tierpoort River	S 29.455070°, E 26.218427°	Seasonal stream

Description of watercourse:

A significant and large seasonal stream associated with a significant associated floodplain. This stream forms a tributary of the Tierpoort River into which it flows some distance to the north of the site. The stream is also being crossed by the gravel road along the Tierpoort to Rustfontein Dam section of the pipeline route. The stream is situated in the lower lying plains and clearly forms a defined lower foothills stream system. The stream has a broad channel, approximately 10 meters in diameter and from the survey, seems to be seasonal in nature, flowing throughout the rainy season, while it may run dry during winter. It will therefore contain continuous flow for long periods at a time. Construction through this stream will therefore be more difficult, require diversion of flow, attenuation areas and permanently saturated areas. The stream originates some distance to the south with several dryland cropfields situated in the catchment while several small artificial impoundments also occur in its upper reaches. The stream is also being crossed by the gravel road at the site which will also affect it in terms of flow disruption and localised disturbance. It is therefore at least moderately modified. A more detailed discussion of its condition is also given in Section 4.2.6. The stream contains a large and clearly defined main channel with connected flow occurring likely throughout the rainy season. Obligate wetland species clearly indicate that wetland conditions are present along the channel and banks. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.
Dominant plant species: *Paspalum dilatatum* (FW), *Asparagus larcinus, Juncus ocycarpus* (OW), *Cyperus longus* (OW), *Juncus rigidus* (OW), *Pennisetum sphacelatum* (OW), *Leptochloa fusca* (OW), *Berkheya onopordifolia, *Melia azedarach, Juncus exertus* (OW), *Berula erecta* (OW), *Paspalum distichum* (OW), *Marsilea sp.* (OW), *Crassula natans, Cyperus marginatus* (OW), *Heteropogon contortus, Lobelia thermalis, Osteospermum spinescens, Nenax microphylla, Helichrysum lucilioides, Eragrostis bicolor, Nananthus sp., Salsola rabieana*
Protected plant species: None observed.
Notes: Moderate Risk – Given the prominent channel which will flow throughout the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Furthermore, the pipeline will be situated on the downstream side of the gravel road which is likely to increase the extent of the impact to downstream areas. The stream is part of an NFEPA system which also increases the EI&S of the system which contributes toward a higher risk.
Soil sample:




#44 Seasonal stream – Tributary of Tierpoort River
Google Earth
700 m
N



Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#45 Stream and floodplain wetland – Tributary of Tierpoort River	S 29.437598°, E 26.278957°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from south to north, forming a tributary of the Tierpoort River. The stream is also being crossed by the gravel road along the Tierpoort to Rustfontein Dam section of the pipeline route. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Tierpoort River a short distance to the north. The stream originates some distance to the south with several dryland and irrigated cropfields and a large artificial impoundment situated just upstream of the site and which will have a significant impact on the system in terms of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the gravel road at the site which will also affect it in terms of flow disruption and localised disturbance. It is therefore at least moderately modified. Pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. The stream contains an extensive and prominent floodplain wetland which can be as broad as 300 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream contains a large and clearly defined main channel with pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

Dominant plant species:

Pennisetum sphacelatum (OW), *Cyperus marginatus* (OW), *Cyperus fastigiatus* (OW), *Persicaria lapathifolia* (OW), *Leptochloa fsuca* (OW), *Paspalum distichum* (OW), *Agrostis lachnantha* (OW), *Diospyros lycioides, Asparagus larcinus, Schoenoplectus sp.* (OW), *Phyla nodiflora*

Protected plant species:

None observed.

Notes:

Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding, presence of clear wetland conditions and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher. The stream is also part of an NFEPA wetland system which also increases the EI&S of the system which contributes toward a higher risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:

#46 Tierpoort River	S 29.427462°, E 26.307373°	Seasonal river

Description of watercourse:

A significant and large seasonal river flowing from east to west and forming one the main drainage systems in the region. It originates a long distance to the east of the site. The river also contains the remains of a bridge crossing at the site and which still affected to some degree as flow barrier. Being a large seasonal river, this can be considered as a lowland system. The river has a broad channel, approximately 20 meters in diameter while the floodplain is also fairly large. Connected main channel flow is anticipated to occur on a seasonal basis during the rainy season and deep pools are clearly present. Construction through this river will therefore be more difficult, require diversion of flow, attenuation areas and permanently saturated areas. Impacts affecting the river include a few road crossings, numerous dryland and irrigated cropfields while several small artificial impoundments also occur in its upper reaches. It is therefore at least moderately modified. A more detailed discussion of its condition is also given in Section 4.2.6.

The river will flow throughout the rainy season but may cease flowing during the winter season, when sections of the river may also run dry for some periods. It is however likely that large sections of pools or "kuile" will retain surface water on a perennial basis. Facultative and obligate wetland species are abundant along the main channel and indicate clear wetland conditions. Soil samples also indicate a grey matrix and mottling indicating wetland conditions on a perennial basis, i.e. the river will contain perennially saturated areas along its banks. Several exotic species do indicate some disturbance of the river.

Dominant plant species:

Phragmites australis (OW), *Salic mucronata, Pseudoschoenus inanus* (OW), *Searsia pyroides, Asparagus larcinus, Cymbopogon pospischillii, Artemisia afra, Vachellia karroo, Gomphostigma virgatum* (OW), *Cyperus congestus* (OW), *Cyperus fastigiatus* (OW), *Juncus exertus* (OW), **Oenothera rosea, Panicum coloratum* (FW), *Carex glomerabilis* (OW), *Hemarthria altissima* (OW), *Gomphocarpus fruticosus, Eriocephalus ericoides*

Protected plant species:

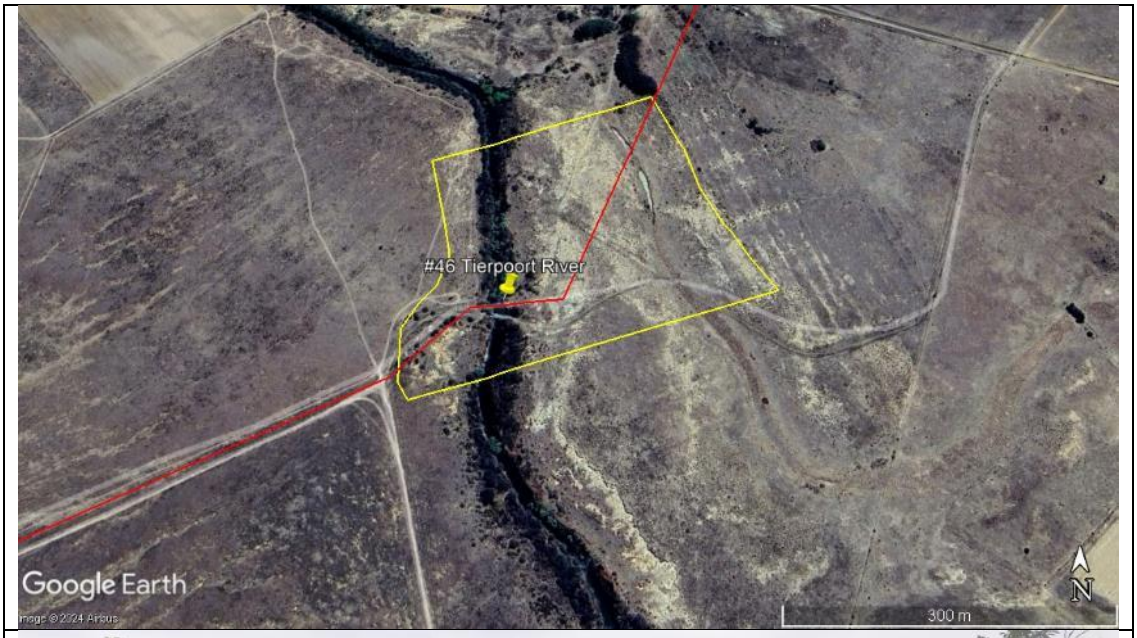
None observed.

Notes:

Moderate Risk – Given the prominent channel which will flow throughout the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#47 Stream and floodplain wetland – Tributary of Tierpoort River	S 29.404932°, E 26.322607°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from north east to south west, forming a tributary of the Tierpoort River. The stream is also being crossed by the gravel road along the Tierpoort to Rustfontein Dam section of the pipeline route. The stream is situated in the lower lying plains and though it may resemble a channelled valley-bottom wetland can, with certainty, be regarded as a stream system with adjacent floodplain wetland. The stream flows into the Tierpoort River a short distance to the west. The stream originates some distance to the east with several dryland and irrigated cropfields and a few small artificial impoundments situated upstream of the site and which will have a significant impact on the system in terms of the flow and flooding regime, sediment load and water quality of the stream. The stream is also being crossed by the gravel road at the site which will also affect it in terms of flow disruption and localised disturbance. It is therefore at least moderately modified.

Pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. The stream contains an extensive and prominent floodplain wetland which can be as broad as 350 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream contains a large and clearly defined main channel with pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

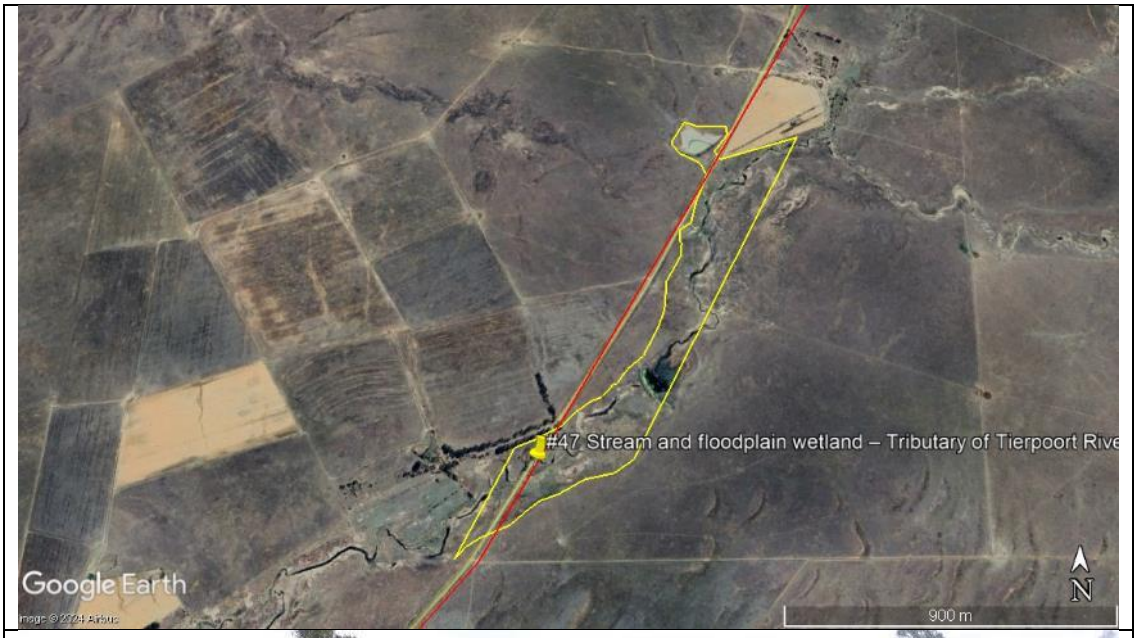
Dominant plant species:
Persicaria lapathifolia (OW), *Themeda triandra, Pennisetum sphacelatum* (OW), *Leptochloa fusca* (OW), *Eleocharis dregeana* (OW), **Cirsium vulgare, Cyperus congestus* (OW)

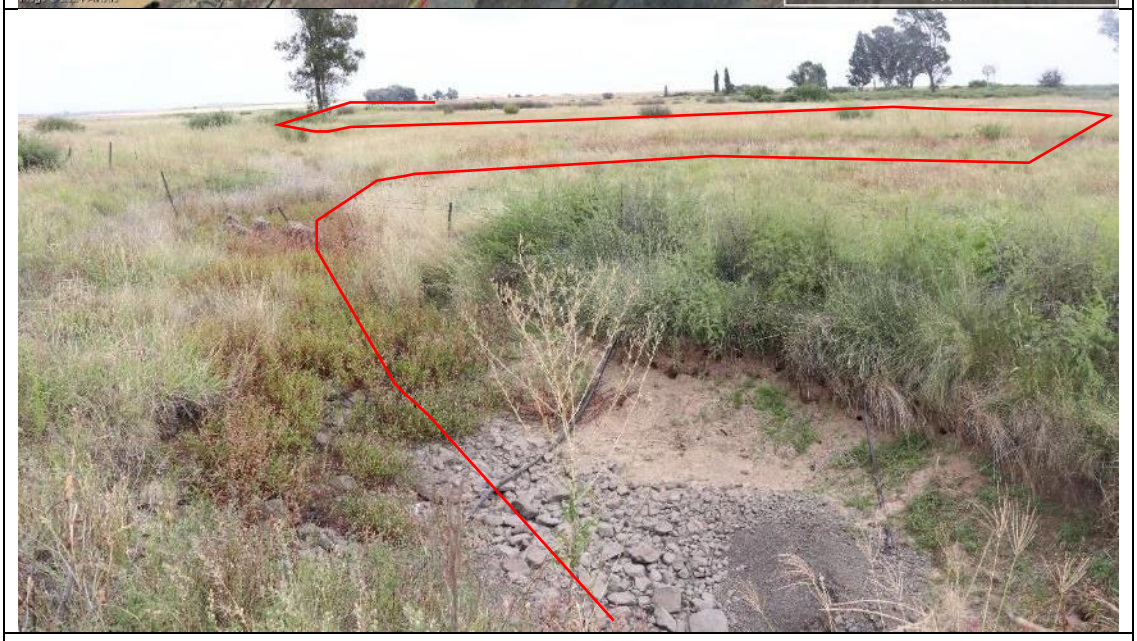
Protected plant species:
None observed.

Notes:
Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding, presence of clear wetland conditions and because the system is considered to have a higher EI&S, the impacts are anticipated to be higher.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#48 Channelled valley-bottom wetland – Tributary of Renosterspruit	S 29.359579°, E 26.381056°	Seasonal wetland

Description of watercourse:

A large and prominent valley-bottom wetland that is situated in a natural area, not affected by any road crossings along the pipeline section between the Tierpoort and Rustfontein Dams. The point of crossing could not be accessed and the survey of the system was undertaken a short distance downstream but which is still considered to provide an accurate description of the affected system. The system is not easily distinguishable between a valley-bottom and floodplain wetland systems, most probably also due to impacts caused by large artificial impoundments which modifies its functioning and characteristics. However, given the current condition, it is considered better placed as a channelled valley-bottom wetland system. The origin of this wetland is situated a short distance to the south of the site. The wetland is most likely modified to a significant degree by several large artificial impoundments upstream and downstream while

agricultural cropfields will also contribute some impacts to it. As indicated, the point of crossing is also not affected by any existing roads and the proposed pipeline is therefore likely to cause significant new impacts to the system. The wetland is therefore considered only to be modified to a moderate degree and still contain significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is fairly large, containing extensive wetland areas while clearly being at least moderately modified. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:
Typha capensis (OW), *Paspalum distichum* (OW), *Juncus exertus* (OW), **Cirsium vulgare,* *Leptochloa fusca* (OW), *Cyperus marginatus* (OW), *Carex glomerabilis* (OW), *Cyperus longus* (OW), *Marsilea sp.* (OW)

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the presence of clear wetland conditions which will contain saturated conditions over long periods and because the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the wetland.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#49 Renosterspruit	S 29.331491°, E 26.379950° S 29.342091°, E 26.408640°	Ephemeral stream

Description of watercourse:

A significant and large ephemeral stream with the point of crossing situated in the upper reaches of the system. The stream will be crossed by the pipeline once but either by Alternative B1 or B2. The Renosterspruit is better as the large, seasonal watercourse flowing along the eastern outskirts of Bloemfontein but here in its upper reaches it is a prominent but distinctly ephemeral stream system which discharges by flash floods after heavy rainfall events or flows for some periods during years of high rainfall. This stream also forms part of the Modder River system. The stream is being crossed by a few small dirt tracks, contains several significant artificial impoundments upstream and is also affected by some dryland and irrigated cropfields. It is therefore at least moderately modified. The stream is situated in the lower lying plains and clearly forms a defined lower foothills stream system. The stream has a broad channel, approximately 10 meters in diameter and at the time of the survey, was devoid of any surface water, also

confirming an ephemeral flow regime. It is however well known for substantial flooding events occurring.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and indicate that prominent, seasonal wetland conditions are present. A prominent and extensive floodplain also occurs along the stream system. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

Dominant plant species:
Vachellia karroo, Cyperus marginatus (OW), *Paspalum dilatatum* (FW), *Cyperus erragrostis* (OW), *Asparagus larcinus, Leptochloa fusca* (OW), *Marsilea sp.* (OW), *Juncus exertus* (OW), *Diospyros lycioides, Pennisetum sphacelatum* (OW), **Gleditsia triacanthos, Searsia pyroides, Delosperma cooperi, Digitaria eriantha, Cyperus congestus* (OW), *Agrostis lachnantha* (OW), *Paspalum distichum* (OW), *Gomphostigma virgatum* (OW), *Conyza podocephala, Cynodon dactylon, Phragmites australis* (OW)

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the prominent channel which will flow for some periods during the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Furthermore, the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the wetland.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#50 Stream and floodplain wetland – Tributary of Koringspruit	S 29.321831°, E 26.397984° S 29.324355°, E 26.427742° S 29.321911°, E 26.434190° S 29.317924°, E 26.446065° S 29.312843°, E 26.462904°	Ephemeral stream with seasonal floodplain wetland

Description of watercourse:

A significant and large ephemeral stream associated with an extensive floodplain flowing from west to east, forming a tributary of the Koringspruit. The stream system will be crossed at five different locations by the proposed pipeline, varying between 500 meter and 2 kilometers between crossings. These will all be discussed together as they form part of the same system, in close proximity and impacts should therefore be similar. Crossing sites were also not accessible due to a lack of access roads and electrified fencing. The stream is not currently being crossed by any existing roads or tracks and the pipeline will therefore entail a new impact, thus increasing the anticipated impact as well. This wetland is quite extensive and can be confused with a valley-bottom wetland though due to the defined channel banks, gradient and being situated in lower foothills, it can with relative certainty be regarded as a floodplain wetland. This wetland system is considered to be quite natural though a few impacts will however still affect its condition. The wetland contains a few small artificial impoundments upstream which will have a low impact in terms of the overall flooding regime of the wetland. Within the upstream catchment of the wetland, previously ploughed areas are also evident. The wetland can therefore be regarded as being largely natural, which will also increase the anticipated impacts on it. The wetland contains a few small artificial impoundments upstream which will have a low

impact in terms of the overall flooding regime of the wetland. Within the upstream catchment of the wetland, previously ploughed areas are also evident. Pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. The stream contains an extensive and prominent floodplain wetland which can be as broad as 800 meters and also contains quite clear wetland conditions. The stream itself is however ephemeral and will only contain connected channel flow during years of high rainfall and after heavy rainfall events.

The stream contains a large and clearly defined main channel with pools occur within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

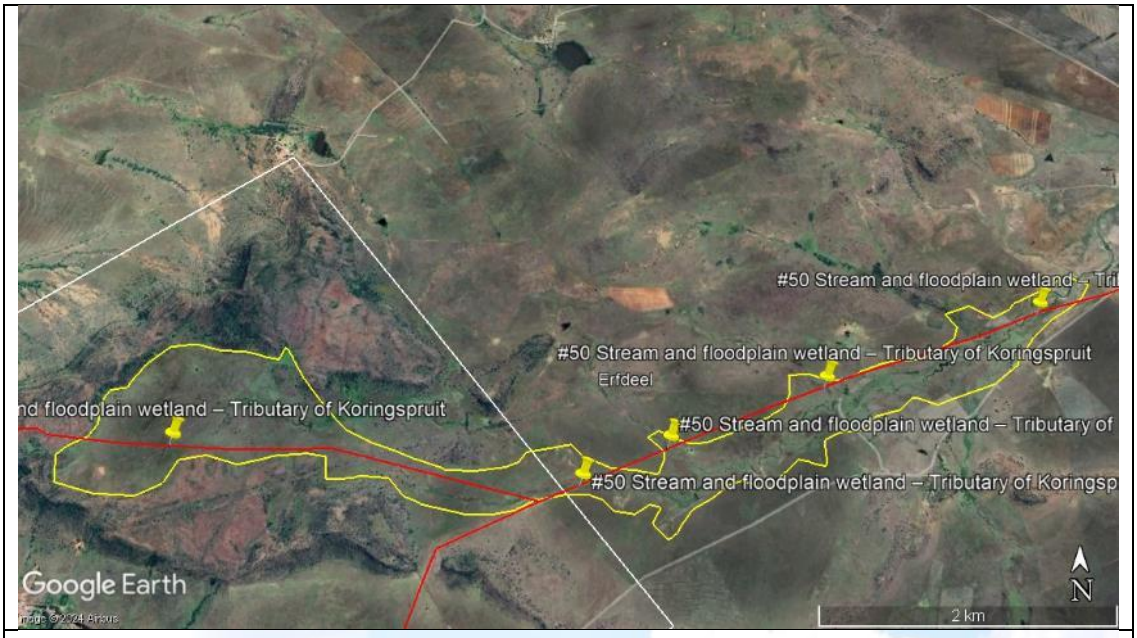
Dominant plant species:
Pennisetum sphacelatum (OW), *Cyperus marginatus* (OW), *Leptochloa fsuca* (OW), *Cyperus congestus* (OW), *Conyza podocephala, Cyperus marginatus* (OW), *Haplocarpha scaposa, Berkheya radula, Cyperus fastigiatus* (OW), *Eleocharis dregeana* (OW)

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the prominent channel and large extensive floodplain which will experience periodic flooding, presence of clear wetland conditions and because the system is considered to have a higher EI&S and forms part of a NFEPA catchment, the impacts are anticipated to be higher. Furthermore, the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the wetland.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#51 Koringspruit	S 29.300012°, E 26.500911°	Ephemeral stream

Description of watercourse:

A significant and large ephemeral stream with the point of crossing situated in the upper reaches of the system. The stream will be crossed by the pipeline a short distance upstream of the existing gravel road between the Tierpoort and Rustfontein Dams. It is a prominent but distinctly ephemeral stream system which discharges by flash floods after heavy rainfall events or flows for some periods during years of high rainfall. This stream also forms part of the Modder River system. The stream seems to be natural to a large degree although a few impacts do however cause it to be somewhat modified. Several small agricultural dams and weirs occur in the upper reaches of the stream and will cause some alteration to the flow and flood regime of the stream system. An extensive dirt road network also cross over the stream at several points and which

will act as flow barriers, while also promoting erosion. Agricultural crop production is fairly common along the stream especially along the adjacent alluvial plains and these will contribute a significant impact on the stream system. It is therefore at least moderately modified. A more detailed discussion of its condition is also given in Section 4.2.6. The stream is situated in the lower lying plains and clearly forms a defined lower foothills stream system. The stream has a broad channel, approximately 10 meters in diameter and at the time of the survey, only contained isolated pools. It is however well known for substantial flooding events occurring.

The ephemeral stream will flow very infrequently but is nonetheless a prominent watercourse and will contain substantial flooding after heavy rainfall occurs. Obligate wetland vegetation is present within the main channel of the stream and indicate that prominent, seasonal wetland conditions are present. A prominent and extensive floodplain also occurs along the stream system. Soil samples also indicate at least seasonal indicators of saturation and confirm the presence of wetland conditions.

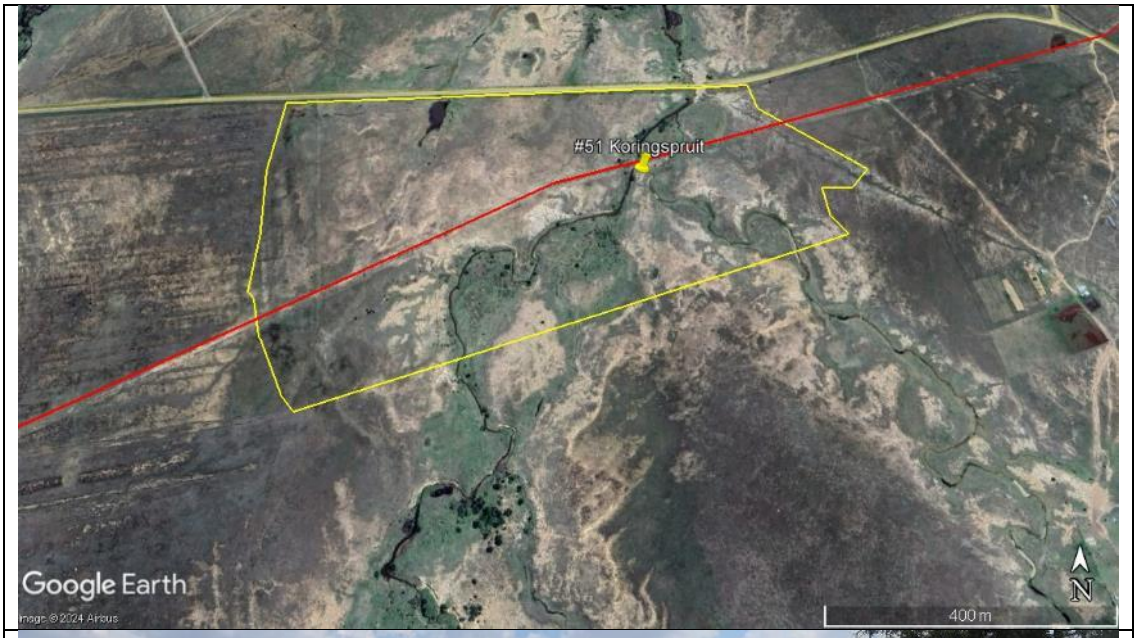
Dominant plant species:
Artemisia afra, Themeda triandra, Vachellia karroo, Gomphostigma virgatum (OW), *Cyperus congestus* (OW), *Paspalum dilatatum* (FW), *Asparagus larcinus, Juncus exertus* (OW), *Helictotrichon turgidulum* (FW), *Sporobolus africanus, Setaria sphacelata* (FW), *Leptochloa fusca* (OW), *Chrysocoma ciliata, Pennisetum sphacelatum* (OW)

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the prominent channel which will flow for some periods during the rainy season and is likely to contain saturated conditions throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher. Furthermore, the pipeline will be situated on the downstream side of the gravel road which is likely to increase the extent of the impact to downstream areas. The stream is part of an NFEPA system which also increases the EI&S of the system which contributes toward a higher risk.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#52 Ephemeral stream – Tributary of Koringspruit	S 29.289782°, E 26.520901°	Ephemeral stream

Description of watercourse:

A significant and large ephemeral stream with a prominent floodplain flowing from east to west, forming a tributary of the Koringspruit. The stream is situated in a in a natural area, not affected by any road crossings along the pipeline section between the Tierpoort and Rustfontein Dams. The point of crossing could not be accessed and the survey of the system was undertaken a short distance downstream but which is still considered to provide an accurate description of the affected system. At the site and upstream, the stream is not currently being crossed by any existing roads or tracks and the pipeline will therefore entail a new impact, thus increasing the anticipated impact as well. It is a prominent but distinctly ephemeral stream system which discharges by flash floods after heavy rainfall events or flows for some periods during years of high rainfall. The stream seems to be natural to a large degree although a few impacts do however cause it to be somewhat modified. Several small agricultural dams and weirs occur in the upper reaches of the stream and will cause some alteration to the flow and flooding regime of the stream system. Agricultural crop production is fairly common along the stream especially

along the adjacent alluvial plains and these will contribute a significant impact on the stream system. It is therefore at least moderately modified. The stream is situated in the lower lying plains and clearly forms a defined lower foothills stream system. The stream has a narrow but prominent channel, approximately 2 meters in width and at the time of the survey, only contained isolated pools.

The stream contains a narrow but clearly defined main channel with pools occurring within the stream though it is clearly ephemeral in nature and only flows for short periods after heavy rainfall events. Obligate wetland species clearly indicate that wetland conditions are present. Soil sample has a prominent grey matrix substantiating the wetland conditions of the stream.

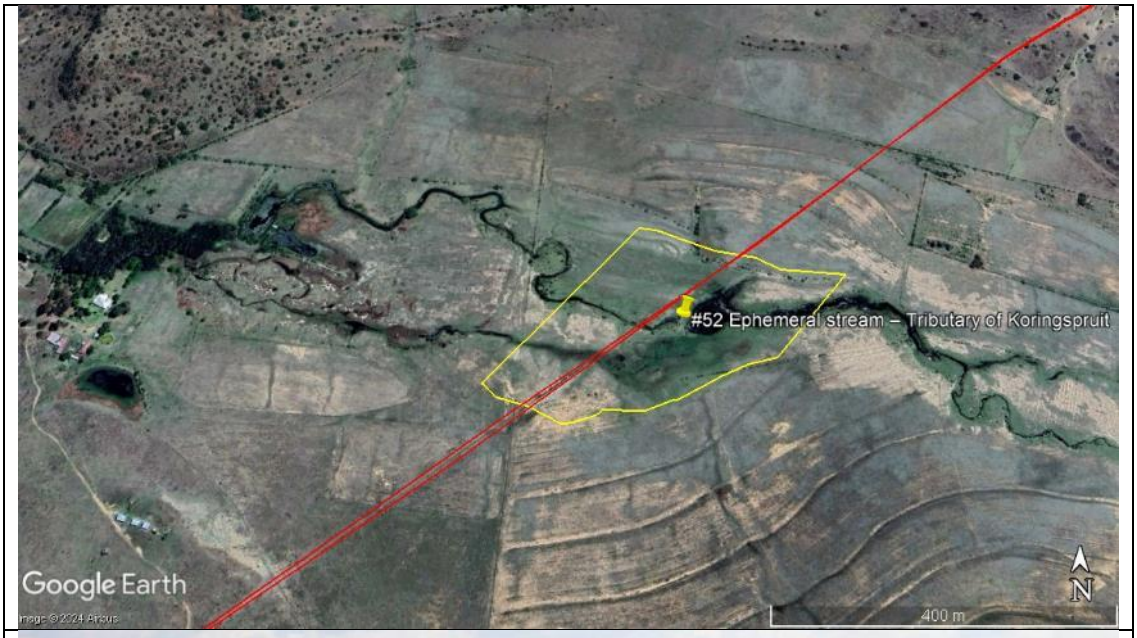
Dominant plant species:
**Gleditsia triacanthos, Cymbopogon pospischillii, Diospyros lycioides, Paspalum dilatatum* (FW), *Searsia lancea, Berkheya radula, Juncus rigidus* (OW), *Cyperus longus* (OW), **Conyza bonariensis, *Tagetes minuta, Cyperus fastigiatus* (OW), *Cyperus congestus* (OW), *Conyza podocephala, Asparagus larcinus, Agrostis lachnantha* (OW), *Carex glomerabilis* (OW), *Pennisetum spacelatum* (OW), *Artemisia afra, Persicaria lapathifolia*

Protected plant species:
None observed.

Notes:
Moderate Risk – Given the prominent channel which will experience periodic flooding, presence of clear wetland conditions and because the system is considered to have a higher EI&S and forms part of a NFEPA catchment, the impacts are anticipated to be higher. Furthermore, the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the wetland.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#53 Drainage line – Tributary of Koringspruit	S 29.281646°, E 26.533183°	Ephemeral drainage line

Description of watercourse:

A very small drainage line that drains along the slope of a hill to the south of the site. It flows from south to north and drains into the Koringspruit some distance to the north west of the site. The drainage line is situated in a in a natural area, not affected by any road crossings along the pipeline section between the Tierpoort and Rustfontein Dams. The point of crossing could not be accessed and the survey of the system was undertaken a short distance downstream but which is still considered to provide an accurate description of the affected system. At the site and upstream, the drainage line is not currently being crossed by any existing roads or tracks and the pipeline will therefore entail a new impact, thus increasing the anticipated impact as well. The drainage line has its origin on the plateau of the large hill to the south of the site. It is not affected by many impacts but is being crossed by the gravel road, downstream of the site. A main channel is present, incised into the slope but it is clearly ephemeral and where it enters the lower foothill the slope also decreases and flow slows as well. The drainage line is still clearly ephemeral and continuous flow will only take place during large rainfall events and will flow for short periods. Due to the moderate slope at the site and the higher annual rainfall in this region, temporary wetland conditions have been able to establish here.

The drainage line can be identified by a clearly defined main channel although it is clear that flow occurs on an ephemeral basis. Despite its ephemeral flow regime, sufficient saturation occurs for a few obligate wetland species to establish while soils also indicate the establishment of temporary wetland conditions. This also confirms the ephemeral nature as saturated conditions will only occur for short periods.

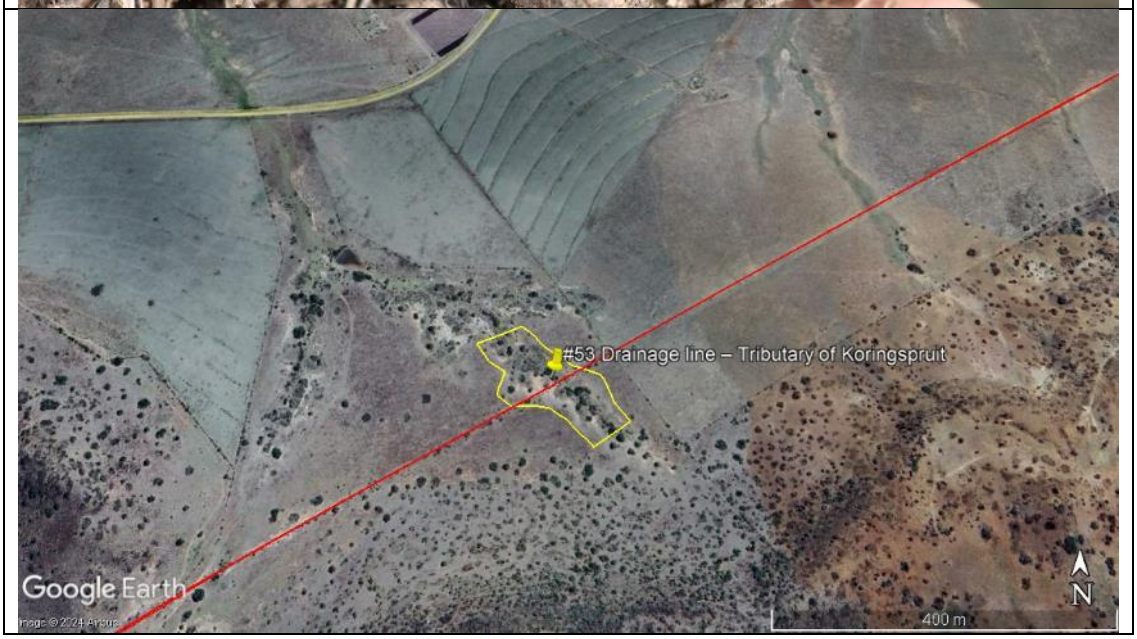
Dominant plant species:
Pennisetum sphacelatum (OW), **Conyza bonariensis, Leptochloa fusca* (OW), **Tagetes minuta, *Cirsium vulgare, Asparagus larcinus, Setaria sphacelata* (FW)

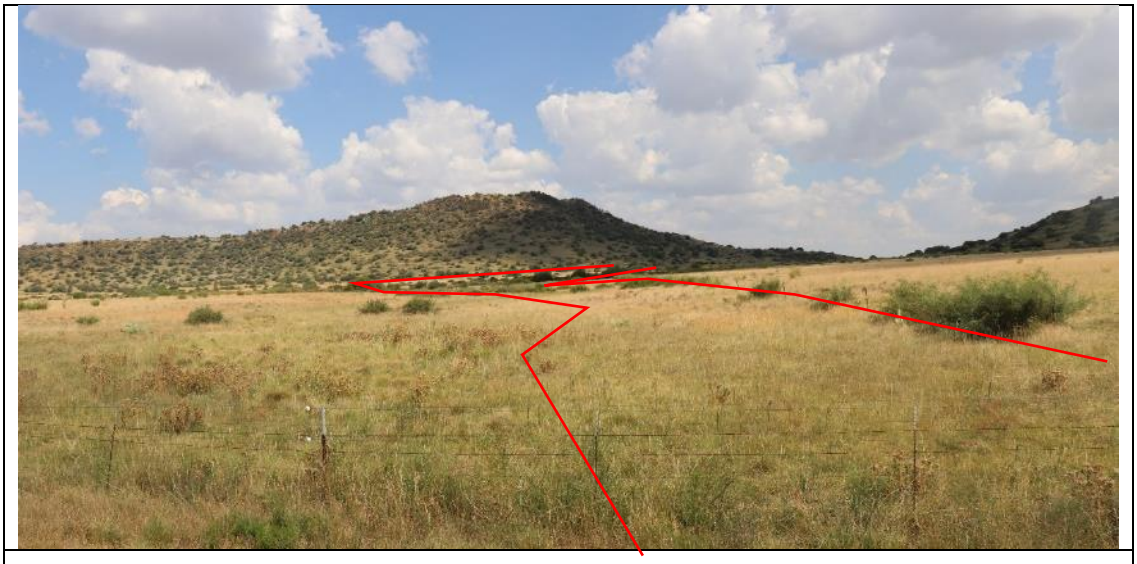
Protected plant species
None observed

Notes:
Moderate Risk – The drainage line is small but due to the overall system being considered to have a higher EI&S and forming part of a NFEPA catchment, the impacts are anticipated to be higher. Furthermore, the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the drainage line.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#54 Drainage line – Tributary of Koringspruit	S 29.271326°, E 26.553136°	Ephemeral drainage line

Description of watercourse:

A very small drainage line that drains along the slope of a hill to the south of the site. It flows from south to north we and drains into the Koringspruit some distance to the north west of the site. The drainage line is situated in a in a natural area, not affected by any road crossings along the pipeline section between the Tierpoort and Rustfontein Dams. The point of crossing could not be accessed and the survey of the system was undertaken a short distance downstream but which is still considered to provide an accurate description of the affected system. At the site and upstream, the drainage line is not currently being crossed by any existing roads or tracks and the pipeline will therefore entail a new impact, thus increasing the anticipated impact as well. The drainage line has its origin along the crest of the hill to the south of the site. It is not affected by many impacts but is being crossed by the gravel road, downstream of the site. A main channel is present, incised into the slope but it is clearly ephemeral and where it enters the lower foothill the slope also decreases and flow slows as well. The drainage line is still clearly ephemeral and continuous flow will only take place during large rainfall events and will flow for short periods. Due to the moderate slope at the site and the higher annual rainfall in this region, temporary wetland conditions have been able to establish here.

The drainage line can be identified by a clearly defined main channel although it is clear that flow occurs on an ephemeral basis. Despite its ephemeral flow regime, sufficient saturation occurs for a few obligate wetland species to establish. Soils do not conclusively indicate the presence of wetland conditions though the presence of temporary wetland conditions can, with certainty be regarded as present. This also confirms the ephemeral nature as saturated conditions will only occur for short periods.

Dominant plant species:

Themeda triandra, Asparagus larcinus, Pennisetum sphacelatum (OW), *Cyperus marginatus* (OW), *Schoenoplectus sp.* (OW), *Setaria sphacelata* (FW), *Agrostis lachnantha* (OW), *Marsilea sp.* (OW), *Cyperus congestus* (OW), *Panicum coloratum* (FW), *Lycium cinerium, Asparagus suaveolens, Rosenia humilis*

Protected plant species

None observed

Notes:
Moderate Risk – The drainage line is small but due to the overall system being considered to have a higher EI&S and forming part of a NFEPA catchment, the impacts are anticipated to be higher. Furthermore, the proposed pipeline will entail a new impact (it is not situated adjacent to a road or other similar existing impacts), the impacts are anticipated to be higher. This is also likely to increase the extent of impacts to downstream areas of the drainage line.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#55 Channelled valley-bottom wetland	S 29.268473°, E 26.571671°°	Temporary wetland

Description of watercourse:
A small but prominent valley-bottom wetland that is situated in a shallow valley between low hills. It flows from west to east and drains into the Rustfontein Dam a short distance to the east of the site. The drainage line is situated in a in a natural area, but affected by a railway crossing and also draining into the Rustfontein Dam downstream of the site. The point of crossing could not be accessed and the survey of the system was undertaken a short distance downstream but which is still considered to provide an accurate description of the affected system. The wetland is situated within a shallow valley, in a higher lying area, which drains directly into the Rustfontein Dam. The origin of this wetland is situated a short distance to the east of the site. The wetland seems to be natural though is clearly modified to some extent by the crossing of a railway line upstream of the site, as well as a large artificial impoundment downstream of the site. The wetland is therefore considered to be modified to a significant extent. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is fairly small and also contains significant levels of modification, although significant wetland conditions will still occur. As a result, obligate wetland vegetation is abundant although soils do not indicate prolonged saturation. These wetland conditions are considered to indicate a temporary zone of saturation and wetland conditions are considered to be present for periods during the rainy season.

Dominant plant species:
Sporobolus fimbriatus. Setaris sphacelata (FW), *Themeda triandra, Panicum coloratum* (FW), *Leptochloa fusca* (OW), *Pennisetum sphacelatum* (OW), **Ciclospermum leptophyllum*

Protected plant species
None observed

Notes:
Low Risk – The wetland is small and already heavily modified and consequently, impacts are anticipated to remain low. In addition, the wetland flows into the Rustfontein Dam a short distance downstream and which will also limit the extent of impacts and also contributes toward the modification of the wetland.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#55 Modder River	S 29.268046°, E 26.615938°	Perennial river

Description of watercourse:

A significant and large perennial river flowing from south to north and forming one the main drainage systems in the region. It originates a long distance to the south of the site. It is affected by a large artificial impoundment, Rustfontein, immediately upstream which will alter the flow and flood regime of the river significantly. A bridge crossing at the site, will also affect it. The NOVO transfer scheme will have a further significant impact on its flow and flooding regime. Limited crop irrigation takes place and will have a low impact on the river. This is a heavily utilised river system which is considered to be quite heavily modified, even in this section upstream of large urban areas. A more detailed discussion of its condition is also given in Section 4.2.6. It contains a large and distinct main channel while the floodplain is also fairly large. Connected main channel flow is anticipated to occur on a perennial basis also largely as a result of the Rustfontein Dam upstream of the site. This is clearly a large river system with large channel of approximately 30 meters in width. Construction through this river will clearly be difficult, require diversion of flow, attenuation areas and permanently saturated areas.

The river will flow throughout the year, with low flows occurring during the winter season. Flow rates can, to some degree, also be controlled by releases from the Rustfontein Dam. Facultative and obligate wetland species are abundant along the main channel and indicate clear wetland conditions. Soil samples also indicate a grey matrix and mottling indicating wetland conditions on a perennial basis, i.e. the river will contain perennially saturated areas along its banks. Several exotic species do indicate some disturbance of the river.

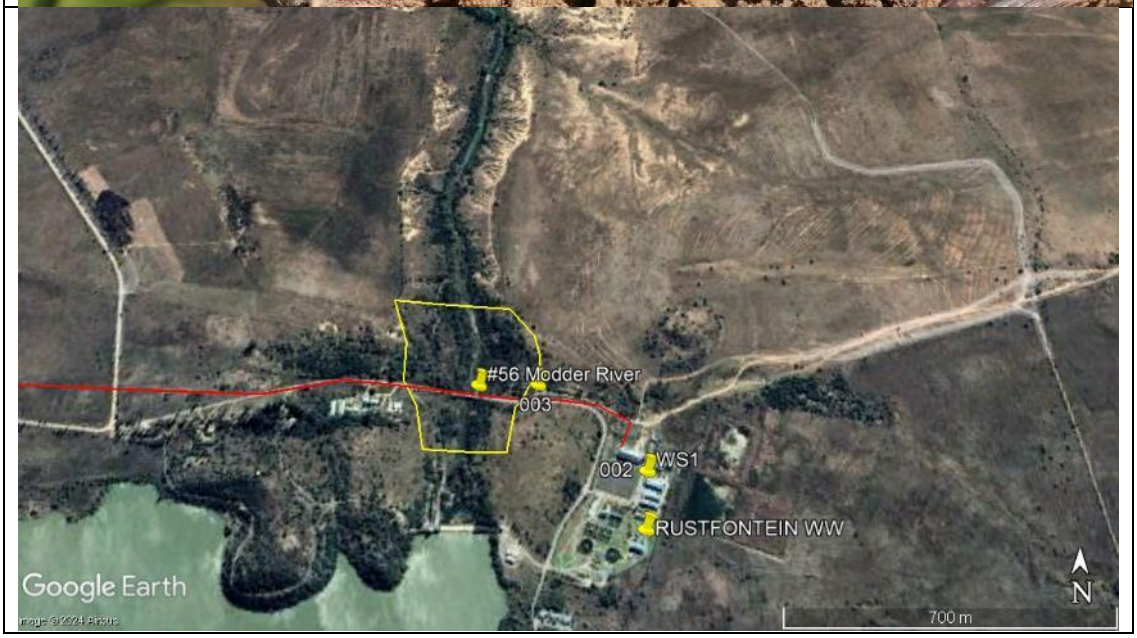
Dominant plant species:
Phragmites australis (OW), **Populus deltoidea, Searsia lancea, Juncus rigidus* (OW), *Vachellia karroo, Cleamtis brachiata, *Gleditsia triacamthos, Searsia pyroides, Themeda triandra, *Verbena bonariensis, *Opuntia lindheimeri, Artemisia afra, Cyperus fastigiatus* (OW), **Xanthium strumarium*

Protected plant species:
None observed

Moderate Risk – The river is a large lowland system which will flow throughout the year, in addition, given the large size of the watercourse and the likelihood of flooding, the impacts are anticipated to be higher.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#57 Channelled valley-bottom wetland – Tributary of Renosterspruit	S 29.329511°, E 26.370340°	Seasonal wetland

Description of watercourse:

A large and prominent valley-bottom wetland that is situated adjacent to the R702 tarred road and is also affected by the existing Welbedacht-Bloemfontein pipeline. The wetland will also be affected by the crossing of the proposed Bloemfontein pipeline section. The system is not easily distinguishable between a valley-bottom and floodplain wetland systems, most probably also due to impacts caused by a large artificial impoundment which modifies its functioning and characteristics. However, given the current condition, it is considered better placed as a channelled valley-bottom wetland system. The origin of this wetland is situated a short distance to the south west of the site. The wetland is most likely modified to a significant degree by a large artificial impoundment upstream while the crossing of the existing pipeline and R702 tarred road will also contribute some impacts to it. As indicated, the point of crossing is already affected by other infrastructure (existing pipeline and road), which is likely to decrease the anticipated impacts associated with the new pipeline. The wetland is considered to be modified to at least a moderate degree but still contains significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is fairly large, containing extensive wetland areas while clearly being at least moderately modified. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:

**Cirsium vulgare, Asparagus larcinus, Eleocharis dregeana* (OW), *Marsilea sp.* (OW), *Paspalum distichum* (OW), *Cyperus longus* (OW), *Schoenoplectus sp.* (OW), *Leptochloa fusca* (OW), *Cynodon transvaalensis, Paspalum dilatatum* (FW), *Themeda triandra, *Xanthium strumarium*

Protected plant species:

None observed.

Notes:

Low Risk – The wetland is already heavily modified, situated along the existing road and pipeline and consequently, impacts are anticipated to remain low. The pipeline will be situated on the

upstream side of the R702 road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#58 Seasonal stream – Tributary of Renosterspruit	S 29.329511°, E 26.370340°	Seasonal wetland

Description of watercourse:
A significant and large seasonal stream with a prominent floodplain flowing from west to east, forming a tributary of the Renosterspruit. The stream is also situated adjacent to the R702 tarred road and is also affected by the existing Welbedacht-Bloemfontein pipeline. The wetland will also be affected by the crossing of the proposed Bloemfontein pipeline section. The origin of the stream is situated a significant distance to the south of the site. The stream will also be most likely modified to a significant degree by a large artificial impoundment upstream while the crossing of the existing pipeline and R702 tarred road will also contribute some impacts to it. As indicated, the point of crossing is already affected by other infrastructure (existing pipeline and road), which is likely to decrease the anticipated impacts associated with the new pipeline. The stream is considered to be modified to at least a moderate degree but still contains significant wetland habitat in good condition while it has also been listed as an NFEPA system, substantially increasing its conservation value. The upstream dam will also contribute toward a steady flow of surface water and the stream is likely to contain low flows at least throughout the rainy season.

The stream is fairly large, containing extensive wetland areas while clearly being at least moderately modified. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:
**Salix babylonica, *Conyza bonariensis, Carex glomerabilis* (OW), *Cyperus congestus* (OW), *Typha capensis* (OW), **Veronica anagalis-aquatica, Paspalum dilatatum* (FW), **Cirsium vulgare, Agrostis lachnantha* (OW), **Verbena bonariensis, Cyperus marginatus* (OW), *Pennisetum sphacelatum* (OW), **Ciclospermum leptophyllum, Juncus rigidus* (OW), *Ranunculus multifidus, Cyperus longus* (OW), *Paspalum distichum* (OW), **Xanthium strumarium*

Protected plant species:
None observed.

Notes:
Moderate Risk – The wetland is already heavily modified, situated along the existing road and pipeline and consequently, impacts are anticipated to remain low. The pipeline will be situated on the upstream side of the R702 road which should therefore act as an impact buffer and decrease the anticipated extent of the impact. However, because the system is considered to have a higher EI&S and forms part of a NFEPA catchment, the risks are anticipated to be higher.

Soil sample:







Watercourse name:	**Coordinates of crossing:**	**Flow regime:**
#59 Channelled valley-bottom wetland – Tributary of Renosterspruit	S 29.273860°, E 26.315374°	Seasonal wetland

Description of watercourse:

A large and prominent valley-bottom wetland that is situated further to the west of the R702 tarred road but which is situated adjacent to the existing Welbedacht-Bloemfontein pipeline. The wetland will also be affected by the crossing of the proposed Bloemfontein pipeline section. The system is not easily distinguishable between a valley-bottom and floodplain wetland systems,

most probably also due to impacts caused by a large artificial impoundment which modifies its functioning and characteristics. However, given the current condition, it is considered better placed as a channelled valley-bottom wetland system. The origin of this wetland is situated a short distance to the south west of the site. The wetland is most likely modified to a significant degree by a large artificial impoundment upstream while the crossing of the existing pipeline will also contribute some impacts to it. As indicated, the point of crossing is already affected by other infrastructure (existing pipeline), which is likely to decrease the anticipated impacts associated with the new pipeline. The wetland is considered to be modified to at least a moderate degree but still contains significant wetland habitat in good condition. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is fairly large, containing extensive wetland areas while clearly being at least moderately modified. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:
Typha capensis (OW), *Cyperus longus* (OW), *Cynodon dactylon, Themeda triandra, Gomphocarpus fruticosus, Panicum coloratum* (FW), *Cyperus congestus* (OW), *Sporobolus iocaldo* (FW), *Cyperus marginatus* (OW), *Pennisetum sphacelatum* (OW), **Cirsium vulgare, Echichloa sp., *Lactuca seriola, Eragrostis obtusa*

Protected plant species:
None observed.

Notes:
Low Risk – The wetland is already heavily modified, situated along the existing pipeline and consequently, impacts are anticipated to remain low. The pipeline will be situated on the upstream side of the R702 road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#60 Channelled valley-bottom wetland – Tributary of Kaalspruit	S 29.206722°, E 26.208117°	Seasonal wetland

Description of watercourse:

A large and prominent valley-bottom wetland that is situated adjacent to the M30 tarred road and is also affected by the existing Welbedacht-Bloemfontein pipeline. The wetland will also be affected by the crossing of the proposed Bloemfontein pipeline section. The system is not easily distinguishable between a valley-bottom and floodplain wetland systems, most probably also due to impacts caused by a large artificial impoundment as well as high volumes of storm water effluent generated by the surrounding urban areas and which modifies its functioning and characteristics. However, given the current condition, it is considered better placed as a channelled valley-bottom wetland system. The origin of this wetland is situated a short distance to the north east of the site and within the urban area of Blowmfotein. The wetland is heavily modified by the urban area and resulting storm water effluent while several large artificial impoundments will also affect it. The crossing of the existing pipeline and M30 tarred road will also contribute some impacts to it. As indicated, the point of crossing is already affected by other infrastructure (existing pipeline and road), which is likely to decrease the anticipated impacts associated with the new pipeline. The wetland is considered to be modified to a large degree though still contains extensive wetland habitats. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland is fairly large, containing extensive wetland areas while clearly being modified to large degree. As a result, obligate wetland vegetation is abundant while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a

seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

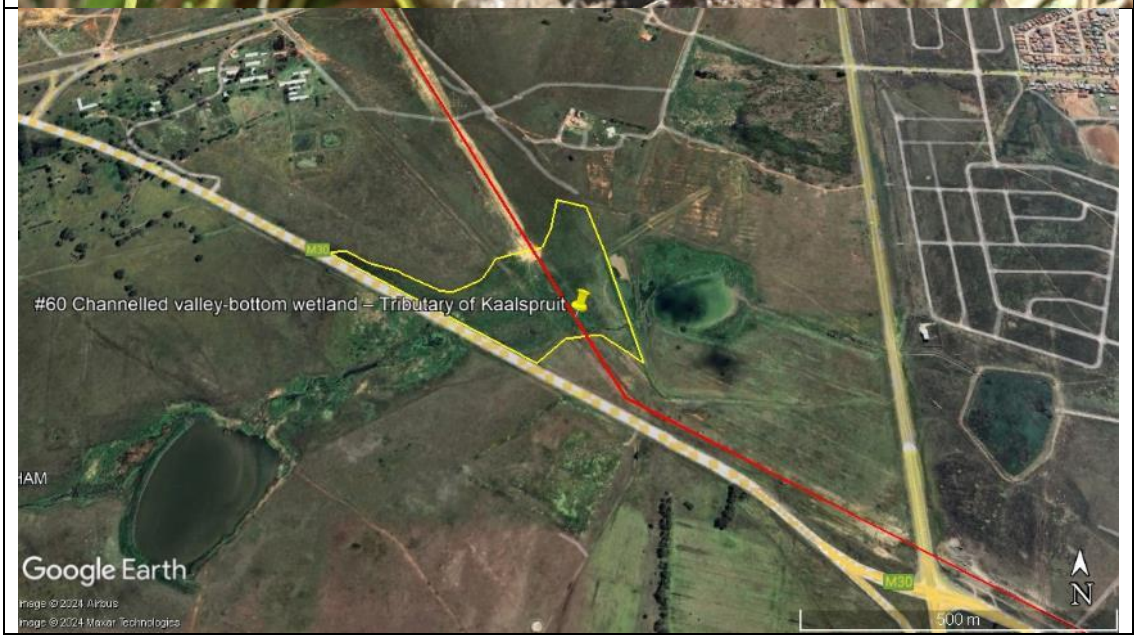
Dominant plant species:
Marsilea sp. (OW), *Paspalum dilatatum* (FW), *Schoenoplectus sp.* (OW), *Cyperus erragrostis* (OW), *Leptochloa fusca* (OW), *Eleocharis dregeana* (OW), *Cyperus longus* (OW), *Persicaria lapathifolia* (OW), *Cyperus congestus* (OW), *Cyperus marginatus* (OW)

Protected plant species:
None observed.

Notes:
Low Risk – The wetland is already heavily modified, situated along the existing road and pipeline and consequently, impacts are anticipated to remain low. The pipeline will be situated on the upstream side of the M30 road which should therefore act as an impact buffer and decrease the anticipated extent of the impact.

Soil sample:







Watercourse name:	Coordinates of crossing:	Flow regime:
#61 Channelled valley-bottom wetland – Tributary of Kaalspruit	S 29.181636°, E 26.184385°	Seasonal wetland

Description of watercourse:

A small and heavily modified valley-bottom wetland that is situated downstream of the N1 National Road, within the urban area of Bloemfontein road and is also affected by the existing Welbedacht-Bloemfontein pipeline. The wetland will also be affected by the crossing of the proposed Bloemfontein pipeline section. The system is heavily modified and is now more akin to a storm water conduit, mostly because it is utilised for the discharge of storm water effluent from urban areas to the north east of the site. It is considered here as most similar to a valley-bottom wetland but may probably have been a drainage line system originally. The origin of this wetland is situated a short distance to the north east of the site and within the urban area of Bloemfontein. The wetland is heavily modified by the urban area and resulting storm water effluent while several infrastructure crossings will also affect it. As indicated, the point of crossing is already affected by other infrastructure (existing pipeline and road), which is likely to decrease the anticipated impacts associated with the new pipeline. The wetland is considered to be modified to a large degree though still contains wetland habitats. The wetland will contain substantial, but diffuse flows and will become saturated for long periods during the rainy season.

The wetland does not contain extensive wetland areas, while clearly being modified to large degree. As a result, obligate wetland vegetation is present while soils are also clearly indicative of wetland conditions. These wetland conditions are considered to at least indicate a seasonal zone of wetness which indicates that the wetland may become saturated for longer periods during the rainy season.

Dominant plant species:

**Xanthium spinosum, *Argemone ochroleuca, Paspalum distichum* (OW), *Marsilea sp.* (OW), **Pennisetum clandestinum, Leptochloa fusca* (OW), *Conyza podocephala, Cyperus erragrostis* (OW), *Cyperus longus* (OW), *Paspalum dilatatum* (FW), *Cyperus congestus* (OW)

Protected plant species:

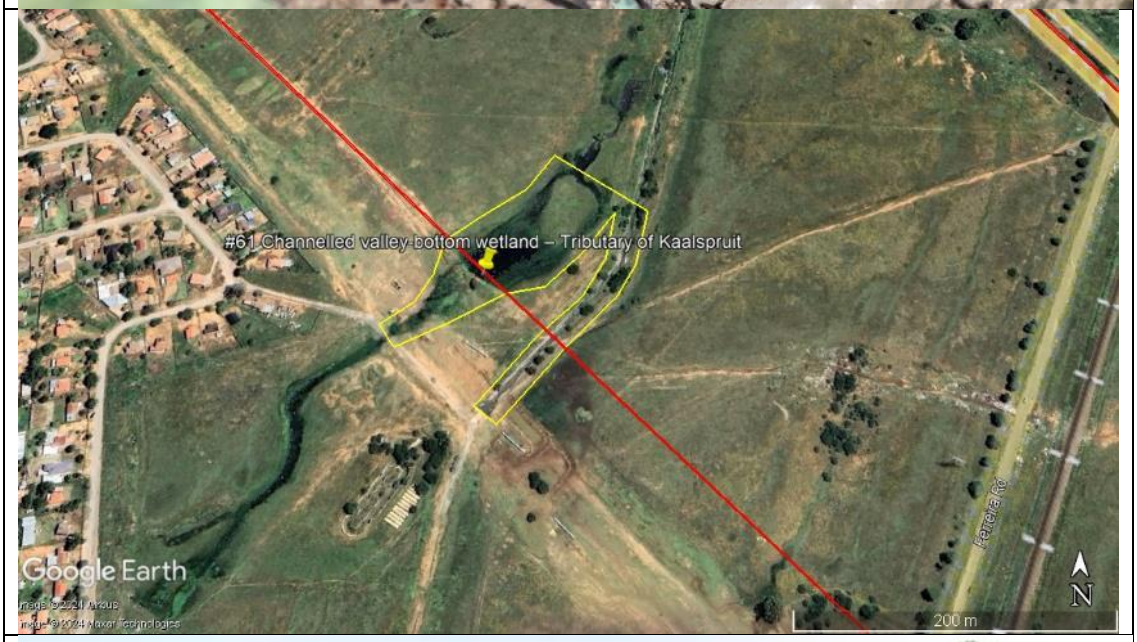
None observed.

Notes:

Low Risk – The wetland is already heavily modified, situated along the existing road and pipeline and consequently, impacts are anticipated to remain low.

Soil sample:




#61 Channelled valley-bottom wetland – Tributary of Kaalspruit
Google Earth
200 m
N





4.3 Risk Assessment

A Risk Assessment for the proposed Xhariep Bulk Water Pipeline from the Gariep Dam to Bloemfontein and the Rustfontein Dam has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). Having a large diameter and therefore requiring extensive trench excavation and construction footprint will result in significant impacts on the affected watercourses and wetlands. The following was also taken into account and which is considered to contribute toward lowering these impacts. These include:

- Those sections of the pipeline situated adjacent to similar existing impacts such as the N1 National Road, larger gravel roads and the existing Welbedacht-Bloemfontein bulk water pipeline already impact on the watercourses and wetlands and they already contain disturbances associated with a similar development and the proposed pipeline will therefore not entail a new impact but will simply contribute toward existing impacts.
- Where roads cross over watercourses and wetlands they influence the flow and flooding regime. Upstream of these structures this results in the retardation of flow and accumulation of sediments. Downstream of these structures results in concentrated flow and more erosion. As a result, in those instances where the pipeline will be situated on the upstream side of roads, the likelihood of erosion will be lower, while the structure itself can also be used as a buffer in order to contain impacts to the construction site while limiting the impacts downstream.
- The road reserve along the N1 National Road contains high levels of disturbance and should the pipeline installation be able to retain the disturbance footprint within the road reserve, it will also decrease the anticipated impact significantly.
- The impacts associated with the pipeline will be largely confined to the construction phase and will largely cease once successful rehabilitation of the watercourse or wetland has been completed.

The pipeline is extensive and will have a length of more than 200 km while also requiring a significant construction footprint and will therefore affect almost 70 different watercourses and wetlands and it is evident that these vary considerably in terms of their characteristics, functioning and descriptions and consequently the impacts on them will also vary significantly (Appendix A: Map 2 – 7). The following aspects has therefore also been taken into account and which has influenced the risk determination on these systems:

- Almost all affected wetland and watercourses are linear systems, i.e. they are connected to downstream areas. Consequently, impacts on them may also be propagated to downstream sections and which will increase the extent of the impact.
- Where watercourses occur along steeper slopes, this will increase the erosion potential and the implementation of erosion intervention structures are also more likely to be necessary.
- The majority of watercourses are ephemeral in terms of flow regime and will therefore only flow after heavy rainfall events or during years of high rainfall. However, they are all subjected to periodic flash floods and which is important to take into account.
- Larger wetlands and watercourses, or where soil saturation occurs for longer periods will be more difficult for construction, will experience frequent inundation of trenches and construction areas, will require diversion of flow, attenuation areas and will increase the pollution risk during construction.

- Several systems form part of National Freshwater Ecosystem Priority Areas (NFEPA) and includes systems such as the Donkerkloofspruit, Vanzylspruit, Tributary of the Tierpoort River, Tributary of the Renosterspruit, Koringspruit as well as a few smaller wetlands. All of these must be regarded as having a higher conservation value which increases their Ecological Importance & Sensitivity (EI&S) and thus increasing the anticipated risk.
- Where the proposed pipeline route will not be situated along any existing roads or infrastructure, the anticipated impact on wetlands and watercourses will be higher.

The following 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 (Appendix E):

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. Impacts are however still anticipated to be significant and the following interventions and mitigation is therefore recommended:

- 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 increased sedimentation of the river. As a result, disturbance of the banks should be kept to a minimum and erosion remediated where it occurs.
- Removal of vegetation should also be kept to a minimum.
- The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the construction site prior to construction and continued until rehabilitation of the pipeline route has been completed (Appendix B).

- 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.
- Where concrete is utilised the detrimental impacts of uncured cement on watercourses must be taken into consideration.
- 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.
- The construction and excavation through the floodplain of affected watercourses is likely to result in fewer impacts as compared to the main channel of the watercourse. This is largely due to the absence of concentrated flow here, which will reduce the risks for erosion occurring. However, the removal of riparian and wetland vegetation will still result in significant impacts.
- During construction, vehicles are likely to contribute to trampling of saturated soils, the construction footprint may also result in compacted soils and the disturbance footprint will also be highly susceptible to the establishment and proliferation of exotic weeds.
- 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.
- When trenches are excavated through any river and a flood event takes place this will lead to an obstruction to flow to some degree and will retard flow considerably. It is not possible to recommend any mitigation for this as flooding events are unpredictable. The only mitigation which will alleviate this impact should it occur is that construction through watercourses and wetlands 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.
- 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.

- Monitoring of construction and compliance with recommended mitigation measures must take place and should include biomonitoring of wetlands by using the WET-Health 2 indices while watercourses should be monitored by using the Index of Habitat Integrity indices. The larger seasonal and perennial watercourses should be monitored using periodic water quality monitoring and SASS5 and FRAI indices.
- 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.

For the complete risk assessment please refer to Appendix E.

5. Biodiversity sensitivity rating (BSR)

Habitat diversity and species richness:
Habitat diversity along the pipeline route is considered moderate. Along the entire route only five vegetation types occur (Appendix A: Map 1), 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 amount of protected species and certain habitats may contain a higher diversity of species often associated with watercourses and their floodplains and hills and ridges.

Presence of rare and endangered species:
The pipeline route does not contain any exceptionally rare or endangered species which could be identified and the area is not known for such species. However, several protected species were noted and it is likely that many others will occur (Appendix B).

Noted protected species include *Euphorbia clavaroides, E. arida, Kniphofia ensifolia* subsp. *ensifolia, Eucomis autumnalis, Avonia ustulata* and *Mesembryanthemum rabiei*.

Some of these are also considered as regional endemic endemic species such as *Euphorbia arida, Mesembryanthemum rabiei* and *Nananthus sp.* which are confined to the floodplains of some of the larger watercourses in the region.

Ecological function:
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.

Degree of rarity/conservation value:
According to Mucina & Rutherford (2006) the pipeline route will be situated within the Central Free State Grassland (Gh 6), Winburg Grassy Shrubland (Gh 7), Bloemfontein Dry Grassland (Gh 5), Xhariep Karroid Grassland (Gh 3) and Besemkaree Koppies Shrubland (Gh 4). All of these are listed as being of Least Concern (LC) except for the Bloemfontein Dry Grassland which is listed as a Threatened Ecosystem with a status of Vulnerable (VU) (National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)) (Appendix A: Map 1). A portion of this vegetation type occurs in the northern part of the pipeline route. However, the footprint of the pipeline will be limited and not a large portion of the vegetation will be transformed.

Numerous protected species occurring along the watercourses crossed by the pipeline have a significant conservation value (Appendix B). However, as long as they are transplanted during the construction process, the impact on them will be low. The pipeline footprint being limited, the number of these species which will be affected will also remain low.

The majority of the watercourses along the pipeline route is in a good condition with few modifications. Normally all watercourses are considered as sensitive system, consequently the affected watercourses being in a good condition should be considered even more so.

Percentage ground cover:
The percentage ground cover ranges from high in the north to sparse in the south but is considered natural along most of the route.

Vegetation structure:
The vegetation structure along most of the watercourses is still largely natural. Where some of the larger watercourses are affected by large impoundments the vegetation structure would have been modified to some degree. As discussed in section 4.2.2 flooding plays a vital role in these systems and alter and modify riparian communities on a constant basis. Large impoundments however restrict flooding and as a result the riparian communities are also altered where such impoundments alter the flooding regime.

Infestation with exotic weeds and invader plants:
Exotic weeds and invaders are present along most of the watercourses and may become more abundant where cropfields or impoundments occur upstream or where a road crossing occurs in close proximity but do not dominate in any of the watercourses.

Degree of grazing/browsing impact:
Almost the entire pipeline route is situated within an area utilised as natural grazing for domestic stock. Overgrazing is not visibly high but is nonetheless still considered as moderate.

Signs of erosion:
Erosion occurs along several of the watercourses in the form of gulley erosion. In all cases this is considered part of the natural functioning of these watercourses whereby silt is removed from some areas and deposited in others. The erosion is however exacerbated in some areas due to trampling which mobilises sediment and road or rail crossings where culverts concentrate flow and encourage erosion. Erosion is therefore considered moderate.

Terrestrial animals:
The watercourses along the pipeline route are all seasonal or ephemeral in nature and therefore limit the aquatic fauna to those adapted to survive dry times in the dormant state or in perennial pools. As a result the diversity of aquatic fauna is relatively low although it contains several unique species adapted to these systems. Although unique, they are almost all widespread and relatively common and therefore not of significantly high conservation concern. The exception being the Giant Bullfrog (*A. adpsersus*) and Cape Clawless Otter (*A. capensis*), both being Near Threatened. Although not observed along any of the watercourses it remains likely that they will occur. Empty shells of the Cape River Mussel (*Unio caffer*) indicate a population of this species in the Riet River. It is also listed as being Near Threatened (NT).

Table 10: Biodiversity Sensitivity Rating for the proposed pipeline development.

	Low (3)	Medium (2)	High (1)
Vegetation characteristics			
Habitat diversity & Species richness		2	
Presence of rare and endangered species		2	
Ecological function			1
Uniqueness/conservation value			1
Vegetation condition			
Percentage ground cover			1
Vegetation structure		2	
Infestation with exotic weeds and invader plants or encroachers		2	
Degree of grazing/browsing impact		2	
Signs of erosion		2	
Terrestrial animal characteristics			
Presence of rare and endangered species		2	
Sub total	0	14	3
Total		17	

6. Biodiversity sensitivity rating (BSR) interpretation

Table 11: Interpretation of Biodiversity Sensitivity Rating.

Site	Score	Site Preference Rating	Value
Xhariep Bulk Water Pipeline	17	Good Condition	2

7. Comparative developments (Welbedacht Pipeline)

A development very similar to the proposed Xhariep Bulk Water Pipeline project was the construction of the Welbedacht Dam – Bloemfontein bulk water transport pipeline constructed in 1973. The pipeline diameter and underground installation was similar to the proposed Xhariep pipeline development. That pipeline was completed more than 40 years ago. A visual inspection of some of the larger watercourses was done to determine if this similar project had any long term impacts on them. The aim of this was to determine if the proposed Xhariep pipeline between the Gariep and Rustfontein Dams and Bloemfontein would have any prominent long term or permanent impacts on the watercourses and their associated wetlands where the pipeline will cross them.

Form the survey of the area where the pipeline was installed it showed no discernible residual impacts from the initial installation of the pipeline. The bed and bank morphology is not different from the surrounding unaffected areas and the installation of the pipeline has not caused any flow obstruction or structure promoting erosion or scouring of the watercourse. The riparian and wetland vegetation within the watercourse is also indistinguishable from the surrounding unaffected vegetation and the species composition is the same within the pipeline footprint and surrounding area. It can therefore be concluded that the installation of the proposed Xhariep pipeline can be done without having any long term or permanent alteration to the watercourses it will cross. This is however also dependant on adequate mitigation and rehabilitation but serves to illustrate that it is possible.



Figure 22: View of the installation of the Welbedacht – Bloemfontein. Note that initial disturbance was substantial (eWISA 2017).



Figure 23: View of a seasonal watercourse (blue) through which the Welbedacht pipeline (red) was installed. The inspection manhole is all that remain. Note that the vegetation composition does not indicate any residual impact from the pipeline.



Figure 24: Another view of a seasonal watercourse (blue) through which the Welbedacht pipeline (red) was installed. Note again that no permanent modification to the stream morphology or species composition has resulted.

However, more recent refurbishment and replacement of the old Welbedacht – Bloemfontein pipeline has confirmed that the mitigation impacts and prevention of long term impacts on wetlands and watercourses are largely dependant on the implementation of adequate and successful rehabilitation being implemented. Notable impacts which will hamper rehabilitation and which will result in long terms impacts on wetlands and watercourses include:

- Failure to re-instate the natural surface topography results in habitat that is not easily integrated into the surrounding natural environment and also acts as flow barriers within wetlands and watercourses.
- Spoil and rock dumps are not able to be rehabilitated and remain disturbance nodes from where exotic vegetation can spread into the surroundings.
- Poor topsoil management and a lack of exotic weed monitoring and eradication leads to the establishment of invasive species that are likely to persist in the area unless active monitoring and eradication is implemented.



Figure 25: Poor surface rehabilitation (red), results in the area being unable to integrate into the natural surroundings and also acts as flow barrier to wetlands (blue).



Figure 26: Leaving spoil and rock dumps in the landscape will result in areas that are not able to be rehabilitated and will persist as disturbance nodes.



Figure 27: Poor topsoil management and rehabilitation leads to the establishment of invasive species (*Nicotiana glauca* – red) which are likely to persist in the landscape without any additional intervention.

8. Anticipated impacts

The proposed pipeline is anticipated to have several significant impacts on the watercourses and wetlands being crossed. These will be discussed below. Please refer to Appendix F for the impact methodology.

Watercourses are affected in a somewhat different manner than terrestrial systems. Most of the impacts will be comparable but it should be kept in mind that where terrestrial systems are affected the impact is often localised to the immediate area of the activity. In contrast, watercourses are linear systems, connected to downstream areas. Consequently, impacts on a watercourse is often propagated to downstream sections.

Loss of riparian and wetland vegetation, including protected and rare species

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 most prominent impacts associated with this will be the loss of vegetation and protected species and therefore a loss of diversity. 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. The impact on species of conservation importance should remain moderate, as the footprint, though significant, does not extend over large areas, while adequate mitigation (transplanting affected specimens) will further decrease the anticipated impact. In addition, allowing that adequate topsoil management and rehabilitation is undertaken, the affected area should be able to re-establish a vegetation composition that is fairly similar to the natural condition. This is also affirmed by observation of the Welbedacht pipeline (Section 7). The loss of any protected or rare species can further be mitigated by transplanting these to adjacent areas where they will not be affected by the pipeline (Appendix B). The loss of natural vegetation can also be further mitigated by retaining the construction footprint, wherever possible, within the road reserve of the N1 National Road.

The impact itself will be limited to the construction phase of the development although the effects of it will be visible long after the completion of construction. As a result it is also recommended that monitoring and remedial action be maintained for a period of two years after construction has been completed.

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, tranplant			
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.			

Disturbing the bed and banks of watercourses and the associated erosion and sedimentation

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. As a result disturbance of the banks should be kept to a minimum and erosion remediated where it occurs. Removal of vegetation should also be kept to a minimum. 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. This will also provide a stable environment for the re-establishment of the natural vegetation community.

Sedimentation of watercourses caused by erosion and the release of the resultant sediments into the watercourse has several detrimental impacts on watercourses. This includes the suffocation of aquatic vegetation, prevention of plankton to photosynthesize and increasing the turbidity of the water column amongst others.

The impact itself will be limited to the construction phase of the development although the effects of it will continue for a period after construction has been completed. As a result it is also recommended that monitoring and remedial action be maintained for a period of two years after construction has been completed.

Several mitigation measures are recommended to attempt to minimise erosion and to promote stabilisation of the bed and banks.

When excavating in 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. After rehabilitation any excess soil or material should be removed and disposed of at a registered disposal facility. Installation of the pipeline through the watercourses should preferably be undertaken during the winter months (July to September) when baseflow will be at its lowest level and the likelihood of erosion will be lowest.

The watercourse bed and bank morphology should also be re-instated as far as possible, which will also speed up the stabilisation of the bed and banks as it will resemble the surrounding stream morphology and therefore won't be subjected to additional erosion as opposed to depressions or extrusions which will be subjected to erosion during flooding.

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. Upon refilling of the trench this will cause an area of the bed of the watercourse to be susceptible to erosion and scouring in comparison to the surrounding bedrock which will be resistant to erosion and scouring. As a result 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.

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.

Ref:	2			
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, re-instate bank and bed geomorphology to**			
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 birdges 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.			

Establishment of exotic weeds and invaders

The disturbance caused by construction will also cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the crossing sites prior to construction and continued until rehabilitation of the pipeline route has been completed. This should include monitoring and eradication for a period of at least 2 years after construction has ceased.

Watercourses function with a natural disturbance regime. Annual or ephemeral flooding causes disturbance due to scouring, removal of vegetation and depositing of sediments. This causes areas of disturbance which are naturally colonised by pioneer species. This however also cause watercourses to be highly susceptible to the establishment of exotics. As a result the monitoring and eradication of exotic species should be especially important along watercourses and wetlands.

This impact is however easily mitigated should adequate weed eradication and monitoring be implemented.

Ref:	3			
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.			

Altering the flow and flooding regime of watercourses

Altering the flow and flooding regime seriously modifies the natural functioning of watercourses. This is especially so for seasonal and ephemeral systems and should be clear from the discussion in Section 4.2.2.

The installation of the pipeline may influence the flow and flooding regime as a result of the excavation of trenches for the installation of the pipeline and is therefore only likely to impact them during the construction phase. However, should a pylon bridge be constructed over a watercourse this may retard flow and flooding events albeit on a low scale. The pipeline will however be installed underground as far as possible and the impact is therefore focused on the excavation of trenches during the construction phase.

When tranches are excavated through watercourses and flooding takes place this will lead to an obstruction to flooding to some degree and will retard flow considerably. It is not possible to recommend any mitigation for this as flooding of ephemeral systems are unpredictable. The only mitigation which will alleviate this impact should it occur is that construction through ephemeral systems be completed in the shortest timeframe to minimise the likelihood of flooding taking place and that no open trenches through ephemeral systems be left for any extended period. Where trenches are being excavated through seasonal watercourses this should preferably be done during the winter months when base flow will be lowest and flooding is unlikely to take place.

The larger seasonal watercourses are more likely to be affected by this impact as they flow for longer periods. This impact can be minimised by completing construction in these areas during the winter months (July to September). Where this is not possible and the main channel experiences active connected flow only half of the channel should be blocked of 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.

The impact is only relevant during the construction phase and will not be present during operation as long as backfilling and rehabilitation is adequately undertaken.

Ref:	4			
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
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.			

Maintenance and repair of pipeline and associated infrastructure

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.

A comprehensive maintenance management plan should therefore 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.

Ref:	5			
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 constructoin phase and can be significant should adequate and successful rehabilitation not be implemented.			
Cumulative impacts	Cumulative impacts should remain fairly low as repair and maintenance is usually confined to localised sites.			

The no-go alternative or retaining the status quo of affected watercourses and wetland would simply result in these systems remaining in their current condition which varies from being Largely Natural to Largely Modified.

7. Discussion and conclusions (Appendix A: Map 1 & 2)

The general ecology and ecosystem health along the proposed pipeline route is considered in a relatively good condition and although some impacts affect the area preventing it from being pristine it is still largely natural and in a good condition.

The development entails the proposed construction of a potable water transfer pipeline in order to augment the requirements of the Mangaung Metropolitan Municipality. The pipeline will be constructed from the Gariep Dam to the city of Bloemfontein and will roughly follow the layout of the N1 National Road situated alongside this road (Appendix A: Map 1 & 2). The pipeline will then veer away from the N1 National Road just to the south of the Tierpooort Dam from where it will cross over natural areas and along gravel roads. Where the pipeline meets the R702 tarred road, it will split off into two lines, one being a gravity/pumped pipeline to Bloemfontein (Alternative 1B1/2 – Gravity/Pumped line to Bloemfontein) and the other connecting to the Rustfontein Dam (Alternative 1B – Gariep – Rustfontein) (Figure 1 & 2). The pipeline will have a diameter of 1.2 meters and will require a footprint width of approximately 40 meters. Large sections of the pipeline will be situated within the road reserve of the N1 National Road though large portions will also be situated in natural areas. In general, the catchment of the watercourses and wetlands in the Southern Free State are still natural with limited transformation and as a result, these systems are also still functioning largely naturally. Impacts that may still affect these systems include infrastructure such as the N1 National Road and an extensive gravel road network, limited transformation for small crop fields and some irrigated fields and farm dams and weirs acting as containment structures. A large number of watercourses and wetlands will be affected by the pipeline construction though almost all of these are seasonal systems and will only contain active flow after rainfall occurs. Due to the current drought in the area, the majority of these also did not contain any flow or surface water during the survey, though soils were still saturated and contains prominent wetland indicators in almost all affected systems.

The majority of the pipeline route consists of natural vegetation except in the north of the route and within the Bloemfontein Dry Grassland where portions has been transformed for crop cultivation (Appendix A: Map 1). The natural vegetation structure is largely intact but may be degraded to a significant extent where the pipeline route occurs in or close to road reserves (particularly the N1 National Road). Where the route occurs near small towns the natural vegetation is also degraded to some extent. The most significant impact along the majority of the pipeline route is grazing by domestic stock which is considered a relatively low impact. Scattered small crop fields and irrigated fields occur, especially along the larger rivers (Riet River, Vanzylspruit, Tierpoort River) though are normally localised and does not entail a high impact.

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 (Appendix A: Map 1). 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 (Appendix A: Map 2). 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 (Appendix A: Map 1 - 7).

The entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and RietModder Sub WMA (Appendix A: Map 2). 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 (Appendix A: Map 2 - 7):

- 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 **(FEPA) 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 National Freshwater Ecosystem Priority Area's **(FEPA) 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 Renostersprui, 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 National Freshwater Ecosystem Priority Area's **(FEPA) 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 National Freshwater Ecosystem Priority Area (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 not compromise this natural functioning to any significant degree.

The watercourses and wetland systems were delineated by use of topography (land form and drainage pattern) and riparian vegetation with limited soil sampling (Appendix C). The presence of wetland conditions was also confirmed by undertaking a sample survey within each of the watercourses and wetlands which will be affected by the pipeline route (Section 4.2.7: Table 9).

Due to the high amount of watercourses being crossed by the pipeline a determination of the Index of Habitat Integrity (IHI) will only be conducted for the larger watercourses being crossed by the pipeline (Appendix A: Map 2 - 7). These will be the Modder River, Koringspruit, Tierpoort River, Riet River, Vanzylspruit and Bossiespruit. This is considered to give an adequate representation of the overall condition of the watercourses being crossed by the pipeline. The IHI will be taken as representative of the Present Ecological State (PES) of these systems. As previously indicated, the entire pipeline route falls within the Upper Orange Water Management Area (WMA) which can also be subdivided into the Vanderkloof and Riet-Modder Rivers 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 and their catchments affected by largely the same impacts and the impact caused by the proposed pipeline will therefore largely affect them to the same degree and their assessment is therefore considered to give a fairly good indication of the overall condition of watercourses that will be affected by the pipeline development. In order to further improve the determination of the condition of the affected watercourses, a WET-Health determination will also be undertaken for portions of a few of the larger floodplain wetlands which will be affected by the pipeline development (Appendix D).

Table 12: Summary of Present Ecological State (PES) scores for significant watercourses assessed along the pipeline route.

Watercourse	PES	EI&S	Order
Modder River	Class D: Largely Modified	Moderate	3
Koringspruit	Class C: Moderately Modified	High	1
Tierpoort River	Class C: Moderately Modified	High	2
Riet River	Class C: Moderately Modified	Moderate	4
Vanzylspruit	Class B/C: Largely Natural to Moderately Modified	High	2
Bossiespruit	Class C: Moderately Modified	Moderate	1

The results of the assessment of the significant watercourses along the pipeline route indicate that the majority are still natural to a large extent and only moderately modified (Table 12). It is also evident that the larger watercourses affected by higher levels of utilisation are more modified while the proximity to urban areas (Modder and Tierpoort Rivers), also corresponds to a decrease in condition.

The propose pipeline route will cross over and affect a large number of watercourses and wetlands (Appendix A: Map 2 - 7). A short description of these watercourses and wetland, their

vegetation composition and functioning has been provided (Section 4.2.7: Table 9). Where several tributaries are situated adjacent to each other, or where a watercourse is crossed at more than one point, they may be combined in one sample site to serve as representative for all affected sections.

A Risk Assessment for the proposed Xhariep Bulk Water Pipeline from the Gariep Dam to Bloemfontein and the Rustfontein Dam has been undertaken according to the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use (Appendix E). Having a large diameter and therefore requiring extensive trench excavation and construction footprint will result in significant impacts on the affected watercourses and wetlands. The following was also taken into account and which is considered to contribute toward lowering these impacts. These include:

- Those sections of the pipeline situated adjacent to similar existing impacts such as the N1 National Road, larger gravel roads and the existing Welbedacht-Bloemfontein bulk water pipeline already impact on the watercourses and wetlands and they already contain disturbances associated with a similar development and the proposed pipeline will therefore not entail a new impact but will simply contribute toward existing impacts.
- Where roads cross over watercourses and wetlands they influence the flow and flooding regime. Upstream of these structures this results in the retardation of flow and accumulation of sediments. Downstream of these structures results in concentrated flow and more erosion. As a result, in those instances where the pipeline will be situated on the upstream side of roads, the likelihood of erosion will be lower, while the structure itself can also be used as a buffer in order to contain impacts to the construction site while limiting the impacts downstream.
- The road reserve along the N1 National Road contains high levels of disturbance and should the pipeline installation be able to retain the disturbance footprint within the road reserve, it will also decrease the anticipated impact significantly.
- The impacts associated with the pipeline will be largely confined to the construction phase and will largely cease once successful rehabilitation of the watercourse or wetland has been completed.

The pipeline is extensive and will have a length of more than 200 km while also requiring a significant construction footprint and will therefore affect almost 70 different watercourses and wetlands and it is evident that these vary considerably in terms of their characteristics, functioning and descriptions and consequently the impacts on them will also vary significantly (Appendix A: Map 2 – 7). The following aspects has therefore also been taken into account and which has influenced the risk determination on these systems:

- Almost all affected wetland and watercourses are linear systems, i.e. they are connected to downstream areas. Consequently, impacts on them may also be propagated to downstream sections and which will increase the extent of the impact.
- Where watercourses occur along steeper slopes, this will increase the erosion potential and the implementation of erosion intervention structures are also more likely to be necessary.
- The majority of watercourses are ephemeral in terms of flow regime and will therefore only flow after heavy rainfall events or during years of high rainfall. However, they are all subjected to periodic flash floods and which is important to take into account.
- Larger wetlands and watercourses, or where soil saturation occurs for longer periods will be more difficult for construction, will experience frequent inundation of trenches and

construction areas, will require diversion of flow, attenuation areas and will increase the pollution risk during construction.

- Several systems form part of National Freshwater Ecosystem Priority Areas (NFEPA) and includes systems such as the Donkerkloofspruit, Vanzylspruit, Tributary of the Tierpoort River, Tributary of the Renosterspruit, Koringspruit as well as a few smaller wetlands. All of these must be regarded as having a higher conservation value which increases their Ecological Importance & Sensitivity (EI&S) and thus increasing the anticipated risk.
- Where the proposed pipeline route will not be situated along any existing roads or infrastructure, the anticipated impact on wetlands and watercourses will be higher.

The following 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 (Appendix E):

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 (Appendix E). 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. Impacts are however still anticipated to be significant and the following interventions and mitigation is therefore recommended:

8. Recommendations

- 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.

- As discussed in the report, the affected area contains numerous protected species (Appendix B). 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). 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). 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

increased sedimentation of the 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 (Section 4.2.7: Table 9). 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 (Section 4.2.7: Table 9) (Appendix A: Map 2 - 7).

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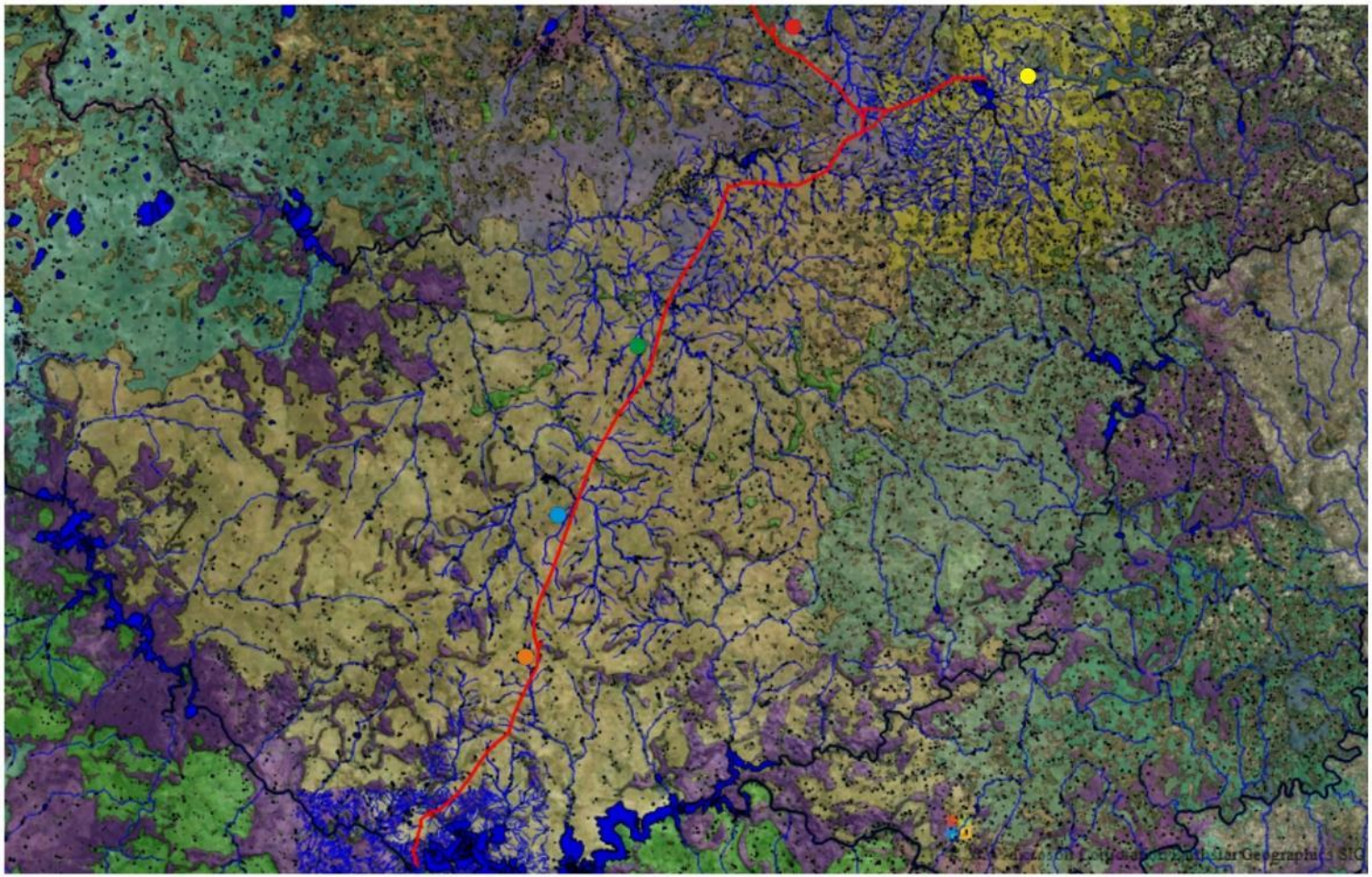
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Annexure A: Maps

Locality map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.





Preparred for:
Zutari
1 Century City Drive
Century City
Cape Town

Legend:

- Pipeline route
- Watercourses
- Wetlands and impoundments
- Central Free State Grassland
- Bloemfontein Dry Grassland
- Winburg Grassy Shrubland
- Xhariep Karroid Grassland
- Besemkaree Koppies Shrub
- Bloemfontein
- Botshabelo
- Edinburg
- Trompsburg
- Springfontein

Map Information

Spheroid: WGS 84

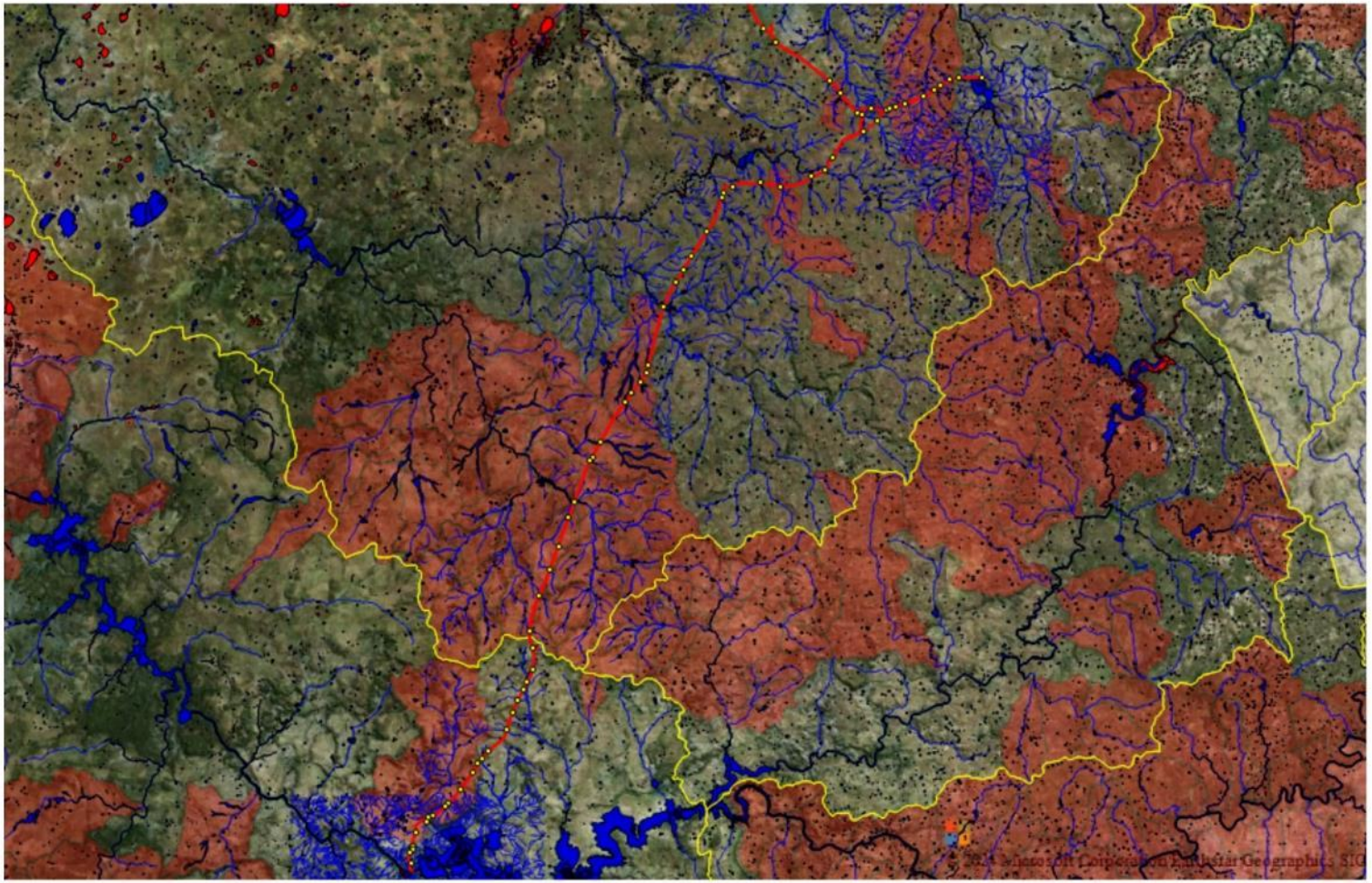
Quantum GIS

Scale: 1:1 280 000

DPR Ecologists
Contact Darius van Rensburg at:
darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
Tel: 083 410 0770

Map 1: Locality map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The pipeline route is indicated as well as the towns situated along it. Major watercourses, wetlands and impoundments are also indicated and it is clear that a high number of watercourses and wetlands will be affected by the development. The remaining natural vegetation types area also indicated which illustrates a moderate diversity of vegetation types with the central section being fairly uniform while the vegetation is also clealry still largely natural but some transformation increasing toward the north and north east, mostly due to dryland crop production.

Watercourses and wetlands map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.





Preparred for:
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Century City
Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

Spheroid: WGS 84

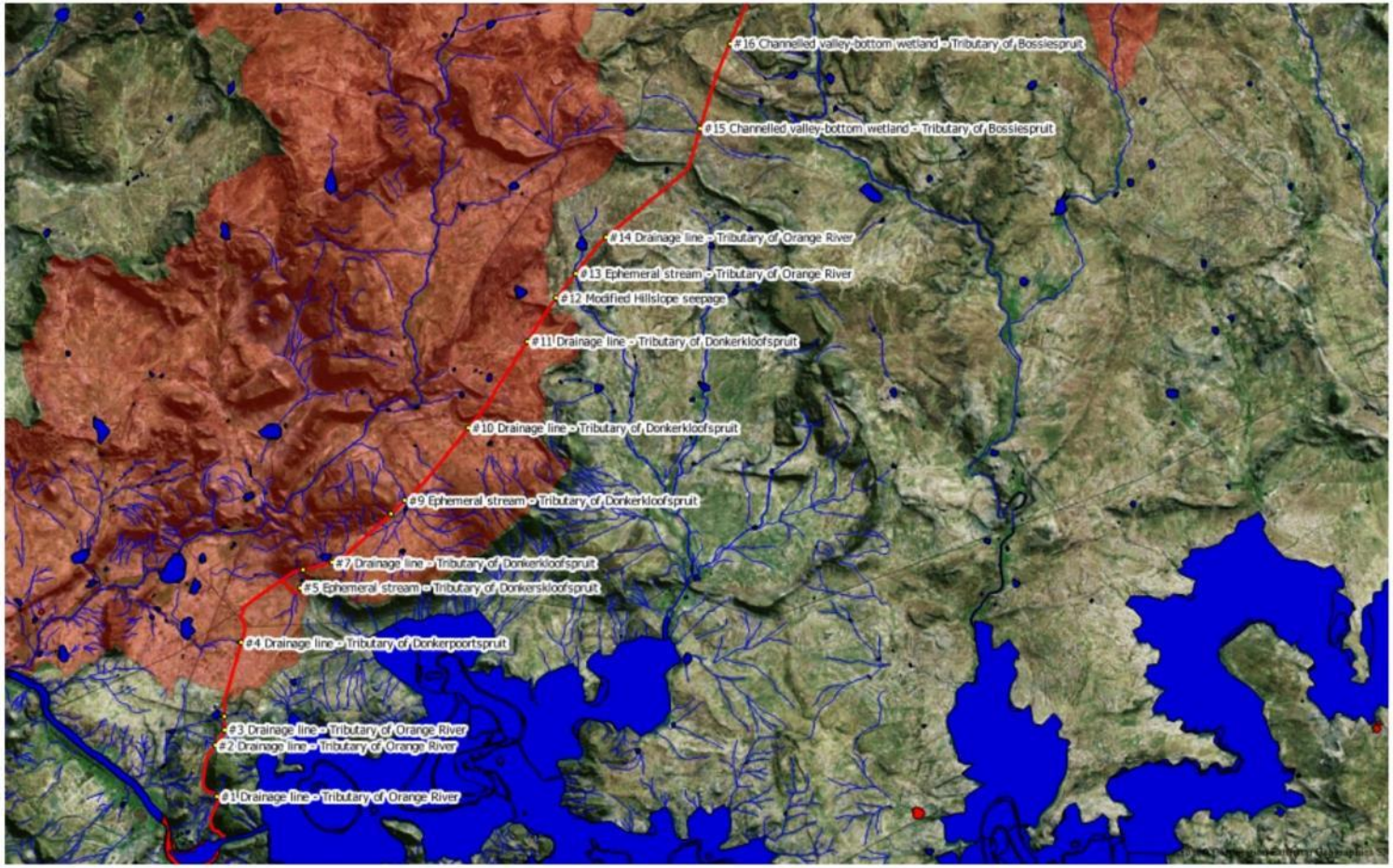
Quantum GIS

Scale: 1:1 280 000

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darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
Tel: 083 410 0770

Map 2: Overall watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The pipeline route is indicated as well as major watercourses and wetland along the pipeline route. All of the crossings occurring along the route are also indicated and it is notable that there will be a high number of affected watercourses and wetlands involved. However, these watercourses and wetlands all form part of the Upper Gariep Water Management Area (WMA), while they are also situated in only two Sub WMA's namely the northern Modder-Riet Sub WMA and southern Vanderkloof Sub WMA.

Watercourses and wetland crossings map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.



Map 3: Overall watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The southern section of the pipeline route will connect to an existing abstraction from the Gariep Dam from where it will be situated adjacent to the N1 National Road to the north. Watercourses and wetlands in this section are almost all ephemeral systems due to the arid climate and all drain southwards towards the Orange River. Many smaller drainage lines also form part of the Donkerkloofspruit stream system which is also listed as a National Freshwater Ecosystem Priority Area (NFEPA) river system and these watercourses are therefore considered to have a higher conservation value.



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Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and Impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

Spheroid: WGS 84

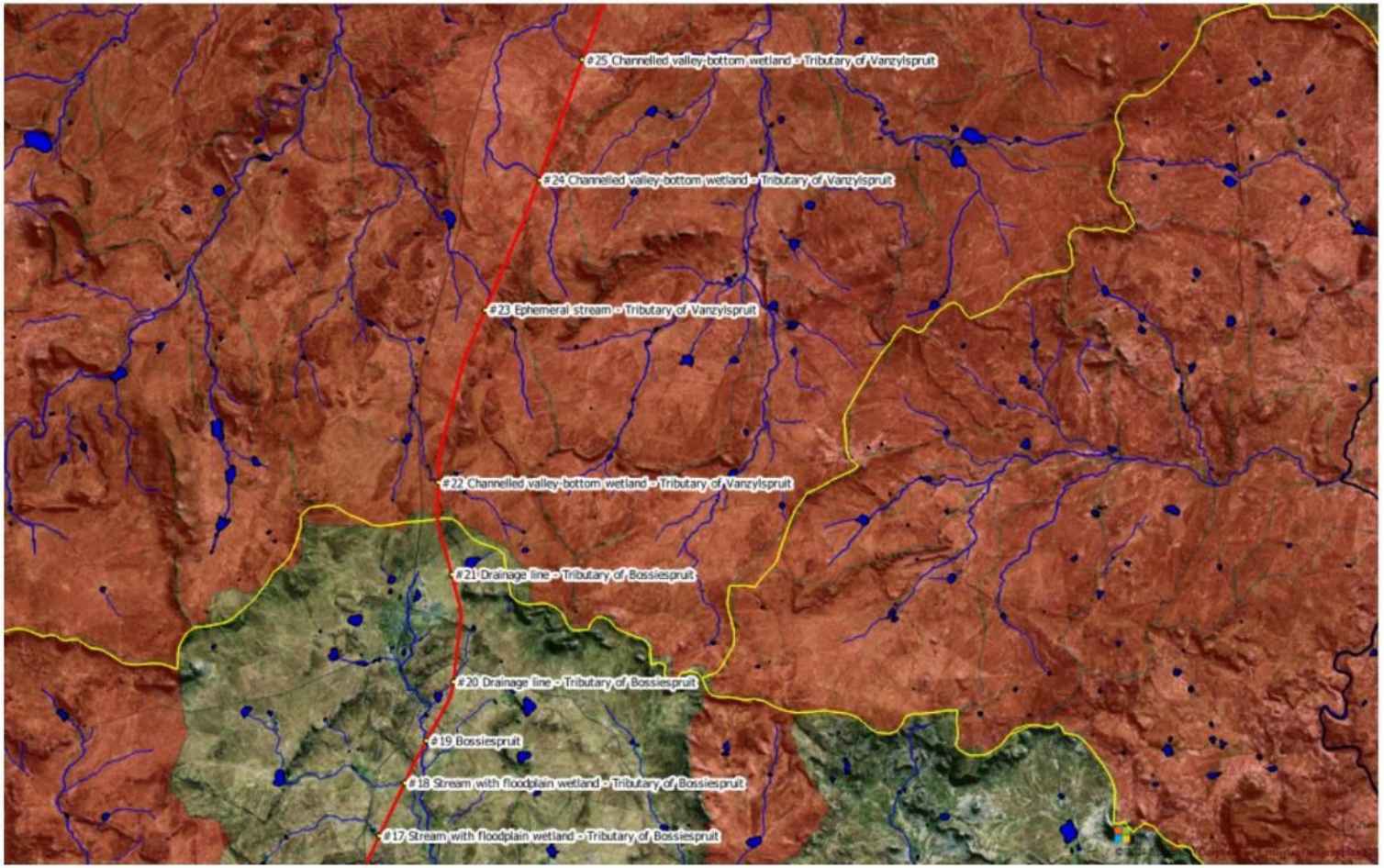
Quantum GIS

Scale: 1:250 000

DPR Ecologists
Contact Darius van Rensburg at:
darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
Tel: 083 410 0770

DPR Ecologists & Environmental Services

Watercourses and wetland crossings map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.



Map 4: Watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The pipeline section from the small town of Springfontein southwards still falls within the Vanderkloof Sub WMA and which drains toward the Orange River and Gariep Dam to the south. The catchment is dominated by the Bossiespruit, an ephemeral but fairly large stream system but which is not considered an NFEPA system. The pipeline section to the north of Springfontein falls within the Modder-Riet Sub WMA and these watercourses and wetlands all form part of the Vanzylspruit catchment which is also considered a NFEPA system and therefore of high conservation value.



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Century City
Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

Spheroid: WGS 84

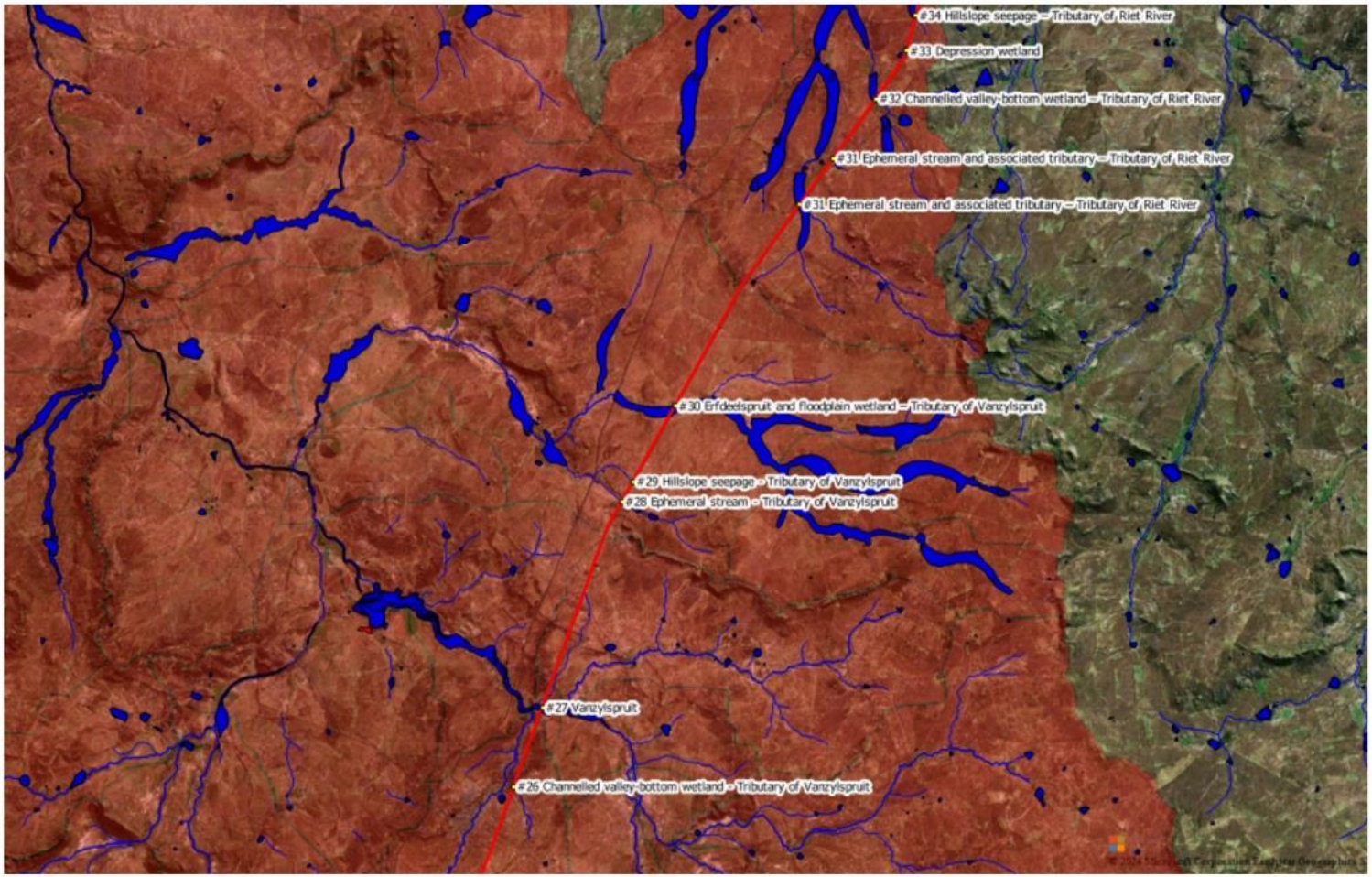
Quantum GIS

Scale: 1:250 000

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Contact Darius van Rensburg at:
darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
Tel: 083 410 0770

DPR Ecologists & Environmental Services

Watercourses and wetland crossings map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.



Map 5: Watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The Vanzylspruit, an NFEPA system, is situated just to the north of the town of Trompsburg and also includes several associated tributaries to the north. All of these, as well as a tributary of the Riet River to the north, form part of the NFEPA catchment and are regarded as having a high conservation value. The Vanzylspruit is a fairly large seasonal river and will contain a flowing main channel throughout the rainy season, with surface water likely persisting throughout the year.



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Century City
Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

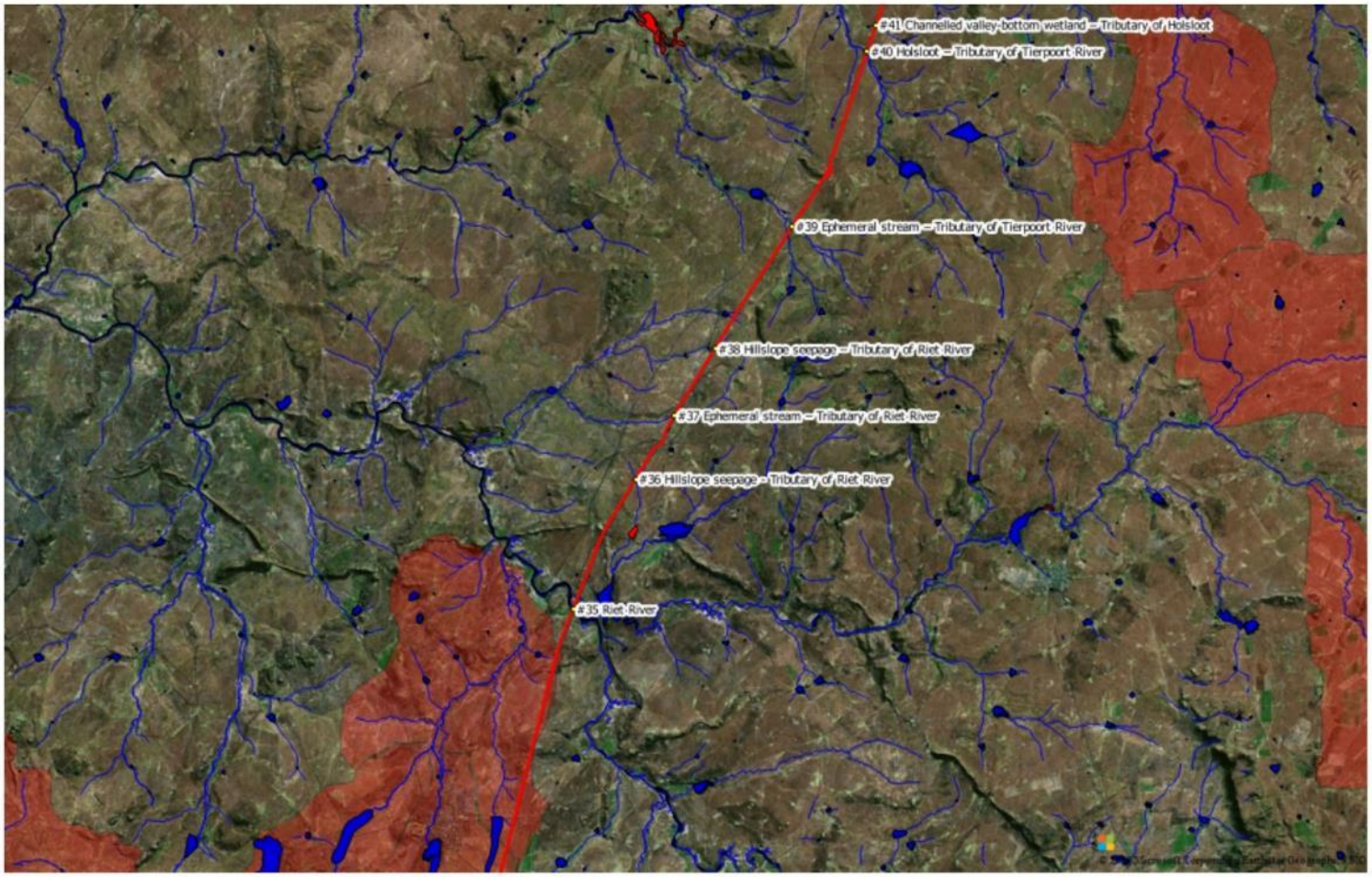
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Quantum GIS

Scale: 1:250 000

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Contact Darius van Rensburg at:
darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
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Watercourses and wetland crossings map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.



Map 6: Watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. The Rier River is situated just north of the town of Edinburg where the pipeline will still follow the N1 National Road northwards. Several tributaries of the Riet- and Tierpoort Rivers will also be crossed by the pipeline in this section. However, none of these form part of an NFEPA system or catchment. The Riet River is however a large seasonal river with wide channel that is likely to flow throughout the rainy season.



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Century City
Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

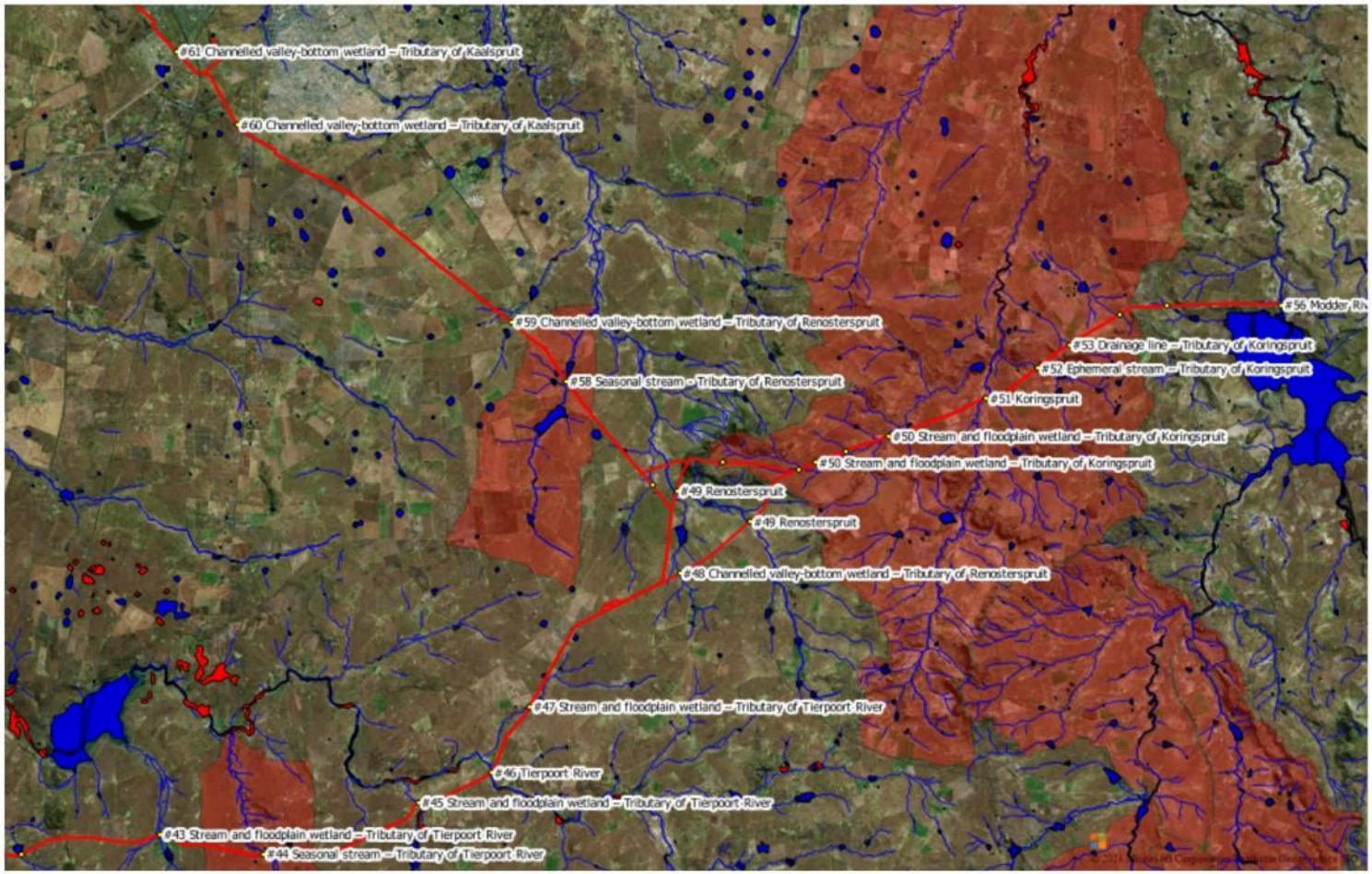
Spheroid: WGS 84

Quantum GIS

Scale: 1:250 000

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darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
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Watercourses and wetland crossings map for the proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.



Map 7: Watercourses and wetlands map for the Xhariep bulk water supply pipeline between the Gariep Dam, Bloemfontein and the Rustfontein Dam. Just to the south of the Tierpoort Dam the pipeline route will veer east along a series of gravel roads and natural areas. The pipeline route will connect to the Rustfontein Dam from here and will also split off along the R702 tarred road to connect to Bloemfontein. Several large watercourses will be crossed and includes the Tierpoort River, Renostersprui, Krongspruit and Modder River. Some of these are also considered to be NFEPA systems and includes a tributary of the Tierpoort River, tributary of the Renostersprui and the entire Koringspruit system, which are considered to have a very high conservation value.



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Cape Town

Legend:

- Pipeline route
- Sub Water Management Area
- Watercourses
- Wetlands and impoundments
- NFEPA catchments
- Watercourse/Wetland crossing

Map Information

Spheroid: WGS 84

Quantum GIS

Scale: 1:250 000

DPR Ecologists
Contact Darius van Rensburg at:
darius@dprecologists.co.za
P.O. Box 12726, Brandhof, 9324
Tel: 083 410 0770

Appendix B: Species list

Species indicated with an * are exotic.

Protected species are coloured orange and Red Listed species red.

Species	Growth form
**Bidens bipinnata*	Herb
**Cirsium vulgare*	Herb
**Conyza bonariensis*	Herb
**Cotoneaster franchettii*	Shrub
**Falkia oblonga*	Herb
**Fraxinus americana*	Tree
**Gleditsia triacanthos*	Tree
**Hordeum stenostachys*	Grass
**Lactuca seriola*	Herb
**Melia azedarach*	Tree
**Oenothera rosea*	Herb
**Opuntia lindheimeri*	Succulent
**Pennisetum clandestinum*	Grass
**Plantago lanceolata*	Herb
**Populus deltoidea*	Tree
**Populus x simonii*	Tree
**Pyracantha angustifolia*	Shrub
**Salix babylonica*	Tree
**Solanum eleagnifolium*	Herb
**Sonchus oleraceus*	Herb
**Tagetes minuta*	Herb
**Verbena bonariensis*	Herb
**Verbena officinalis*	Herb
**Veronica anagalis-aquatica*	Herb
**Xanthium spinosum*	Herb
**Xanthium strumarium*	Herb
Agrostis lachnantha	Grass
Alternanthera sessilis	Herb
Ammocharis coranica	Geophyte
Aponogeton junceus	Herb
Aristida congesta	Grass
Aristida diffusa	Grass
Artemisia afra	Herb
Asparagus capensis	Dwarf shrub
Asparagus larcinus	Shrub
Asparagus suaveolens	Dwarf shrub
Barleria rigida	Dwarf shrub
Berkheya onopordifolia	Herb
Berkheya radula	Herb
Berula erecta	Herb

Brachiaria eruciformis	Grass
Brunsvigia radulosa	Geophyte
Carex glomerabilis	Sedge
Chloris virgata	Grass
Chrysocoma ciliata	Dwarf shrub
Ciclopsermum leptophyllum	Herb
Clematis brachiata	Climber
Conyza podocephala	Herb
Crassula coralina	Succulent
Crassula natans	Succulent
Cullen tomentosum	Herb
Cymbopogon pospischillii	Grass
Cynodon dactylon	Grass
Cynodon hirsutus	Grass
Cynodon transvaalensis	Grass
Cyperus congestus	Sedge
Cyperus erragrostis	Sedge
Cyperus fastigiatus	Sedge
Cyperus longus	Sedge
Cyperus marginatus	Sedge
Cyperus sp.	Sedge
Cyphia stenopetala	Climber
Delosperma cooperi	Succulent
Digitaria eriantha	Grass
Diospyros lycioides	Shrub
Echinochloa sp.	Grass
Eleocharis dregeana	Sedge
Enneapogon cenchroides	Grass
Eragrostis bicolor	Grass
Eragrostis chloromelas	Grass
Eragrostis lehmanniana	Grass
Eragrostis obtusa	Grass
Eragrostis truncata	Grass
Eriocephalus ericoides	Dwarf shrub
Eucomis autumnalis	Geophyte
Euphorbia arida	Succulent
Fingerhuthia africana	Grass
Gomphocarpus fruticosus	Herb
Gomphostigma virgatum	Dwarf shrub
Haplocarpha scaposa	Herb
Helichrysum lucilioides	Dwarf shrub
Helictotrichon turgidulum	Grass
Hemarthria altissima	Grass
Heteropogon contortus	Grass
Hyparrhenia hirta	Grass
Juncus exertus	Rush

Juncus inanus	Rush
Juncus oxycarpus	Rush
Juncus rigidus	Rush
Kniphofia ensifolia subsp. *ensifolia*	Geophyte
Leptochloa fusca	Grass
Limosella major	Herb
Lobelia thermalis	Herb
Lycium cinerium	Dwarf shrub
Lycium horridum	Dwarf shrub
Marsilea sp.	Fern
Massonia jasminiflora	Geophyte
Melianthus comosus	Shrub
Melolobium candicans	Dwarf shrub
Mesembryanthemum rabiei	Succulent
Mestoklema tuberosum	Succulent
Microloma armatum	Dwarf shrub
Miscanthus capensis	Grass
Nananthus sp.	Succulent
Nenax microphylla	Dwarf shrub
Olea europaea subsp. *africana*	Tree
Osteospermum muricatum	Dwarf shrub
Osteospermum sinuata	Dwarf shrub
Osteospermum spinescens	Dwarf shrub
Panicum coloratum	Grass
Paspalum dilatatum	Grass
Paspalum distichum	Grass
Pennisetum sphacelatum	Grass
Pentzia globosa	Dwarf shrub
Pentzia incana	Dwarf shrub
Persicaria lapathifolia	Herb
Phragmites australis	Reed
Phyla nodiflora	Herb
Pseudoschoenus inanus	Rush
Ranunculus multifidus	Herb
Rosenia humilis	Dwarf shrub
Rumex crispus	Herb
Ruschia intricata	Succulent
Salix mucronata	Tree
Salsola rabieana	Dwarf shrub
Salvia verbenaca	Herb
Scabiosa columbaria	Herb
Schoenoplectus sp.	Sedge
Scirpoides dioecus	Sedge
Searsia burchellii	Shrub
Searsia ciliata	Shrub
Searsia erosa	Shrub

Searsia lancea	Tree
Searsia pyroides	Shrub
Senecio reptans	Herb
Setaria pallide-fusca	Grass
Setaria sphacelata	Grass
Setaria verticilata	Grass
Sonchus oleraceus	Herb
Sporobolus africanus	Grass
Sporobolus fimbriatus	Grass
Sporobolus ioclados	Grass
Themeda triandra	Grass
Tragus keolerioides	Grass
Trichodiadema pommeridianum	Succulent
Trifolium africanum	Herb
Typha capensis	Bulrush
Vachellia karroo	Tree
Ziziphus mucronata	Tree

Appendix C: Soil Samples Methodology

Obligate wetland vegetation was utilised to determine the presence and border of wetlands. Soil samples were used to confirm the wetland conditions in the study area. Soil samples were investigated for the presence of anaerobic evidence which characterises wetland soils.

Within wetlands the hydrological regime differs due to the topography and landscape. For instance; a valley bottom wetland would have a main channel that is below the water table and consequently permanently saturated, i.e. permanent zone of wetness. As you move away from the main channel the wetland would become dependent on flooding in order to be saturated. As a result along this hydrological regime areas of permanent saturation, seasonal and temporary saturation would occur. At some point along this gradient the saturation of the soil would be insufficient to develop reduced soil conditions and therefore will not be considered as wetland.

Within wetland soils the pores between soil particles are filled with water instead of atmosphere. As a result available oxygen is consumed by microbes and plantroots and due to the slow rate of oxygen diffusion oxygen is depleted and biological activity continues in anaerobic conditions and this causes the soil to become reduced.

Reduction of wetland soils is a result of bacteria decomposing organic material. As bacteria in saturated soils deplete the dissolved oxygen they start to produce organic chemicals that reduce metals. In oxidised soils the metals in the soil give it a red, brown, yellow or orange colour. When these soils are saturated and metals reduced the soil attains a grey matrix characteristic of wetland soils.

Within this reduction taking place in the wetland soils there may be reduced matrix, redox depletions and redox concentrations. The reduced matrix is characterised by a low chroma and therefore a grey soil matrix. Redox depletions result in the grey bodies within the soil where metals have been stripped out. Redox concentrations result in mottles within the grey matrix with variable shape and are recognised as blotches or spots, red and yellow in colour.

Soil wetness indicator is used as the primary indicator of wetlands. The colour of various soil components are often the most diagnostic indicator of hydromorphic soils. Colours of these components are strongly influenced by the frequency and duration of soil saturation. Generally, the higher the duration and frequency of saturation in a soil profile, the more prominent grey colours become in the soil matrix.

Coloured mottles, another feature of hydromorphic soils, are usually absent in permanently saturated soils and are at their most prominent in seasonally saturated soils, becoming less abundant in temporarily saturated soils until they disappear altogether in dry soils (Collins 2005).

The following soil wetness indicators can be used to determine the permanent, seasonal and temporary wetness zones. The boundary of the wetland is defined as the outer edge of the temporary zone of wetness and is characterised by a minimal grey matrix (<10%), few high chroma mottles and short periods of saturation (less than three months per year). The seasonal zone of wetness is characterised by a grey matrix (>10%), many low chroma mottles and significant periods of wetness (at least three months per year). The permanent zone of wetness is characterised by a prominent grey matrix, few to high chroma mottles, wetness all year round and sulphuric odour (rotten egg smell). According to convention hydromorphic soil must display signs of wetness within 50 cm of the soil surface (DWAF 2005).

Appendix D: Index of Habitat Integrity (IHI)/WET-Health Summary

For the complete IHI and WET-Health please contact the author of this report.

Bossiespruit

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Bossiespruit
SITE LATITUDE (if applicable)	S 30.304922°
SITE LONGITUDE (if applicable)	E 25.717200°
SITE ALTITUDE (if applicable)	1467 m
WMA	Upper Orange
QUATERNARY	D35F
ECOREGION 2	26_3
DATE	27/02/2024
RIVER	Bossiespruit
TRIBUTARY	Orange River
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	1.0
Floods	1.5
HYDROLOGY RATING	**1.5**
pH	0.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.5
Oxygen	1.5
Toxics	1.0
PC RATING	**1.2**
Sediment	1.5
Benthic Growth	1.5
BED RATING	**1.5**
Marginal	1.5
Non-marginal	1.5
BANK RATING	**1.5**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.4**
INSTREAM IHI %	**71.5**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	1.0
Moderate Floods	1.5
Large Floods	2.0
HYDROLOGY RATING	**1.7**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	2.0
Invasive Alien Vegetation (non-marginal)	1.0
Erosion (marginal)	2.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.0
Marginal	2.0
Non-marginal	2.0
BANK STRUCTURE RATING	**2.0**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.3**
RIPARIAN IHI %	**64.9**
RIPARIAN IHI EC	**C**
RIPARIAN CONFIDENCE	**3.7**

Vanzylspruit

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Vanzylspruit
SITE LATITUDE (if applicable)	S 29.996433°
SITE LONGITUDE (if applicable)	E 25.810701°
SITE ALTITUDE (if applicable)	1388 m
WMA	Upper Orange
QUATERNARY	C51G
ECOREGION 2	26_3
DATE	26/03/2024
RIVER	Vanzylspruit
TRIBUTARY	Kromellenboogspruit
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	-0.5
Zero Flows	0.5
Floods	1.0
HYDROLOGY RATING	**0.7**
pH	0.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.0
Oxygen	1.5
Toxics	1.0
PC RATING	**1.2**
Sediment	1.0
Benthic Growth	1.0
BED RATING	**1.0**
Marginal	1.0
Non-marginal	1.0
BANK RATING	**1.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
INSTREAM IHI %	**80.8**
INSTREAM IHI EC	**B/C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-0.5
Zero Flows	0.5
Moderate Floods	1.0
Large Floods	1.0
HYDROLOGY RATING	**0.8**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	1.0
Invasive Alien Vegetation (marginal)	1.0
Invasive Alien Vegetation (non-marginal)	1.0
Erosion (marginal)	1.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.0
Marginal	1.0
Non-marginal	1.0
BANK STRUCTURE RATING	**1.0**
Longitudinal Connectivity	1.0
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.0**
RIPARIAN IHI %	**81.3**
RIPARIAN IHI EC	**B/C**
RIPARIAN CONFIDENCE	**3.7**

Erfdeelspruit floodplain wetland

WET-Health Level 2 assessment: PES Summary

This worksheet provides an overall summary of the WET-Health Assessment that can be used for reporting purposes

	Wetland PES Summary
Wetland name	**Erfdeelspruit Floodplain**
Assessment Unit	**4**
HGM type	Floodplain wetland
Areal extent (Ha)	620.0 Ha

Unadjusted (modelled) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	2.6	1.6	0.4	1.0
PES Score (%)	74%	84%	96%	90%
Ecological Category	**C**	**B**	**A**	**B**
Combined Impact Score	1.5			
Combined PES Score (%)	85%			
Combined Ecological Category	**B**			
Hectare Equivalents	524.4 Ha			
Confidence (modelled results)	RATE-TO-HIGH: Field-based assessment including information about the regional a			

Riet River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Riet River
SITE LATITUDE (if applicable)	S 29.663696°
SITE LONGITUDE (if applicable)	E 25.987225°
SITE ALTITUDE (if applicable)	1329 m
WMA	Upper Orange
QUATERNARY	C51A
ECOREGION 2	
DATE	26/02/2024
RIVER	Riet River
TRIBUTARY	
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	-2.0
Zero Flows	1.0
Floods	1.5
HYDROLOGY RATING	**1.5**
pH	0.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.5
Oxygen	1.5
Toxics	0.0
PC RATING	**1.0**
Sediment	1.5
Benthic Growth	1.5
BED RATING	**1.5**
Marginal	1.5
Non-marginal	1.5
BANK RATING	**1.5**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.4**
INSTREAM IHI %	**72.4**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-2.0
Zero Flows	1.0
Moderate Floods	1.5
Large Floods	2.0
HYDROLOGY RATING	**1.7**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	2.0
Invasive Alien Vegetation (non-marginal)	1.0
Erosion (marginal)	2.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.0
Marginal	2.0
Non-marginal	2.0
BANK STRUCTURE RATING	**2.0**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.0
CONNECTIVITY RATING	**1.3**
RIPARIAN IHI %	**64.9**
RIPARIAN IHI EC	**C**
RIPARIAN CONFIDENCE	**3.7**

Tierpoort River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Tierpoort River
SITE LATITUDE (if applicable)	S 29.427462°
SITE LONGITUDE (if applicable)	E 26.307373°
SITE ALTITUDE (if applicable)	1416 m
WMA	Upper Orange
QUATERNARY	C51D
ECOREGION 2	11_10
DATE	28/02/2024
RIVER	Tierpoort River
TRIBUTARY	Riet River
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	-1.5
Zero Flows	1.0
Floods	1.5
HYDROLOGY RATING	**1.4**
pH	0.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.5
Oxygen	1.5
Toxics	1.0
PC RATING	**1.2**
Sediment	2.0
Benthic Growth	1.5
BED RATING	**1.8**
Marginal	1.5
Non-marginal	1.5
BANK RATING	**1.5**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.5**
INSTREAM IHI %	**70.8**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-1.5
Zero Flows	1.0
Moderate Floods	1.5
Large Floods	1.5
HYDROLOGY RATING	**1.4**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	1.0
Invasive Alien Vegetation (non-marginal)	1.0
Erosion (marginal)	2.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.0
Marginal	2.0
Non-marginal	2.0
BANK STRUCTURE RATING	**2.0**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.5**
RIPARIAN IHI %	**66.1**
RIPARIAN IHI EC	**C**
RIPARIAN CONFIDENCE	**3.7**

Tierpoort tributary floodplain wetland

WET-Health Level 2 assessment: PES Summary

This worksheet provides an overall summary of the WET-Health Assessment that can be used for reporting purposes

	Wetland PES Summary
Wetland name	**Tierpoort Floodplain**
Assessment Unit	**3**
HGM type	Floodplain wetland
Areal extent (Ha)	180.0 Ha

Unadjusted (modelled) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	3.7	2.1	0.6	1.8
PES Score (%)	63%	79%	94%	83%
Ecological Category	**C**	**C**	**A**	**B**
Combined Impact Score	2.2			
Combined PES Score (%)	78%			
Combined Ecological Category	**C**			
Hectare Equivalents	139.7 Ha			
Confidence (modelled results)	RATE-TO-HIGH: Field-based assessment including information about the regional a			

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Koringspruit
SITE LATITUDE (if applicable)	S 29.300012°
SITE LONGITUDE (if applicable)	E 26.500911°
SITE ALTITUDE (if applicable)	1393 m
WMA	Upper Orange
QUATERNARY	C52D
ECOREGION 2	11_10
DATE	28/02/2024
RIVER	Koringspruit
TRIBUTARY	Modder River
PERENNIAL (Y/N)	**N**
GEOMORPH ZONE	**FOOTHILL**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	-1.0
Zero Flows	1.0
Floods	2.5
HYDROLOGY RATING	**1.6**
pH	0.0
Salts	1.0
Nutrients	1.5
Water Temperature	2.0
Water clarity	1.5
Oxygen	1.5
Toxics	1.0
PC RATING	**1.2**
Sediment	1.0
Benthic Growth	1.0
BED RATING	**1.0**
Marginal	1.5
Non-marginal	1.5
BANK RATING	**1.5**
Longitudinal Connectivity	2.0
Lateral Connectivity	2.0
CONNECTIVITY RATING	**2.0**
INSTREAM IHI %	**71.4**
INSTREAM IHI EC	**C**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	-1.0
Zero Flows	1.0
Moderate Floods	2.0
Large Floods	2.0
HYDROLOGY RATING	**1.6**
Substrate Exposure (marginal)	1.0
Substrate Exposure (non-marginal)	2.0
Invasive Alien Vegetation (marginal)	1.0
Invasive Alien Vegetation (non-marginal)	1.0
Erosion (marginal)	2.0
Erosion (non-marginal)	1.0
Physico-Chemical (marginal)	1.0
Physico-Chemical (non-marginal)	1.0
Marginal	2.0
Non-marginal	2.0
BANK STRUCTURE RATING	**2.0**
Longitudinal Connectivity	1.5
Lateral Connectivity	1.5
CONNECTIVITY RATING	**1.5**
RIPARIAN IHI %	**64.9**
RIPARIAN IHI EC	**C**
RIPARIAN CONFIDENCE	**3.7**

Koringspruit tributary floodplain wetland

WET-Health Level 2 assessment: PES Summary

This worksheet provides an overall summary of the WET-Health Assessment that can be used for reporting purposes

	Wetland PES Summary
Wetland name	**Koringspruit Floodplain**
Assessment Unit	**2**
HGM type	Floodplain wetland
Areal extent (Ha)	110.0 Ha

Unadjusted (modelled) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	3.7	2.0	0.4	1.0
PES Score (%)	63%	80%	96%	90%
Ecological Category	**C**	**B**	**A**	**B**
Combined Impact Score	2.0			
Combined PES Score (%)	80%			
Combined Ecological Category	**B**			
Hectare Equivalents	88.3 Ha			
Confidence (modelled results)	RATE-TO-HIGH: Field-based assessment including information about the regional a			

Modder River

ASSESSMENT UNIT INFORMATION	
ASSESSMENT UNIT INFORMATION	Xhariep Pipeline
UPPER LATITUDE	
UPPER LONGITUDE	
UPPER ALTITUDE	
LOWER LATITUDE	
LOWER LONGITUDE	
LOWER ALTITUDE	
SURVEY SITE (if applicable)	Modder River
SITE LATITUDE (if applicable)	S 29.268046°
SITE LONGITUDE (if applicable)	E 26.615938°
SITE ALTITUDE (if applicable)	1354 m
WMA	Upper Orange
QUATERNARY	C52B
ECOREGION 2	11_3
DATE	28/02/2024
RIVER	Modder River
TRIBUTARY	
PERENNIAL (Y/N)	**Y**
GEOMORPH ZONE	**LOWLAND**
WIDTH (m)	**2-15**

	MRU
INSTREAM IHI	
Base Flows	2.0
Zero Flows	-4.0
Floods	2.5
HYDROLOGY RATING	**4.0**
pH	1.5
Salts	1.5
Nutrients	2.0
Water Temperature	2.5
Water clarity	2.0
Oxygen	1.5
Toxics	2.0
PC RATING	**1.8**
Sediment	2.0
Benthic Growth	2.0
BED RATING	**2.0**
Marginal	2.5
Non-marginal	2.0
BANK RATING	**2.3**
Longitudinal Connectivity	2.5
Lateral Connectivity	2.5
CONNECTIVITY RATING	**2.5**
INSTREAM IHI %	**47.8**
INSTREAM IHI EC	**D**
INSTREAM CONFIDENCE	**3.2**

	MRU
RIPARIAN IHI	
Base Flows	3.0
Zero Flows	-4.0
Moderate Floods	3.5
Large Floods	2.5
HYDROLOGY RATING	**3.2**
Substrate Exposure (marginal)	2.0
Substrate Exposure (non-marginal)	3.0
Invasive Alien Vegetation (marginal)	3.0
Invasive Alien Vegetation (non-marginal)	2.0
Erosion (marginal)	3.0
Erosion (non-marginal)	3.0
Physico-Chemical (marginal)	2.0
Physico-Chemical (non-marginal)	1.5
Marginal	3.0
Non-marginal	3.0
BANK STRUCTURE RATING	**3.0**
Longitudinal Connectivity	2.0
Lateral Connectivity	2.0
CONNECTIVITY RATING	**2.0**
RIPARIAN IHI %	**43.1**
RIPARIAN IHI EC	**D**
RIPARIAN CONFIDENCE	**3.7**

Modder River valley bottom wetland

WET-Health Level 2 assessment: PES Summary

This worksheet provides an overall summary of the WET-Health Assessment that can be used for reporting purposes

	Wetland PES Summary			
Wetland name	Modder Valley-Bottom			
Assessment Unit	1			
HGM type	Unchannelled VB wetland			
Areal extent (Ha)	3.8 Ha			
Unadjusted (modelled) Scores				
PES Assessment	**Hydrology**	**Geomorphology**	**Water Quality**	**Vegetation**
Impact Score	6.1	1.4	0.4	2.3
PES Score (%)	39%	86%	96%	77%
Ecological Category	**E**	**B**	**A**	**C**
Combined Impact Score	3.7			
Combined PES Score (%)	63%			
Combined Ecological Category	**C**			
Hectare Equivalents	2.4 Ha			
Confidence (modelled results)	RATE-TO-HIGH: Field-based assessment including information about the regional a			

Appendix E: Risk Assessment Matrix

PROJECT: Proposed Xhariep bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1

Name of Assessor: Darius van Rensburg **Signature:**

SACNASP Registration Number: 400284/13

Date of assessment: 13/03/2024

Phase	Activity	Impact	Potentially affected watercourses			Significance (max = 100)	Risk Rating	Confidence level
			Name/s	PES	Overall Watercourse Importance			
	Excavation and backfilling of trenches	Excavation of trenches will impede flow while trenches are open.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
		Disturbance of the bed and banks will promote sedimentation.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
		Use of concrete casing may also affect the watercourse.	Drainage line - Orange River Tributary	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.36	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.312	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.312	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.336	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Modified hillslope seepage	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Orange River	C	Moderate	0.36	M	High
			Drainage line - Tributary of Orange River	C	Moderate	0.288	L	High
			Channelled valley-bottom wetland - Tributary of Bossiespruit	C	Moderate	0.36	M	High
			Channelled valley-bottom wetland - Tributary of Bossiespruit	C	Moderate	0.312	M	High
			Stream and floodplain wetland - Tributary of Bossiespruit	C	Moderate	0.312	M	High
			Stream and floodplain wetland - Tributary of Bossiespruit	C	Moderate	0.312	M	High
			Bossiespruit	C	Moderate	0.36	M	High
			Drainage line - Tributary of Bossiespruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Bossiespruit	C	Moderate	0.288	L	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vanzylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High	0.384	M	High
			Vanzylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vanzylspruit	B/C	High	0.384	M	High
			Seepage wetland - Tributary of Vanzylspruit	C	High	0.384	M	High
			Erfdeelspruit and floodplain wetland – Tributary of Vanzylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Riet River	C	Moderate	0.288	L	High
			Channelled valley-bottom wetland – Tributary of Riet River	C	Moderate	0.336	M	High
			Depression wetland	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Riet River	C	Moderate	0.36	M	High
			Seepage wetland - Tributary of Riet River	C	Moderate	0.288	M	High
			Ephemeral stream and associated tributary – Tributary of Riet River	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Tierpoort River	C	High	0.384	M	High
			Holsoot - Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom wetland – Tributary of Holsloot	C	High	0.384	M	High
			Channelled valley-bottom wetland – Tributary of Holsloot	C	High	0.416	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High	0.48	M	High
			Seasonal stream – Tributary of Tierpoort River	C	High	0.416	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High	0.384	M	High
			Tierpoort River	C	High	0.48	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate	0.36	M	High
			Renosterspruit	C	Moderate	0.36	M	High
			Stream and floodplain wetland – Tributary of Koringspruit	B	High	0.48	M	High
			Koringspruit	C	High	0.416	M	High
			Channelled valley-bottom wetland	C	Moderate	0.288	L	High
			Modder River	D	Moderate	0.336	M	High

CONSTRUCTION			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate		0.288	L	High
			Seasonal stream – Tributary of Renosterspruit	C	High		0.384	M	High
			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate		0.288	L	High
			Channelled valley-bottom wetland – Tributary of Kaalspruit	D	Moderate		0.288	L	High
			Channelled valley-bottom wetland – Tributary of Kaalspruit	D	Moderate		0.24	L	High
	Removal of riparian vegetation	Removal of riparian vegetation will promote erosion and sedimentation of the river system.	Drainage line - Orange River Tributary	C	Moderate		0.312	M	High
		Disturbance and removal of vegetation will create conditions susceptible to the establishment of exotic weeds.	Drainage line - Orange River Tributary	C	Moderate		0.312	M	High
			Drainage line - Orange River Tributary	C	Moderate		0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate		28.8	L	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate		36	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate		31.2	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate		28.8	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate		31.2	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate		33.6	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate		28.8	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate		28.8	L	High
			Modified hillslope seepage	C	Moderate		28.8	L	High
			Ephemeral stream - Tributary of Orange River	C	Moderate		36	M	High
			Drainage line - Tributary of Orange River	C	Moderate		0.288	L	High
			Channelled valley-bottom wetland - Tributary of Bossiespruit	C	Moderate		0.36	M	High
			Channelled valley-bottom wetland - Tributary of Bossiespruit	C	Moderate		0.312	M	High
			Stream and floodplain wetland - Tributary of Bossiespruit	C	Moderate		0.312	M	High
			Stream and floodplain wetland - Tributary of Bossiespruit	C	Moderate		0.312	M	High
			Bossiespruit	C	Moderate		0.36	M	High
			Drainage line - Tributary of Bossiespruit	C	Moderate		0.288	L	High
			Drainage line - Tributary of Bossiespruit	C	Moderate		0.288	L	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High		0.448	M	High
			Ephemeral stream - Tributary of Vanzylspruit	B/C	High		0.384	M	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High		0.384	M	High
			Channelled valley-bottom wetland - Tributary of Vanzylspruit	B/C	High		0.384	M	High
			Vanzylspruit	B/C	High		0.448	M	High
			Ephemeral stream - Tributary of Vanzylspruit	B/C	High		0.384	M	High
			Seepage wetland - Tributary of Vanzylspruit	C	High		0.384	M	High
			Erfdeelspruit and floodplain wetland – Tributary of Vanzylspruit	B/C	High		0.448	M	High
			Ephemeral stream - Tributary of Orange River	C	Moderate		0.288	L	High
			Channelled valley-bottom wetland – Tributary of Riet River	C	Moderate		0.336	M	High
			Depression wetland	C	Moderate		0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate		0.288	L	High
			Riet River	C	Moderate		0.36	M	High
			Seepage wetland - Tributary of Riet River	C	Moderate		0.288	M	High
			Ephemeral stream and associated tributary – Tributary of Riet River	C	Moderate		0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate		0.288	L	High
			Ephemeral stream - Tributary of Tierpoort River	C	High		0.384	M	High
			Holsoot - Tributary of Tierpoort River	C	High		0.384	M	High
			Channelled valley-bottom wetland – Tributary of Holsloot	C	High		0.384	M	High
			Channelled valley-bottom wetland – Tributary of Holsloot	C	High		0.416	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High		0.48	M	High
			Seasonal stream – Tributary of Tierpoort River	C	High		0.416	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High		0.384	M	High
			Tierpoort River	C	High		0.48	M	High
			Stream and floodplain wetland – Tributary of Tierpoort River	C	High		0.384	M	High
			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate		0.36	M	High
			Renosterspruit	C	Moderate		0.36	M	High
			Stream and floodplain wetland – Tributary of Koringspruit	B	High		0.48	M	High
			Koringspruit	C	High		0.416	M	High
			Channelled valley-bottom wetland	C	Moderate		0.288	L	High
			Modder River	D	Moderate		0.336	M	High

			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate		0.288	L	High
			Seasonal stream – Tributary of Renosterspruit	C	High		0.384	M	High
			Channelled valley-bottom wetland – Tributary of Renosterspruit	C	Moderate		0.288	L	High
			Channelled valley-bottom wetland – Tributary of Kaalspruit	D	Moderate		0.288	L	High
			Channelled valley-bottom wetland – Tributary of Kaalspruit	D	Moderate		0.24	L	High
							0		
OPERATIONAL	Maintenance of pipeline	Renewed disturbance of wetlands and watercourses which may again destabilise the system and result in new impacts.	Watercourses and wetlands	B	High		38.4	M	High
		Maintenance activities and may also have long-term impacts should poor rehabilitation be done afterwards.	Watercourses and wetlands	C	Moderate		28.8	L	High
		<1c>	Watercourses and wetlands	D	Moderate		28.8	L	High

Appendix F: 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 criteria based on a seven-point scale (refer to Table 1); and the significance is auto-generated using a spreadsheet through application of the calculations in Figure 1. Specialists can comment where they disagree with the auto-calculated impact significance rating.

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 as negligible, minor, moderate or major, and the type would be either positive or negative.

Figure 1: Calculation of significance

Table 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

Criteria	Numerical Rating	Category	Description
	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 2, Table 3 and Table 4, respectively.

Table 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: 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 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

PROJECT: **Proposed Kharieb bulk water supply pipeline from Gariep Dam to Bloemfontein and the Rustfontein Dam, Free State Province.**

RISK ASSESSMENT MATRIX for Section 21 (c) and (i) Water Use activities - Version 2.1

Name of Assessor: Darius van Rensburg **Signature:**

SACNASP Registration Number: 400286/13

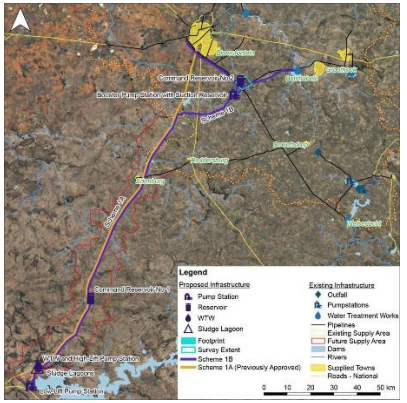
Date of assessment: 13/03/2024

Phase	Activity	Impact	Potentially affected watercourses			Significance (Area = 100)	Risk Rating	Confidence level
			Remark	PES	Overall Watercourse Importance			
CONSTRUCTION	Excavation and backfilling of trenches	Excavation of trenches will impede flow while trenches are open.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
		Disturbance of the bed and banks will promote sedimentation.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
		use of concrete casing may also affect the watercourse.	Drainage line - Orange River Tributary	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.36	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.312	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.312	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	0.336	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	0.288	L	High
			Modified hillslope seepage	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Orange River	C	Moderate	0.36	M	High
			Drainage line - Tributary of Orange River	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Boesmanspruit	C	Moderate	0.36	M	High
			Channelled valley-bottom w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Stream and floodplain w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Stream and floodplain w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Boesmanspruit	C	Moderate	0.36	M	High
			Drainage line - Tributary of Boesmanspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Boesmanspruit	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Seepage w etland - Tributary of Vrancylspruit	C	High	0.384	M	High
			Erf Sweepruit and floodplain w etland - Tributary of Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Riet River	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Riet River	C	Moderate	0.336	M	High
			Depression w etland	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Riet River	C	Moderate	0.36	M	High
			Seepage w etland - Tributary of Riet River	C	Moderate	0.288	M	High
			Ephemeral stream and associated tributary - Tributary of Riet River	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Tierpoort River	C	High	0.384	M	High
			Helmoot - Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Hilsloot	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Hilsloot	C	High	0.432	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.48	M	High
			Seasonal stream - Tributary of Tierpoort River	C	High	0.432	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.384	M	High
			Tierpoort River	C	High	0.48	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.36	M	High
			Rensmanspruit	C	Moderate	0.36	M	High
			Stream and floodplain w etland - Tributary of Koringspruit	B	High	0.48	M	High
			Koringspruit	C	High	0.432	M	High
			Channelled valley-bottom w etland	C	Moderate	0.288	L	High
			Modder River	D	Moderate	0.336	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.288	L	High
			Seasonal stream - Tributary of Rensmanspruit	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Kaalkuilspruit	D	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Kaalkuilspruit	D	Moderate	0.24	L	High
	Removal of riparian vegetation	Works at of riparian vegetation will promote erosion and sedimentation of the river system.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
		Disturbance and removal of vegetation will create conditions favourable to the establishment of exotic w eeds.	Drainage line - Orange River Tributary	C	Moderate	0.312	M	High
			Drainage line - Orange River Tributary	C	Moderate	0.288	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	20.8	L	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	36	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	31.2	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	20.8	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	31.2	M	High
			Ephemeral stream - Tributary of Donkerpoortspruit	C	Moderate	33.6	M	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	20.8	L	High
			Drainage line - Tributary of Donkerpoortspruit	C	Moderate	20.8	L	High
			Modified hillslope seepage	C	Moderate	20.8	L	High
			Ephemeral stream - Tributary of Orange River	C	Moderate	36	M	High
			Drainage line - Tributary of Orange River	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Boesmanspruit	C	Moderate	0.36	M	High
			Channelled valley-bottom w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Stream and floodplain w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Stream and floodplain w etland - Tributary of Boesmanspruit	C	Moderate	0.312	M	High
			Boesmanspruit	C	Moderate	0.36	M	High
			Drainage line - Tributary of Boesmanspruit	C	Moderate	0.288	L	High
			Drainage line - Tributary of Boesmanspruit	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Vrancylspruit	B/C	High	0.384	M	High
			Seepage w etland - Tributary of Vrancylspruit	C	High	0.384	M	High
			Erf Sweepruit and floodplain w etland - Tributary of Vrancylspruit	B/C	High	0.448	M	High
			Ephemeral stream - Tributary of Orange River	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Riet River	C	Moderate	0.336	M	High
			Depression w etland	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Riet River	C	Moderate	0.36	M	High
			Seepage w etland - Tributary of Riet River	C	Moderate	0.288	M	High
			Ephemeral stream and associated tributary - Tributary of Riet River	C	Moderate	0.288	L	High
			Hillslope seepage - Tributary of Riet River	C	Moderate	0.288	L	High
			Ephemeral stream - Tributary of Tierpoort River	C	High	0.384	M	High
			Helmoot - Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Hilsloot	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Hilsloot	C	High	0.432	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.48	M	High
			Seasonal stream - Tributary of Tierpoort River	C	High	0.432	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.384	M	High
			Tierpoort River	C	High	0.48	M	High
			Stream and floodplain w etland - Tributary of Tierpoort River	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.36	M	High
			Rensmanspruit	C	Moderate	0.36	M	High
			Stream and floodplain w etland - Tributary of Koringspruit	B	High	0.48	M	High
			Koringspruit	C	High	0.432	M	High
			Channelled valley-bottom w etland	C	Moderate	0.288	L	High
			Modder River	D	Moderate	0.336	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.288	L	High
			Seasonal stream - Tributary of Rensmanspruit	C	High	0.384	M	High
			Channelled valley-bottom w etland - Tributary of Rensmanspruit	C	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Kaalkuilspruit	D	Moderate	0.288	L	High
			Channelled valley-bottom w etland - Tributary of Kaalkuilspruit	D	Moderate	0.24	L	High
						0		
OPERATIONAL	Maintenance of pipeline	Renewed disturbance of w etlands and watercourse w hich may again destabilise the system and result in new impacts.	Watercourses and w etlands	B	High	38.4	M	High
		Maintenance activities and may also have long term impacts should poor rehabilitation be done where erosi.	Watercourses and w etlands	C	Moderate	20.8	L	High
		ITEM	Watercourses and w etlands	D	Moderate	20.8	L	High

Appendix B:

Comment and Response Report



	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
1.	Tshiamo Malatji **Malatji.tshiamo@gmail.com**		02/06/2024	**Email to Zutari:** Greetings I no longer use Google Mail. If you want to reach me, send me an email via **malatji@protonmail.com**. This is an auto-generated message. Regards, Tshi Malatji	**Response: 02/06/2024** Zutari amended email address on the I&AP list.
2.	Mnr Pedre Kruger **pedrekruger@gmail.com**	Infrastructure Maintenance Transnet Freight Rail	03/06/2024	**Phone Call to Zutari:** Mr Kruger phoned the Zutari office w.r.t the planned pipeline route. He was previously one of the affected landowners before the change.	**Email Response: 03/06/2024** Good morning Mr Kruger, You called this morning to find out if the planned pipeline route from Xhariep to Bloemfontein had changed. This email is to confirm that the route has indeed changed. Below is a map showing the new route. The blue/purple route is the new route, and the orange route is the previous route that will no longer take place. Please let me know if you have any further questions. 
			03/06/2024	**Email to Zutari:** Thank you Corlie, but unfortunately, I can't see on the map if Farm Paradys will still be affected. If you might have a map with more details showing the farms, it would be appreciated.	**Email Response: 03/06/2024** Hallo Pedre, Attached is a list of the farms and each farm's co-ordinates that are affected. There is also a link that you can visit and if you go to Annexure E, there are 12 attachments that also show these co-ordinates as well as maps. https://geoverse.zutari.com/portal/apps/experiencebuilder/experience/?id=2f48681c19a24836bcfc03da3c653c3a Farm Paradys is not affected.
3.	Canny Mothapo **mothapoc@caa.co.za**	Procedure Design & Cartography, Air Navigation Services, Aviation	03/06/2024	**Email to Zutari:** Good morning, May you kindly delist all other SACAA email addresses and please save and send your environmental impact analysis reports, meeting requests and request for comments to **environment@caa.co.za**, going forward please.	**Response: 03/06/2024** Zutari amended the email address and sent out the BID and PPP notification to the new address.

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
		Safety Infrastructure		Regards	
4.	Chris Richter **chris.richter.simbras@gmail.com**		03/06/2024	**Email to Zutari:** Hi Genie I am writing to request information regarding the proposed construction of a water pipeline on the farm. It is imperative for the Trustees to understand the details and implications of this project. Below are specific questions that I kindly request you to address: 1. Can you please provide the documentation from the Department of Water and Sanitation appointing you as the contractor and indicating that the route must pass through this farm? 2. What is the proposed timeline for the construction of the water pipeline on my farm? 3. Can you provide detailed information about the pipeline route and its potential impact on my land and operations? 4. What measures will be implemented to minimize disruption to my farm during the construction process? 5. Are there any potential environmental impacts associated with the pipeline construction, and if so, how do you plan to address them? 6. Will there be any ongoing maintenance or access requirements after the pipeline is installed? 7. What assurances can you provide regarding the safety and integrity of the pipeline system? 8. How will compensation or reimbursement for any property damage during construction be handled? 9. Are there any regulatory approvals or permits required for the pipeline, and if so, what is the process for obtaining them? 10. Can you provide references or examples of similar pipeline projects you have completed in the past? 11. What channels are available if I have concerns or questions throughout the project's duration? 12. Can you supply me with relevant details of individuals requiring access to my farm, including their full names, IDs, job descriptions, and the companies they represent? 13. Will any type of housing, whether temporary or permanent, be constructed on the farm? If so, please provide details. 14. Which company is responsible for conducting the environmental assessment for the pipeline project? 15. Can you provide a clear, enlarged map showing the entire route from Reddersburg road to Rustfontein dam to Bloemfontein, including all relevant details? 16. What is the width of the pipeline and the designated area of operation along the route? 17. How large will the pumping station be, where will it be located, and how will it be connected to power? 18. What is the size and location of the reservoir, and how will it be connected to power? 19. How will access to the reservoir from the surrounding area be facilitated?	**Email Response: 04/06/2024** Dear Chris Thank you so much for your email below and pertinent questions regarding the Xhariep pipeline project. The project team will formulate replies to your information requests as per below and revert in due course. The public participation process has now commenced for the project – the comment period for the draft Basic Environmental Assessment Report and Water Use Licence application opened yesterday and a series of three information-sharing meetings are scheduled for 11 June 2024 as follows: ❖ *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* You are most welcome to join any of these meetings that may be convenient for you, but our technical team, together with DWS, are also able to meet with you personally at the Zutari offices in Bloemfontein at 08:00 on the morning of 12 June 2024. If you would like to / are able to meet at this time, please let us know. A Hydro Park, 135 President Reitz Avenue Westdene, Bloemfontein 9301 P Private Bag X11, Suite 70, Brandhof 9324 T +27 51 408 9600 Look forward to hearing from you. **Email/Letter Response: 14/06/2024** Dear Mr Richter **Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State** Your email dated 3 June 2024 has reference. Please refer to the answers provided below in relation to your questions posed (*italics*) in your email to correspondence to Zutari. 1. *Can you please provide the documentation from the Department of Water and Sanitation appointing you as the contractor and indicating that the route must pass through this farm?* Department of Water and Sanitation (DWS) appointed Zutari (Pty) Ltd as the Professional Service Provider (PSP) for the Xhariep Pipeline Feasibility Study. A copy of the Letter of Appointment, and Zutari's acceptance thereof, is attached, refer Annexure 1. The scope entails the detailed feasibility study for the Xhariep Pipeline Project, which builds on previous studies undertaken by Vaal Central Water Board (VCWB) (previously known as BloemWater) and Mangaung Metropolitan Municipality (MMM). The scope includes the need for Zutari,

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
				20. Can you clearly indicate on the map the access routes to the reservoir and pump station. Will these routes be tarmac? 21. What is the anticipated duration of the project from start to completion? 22. Are there any plans to construct a new pipeline from R702 to Bloemfontein or from R702 to Rustfontein dam, or will the existing pipeline route be utilized? Will Bloemwater be utilized for the pipeline to Bloemfontein? 23. Why is the originally approved pipeline route from Gariep to Bloemfontein not being utilized? 24. When is the environmental impact study scheduled to be conducted, and by whom will it be conducted? 25. What alternative routes were considered for the pipeline from Reddersburg road to Rustfontein dam? 26. What alternative options and locations were considered for the placement of the reservoir and pumping station? 27. What measures will you put in place to prevent disturbance to the farming operations on the property? 28. What precautions will you put in place to prevent biosecurity risks? I appreciate your prompt attention to these inquiries and look forward to receiving comprehensive answers to assist the trustees in understanding the project fully. Regards	as appointed 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). The previous studies had shortcomings in that it could not address the demands on a regional basis. The DWS appointment requires that the Xhariep Pipeline Project be designed such that it can meet the demands of all major demand centres until the year 2050. In order to achieve this objective, water from Gariep Dam needs to be split at a command reservoir from where Bloemfontein, Botshabelo and Thaba Nchu can be supplied. Furthermore, the number of pump stations need to be minimised to simplify operations and reduce the risk of mechanical failure/downtime. The technically preferred and most cost-effective solution entails pumping potable water from Gariep Dam to the command reservoir on your property, from where water can gravity to Bloemfontein, Botshabelo and Thaba Nchu. The elevation of this command reservoir must be 1530 metre above sea level or higher to operate under gravity. An alternative reservoir site was identified to the south-east of the proposed reservoir site but will require the overall pipeline length to be increased by more than 20 km, which will increase the overall project cost by more than R 1 billion. 2. *What is the proposed timeline for the construction of the water pipeline on my farm?* The Basic Assessment (BA) process is undertaken first in terms of regulations 19 and 20 of the 2014 NEMA EIA Regulations (as amended). This process must be completed, and environmental authorisation must be obtained before any construction can start. The Water Use License (WUL) is also being applied for. The current planning indicates that environmental authorisation will be obtained in 2024 and the water use license during early 2025. Indications are that construction will commence by early 2028. In terms of construction timeframes, the pipeline installation is typically done at a rate that varies from 50m to 100m per day. The command reservoir construction is anticipated to take 18 to 24 months, including the construction of the access road. 3. *Can you provide detailed information about the pipeline route and its potential impact on my land and operations?* Please refer to Section 5 of the draft BAR for the route and Section 7 for the impact on your farm. The draft BAR details input and assessments from various independent specialists. Please note specialists could not access your property and therefore compiled desktop assessment studies. 4. *What measures will be implemented to minimize disruption to my farm during the construction process?* Please refer to the EMPr (Annexure G) of the draft BAR. The EMPr details the information of the role players (Developer, Site Engineer, Environmental Site Agent, Record keeping) as well as safety and mitigation measures.

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					The following methodology will be followed during the installation of the pipeline: • The pipeline route will be set out with markers by the contractor, whereafter the engineer and landowner will verify that the alignment is as per the approved design; • The contractor will erect a temporary fence on the edge of the working area (typically a width of ±50m from the existing fence line on the edge of the road). This fence is to protect people and animals from entering the working area or falling into the pipe trench; • The maximum length of open trench will be limited to 300m; • Once the trench is backfilled, the completed work will be inspected by the engineer, whereafter the landowner will be asked to confirm that he/she is happy. Any further remedial work will be undertaken immediately by the contractor until the site has been reinstated to the same condition as prior to the commencement of construction; and • An Environmental Control Officer (ECO) will be appointed to oversee that the construction activities are taking place in accordance with the EMPr. The ECO must submit monthly audit reports to DFFE (the competent authority) who will have the right to suspend the work if deemed necessary. The ECO must also maintain a complaint register, which must be submitted monthly to DFFE. Should you want to discuss any additional measures you are welcome to contact Zutari in this regard so that it can be negotiated with the client for inclusion in the environmental authorisation and construction documentation. 5. *Are there any potential environmental impacts associated with the pipeline construction, and if so, how do you plan to address them?* Please refer to Section 7 of the draft BAR which details the environmental impact assessment. Furthermore Section 8 provides the environmental statements of all the appointed specialists and the EMPr (Annexure G) captures all the mitigation measures and role players. 6. *Will there be any ongoing maintenance or access requirements after the pipeline is installed*? Yes, there will be maintenance of the infrastructure after the pipeline is installed. The pipeline route should be inspected once a month for any visual leaks. Where the pipeline is located next to the road, the inspection can be performed from the access road. In the unlikely event of a leak, access will be required to repair the leak. 7. *What assurances can you provide regarding the safety and integrity of the pipeline system?* Bulk water pipelines are typically designed with a life expectancy of 50 to 100 years. This is achieved through specifying the appropriate pipe material, the appropriate pipe coating to mitigate the risk of corrosion, the require pipe wall thickness and any other mitigation measures (e.g. cathodic protection) required to prolong the life of the infrastructure. The information obtained from the geotechnical investigation (still to be undertaken) informs aspects such as the wall thickness, coating selection

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					and need for cathodic protection. As such, it is considered in the interest of all parties to grant access for the investigation to be undertaken. Any additional safety measures you would like to rise can be discussed with the client for inclusion in documentation. 8. *How will compensation or reimbursement for any property damage during construction be handled?* The information related to compensation during construction, and for registration of servitudes, has been communicated in our response dated 10 June 2024. The relevant information is repeated below for ease of reference/completeness. In terms of property rights and further engagements, kindly note that the project is currently in the detailed feasibility phase, whereafter a detailed design must be undertaken prior to construction commencing. Upon completion of the detailed feasibility phase, DWS will issue an instruction to the Sub Directorate: Land Rights Administration (LRA), which is the unit within DWS responsible for all land related matters for the DWS (country-wide) to acquire the land and servitudes needed for the project. LRA will obtain approval from the Minister of Water and Sanitation to expropriate the land and servitudes. After approval is granted, LRA will appoint a professional registered valuer (at the cost of the project, not the landowners) and a public meeting will be arranged, normally by/through an appointed social facilitator, with all the affected owners/persons. At the meeting, LRA, together with the appointed valuer, will explain the acquisition process and the valuation process. After this meeting, one-on-one meetings will be held with all the affected owners where the processes will again be explained in detail. The valuer will then visit every affected owner on site and conduct his valuation of the servitude or the land affected by the project. The valuer will then do market research, etc, and compile his valuation report for each owner, and then submit it to LRA who will have the compensation, as recommended by the valuer, approved, and notices of expropriation will be compiled wherein the amount offered will be mentioned and sent to the affected owners. The valuation will take into consideration the impacts during construction, any post-construction impacts (e.g. time needed for the vegetation to re-establish before the area can be used for grazing), and servitude registration. The working area during construction will likely be ±50m, whereas the servitude will be ±15m. In terms of the Expropriation Act, the owner then has 60 days to indicate whether he/she accepts the offer or not. If the offer is not accepted, the owner can submit a counterclaim in terms of the Act, which claim must be accompanied with motivation/own valuation report. This claim will be forwarded to the valuer for consideration and comments. After the valuer's comments and recommendation is received, a round-table meeting can be held between the owner, his/her valuer/experts, LRA and their valuer, to see if agreement on the amount of compensation can be reached. If no agreement can be reached, the owner can then, in terms of the Act, take the matter to a suitable court, who will decide on the compensation to be paid.

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					LRA makes use of the State Attorney to register the servitudes or acquired land/portions of land, in the relevant Deeds Office. The servitude conditions can also be negotiated with the owner in order to cover the owner's concerns. LRA uses the following legislation for the acquisition of land and servitudes: • The Constitution, section 25; • The National Water Act, Act 36 of 1998, sections 64 and 65; and • The Expropriation Act, Act 63 of 1975. 9. *Are there any regulatory approvals or permits required for the pipeline, and if so, what is the process for obtaining them?* Yes, there are regulatory approvals that must be obtained. Please refer to section 2.1 of the draft BAR which describes the permits that need to be obtained as well as the WULA which is separate from the EA (Environmental Authorisation) 10. *Can you provide references or examples of similar pipeline projects you have completed in the past?* Zutari has completed numerous projects that are similar in size and complexity. Some of the more recent projects are noted below: • Olifants River Water Resources Development Project, Phase 2: 219 km of pipelines with diameters ranging from 1000mm to 180mm, four pump stations (27MW installed capacity); • Mokolo Crocodile Water Augmentation Project: 43km of steel pipelines with diameters of up to 110mm with a 4.5MW pump station; and • Vaal River Eastern Sub-System Augmentation Project: 115km of steel pipelines with a diameter of 1900mm. It is, however, understood that this question might be more related to the competence of the contractor that will be appointed to construct the pipeline. In this regard, a functionality requirement will be introduced in the tender documentation of the contractors where a minimum score (typically 70%) must be achieved in order to be considered eligible. In terms of functionality criteria, the following would typically be specified: • Tenderers must demonstrate that they have constructed continuously welded steel pipelines with a minimum diameter of 900mm and pipeline lengths of at least 10km or longer; • Tenderers must demonstrate that they have constructed water retaining structures (e.g. water treatment works and reservoirs) of a minimum size/capacity; • Tenderers must demonstrate that they have constructed pump stations, especially the mechanical and electrical equipment with a minimum power rating (kW); and • Minimum requirements for the contractor's staff in terms of years' experience and qualifications.

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					11. *What channels are available if I have concerns or questions throughout the project's duration?* Zutari's appointment lapses after completion of the detailed feasibility design of the Xhariep Pipeline Project, whereafter DWS will appoint another consultant to undertake the detailed design and site supervision of the construction activities. DWS will also appoint the contractor(s) to undertake the construction of the infrastructure components. It is proposed that you contact Ms Sanet van Jaarsveld (**vanjaarsvelds@dws.gov.za**) at DWS should you have any concerns or questions regarding the project. During the construction phase, a full-time environmental control officer (ECO) will be appointed to independently audit compliance with the environmental authorisation. The ECO will be the point of contract for any non-compliance matters during construction, but this can also be escalated to the relevant DWS project manager. 12. *Can you supply me with relevant details of individuals requiring access to my farm, including their full names, IDs, job descriptions, and the companies they represent?* To date, the individuals requiring access to your property are related to the environmental impact assessment process (specialists in various fields) as well as the geotechnical specialist needing to assess founding conditions. Attempts were made to inform you and request permission for access via email, telephonically, as well as through members/representatives of the local farmers associations. The individuals mentioned above, who have already conducted their site visits as necessary (excluding on your property) are: • John Gribble (archaeology) - TerraMare Archaeology (Pty) Ltd • Johannes Maree (terrestrial biodiversity) - Setala Environmental • Johan van Tol (soils/agriculture) - Professor: Soil- and Crop- and Climate Sciences Faculty Natural and Agricultural Sciences, University of the Free State • Darius van Rensburg (wetlands) - DPR Ecologists & Environmental Services The geotechnical contractor should be appointed by 21 June 2024 with field investigations to commence by mid-July 2024. Details of the geotechnical contractor, as well as dates when access will be required, will be communicated to you in advance before access is required. 13. *Will any type of housing, whether temporary or permanent, be constructed on the farm? If so, please provide details.* 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.

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					In terms of pipeline and reservoir construction, no temporary or permanent housing will be required on the property. However, for the command reservoir construction, a temporary site camp will be required close to the reservoir site to store equipment with only security personnel staying at the camp site overnight. The completed reservoir will be unmanned and will only be visited on an ad hoc basis to inspect the reservoir for any leaks. 14. *Which company is responsible for conducting the environmental assessment for the pipeline project?* DWS appointed Zutari (Pty) Ltd 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). 15. *Can you provide a clear, enlarged map showing the entire route from Reddersburg road to Rustfontein dam to Bloemfontein, including all relevant details?* Please refer to the maps attached in Annexure I of the draft BAR which details all infrastructure and sensitive areas. Furthermore, please refer to the attached zip file for the locality maps indicating the entire route. *16. What is the width of the pipeline and the designated area of operation along the route?* Please refer to Section 5 of the draft BAR which provide a detailed description of the project. A 100 m wide corridor was evaluated for the proposed pipeline routes to permit refinement of the pipeline routes in consultation with the landowners. The final construction width will be restricted to a maximum width of 50m, whereas a 15m wide servitude will be registered for the pipelines. 17. *How large will the pumping station be, where will it be located, and how will it be connected to power?* Please refer to Section 5.3.1 of the draft BAR which details the location and capacity of all the infrastructure. **Size** The estimated footprint of the Gariep Low Lift Pump Station pumpstation will be approx.10,000 $m^{2.}$ and the footprint of the Gariep High Lift Pump Station will be approx. 60,000m^2 including the water treatment works, 10,000m^2 and the Booster Pumpstation will equate to approx. 10,000 m^2. Please note 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 1st command reservoir, 4. A booster pump station and suction reservoir, 5. A 2nd command reservoir, and,

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					6. The pipeline route from the Gariep Dam to the connection points at Bloemfontein and Rustfontein Pump Station. **Location** 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 1st 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. Furthermore, please refer to the table from the draft BAR which details the sizing and capacity of the proposed infrastructure for the Xhariep Pipeline Project Scheme 1B. **Table 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

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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

Power:

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.

18. *What is the size and location of the reservoir, and how will it be connected to power?*

Please refer to Section 5 of the draft BAR which provide a detailed description of the project as well as the answer provided in question 17.

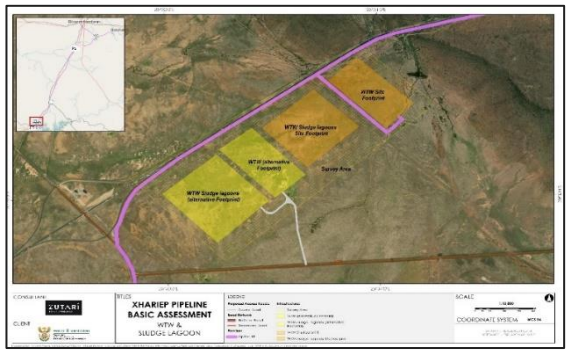
19. *How will access to the reservoir from the surrounding area be facilitated?*

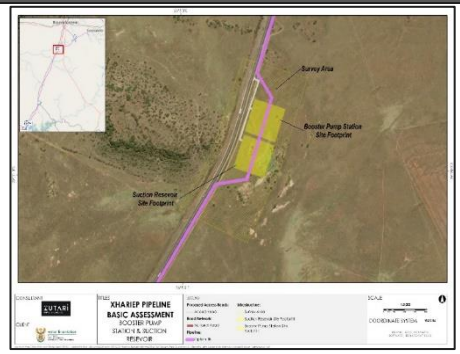
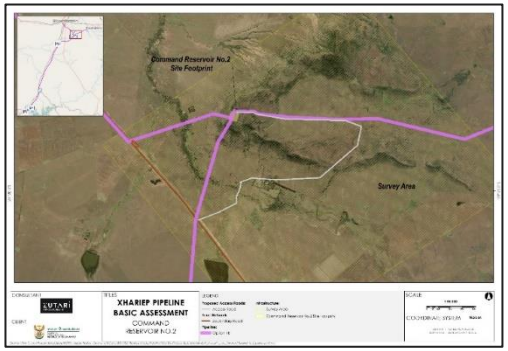
Existing roads will be used as far as practically possible and feasible with new access roads to be constructed to permanent infrastructure locations, e.g. the water treatment works, pump stations and command reservoirs. The access roads to the water treatment works and pump stations will be 8.6m wide 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.

20. *Can you clearly indicate on the map the access routes to the reservoir and pump station. Will these routes be tarmac?*

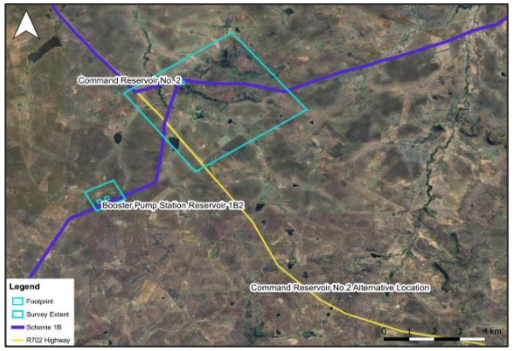
Please refer to the maps below. These maps are also incorporated in the draft BAR **Section 5**.

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					 **Figure 1: Layout and access for the proposed low-lift pump station**  **Figure 2: Proposed layout access of the WTP, sludge lagoons, and High Lift Pump Station**  **Figure 3: Layout and access of the proposed command reservoir No 1**

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					 **Figure 4: Proposed layout and access for booster pump station with suction reservoir**  **Figure 5: Proposed layout and access of the command reservoir No 2** 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. 21. *What is the anticipated duration of the project from start to completion?* It is anticipated that construction could commence by early 2028 and be completed by early to mid-2032, whereafter the overall project must be

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					commissioned. The commissioning phase can take up to six months, meaning that the scheme should be fully operational by end 2032. 22. *Are there any plans to construct a new pipeline from R702 to Bloemfontein or from R702 to Rustfontein dam, or will the existing pipeline route be utilized? Will Bloemwater be utilized for the pipeline to Bloemfontein?* Yes, a new pipeline will be constructed from the 2nd command reservoir to Bloemfontein, as well as to Rustfontein/Botshabelo. The pipeline to Bloemfontein will follow the existing pipeline servitude along the R702 so that services can be grouped. Vaal Central Water Board (previously known as Bloemwater) will not be used for construction or implementation of this pipeline. 23. *Why is the originally approved pipeline route from Gariep to Bloemfontein not being utilized?* An Environmental Authorisation (EA) was signed and authorised by the Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA) on 07 July 2018 in terms of the NEMA Regulations of 2014 (as amended). Condition 1.6 stipulates: *If commencement of the activity does not occur within a period of 3 (three) years from the date of issue, the Authorisation lapses, and a new application for and EA must be made*. The applicant was the Manguang Metropolitan Municipality. The EA lapsed, and a new process is now underway, and the new applicant is the Department Water and Sanitation (DWS). As noted in the response to Question 1, the previous studies had shortcomings in that it could not meet the demands of all the major demand centres. The originally approved option/scheme would have supplied potable water to Bloemfontein but would not have addressed the current shortages experienced at Botshabelo and Thaba Nchu. 24. *When is the environmental impact study scheduled to be conducted, and by whom will it be conducted?* DWS appointed Zutari (Pty) Ltd 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). The impact assessments which were done by independent specialists was finalised during the first half of 2024. The compilation of the draft BAR also took place during this period. Zutari started engagement with yourself on 23/01/2024 to inform you of the proposed project and to obtain your permission to access your farm as part of these assessments. Contact to engage with you comprised of phone calls, emails, contact with the farmers' association, a register letter, a detailed email notification to indicate the start of the public participation process for the environmental authorisation as well as an invitation to yourself written on 19/03/2024 to invite you to attend an engagement meeting where you could meet the project team in person to discuss the

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					project. Furthermore, please note the following steps that was done as part of the public participation process: 1. **BID** – a Background Information Document (BID) wa 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 landowners along the proposed pipeline route and placed along with the draft BAR hard copies in the four identified public libraries as listed below. 2. **Written notice** – Written notices were 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 3. **Site Notices –** The availability of the Draft BAR was advertised via ten site notices placed at strategic locations along the project. 4. **Newspaper advert –** The availability of the Draft BAR was advertised in the 'The City Press and the "Rapport" newspapers on 2 June 2024 and informed the public of the public participation opportunities and the availability of the Draft BAR for comment. 5. **Information for review:** the draft BAR is accessible during the comment period as follows: 6. **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 7. **Electronic copy:** is currently 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** 8. **Focused Engagements:** focused engagements with key stakeholder groups, e.g. farmers and landowners, took place during the 30-day comment period. Three engagements took 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

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					• Bloemfontein: 18:00 to 20:30: Protea Hotel by Marriott Bloemfontein Willow Lake, 101 Henry Street, Willows 9. **Comment period:** The Draft BAR was available for comment for 30-days from the 3rd of June 2024 to the 4th of July 2024 10. **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. *25. What alternative routes were considered for the pipeline from Reddersburg road to Rustfontein dam?* The location of the 2nd command reservoir, which had to be located at a minimum elevation of 1535 metres above sea level, dictated the pipeline alignment options. In order to minimise impacts on landowners and farming activities, the approach is to keep the pipeline close to or adjacent to existing services such as roads and overhead powerlines. The construction cost of the pipeline is approximately R 50 million per kilometre – as such, shorter routes are prioritised. 26. *What alternative options and locations were considered for the placement of the reservoir and pumping station*? Refer to the responses to Questions 1 and 25 with respect to the location and options for the 2nd command reservoir. In terms of the pump station, two positions were considered – one along the N1 Road (see Figure 4 above) and one close to the 2nd command reservoir (see Figure 6 below). These positions were determined by the hydraulic capacity of the pipelines, i.e. how far can the booster pump station be located from the 1st command reservoir before pumping is again required. Based on various considerations (e.g. impact on landowners, ease of access, power supply to the site, security, etc.), it was concluded that the site located along the N1 Road (shown in Figure 4) was preferred. As such, the site located close to the 2nd command reservoir (shown in Figure 6) is no longer being considered. 

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					Figure 6: Location of booster pump station in vicinity of command reservoir No 2 27. *What measures will you put in place to prevent disturbance to the farming operations on the property*? Please refer to the response provided to Question 4. Please refer to the EMPr (Annexure G). Any additional safety measures can be raised, and this can be discussed with the client and be included in documentation. 28. *What precautions will you put in place to prevent biosecurity risks?* Please refer to the EMPr (Annexure G). Any additional safety measures can be raised, and this can be discussed with the client to be included in documentation. Yours faithfully Stephan Kleynhans 

water & sanitation
Department:
Water and Sanitation
REPUBLIC OF SOUTH AFRICA

Private Bag X 313, Pretoria 0001, Sedibeng Building, 185 Francis Baard Street, Pretoria 0002.Tel: +2712 336 7500,
Enquiries: Zelda Phiri e-mail: phiriz@dws.gov.za Tel: (012) 336 7954

Zutari (Pty)Ltd
Private Bag X11
Suite 70
Brandhof
9324

By email: Stephen.kleyhans@zutari.com

Dear Mr Stephan Klynhans

LETTER OF APPOINTMENT

WP11405: GREATER MANGAUNG WATER AUGMENTATION PROJECT – XHARIEP PIPELINE FEASIBILITY STUDY.

Your bid dated 05 August 2022 regarding the above-mentioned project refers.

We are pleased to inform you that your company has been appointed for the Greater Mangaung Water Augmentation project – Xhariep pipeline feasibility study.

Your appointment to render Greater Mangaung Water Augmentation project – Xhariep pipeline feasibility study is accepted at a total amount of R23,797,398.62 including vat.

Kindly take note that the required services should only be rendered after the issue of an official purchase order and the conclusion of a service level agreement.

You are requested to sign the acceptance of offer and submit to phiriz@dws.gov.za within two days of receipt of this letter.

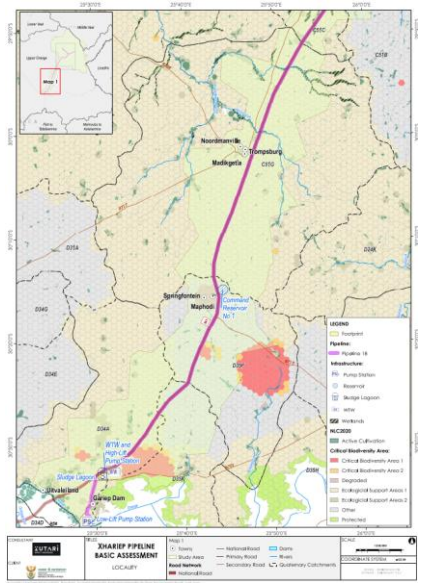
The contact person for this project is Mrs Sanet van Jarsveld Tel: 012 336 7284, or E-mail address: vanjaarsvelds@dws.gov.za

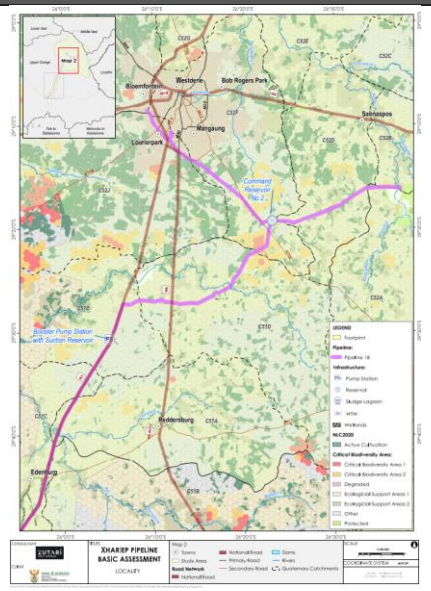
Yours sincerely,

MS NANCY KHUBANA
DIRECTOR: SUPPLY CHAIN MANAGEMENT
DATE: 17/10/2022

NATIONAL DEVELOPMENT PLAN
Our Future - make it work

Page 1 of 2

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA ACCEPTANCE OF OFFER WP 11405: GREATER MANGAUNG WATER AUGMENTATION PROJECT – XHARIEP PIPELINE FEASIBILITY STUDY. I/We. I STEPHANUS HENDRIK KLEYNHANS from (company name) ZUTARI (PTY) LTD hereby unconditionally accept the offer and agree to the prescribed conditions for bid No: WP11405 Signed at CAPE TOWN on 18 OCTOBER 2022 Signature Date 18/10/2022 NDP 2030 NATIONAL DEVELOPMENT PLAN Our Future - make it work Page 2 of 2 

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					
5.	Chris Richter **chris.richter.simbras@gmail.com**		06/06/2024	After careful consideration and consultation with relevant stakeholders, legal advisors, and environmental experts, it has been determined that permitting the installation of a water pipeline through my farm ground is not feasible or permissible for the following reasons: 1. Environmental Concerns: The proposed pipeline route traverses environmentally sensitive areas within my farms, including wetlands, wildlife habitats, and conservation zones. Installation and operation of the pipeline etc. would pose a significant risk of ecosystem disruption, potentially leading to irreparable harm to local flora and fauna. There was no Environmental Impact Assessment on my farms, and this is unacceptable. 2. Agricultural Impacts: My farms are a vital component of the local agricultural landscape, contributing to food production and rural livelihoods. The presence of a water pipeline could interfere with farming operations, including cultivation, irrigation, and livestock management, leading to adverse impacts on agricultural productivity and sustainability. 3. Property Rights and Easements: As the landowner, I have a legal right to control and manage the use of my property. Granting easements or rights-of-way for the installation of a water pipeline would infringe upon these property rights and could have long-term implications for land tenure and ownership. 4. Safety:	**Email Response: 04/06/2024** Good Morning Chris Please see replies to the points mentioned in your email below, of 6 June 2024, in green text. As mentioned in my email to you dated 4 June 2024, please let us know if you would like to take the opportunity to meet with the project team and DWS at the Zutari offices in Bloemfontein at 08:00 on the morning of 12 June 2024 (coming Wednesday morning). Kind Regards Genie 1. Environmental Concerns: The proposed pipeline route traverses environmentally sensitive areas within my farms, including wetlands, wildlife habitats, and conservation zones. Installation and operation of the pipeline etc. would pose a significant risk of ecosystem disruption, potentially leading to irreparable harm to local flora and fauna. There was no Environmental Impact Assessment on my farms, and this is unacceptable. All efforts were made to contact you (phone calls, emails and a registered letter), as well as messages via the Farmer's Association, to inform you of the proposed environmental process that will take place. None of these were answered. The proposal involves service delivery and the specialists therefore conducted desktop studies of the areas where they could not gain access to. The competent authority, namely DFFE, will decide whether

<table>
<tr><th></th><th colspan="5">XHARIEP BASIC ASSESSMENT REPORT
Comments and Response Register (PPP 3 June 2024 – 4 July 2024)</th></tr>
<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td></td><td></td><td></td><td></td><td>There are concerns regarding the potential risks associated with the installation and operation of a water pipeline etc. Ensuring the safety of my family is paramount, and permitting the pipeline will compromise my welfare.
In light of the aforementioned considerations, we must respectfully decline the request to allow the installation of a water pipeline etc. on my farms. I trust that you will understand and respect the owner's decision.
Regards
Chris Richter</td><td>these studies are sufficient to make an informed decision, namely, to grant environmental authorisation or not. It has been noted in the environmental Basic Assessment that the proposed area for Command Reservoir 2 (on your farm) is located within a Critical Biodiversity Area (CBA). With mitigation measures, the major -negative impact on flora and fauna can be mitigated to moderate, as per the specialist studies - see extract below.
<table>
<tr><td>Project phase</td><td colspan="4">Construction</td></tr>
<tr><td>Impact</td><td colspan="4">Loss of Vegetation - Command Reservoir 2</td></tr>
<tr><td>Description of impact</td><td colspan="4">Clearance of vegetation for the construction of large concrete closed reservoir and access road</td></tr>
<tr><td>Mitigatability</td><td>Low</td><td colspan="3">Mitigation does not exist; or mitigation will slightly reduce the significance of impacts</td></tr>
<tr><td>Potential mitigation</td><td colspan="4">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.</td></tr>
<tr><td>Assessment</td><td colspan="2">Without mitigation</td><td colspan="2">With mitigation</td></tr>
<tr><td>Nature</td><td colspan="2">Negative</td><td colspan="2">Negative</td></tr>
<tr><td>Duration</td><td>Permanent</td><td>Impact may be permanent, or in excess of 20 years</td><td>On-going</td><td>Impact will last between 15 and 20 years</td></tr>
<tr><td>Extent</td><td>Local</td><td>Extending across the site and to nearby settlements</td><td>Local</td><td>Extending across the site and to nearby settlements</td></tr>
<tr><td>Intensity</td><td>Very high</td><td>Natural and/ or social functions and/ or processes are majorly altered</td><td>High</td><td>Natural and/ or social functions and/ or processes are notably altered</td></tr>
<tr><td>Probability</td><td>Certain / definite</td><td>There are sound scientific reasons to expect that the impact will definitely occur</td><td>Almost certain / Highly probable</td><td>It is most likely that the impact will occur</td></tr>
<tr><td>Confidence</td><td>High</td><td>Substantive supportive data exists to verify the assessment</td><td>Medium</td><td>Determination is based on common sense and general knowledge</td></tr>
<tr><td>Reversibility</td><td>Low</td><td>The affected environment will not be able to recover from the impact - permanently modified</td><td>Medium</td><td>The affected environment will only recover from the impact with significant intervention</td></tr>
<tr><td>Resource irreplaceability</td><td>Medium</td><td>The resource is damaged irreparably but is represented elsewhere</td><td>Medium</td><td>The resource is damaged irreparably but is represented elsewhere</td></tr>
<tr><td>Significance</td><td colspan="2">Major - negative</td><td colspan="2">Moderate - negative</td></tr>
<tr><td>Comment on significance</td><td colspan="4">None</td></tr>
</table>
</td></tr>
</table>

XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)					
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**

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			

2. Agricultural Impacts:

My farms are a vital component of the local agricultural landscape, contributing to food production and rural livelihoods. The presence of a water pipeline could interfere with farming operations, including cultivation, irrigation, and livestock management, leading to adverse impacts on agricultural productivity and sustainability.

The outcome of the agricultural specialist study in reference to Command Reservoir, 2 is shown below. With the proposed mitigation measures, the outcome in significance is negligible.

TABLE 12: IMPACT OF THE PIPELINE ON AGRICULTURAL RESOURCES

Project phase	Construction			
Impact	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
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			

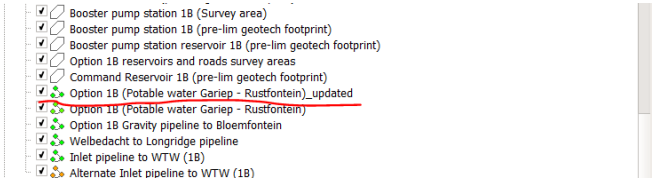
	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					 FIGURE 61: ACTUAL PROJECT FOOTPRINT OF COMMAND RESERVOIR 2 (OPTION 1B1) AND BOOSTER PUMP STATION (OPTION 1B1), HIGH SENSITIVITY AREAS IN RED. 3. Property Rights and Easements: As the landowner, I have a legal right to control and manage the use of my property. Granting easements or rights-of-way for the installation of a water pipeline would infringe upon these property rights and could have long-term implications for land tenure and ownership. 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 - Water and Sanitation Infrastructure which is a nationwide project in all provinces. 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. In terms of the 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. DWS is the applicant and needs to provide this service. In terms of property rights and further engagements, kindly note that the project is currently in the detailed feasibility phase, whereafter a detailed design must be undertaken prior to construction commencing. Upon completion of the detailed feasibility phase, DWS will issue an instruction to the Sub Directorate: Land Rights Administration (LRA), which is the unit within DWS responsible for all land related matters for the DWS (country-wide) to acquire the land and servitudes needed for the project. LRA will obtain approval from the Minister of Water and Sanitation to expropriate the land and servitudes. After approval is granted, LRA will appoint a professional registered valuer (at the cost of the project, not the landowners) and a public meeting will be arranged, normally by/through an appointed social facilitator, with all the affected owners/persons. At the meeting, LRA, together with the appointed valuer, will explain the acquisition process and the valuation process. After this meeting, one-on-one meetings will be held with all the affected owners

Ref	Source Name	Source Organisation	Date Received	Comment	Response + Date
					where the processes will again be explained in detail. The valuer will then visit every affected owner on site and conduct his valuation of the servitude or the land affected by the project. The valuer will then do market research, etc, and compile his valuation report for each owner, and then submit it to LRA who will have the compensation, as recommended by the valuer, approved, and notices of expropriation will be compiled wherein the amount offered will be mentioned and sent to the affected owners. In terms of the Expropriation Act, the owner then has 60 days to indicate whether he/she accepts the offer or not. If the offer is not accepted, the owner can submit a counterclaim in terms of the Act, which claim must be accompanied with motivation/own valuation report. This claim will be forwarded to the valuer for consideration and comments. After the valuer's comments and recommendation is received, a round-table meeting can be held between the owner, his/her valuer/experts, LRA and their valuer, to see if agreement on the amount of compensation can be reached. If no agreement can be reached, the owner can then, in terms of the Act, take the matter to a suitable court, who will decide on the compensation to be paid. LRA makes use of the State Attorney to register the servitudes or acquired land/portions of land, in the relevant Deeds Office. The servitude conditions can also be negotiated with the owner in order to cover the owner's concerns. LRA uses the following legislation for the acquisition of land and servitudes: • The Constitution, section 25; • The National Water Act, Act 36 of 1998, sections 64 and 65; and • The Expropriation Act, Act 63 of 1975. 4. Safety: There are concerns regarding the potential risks associated with the installation and operation of a water pipeline etc. Ensuring the safety of my family is paramount, and permitting the pipeline will compromise my welfare. Special safety precaution measures can be raised with the Client (DWS) to be included in relevant documentation. It is therefore strongly advised that you pro-actively engage DWS and the project team to ensure that any concerns you may have, are addressed as soon as possible. In light of the aforementioned considerations, we must respectfully decline the request to allow the installation of a water pipeline etc. on my farms. I trust that you will understand and respect the owner's decision. We encourage you to engage DWS and the project team as soon as possible. The project is in the detailed feasibility phase and, as such, infrastructure placement can still be refined (kindly note that the Command Reservoir 2 position is influenced by the elevation thereof and can therefore not be moved) to minimise potential impact. Through early engagement, landowners can provide inputs to servitude conditions, further mitigation measures during and post construction, safety aspects during and post construction, etc.

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					A detailed response will be compiled to your earlier email (3 June 2024), containing 28 questions, and will be shared in due course.
6.	Ian McLachlan **ian@hillsidefarm.co.za**	Westwind Estates (Pty) Ltd / Hillside Farm	04/06/2024	**Email to Zutari:** Dear Genie I do not necessarily want to sit through a 2-hour meeting to have the following questions answered: 1. What is the exact route of the pipeline? (ultimately, I want to know if it runs through our farm like the N1 does – farm situated between Springfontein and Trompsburg on the N1). Somehow my thinking was that the pipeline was going to run west of the old gravel road between Springfontein and Trompsburg. 2. If so, will we be able to buy water from the pipeline if it does run though the farm? I look forward to hearing from you. Regards Ian	
			10/06/2024	**Email to Zutari:** Hi Werner Thank you for taking my call. My two questions: 1. What is the exact route of the pipeline? (ultimately, I want to know if it runs through our farm like the N1 does – farm situated between Springfontein and Trompsburg on the N1 2. If so, will we be able to buy water from the pipeline if it does run though the farm? I look forward to hearing from you. Regards Ian	**Email Response: 12/06/2024** Good morning Mr Ian McLachlan, I hope this email finds you well. Thank you for your patience and taking the time to reach out to our office. During the Public Participation meetings held yesterday we made contact with a few of the landowners in your nearby vicinity. Relating to our telephonic conversation on Monday morning and the subsequent correspondence, I am responding to the following points: 1. The pipeline will be routed all along the N1 from the Gariepdam towards Bloemfontein, on the right-hand side, and will deviate from the N1 about 5.5km before Tierpoort Dam onto the S299. According to my knowledge you are more interested in the section between Springfontein and Trompsburg. Attached please find the .kmz file depicting the pipe route.

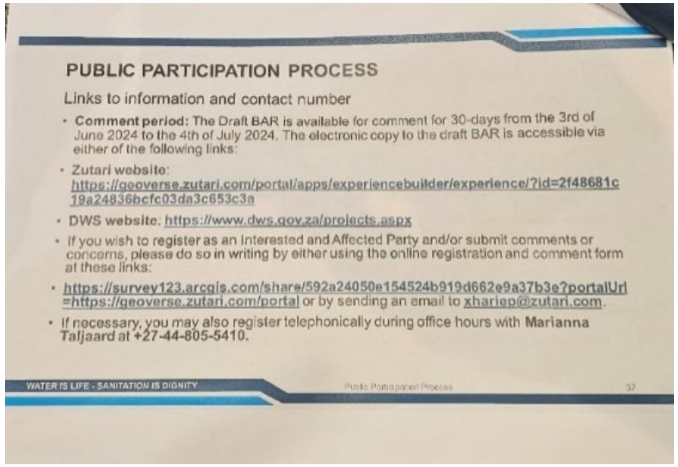
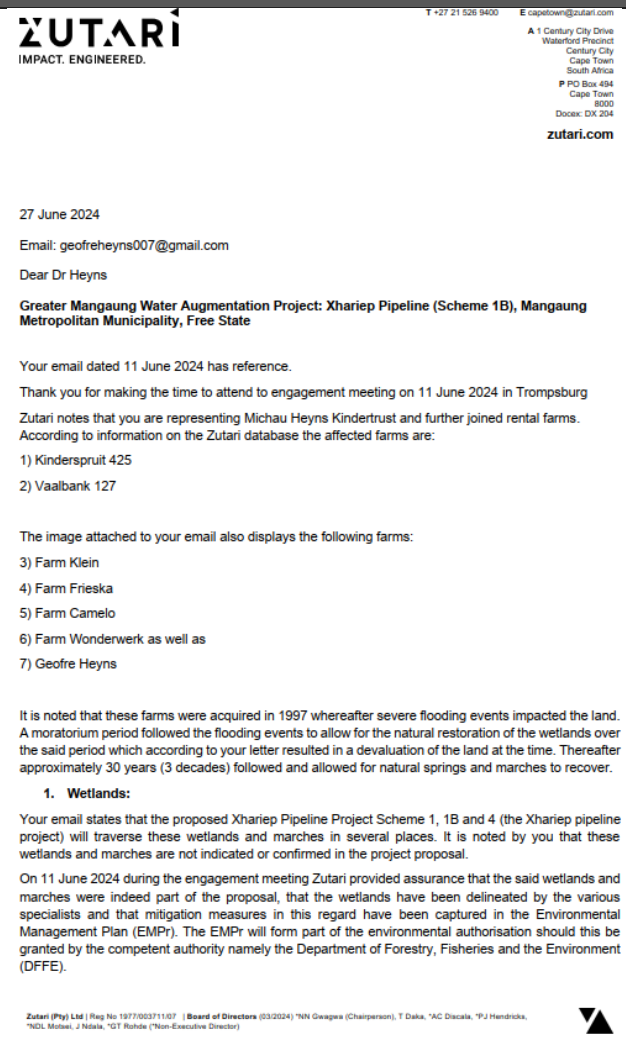
	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					 2. The pipe section between Gariepdam and the Command reservoir near Springfontein is a pumping mainline. Due to the operational conditions of the pump sets, take off points are prohibited on this section. The section passing through your property is a gravity mainline until your reach the booster pump station approximately 7km before the pipeline deviating onto the S299; however, at this stage no allowance was made for take-off points along the pipeline. During our meetings yesterday Mr Stephan Kleynhans (Design Engineers and Study Leader on the project) did not exclude the possibility and suggested that an application can be made for a farmer to have a dedicated take off point for usage of water. Please see the snippet below depicting the booster pump station where the pipeline transitions from a gravity to a pumping mainline. 

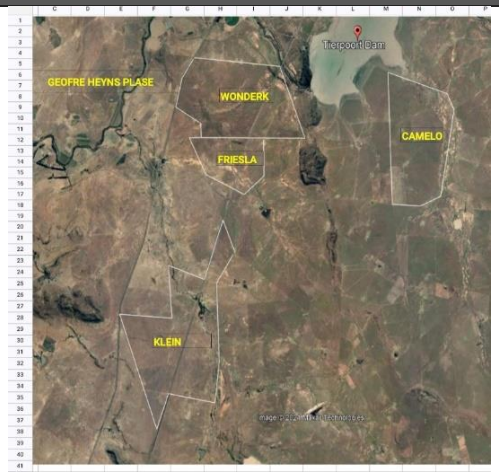
	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					3. You also enquired about the servitude width. A servitude of approximately 15m will be registered with a working width of approximately 50m from the fence line. The aim is to have the centre of the pipeline approximately 25m from the fence line into the farm property. If you have any additional queries or comments, please do not hesitate to contact me. I am glad to assist you in any manner possible. Kind regards Werner Griessel
			12/06/2024	**Email to Zutari:** Hi Werner Thank you for responding. I am interested in a take off point. Please let me know how I need to go about it to apply. Regards Ian McLachlan	**Email Response: 20/06/2024** Good afternoon Mr Ian McLachlan, I hope this email finds you in good faith. Zutari's appointment is for the detailed feasibility phase of the project, whereafter DWS will appoint a professional service provider to undertake the detailed design and construction supervision. However, in terms of engagements between landowners and DWS, the following processes are likely to be followed: The Sub Directorate: Land Rights Administration (LRA) is the unit within the Department of Water and Sanitation (DWS) responsible for all land-related matters nationwide. The LRA unit is situated in Pretoria. After a detailed feasibility phase is approved, an instruction is given to the LRA by the DWS Project Manager to acquire the land and servitudes needed for the project. The LRA will then obtain approval from the Minister of Water and Sanitation to engage affected landowners regarding the procurement of land and registration of servitudes. Once approval is granted, the LRA will appoint a professional registered valuer (at the project's cost), and a public meeting will be arranged, typically through an appointed social facilitator, with all affected owners/persons. At the meeting, the LRA and the appointed valuer will explain the acquisition and valuation processes. Following this meeting, one-on-one meetings will be held with all affected owners to further detail the processes. The valuer will then visit each affected owner on-site to conduct the valuation of the servitude or land affected by the project. During these one-on-one engagements, landowners will have the opportunity to raise conditions (e.g. water off-take point) they may want to propose as part of the Agreement to be concluded between DWS and the landowner. Each condition/request will be evaluated based on merit before being agreed to. After conducting market research and completing other necessary steps, the valuer will compile a valuation report for each owner and submit it to the LRA, which will handle the compensation as recommended by the valuer. Zutari will record your request for an off-take as part of the records of the public participation process. This will ensure that this information can be passed on to the LRA when they commence the one-on-one meetings. I hope this provides you with more clarity on the way forward. Do not hesitate to contact me should you require any additional information. Kind regards

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Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					Wermer Griessel
7.	Tebego Kgaphola **bcadmin@dffe.gov.za**	Department of Forestry, Fisheries and the Environment (DFFE)	06/06/2024	**Email to Zutari:** Dear Sir/Madam DFFE Directorate: Biodiversity Conservation hereby acknowledge receipt of the invitation to review and comment on the project mentioned on the subject line. Kindly note that the project has been allocated to Mrs M Rabothata (**MRABOTHATA@dffe.gov.za**) and Ms Lindiwe Dlamini (**LVDlamini@dffe.gov.za**) (Copied on this email). In addition, kindly share the shapefiles of the development footprints/application site with the Case Officers. Please note: All Public Participation Process documents related to Biodiversity EIA review and any other Biodiversity EIA queries must be submitted to the Directorate: Biodiversity Conservation at Email: **BCAdmin@dffe.gov.za** for attention of Mr Seoka Lekota Regards Tebego Kgaphola	**Email Response: 10/06/2024** For Attention: Mr Seoka Lekota We refer to your email dated 6 June 2024. Please see attached the shapefiles that you have requested. Please let us know should you need any other information. Kind regards Corlie Steyn
					Email Response: 26/06/2024 Good day Mr Seako, I hope you are doing well. We are getting close to the end of our PP period on the Xhariep project. Input from landowners and specialists lead to a slight change in the route:(i) to accommodate the landowner, and ii) for the pipeline route to follow existing infrastructure, which is generally preferable from a disruption and maintenance perspective. It will, however, be a bit more expensive due to the longer pipeline route, hence the original alignment. Please see the new route attached (Krapfontein Farms_alternative image). Attached is also the new kmz. The new route alignment is underlined in red in the screenshot below, note that the old one is still part of the kmz file.  The pipe length only changed by just under 500m: Total pipeline length went from 244.4km to 244.9km. The new details are:

<table>
<tr><th></th><th colspan="5">XHARIEP BASIC ASSESSMENT REPORT
Comments and Response Register (PPP 3 June 2024 – 4 July 2024)</th></tr>
<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>
<table>
<tr><th>Component</th><th>Capacity (m³/s) (1)</th><th>Capacity (Ml/d) (1)</th><th>Estimated Footprint (m²)</th></tr>
<tr><td>Gariep Low Lift Pump Station</td><td>3.8</td><td>328.1</td><td>10,000</td></tr>
<tr><td>Gariep WTP</td><td>-</td><td>312</td><td>600,000</td></tr>
<tr><td>Gariep High Lift Pump Station</td><td>3.62</td><td>312.4</td><td>(included in WTP above)</td></tr>
<tr><td>Command Reservoir (3 sites)</td><td>-</td><td>80 Ml</td><td>112,500</td></tr>
<tr><td>Booster Pump Station</td><td>3.62</td><td>312.4</td><td>10,000</td></tr>
<tr><td>Gariep Pipeline
(188.99 km, 1800 Ø)</td><td>3.62</td><td>312.4</td><td>7,559,600</td></tr>
<tr><td>Gravity Pipeline to Brandkop
(31.37 km, 2000 Ø)</td><td>3.62</td><td>312.4</td><td>1,254,800</td></tr>
<tr><td>Gravity Pipeline to Rustfontein Pump Station
(24.52 km, 1400 Ø)</td><td>2.43</td><td>209.8</td><td>980,800</td></tr>
<tr><td>Substation (2 sites)</td><td>-</td><td>-</td><td>45,000</td></tr>
<tr><td>Total (m²)</td><td></td><td></td><td>10,572,700</td></tr>
<tr><td>Total (ha)</td><td></td><td></td><td>1,057</td></tr>
<tr><td>Total excl. pipeline (m²)</td><td></td><td></td><td>777,500</td></tr>
<tr><td>Total excl. pipeline (ha)</td><td></td><td></td><td>78</td></tr>
</table>
Please do not hesitate should you have questions.
We are aiming to send the amended shapefile soonest.
Kind regards
Corlie Steyn
</td></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Email Response: 26/06/2024
Good day Mr Seoka,
In reference to my email below please see the updated shapefile attached.
Please do not hesitate should you have questions.
Kind regards
Corlie Steyn
Updated Pipeline Route 20240626.zip
18 KB</td></tr>
<tr><td>8.</td><td>SAHRA General
info@sahra.org.za</td><td>South African Heritage Resources Agency</td><td>06/06/2024</td><td>Email with BID document was forwarded to Stephen Van Den Heever at SAHRA - svandenheever@sahra.org.za</td><td>Zutari added Stephen Van Den Heever to I&AP list</td></tr>
<tr><td>9.</td><td>Albie Louw
LouwA1@ufs.ac.za</td><td>University of the Free State</td><td>07/06/2024</td><td>Email to Zutari:
Good day Zutari
1. Map 2 of your draft Basic Environmental Assessment Report and the content of the report have reference.
2. Map 2 provides an overview of the proposed route, and we cannot find any specific reference to affected properties in the report.
3. Can you please provide us with a more detailed map indicating the property descriptions of the affected properties, so that the UFS can determine the exact route and possible impact on our properties?</td><td>Email Response: 10/06/2024
Dear Albie,
Your email dated 4 June has reference:
Please see attached the requested information. Ann F.1 of the Draft BAR comprises of the SG codes and farms portions which will be affected(attached) The attached excel sheet and kmz also indicate all affected properties. Due to the Popi Act we are restricted to share contact details.
My colleagues are all en route to be able to attend to the engagement meetings tomorrow.</td></tr>
</table>

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				4. For easy reference, the UFS is the registered owner of the following properties that may be affected. Farm Paradise Lost 'A" 2095, district Bloemfontein Farm Paradise Lost 1511, district Bloemfontein Re/Ptn 7 farm Paradys 2832, district Bloemfontein Re/Ptn 1 farm Paradys 2832, district Bloemfontein Remainder of farm Kolbe 1538, district Bloemfontein Remainder of farm Kolbe A 1954, district Bloemfontein Remainder of farm Fairview 1169, district Bloemfontein 5. Kindly note that ALL correspondence / communication pertaining to your EIA, must be directed to my office and Mr. Oberholster must be copied in. Regards **Albie Louw** *Pr. Pln A1117/1999* Assistant Director: Property Management - University Estates PO Box 339, Bloemfontein, 9300, Republic of South Africa 051 4019207 LouwA1@ufs.ac.za	You are most welcome to attend the engagement meeting in Bloemfontein tomorrow. Kind regards Corlie Steyn Ann F.1_SG Codes_20240124.pdf 40 KB frmPtn_affected.kmz 165 KB frmPtn_affected.xls 197 KB
			10/06/2024	**Email to Zutari:** Good day Corli Thank you for your e-mail, I will peruse the detail provided and get back to you if needed. Yes, I will attend the meeting on 11 June 2024; 18:00 – 20:30: Bloemfontein, Protea Hotel by Marriott Bloemfontein Willow Lake, 101 Henry Street, Willows. Regards **Albie Louw** *Pr. Pln A1117/1999* Assistant Director: Property Management - University Estates PO Box 339, Bloemfontein, 9300, Republic of South Africa 051 4019207 LouwA1@ufs.ac.za	
10.	Gert Nel **gertjnel@mweb.co.za**	Germar Bonsmaras	11/06/2024	**Email to Zutari:** Received Registration and Comment Form.	**Response: 11/06/2024** Zutari added Mr Nel to the I&AP list.
11.	Dr Geofré Heyns **Geofreheyns007@gmail.com**		11/06/2024	**Email to Zutari:** Dear Zutari/Mr Werner Griessel I, George Frederik Heyns, hereby forward my objection to the draft model as presented on 11th June 2024 at Trompsburg 12:30. The presentation by Mr Stephen Kleynhans was excellently executed and valuable. I was allowed to ask questions. I express herewith my concerns. I am representing Michau Heyns Kindertrust and further joined rental farms. Directly and indirectly influenced by Scheme 1 and 1B and 4.	**Email Response: 28/06/2024** Good Morning Dr Heyns, Trust this mail finds you well. Please see attached response from the project team in reference to your email below dated 11 June 2024. Kind Regards

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				The farms were acquired in 1998.In 1988 after severe floods, a wetland moratorium was placed to prevent reconstruction of broken dam walls and weirs to allow natural wetlands to revive. Farms' prices were also affected with either buying or selling. Natural springs and marshes thereafter sustained and revived through 3 decades. The proposed mainline scheme1 and 4 and 1B hybrid traverse these wetlands and marshes in my farming region at 4 areas. These marshes are not depicted or assigned on the proposed draft as presented today. The Implementation plan and duration to recover span 20 years; leaving my business waterless and most likely impoverished. Devaluating the farms also for selling purposes. I introduced solar and wind energy to supply ultra-high-density potential. Your lines divide the system, thus gravity and balancing dams obsolete. Seven Title Deeds are encompassed as well as adjourning rental farms. I hereby object and register myself with accompanied contact details and cellular number. I kindly request your reconsideration, especially personal direction that I am available to supply on site. Yours sincerely Dr Geofré Heyns 0824549667 **geofreheyns007@gmail.com**  	

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				 	ZUTARI Upon receiving your email Zutari engaged the various independent specialists for their specialist input in the matters raised. Please refer to the attached Annexure 1 (Memorandum) for the verbatim input from (i) Biodiversity and (ii) the Freshwater Specialist regarding the wetlands and marches. Zutari considered the input from the specialists and yourself and proposed to accommodate you with the amended route to follow the N1 as shown by the green line on the image below. The impact would be less on the mentioned wetland and marches. For the pipeline route to follow existing infrastructure, is generally preferable from a disruption and maintenance perspective. It will, however, be more expensive due to the longer pipeline route, hence the original alignment.  **2. Devaluation:** Your letter states that that the proposed Xhariep pipeline project will leave your farming enterprise with a lack of natural water which will lead to devaluation of the farms. Please refer to Annexure 1 in reference to the matter addressing the lack of natural water. Furthermore, please note Zutari's appointment is for the detailed feasibility phase of the project, whereafter DWS will appoint a professional service provider to undertake the detailed design and construction supervision. However, in terms of engagements between landowners and DWS, the following processes are likely to be followed: ▪ The Sub Directorate: Land Rights Administration (LRA) is the unit within the Department of Water and Sanitation (DWS) responsible for all land-related matters nationwide. The LRA unit is situated in Pretoria. ▪ After a detailed feasibility phase is approved, an instruction is given to the LRA by the DWS Project Manager to acquire the land and servitudes needed for the project. The LRA will then obtain approval from the Minister of Water and Sanitation to engage affected landowners regarding the procurement of land and registration of servitudes. Once approval is granted, the LRA will appoint a professional registered valuer (at the project's cost), and a public meeting will be arranged, typically through an appointed social facilitator, with all affected owners/persons. ▪ At the meeting, the LRA and the appointed valuer will explain the acquisition and valuation processes. Following this meeting, one-on-one meetings will be held with all affected owners Project number 1002533, Letter to Dr Heyns_Zutari project team_Final.docx, 2024/06/27, Rev 0 2

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					ZUTARI to further detail the processes. The valuer will then visit each affected owner on-site to conduct the valuation of the servitude or land affected by the project. ▪ During these one-on-one engagements, landowners will have the opportunity to raise conditions they may want to propose as part of the Agreement to be concluded between DWS and the landowner. Each condition/request will be evaluated based on merit before being agreed to. ▪ After conducting market research and completing other necessary steps, the valuer will compile a valuation report for each owner and submit it to the LRA, which will handle the compensation as recommended by the valuer. Should you want to discuss any additional measures you are welcome to contact Zutari in this regard so that it can be negotiated with the client for inclusion in the environmental authorisation and construction documentation. Yours faithfully Stephan Kleynhans Design Director Copies: vanjaarsvelds@dws.gov.za johannes@setalaenvironmental.co.za darius@dprecologists.co.za john.gribble@terramarearchaeology.com Project number 1002533, Letter to Dr Heyns_Zutari project team_Final.docx, 2024/06/27, Rev 0 3

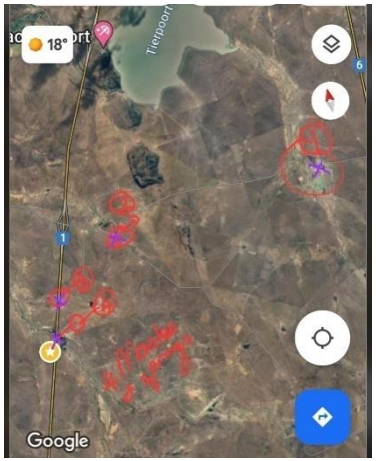
XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)					
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					ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 zutari.com **Memorandum** **To:** Setlala Environmental, DPR Ecologists & Environmental Services and Terramare Archaeology **From:** Zutari **Purpose:** To obtain input from the independent specialist in reference to matters raised by Saamspan Trust regarding the Xhariep pipeline project **Reference:** 1002533 **Date:** 2024-06-24 **Pages (including this page):** 5 **Subject:** Saamspan Trust (Letter dated 20 June 2024) (i) Independent Biodiversity Specialist: Setala Environmental (Verbatim) Firstly, thank you for taking the time to detail your queries and concerns regarding the pipeline project. As hopefully noted from the ecological studies, the protection and avoidance of all watercourses as far as possible, including wetlands, is a priority. However, having said that, it is difficult to be able to demarcate and avoid all wetlands and drainage lines across the entire length of the project especially small seasonal ones, but most of the significant and distinctive watercourses have been highlighted. The project is still in the initial feasibility stage and more fine-tuning will be done as the project progresses. The specialist studies do put forward a number of mitigating measures in an effort to reduce the potential negative impacts the project may have on watercourses, as well as other natural habitats and sensitive areas. These mitigating measures will become part of the actual conditions of environmental authorisations and other environmental management plans that must be implemented and monitored during the construction and operational phases of the project. Hereby, checks and balances are put in place to ensure levels of protection, avoidance and reduction in negative impacts on the natural environment. A water pipeline has a small, linear footprint that has minimal overall negative impact on the natural environment. For the most part the pipeline is going to be buried and the surface area will quickly recover to preconstruction levels and will not even be visible after a short period of time. During the construction phase special attention will be given to watercourse areas. Buffer zones and regulated zones have been demarcated. This means that there will be restricted and controlled access into these areas to limit negative impacts. The pipeline design in the area of watercourses (streams, rivers wetlands) will be given special attention, which may include the depth at which the pipe is buried. This is important to limit and avoid the pipe from impeding and impounding the surface flow and sub-surface flow of groundwater that is important for the maintenance of wetlands. Having worked on numerous pipeline projects across wetland areas, such as in the Mpumalanga Highveld and Free State, I would like to assure concerned landowners that a pipeline of this nature will have negligible to no negative impacts on the movement of surface stormwater and groundwater into wetlands and rivers. Mitigating measures and conditions put 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 1

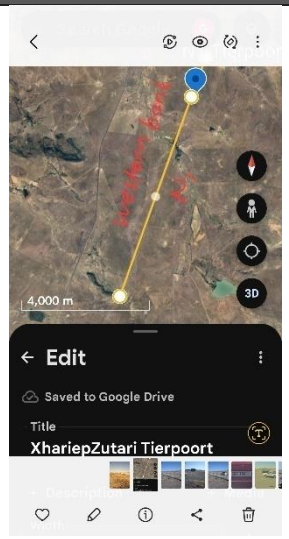
	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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					ZUTARI forward prohibit the impeding and impounding of water flow. It is also a condition that the water presently feeding into a specific wetland, stream or river may not be diverted away and must still enter into those systems. In other words, after design and construction the wetlands of concern will still be adequately fed and sustained from 'upstream' surface and sub-surface stormwater flow. It is important that in these wetland areas the engineers ensure designs are implemented to ensure free flow and movement of stormwater. In other words, no large soil embankments / mounds may be constructed in these areas that will directly and clearly impeded water from feeding into and sustain existing natural wetlands. It has been shown that the sub-surface water moving through an area will easily bypass a buried pipe and still move in the original downstream direction. The comments from the Saamspan Trust mention a 20-year recover time period. In terms of the pipeline the recovery will be within one to two seasons. In other words, regrowth of surface grass will recover within the first season and by the second season minimal to no surface trace of the pipeline should be visible, if construction and rehabilitation processes have been properly followed. It is also for this reason that independent Environmental Control Offices (ECOs) will be assigned to the project to monitor and ensure full compliance. I can assure the concerned landowners that the project will definitely not lead to a lack of natural water as presently found on the farms and watercourses. Once again please note that the nature of the project is such that it will have negligible to no negative impact on the aquatic environment, and most if not all water presently flowing into streams, rivers, wetlands and farm dams will be maintained and not impacted. It should be noted that the initial pipeline servitudes are mostly along existing roads. This has been done in an effort to avoid farming areas and other natural grasslands and koppies (rocky outcrops). This further limits additional negative impacts on natural grasslands and wetlands. In the area of some of the farms the pipeline does cut across open grassland. It might be an option to consider moving some of this pipeline to follow existing roads. There are minimal indigenous trees along the pipeline route, being mostly within a grassland ecosystem. Where trees have been encountered, especially protected trees such as wild olive trees, these have been noted and mitigating measures recommended to avoid them as far as possible, and if not, to offset them by planting additional trees. However, no protected trees were observed in the open grassland areas. In the case of historical farm boundaries and homesteads where large, old gum trees (in particular) are standing additional fine-tuning and measures should be put in place to protect these as well. During further progress and fine-tuning of the project these trees, such as mentioned in the comments from the Saamspan Trust, should be highlighted and protected as far as possible. In summary: ▪ The pipeline will not result in the loss of natural wetlands, rivers and other watercourses as presently found along the route. ▪ Further identification and demarcation of wetlands, etc. as mentioned in comments should be undertaken to address the concerns of landowners. ▪ Special attention will be given in the final designs, layouts and routes to ensure that water feeding into existing wetlands will not be compromised, hereby ensuring their present ecological state and integrity. Please note, that this is also a central issue of the Department of Water & Sanitation (DWS) with such projects. ▪ The recovery rate of disturbed areas along the pipeline route will be one to two seasons at most and definitely not 20 years. ▪ The negative effect on the natural environment by the pipeline will be negligible, especially if it is buried and site-specific rehabilitation is implemented. There will be negligible to no visible negative impact either. I trust that this addresses the queries and concerns as received. Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 2

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					ZUTARI **(ii) Independent Freshwater Specialist: DPR Ecologists & Environmental Services (Verbatim)** I have reviewed the comments as received with regard to affected wetlands. You can consider the following comments and recommendations which can be taken into consideration regarding likely impacts and mitigation. Wetland systems as indicated has been subjected to comprehensive assessment and already included in the wetland assessment (dated March 2024). These wetlands have been listed as follows: ▪ #40 Holsloot – Tributary of Tierpoort River (Page 122 of report). ▪ #41 Channelled valley-bottom wetland – Tributary of Holsloot (Page 124 of report). ▪ #42 Channelled valley-bottom wetland – Tributary of Holsloot (Page 126 of report). ▪ #43 Stream and floodplain wetland – Tributary of Tierpoort River (Page 128 of report) – Additional assessment also included (refer to page 52). A description of each of these affected wetlands have also been provided which indicates that they are all significant systems with extensive wetland conditions. They are also still largely intact though impacts affecting them are significant and include several artificial impoundments (Farm dams) and existing road crossings (N1 as well as gravel road). These are however still regarded as important systems and accordingly the risk matrix indicates a Moderate Risk which will require significant mitigation in order to ensure that the proposed pipeline construction does not adversely affect them. Most important will be to ensure that these systems maintain flow during construction and that adequate and comprehensive rehabilitation is implemented. The following has been included within our assessment and will also be most relevant to these wetland areas as indicated (Also refer to page 163 of the report): ▪ The disturbance caused by construction will cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the construction site prior to construction and continued until rehabilitation of the pipeline route has been completed. ▪ 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. ▪ 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. ▪ 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. ▪ 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 Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 3

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					ZUTARI 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. ▪ Monitoring of construction and compliance with recommended mitigation measures must take place and should include biomonitoring of wetlands by using the WET-Health 2 indices while watercourses should be monitored by using the Index of Habitat Integrity indices. As indicated, though these affected wetlands are all important and sensitive systems and while concerns raised are valid, the following should also be considered: ▪ At the four indicated wetlands (#40, 41, 42, 43) which will be affected by the pipeline crossing, the existing N1 National Road and gravel road already cross over these system and therefore existing, similar impacts are already present, i.e. the pipeline will not entail a new impact. ▪ Similar bulk pipeline developments are common and has reliably shown that as long as adequate rehabilitation is undertaken, these pipeline crossings do not result in any long-term modification of wetlands, wetland vegetation is able to re-establish within a relatively short period (within 2-5 years) and no significant above-ground evidence of these pipelines remain visible. ▪ Belowground pipeline construction entails a temporary impact and the wetlands will only be affected for a short period during construction with complete rehabilitation occurring within 2-5 years after construction. ▪ Because pipelines are linear developments, it is not possible to completely avoid crossing of wetland systems and this is an inevitable impact which remains unavoidable. These wetlands will therefore have to be crossed somewhere and the indicated locations adjacent to the N1 National Road and gravel road will therefore be more suitable (existing road crossings are already present). ▪ If mitigation as indicated are implemented, especially in respect to maintaining adequate flow (see point 8 above), then downstream sections of these wetlands will not be affected to a significant extent in terms of flow regime. In other words, downstream sections will maintain functionality as they will continue receiving inflow from the upstream areas. Hopefully this will provide some clarity on the anticipated impacts on these wetlands. They have been subjected to comprehensive assessment and should indicate how and to what degree the pipeline will affect these wetlands. Please let me know if you require any more information or have any additional questions. **(iii) Independent Heritage Specialist: Terramare Archaeology (Verbatim)** Thank you for forwarding me the comment from Prof Wessels. My response below relates to the second point he makes: that regarding potential impacts from the project to the farm Krapfontein. In responding, I have assumed that the farm portions being referred to are Re 2720 and Portion 2 of 2720 Krapfontein. I note that Prof Wessels is concerned about the magnitude of the construction work and its effects on nature, indigenous trees along the S299 and on the landscape. I cannot comment on the natural environment impacts or on the possible impacts to the tress dotted along the S299 but can respond on the landscape question. The farm complex on Re 2720, which I assume is the one referred to by Prof Wessels as having survived the Anglo-Boer War, is situated more than 400m at its closest point from the proposed alignment of the pipeline and is largely screened by trees. Although there may be visual impacts within the landscape during the installation of the pipeline (the presence of machinery, vehicles, people and the pipe trench, Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 4

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					ZUTARI for example), the fact that the pipe will be a buried feature means that once the area has been rehabilitated post-installation, there should be few to no long-term or continuing visual impacts in or on the landscape. There will certainly be no direct impacts arising from the project as proposed to the farm complex itself. With respect to other heritage resources in proximity to the pipeline route on Krapfontein, we noted no obvious cultural heritage resources on either land parcel in proximity to the proposed pipeline route during our site visit. Best regards Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 5
11.1	Dr Geofré Heyns **Geofreheyns007@gmail.com**		28/06/2024	**Email to Zutari:** Dear ZutariXariep I appreciate your feedback.I forward your response to a respected field and environmental expert/specialist.	

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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				I look forward meeting you at my concerned points of disparity. Kind regards Dr GF Heyns	
11.2	Dr Geofré Heyns **Geofreheyns007@gmail.com**		03/07/2024	**Email to Zutari:** Dear Zutari/Xhariep Tierpoort Region Thank you for the feedback I still would advise to reconsider the "old approved line" along Tierpoort Edenburg dirt road,away from this " high accident zone" of N1.Please refer to Tierpoort Landbou for the zoning as per request in 2022/2023.The Dirt road and Trainline already exists with sevitude.Lastly,the western bank/servitude of the existing N1 High Risk Accident zone ,is lying on a wide land open to excavations,without traversing of agricultural veld,only marshes.Lastly I deem it still my responsibility to put your attention to 4 marshes and wetlands plus there constant springs NOT DEPICTED and addressed by any of the previous remarks and communication and presentations.I refer to the absence of pictures of specimens containing soil from the 4 marshes.  Your attention is appreciated and I look forward meeting you on site. Regards Dr Geofré Heyns 0824549667	**Email Response: 03/07/2024** Dear Dr Heyns, Thank you for your email below as well as all previous emails in reference to the proposed Xhariep pipeline project. Can you please advise whether you have received the attached letter and memorandum that have been emailed to you earlier this week. The memo reflects the input from the independent specialists and the letter addresses your previous comments. Please note mention is also made to Saamspan Trust who raised similar issues so the specialists addressed your comment and the letter from Saamspan Trust in the same response. We will engage with the project team on your email below and will provide further feedback. Kind regards Corlie Steyn Letter to Dr Heyns _ Zutari Project Team _ Final - Signed.pdf 531 KB Annexure 1_ Xhariep Memorandum Specialist Input.pdf 113 KB

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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			03/07/2024	Dear me Marianna Taljaard Kindly confirm: Is green added or initial purple line now first choice? Text not clear. Please notify me whether my input today on 1. Old Approved line along Edenburg Tierpoort Dirt road along railroad as being first choice 2. The servitude on western zone N1 3. High Accident Zone N1 4. My concern on 4 marshes/springs/wetlands not attended to my opinion; is received to be attended. Regards Dr Geofré Heyns	**Email Response: 08/07/2024** Good Day Dr. Heyns, Trust this mail finds you well. Please see attached response from the project team in reference to your email dated 03 July 2024. Kind Regards Marianna Taljaard

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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					ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 **zutari.com** 8 July 2024 Email: geofreheyns007@gmail.com Dear Dr Heyns **Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State** Your email dated 3 July 2024 has reference. We are attaching Annexure 1 again to this letter for ease of reference as this annexure provides the details from the specialists in response to your initial email dated 11 June 2024. Zutari has furthermore engaged the two independent specialists for a second time to clarify your statement that the 4 marshes and wetlands as illustrated in the images provided by you, did not form part of their respective assessments. **The Freshwater specialist indicated the following in email correspondence to Zutari (dated 08/07/2024):** *There may be some misunderstanding in terms of the locations of the "marshes and springs" which are all clearly depicted, described with photos and soil samples in the wetland assessment report. I had also previously provided page references for all of these wetlands in our report, and they are quite clearly exactly the same as those indicated by Dr. Heyns:* • *#40 Holsloot Tributary of Tierpoort River (Page 122 of report) = 4.* • *#41 Channelled valley-bottom wetland Tributary of Holsloot (Page 124 of report) = 3.* • *#42 Channelled valley-bottom wetland Tributary of Holsloot (Page 126 of report) = 2.* • *#43 Stream and floodplain wetland Tributary of Tierpoort River (Page 128 of report) = 1.* **The Botanical specialist indicated the following in email correspondence to Zutari (dated 05/07/2024):** 1. *Please note that the marked marshes (1, 2, 3 & 4) (as per Dr. Heyn's map) have been noted, marked and mentioned in my report and KML files. They are ID numbers 56, 57, 58 & 59. They have not been delineated to the extent of the full watercourse complex, but have been marked and noted, along with recommended mitigating measures, including regulated zones and buffer zone for access control during the construction phase. It is noted that during the full EIA process some of these mentioned watercourses need to be fully delineated.* 2. *At this stage photos of every watercourse crossing have not been added to the reports as this is unnecessary as their locations have been recorded.* **Zutari (Pty) Ltd** | Reg No 1977/003711/07 | **Board of Directors** (03/2024) *NN Gwagwa (Chairperson), T Daka, *AC Discala, *PJ Hendricks, *NDL Mokwe, J Ndala, *GT Rohde (*Non-Executive Director)

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					ZUTARI In refence to the reconsideration of the "old, approved line", please note that the route is not feasible seeing that the pipeline needs to be routed to the 2nd command reservoir which is located east of the N1. Yours faithfully Stephan Kleynhans Design Director Copies: vanjaarsvelds@dws.gov.za johannes@setalaenvironmental.co.za darius@doreologists.co.za john.gribble@terramarearchaeology.com Project number 1002533_2_Letter to Dr Heyns_Zutari project team_Final.docx, 2024/06/27, Rev 0 2

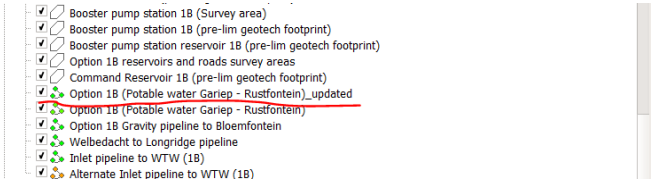
	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 zutari.com **Memorandum** **To:** Setlala Environmental, DPR Ecologists & Environmental Services and Terramare Archaeology **From:** Zutari **Purpose:** To obtain input from the independent specialist in reference to matters raised by Dr Heyns regarding the Xhariep pipeline project **Reference:** 1002533 **Date:** 2024-06-24 **Pages (including this page):** 5 **Subject:** Email Dr Heyns (Letter dated 20 June 2024) (i) Independent Biodiversity Specialist: Setala Environmental (Verbatim) Firstly, thank you for taking the time to detail your queries and concerns regarding the pipeline project. As hopefully noted from the ecological studies, the protection and avoidance of all watercourses as far as possible, including wetlands, is a priority. However, having said that, it is difficult to be able to demarcate and avoid all wetlands and drainage lines across the entire length of the project especially small seasonal ones, but most of the significant and distinctive watercourses have been highlighted. The project is still in the initial feasibility stage and more fine-tuning will be done as the project progresses. The specialist studies do put forward a number of mitigating measures in an effort to reduce the potential negative impacts the project may have on watercourses, as well as other natural habitats and sensitive areas. These mitigating measures will become part of the actual conditions of environmental authorisations and other environmental management plans that must be implemented and monitored during the construction and operational phases of the project. Hereby, checks and balances are put in place to ensure levels of protection, avoidance and reduction in negative impacts on the natural environment. A water pipeline has a small, linear footprint that has minimal overall negative impact on the natural environment. For the most part the pipeline is going to be buried and the surface area will quickly recover to preconstruction levels and will not even be visible after a short period of time. During the construction phase special attention will be given to watercourse areas. Buffer zones and regulated zones have been demarcated. This means that there will be restricted and controlled access into these areas to limit negative impacts. The pipeline design in the area of watercourses (streams, rivers wetlands) will be given special attention, which may include the depth at which the pipe is buried. This is important to limit and avoid the pipe from impeding and impounding the surface flow and sub-surface flow of groundwater that is important for the maintenance of wetlands. Having worked on numerous pipeline projects across wetland areas, such as in the Mpumalanga Highveld and Free State, I would like to assure concerned landowners that a pipeline of this nature will have negligible to no negative impacts on the movement of surface stormwater and groundwater into wetlands and rivers. Mitigating measures and conditions put 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 1

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					ZUTARI forward prohibit the impeding and impounding of water flow. It is also a condition that the water presently feeding into a specific wetland, stream or river may not be diverted away and must still enter into those systems. In other words, after design and construction the wetlands of concern will still be adequately fed and sustained from 'upstream' surface and sub-surface stormwater flow. It is important that in these wetland areas the engineers ensure designs are implemented to ensure free flow and movement of stormwater. In other words, no large soil embankments / mounds may be constructed in these areas that will directly and clearly impeded water from feeding into and sustain existing natural wetlands. It has been shown that the sub-surface water moving through an area will easily bypass a buried pipe and still move in the original downstream direction. The comments from the Saamspan Trust and email mention a 20-year recover time period. In terms of the pipeline the recovery will be within one to two seasons. In other words, regrowth of surface grass will recover within the first season and by the second season minimal to no surface trace of the pipeline should be visible, if construction and rehabilitation processes have been properly followed. It is also for this reason that independent Environmental Control Offices (ECOs) will be assigned to the project to monitor and ensure full compliance. I can assure the concerned landowners that the project will definitely not lead to a lack of natural water as presently found on the farms and watercourses. Once again please note that the nature of the project is such that it will have negligible to no negative impact on the aquatic environment, and most if not all water presently flowing into streams, rivers, wetlands and farm dams will be maintained and not impacted. It should be noted that the initial pipeline servitudes are mostly along existing roads. This has been done in an effort to avoid farming areas and other natural grasslands and koppies (rocky outcrops). This further limits additional negative impacts on natural grasslands and wetlands. In the area of some of the farms the pipeline does cut across open grassland. It might be an option to consider moving some of this pipeline to follow existing roads. There are minimal indigenous trees along the pipeline route, being mostly within a grassland ecosystem. Where trees have been encountered, especially protected trees such as wild olive trees, these have been noted and mitigating measures recommended to avoid them as far as possible, and if not, to offset them by planting additional trees. However, no protected trees were observed in the open grassland areas. In the case of historical farm boundaries and homesteads where large, old gum trees (in particular) are standing additional fine-tuning and measures should be put in place to protect these as well. During further progress and fine-tuning of the project these trees, such as mentioned in the comments from the Saamspan Trust and email, should be highlighted and protected as far as possible. In summary: ▪ The pipeline will not result in the loss of natural wetlands, rivers and other watercourses as presently found along the route. ▪ Further identification and demarcation of wetlands, etc. as mentioned in comments should be undertaken to address the concerns of landowners. ▪ Special attention will be given in the final designs, layouts and routes to ensure that water feeding into existing wetlands will not be compromised, hereby ensuring their present ecological state and integrity. Please note, that this is also a central issue of the Department of Water & Sanitation (DWS) with such projects. ▪ The recovery rate of disturbed areas along the pipeline route will be one to two seasons at most and definitely not 20 years. ▪ The negative effect on the natural environment by the pipeline will be negligible, especially if it is buried and site-specific rehabilitation is implemented. There will be negligible to no visible negative impact either. I trust that this addresses the queries and concerns as received. Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 2

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					ZUTARI (ii) **Independent Freshwater Specialist: DPR Ecologists & Environmental Services (Verbatim)** I have reviewed the comments as received with regard to affected wetlands. You can consider the following comments and recommendations which can be taken into consideration regarding likely impacts and mitigation. Wetland systems as indicated has been subjected to comprehensive assessment and already included in the wetland assessment (dated March 2024). These wetlands have been listed as follows: ▪ #40 Holsloot – Tributary of Tierpoort River (Page 122 of report). ▪ #41 Channelled valley-bottom wetland – Tributary of Holsloot (Page 124 of report). ▪ #42 Channelled valley-bottom wetland – Tributary of Holsloot (Page 126 of report). ▪ #43 Stream and floodplain wetland – Tributary of Tierpoort River (Page 128 of report) – Additional assessment also included (refer to page 52). A description of each of these affected wetlands have also been provided which indicates that they are all significant systems with extensive wetland conditions. They are also still largely intact though impacts affecting them are significant and include several artificial impoundments (Farm dams) and existing road crossings (N1 as well as gravel road). These are however still regarded as important systems and accordingly the risk matrix indicates a Moderate Risk which will require significant mitigation in order to ensure that the proposed pipeline construction does not adversely affect them. Most important will be to ensure that these systems maintain flow during construction and that adequate and comprehensive rehabilitation is implemented. The following has been included within our assessment and will also be most relevant to these wetland areas as indicated (Also refer to page 163 of the report): ▪ The disturbance caused by construction will cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the construction site prior to construction and continued until rehabilitation of the pipeline route has been completed. ▪ 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. ▪ 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. ▪ 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. ▪ 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 Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 3

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					 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. ▪ Monitoring of construction and compliance with recommended mitigation measures must take place and should include biomonitoring of wetlands by using the WET-Health 2 indices while watercourses should be monitored by using the Index of Habitat Integrity indices. As indicated, though these affected wetlands are all important and sensitive systems and while concerns raised are valid, the following should also be considered: ▪ At the four indicated wetlands (#40, 41, 42, 43) which will be affected by the pipeline crossing, the existing N1 National Road and gravel road already cross over these system and therefore existing, similar impacts are already present, i.e. the pipeline will not entail a new impact. ▪ Similar bulk pipeline developments are common and has reliably shown that as long as adequate rehabilitation is undertaken, these pipeline crossings do not result in any long-term modification of wetlands, wetland vegetation is able to re-establish within a relatively short period (within 2-5 years) and no significant above-ground evidence of these pipelines remain visible. ▪ Belowground pipeline construction entails a temporary impact and the wetlands will only be affected for a short period during construction with complete rehabilitation occurring within 2-5 years after construction. ▪ Because pipelines are linear developments, it is not possible to completely avoid crossing of wetland systems and this is an inevitable impact which remains unavoidable. These wetlands will therefore have to be crossed somewhere and the indicated locations adjacent to the N1 National Road and gravel road will therefore be more suitable (existing road crossings are already present). ▪ If mitigation as indicated are implemented, especially in respect to maintaining adequate flow (see point 8 above), then downstream sections of these wetlands will not be affected to a significant extent in terms of flow regime. In other words, downstream sections will maintain functionality as they will continue receiving inflow from the upstream areas. Hopefully this will provide some clarity on the anticipated impacts on these wetlands. They have been subjected to comprehensive assessment and should indicate how and to what degree the pipeline will affect these wetlands. Please let me know if you require any more information or have any additional questions.
			03/07/2024	**Email to Zutari:** Thank you. I will work through the information. Also, utilizing a specialist environmentalist. Your evaluation of my suggestions need priority.	
			PLEASE NOTE ALL CORRESPONDANCE FROM HERE ONWORTH IS AFTER CLOSURE OF THE PP PERIOD **The I&AP also asked for an additional site visit which was attended by the two independent specialists (Biodiversity and Freshwater)**		
			08/07/2024	**Email to Zutari:** Thank You me Taljaard and Mr Kleynhans.	**Email Response: 11/07/2024** Good Morning Dr. Heyns,

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				I deem it still of importance to meet you or hydrogeologist or both parties, on mentioned areas of our concern. I look forward to meet you in person in area mentioned "Tierpoort." Kindly consider and let me know. Regards Dr GF Heyns	Trust this mail finds you well. I've tried to contact you telephonically yesterday afternoon @ 15:06 and this morning @ 09:17 to confirm availability for the on-site meeting but was unsuccessful. Please see snippets below as proof. As per your request below, our team would be able to meet with you on either the 17th or 18th of July 2024. Please advise which date would be best suitable, and time. Kind Regards Marianna Taljaard
			11/07/2024	**Email to Zutari:** Thank you, I will let you know.	**Email Response: 11/07/2024** Dear Dr Heyns Thank you for your email. If you could provide me with the preferred date as soon as possible and a time and place where to meet. We would really appreciate it, as the specialists need to make their necessary travel arrangements. Kind Regards Marianna Taljaard
			11/07/2024	**Email to Zutari:** Dear me Taljaardt,Steyn and messrs Zutari and Dr Louis Du Pusani. The date of 18th July 2024 will be most suitable to meet your team at Tierpoort.The expert opinion of Dr Louis Du Pisani;Specialist Environmentalist,Agricultural Economist and Ecological Farming Expert with more than twenty seven of the similar magnitude impact studies was obtained by me recently on site.Thus rendering all parties a win- win/objective and effective opportunity for discussal purposes. I kindly request Zutari to pay for his professional fees and travel cost. He will also be present on the 18th of July. He is travelling from the Eastern Free State for our meeting and we rely you to find it in good order. Please forward us your expected time of arrival at rendezvous " Tom's Place" next to Tierpoortdam service station.We look forward hearing from you for confirmation. Kind regards Yours sincerely Dr GF Heyns Dr Louis Du Pisani	**Email Response: 12/07/2024** Dear Dr Heyns Thank you for your email. Zutari is appointed by the Department of Water and Sanitation (DWS) and need to keep to the contractual terms of that appointment. The specialists appointed are registered professionals (SACNASP) and they fulfil the protocols and requirements according to the National Environmental Management Act (NEMA), also in terms of being independent and assessing the impacts of the overall project (e.g. the independence of a specialist could be compromised if seen to represent the interest of a specific Interested and Affected Party). The specialist team is highly experienced in their respective fields, and we stand by their findings. Any additional studies/inputs commissioned by private individuals to contribute to their position, and inform their comments submitted on the project, would be for their own information and benefit. As such, in order to comply with our contractual terms whilst maintaining our independence, we are not at liberty to agree to ad hoc payment requests for additional specialists nominated by Interested and Affected Parties. We trust that you will understand the above and look forward to your confirmation whether you wish to proceed with the meeting on 18 July. Kind Regards Marianna Taljaard
			12/07/2024	**Email to Zutari:** Thank you.	**Email Response:** Dear Dr. Heyns

<table>
<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td></td><td></td><td></td><td></td><td>18th July confirmed.
Time please.Toms Pkace Rendezvous.
Regards
Dr GF Heyns</td><td>Thank you for confirming.
Meeting will then take place on Thursday, 18 July 2024 @ 10:00 – Venue: Toms Place Rendezvous (Resort)
Kind Regards
Marianna Taljaard</td></tr>
<tr><td></td><td></td><td></td><td>12/07/2024</td><td>Email to Zutari:
Dear Zutari and Dr Louis Du Pusani.Affirmed
Thank you.I shall escort the company by road to areas of contention.
Regards
Dr GF HEYNS</td><td></td></tr>
<tr><td></td><td></td><td></td><td>15/07/2024</td><td>Email to Zutari:
Dear me M Taljaard
Hope you are well.
Kindly send Google Earth KML formatted files of the proposed XhariepZutari Pipeline to us.
This will be serving to make your meeting with me and Dr Du Pisani on Thursday more appropriate.Look
Regards
Dr Geofré Heyns</td><td>Email Response: 15/07/2024
Dear Dr. Heyns
Thank you for your email. Trust you are well.
Attached is the new kmz as requested.
The new route alignment is underlined in red in the screenshot below, please note that the old one is still part of the kmz file.
 

The pipe length only changed by just under 500m: Total pipeline length went from 244.4km to 244.9km.
The new details are:
<table><tr><th>Component</th><th>Capacity (m³/s) (1)</th><th>Capacity (Ml/d) (1)</th><th>Estimated Footprint (m²)</th></tr><tr><td>Gariep Low Lift Pump Station</td><td>3.8</td><td>328.1</td><td>10,000</td></tr><tr><td>Gariep WTP</td><td>-</td><td>312</td><td>600,000</td></tr><tr><td>Gariep High Lift Pump Station</td><td>3.62</td><td>312.4</td><td>(included in WTP above)</td></tr><tr><td>Command Reservoir (3 sites)</td><td>-</td><td>80 Ml</td><td>112,500</td></tr><tr><td>Booster Pump Station</td><td>3.62</td><td>312.4</td><td>10,000</td></tr><tr><td>Gariep Pipeline
(188.99 km, 1800 Ø)</td><td>3.62</td><td>312.4</td><td>7,559,600</td></tr><tr><td>Gravity Pipeline to Brandkop
(31.37 km, 2000 Ø)</td><td>3.62</td><td>312.4</td><td>1,254,800</td></tr><tr><td>Gravity Pipeline to Rustfontein Pump Station
(24.52 km, 1400 Ø)</td><td>2.43</td><td>209.8</td><td>980,800</td></tr><tr><td>Substation (2 sites)</td><td>-</td><td>-</td><td>45,000</td></tr><tr><td>Total (m²)</td><td></td><td></td><td>10,572,700</td></tr><tr><td>Total (ha)</td><td></td><td></td><td>1,057</td></tr><tr><td>Total excl. pipeline (m²)</td><td></td><td></td><td>777,500</td></tr><tr><td>Total excl. pipeline (ha)</td><td></td><td></td><td>78</td></tr></table>
Kind Regards</td></tr>
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					Marianna Taljaard Geotech & Survey Site Investigations v1)_updated_AH.kmz 28 KB
			15/07/2024	**Email to Zutari:** Well received, thanks.	
			15/07/2024	**Email to Zutari:** Kindly forward number of delegates. Housekeeping purpose Toms Place. We look forward Regards	**Email Response: 16/07/2024** Good Morning Dr Heyns Trust you are well. Two delegates will be joining you: • Johannes Maree • Darius van Rensburg Kind Regards Marianna Taljaard
			19/07/2024	**Email to the Independent Biodiversity and Aquatic Specialists after the site meeting. The author of the email is Dr du Pisani (on behalf of Dr Heyns).** Beste Darius & Johannes Baie dankie vir jul teenwoordigheid by, en jul deelname aan, die vermelde vergadering. Die vier geaffekteerde boere wat dit bygewoon het, het hul waardering uitgespreek vir jul teenwoordigheid, jul spesialis kundigheid en openhartige deelname aan die besprekings. Hulle het ook hul teleurstelling uitgespreek dat daar nie 'n verteenwoordiger van Zutari by die vergadering was nie. Ter opsomming, weer die volgende ter verfrissing van jul geheue: 1) Die geaffekteerde boere maak hul lewe uit hul gronde. Dit is hul primêre bron van inkomste. 2) Die vleie op hul plase maak 'n wesentlike deel van hul gronde se vermoë uit om hul lewendehaweprodukte te produseer. Sommige van hulle is ook afhanklik van die water van veral Holsloot om drinkwater aan hul vee te verskaf en om ekstra voer onder besproeiing met die water te produseer . Alhoewel ons nie oor die standhoudenheid van die Holsloot kon ooreenstem nie, is die goeie gehalte water wat dit op op 'n konstante basis lewer, ononderhandelbaar vir die geaffekteerde boere. 3) Hulle stem saam met die gevolgtrekkings in jul verslae dat hierdie vleie uiters sensitief vir versteuring is, en is van mening dat, as hierdie vleie om een of ander rede vernietig sou word, dit 'n wesentlike impak op hul winsmarges oor 'n baie lang tyd sal hê.	**Email response: 24/07/2024** Beste Dr du Pisani, Die projekspan by Zutari het die punte wat u aangeraak het, asook die verskaffing van die alternatiewe roete (kmz), hieronder in groen beantwoord. Laat weet gerus as u verdere navrae het. Groete *Baie dankie vir jul teenwoordigheid by, en jul deelname aan, die vermelde vergadering. Die vier geaffekteerde boere wat dit bygewoon het, het hul waardering uitgespreek vir jul teenwoordigheid, jul spesialis kundigheid en openhartige deelname aan die besprekings. Hulle het ook hul teleurstelling uitgespreek dat daar nie 'n verteenwoordiger van Zutari by die vergadering was nie.* *Ter opsomming, weer die volgende ter verfrissing van jul geheue:* *1) Die geaffekteerde boere maak hul lewe uit hul gronde. Dit is hul primêre bron van inkomste.* Zutari erken die landbou waarde en afhanklikheid van die grond vir die grondeienaars. Dr Johan van Tol (onafhanklike lanbou spesialis) het die impakstudie op die landbou grond hanteer en versagtende maatreëls is vervat in die Basiese Invloedsbepalingverslag.

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				4) Die boere het kennis geneem van die aanbevelings in jul verslae ten opsigte daarvan om die impakte van die projek op hul vleie te beperk. Hulle is egter nie oortuig dat die aanbevelings in huidige tye tot die letter toegepas sal word nie. Daar is vele voorbeelde in die onlangse verlede van swak bestuurde beperkende planne (mitigation plans) waar die omgewing geskaad is en die boere dan aan die kortste end getrek het. Die Rustfontein-Mangaung waterpypleiding wat in die 2010's gelê is, is 'n goeie voorbeeld daarvan. 5) Volgens inligting wat verbaal aan Dr Geofré Heyns deur Zurtari verskaf is tydens die openbare vergadering in Trompsburg, gaan die beplande pyplyn sowat 2m tot 2.4m in deursneë wees, waarvan die bokant sowat 7.5m onder die grond gelê sal word. Die akwatiese en ekologiese studies wat gedoen is, neem die impak tot op 'n gronddiepte van 500mm tot 600mm in ag. Die geologie van die geaffekteerde boere se vleie is sodanig dat daar rotsplate op dieptes van so vlak as 1 m voorkom. Hierdie plate sal op een of ander wyse gebreek moet word om die pyplyn te kan installeer, wat die gebruik van plofstof kan insluit. Vleie is nie net ekologiese brandpunte (hotspots) nie, maar ook hidrologiese brandpunte ten opsigte van die aanvulling en instandhouding van akwafere en ondergrondse water. Die gebied waar die geaffekteerde boere se plase geleë is, word as 'n semi-ariede gebied geklassifiseer, waar ondergrondse water uiters belangrik is vir die verskaffing van water aan mens en dier. Hulle is dus van mening dat daar ook aan die geo-hidrologiese impak van die projek aandag gegee moet word, met spesiale aandag aan die gesondheid van die akwafere en die aanvulling van die ondergrondse water. 6) As daar wel staalpype gebruik gaan word, sal die pype waarskynlik aanmekaar gesweis moet word. Gesien teen die agtergrond van die aanbeveling dat die pypleiding verkieslik in die winter deur die vleie gelê moet word, sal hierdie aktiwiteit 'n baie groot brandgevaar tot gevolg hê. Die werkswydte word skoongemaak voordat enige pyplyn geinstalleer word, dit sluit die verwydering van bogrond in. Die staalpype mag volgens spesifikasie slegs in hierdie werkswydte hanteer word en alle sweiswerk gebeur ook in hierdie skoongemaakte omgewing. Die persone verantwoordelik vir die sweiswerk moet gesertifiseer word volgens streng spesifikasies en is dus spesialiste op die gebied van sweiswerk. Sweiswerk kan ook nie gebeur wanneer die wind waai en daar stof is nie. Hierdie faktore behoort die risiko van enige brande te verminder. 7) Die geaffekteerdes het 'n voorstel van 'n moontlike alternatiewe roete vir die pyplyn voorgestel, wat die vleie op hul plase heeltemal sal vermy. Sien die Google Earth kmz-lêer aangeheg. Dit sal waardeer word as julle dit onder die aandag van Zutari sal bring. **Vriendelike groete** **Louis** **--**	*2) Die vleie op hul plase maak 'n wesentlike deel van hul gronde se vermoë uit om hul lewendehaweprodukte te produseer. Sommige van hulle is ook afhanklik van die water van veral Holsloot om drinkwater aan hul vee te verskaf en om ekstra voer onder besproeiing met die water te produseer . Alhoewel ons nie oor die standhoudenheid van die Holsloot kon ooreenstem nie, is die goeie gehalte water wat dit op op 'n konstante basis lewer, ononderhandelbaar vir die geaffekteerde boere.* Beide die onafhanlike akwatiese en biodiversiteit spesialiste het aangedui dat die pyplyn wat op plekke deur vleilande sal gaan nie enige merkbare of meetbare langtermyn negatiewe impak op die vleilande sal hê nie. Die pypleiding sal nie water wat na die vleilande vloei belemmer of aflei nie. *3) Hulle stem saam met die gevolgtrekkings in jul verslae dat hierdie vleie uiters sensitief vir versteuring is, en is van mening dat, as hierdie vleie om een of ander rede vernietig sou word, dit 'n wesentlike impak op hul winsmarges oor 'n baie lang tyd sal hê.* Zutari neem kennis. *4) Die boere het kennis geneem van die aanbevelings in jul verslae ten opsigte daarvan om die impakte van die projek op hul vleie te beperk. Hulle is egter nie oortuig dat die aanbevelings in huidige tye tot die letter toegepas sal word nie. Daar is vele voorbeelde in die onlangse verlede van swak bestuurde beperkende planne (mitigation plans) waar die omgewing geskaad is en die boere dan aan die kortste end getrek het. Die Rustfontein-Mangaung waterpypleiding wat in die 2010's gelê is, is 'n goeie voorbeeld daarvan.* *Dit is jammer dat die boere skade gelei het gedurende vorige projek(te) en dat* beperkende planne/ maatreëls nie toegepas was nie. Zutari se advies in hierdie verband sal wees om maatreëls wat nie uitgevoer is nie aan die aangestelde kontrakteur, ingenieur en omgewinsowerhede te raporteer en uit te vind hoe dit reggestel kan word. *5) Volgens inligting wat verbaal aan Dr Geofré Heyns deur Zurtari verskaf is tydens die openbare vergadering in Trompsburg, gaan die beplande pyplyn sowat 2m tot 2.4m in deursneë wees, waarvan die bokant sowat 7.5m onder die grond gelê sal word.* Soos deurgegee tydens die openbare vergadering en soos aangedui op die agtergrondinligtingsdokument die volgende: Die pyplyn diameter is 1.8m en word gelê met 'n grondbedekking wat wissel tussen 1.25m en 2.5m. Die bodemhoogte van die pyplyn kan dus tot 4.5m diep wees. *Die akwatiese en ekologiese studies wat gedoen is, neem die impak tot op 'n gronddiepte van 500mm tot 600mm in ag. Die geologie van die geaffekteerde boere se vleie is sodanig dat daar rotsplate op dieptes van so vlak as 1 m voorkom. Hierdie plate sal op een of ander wyse gebreek moet word om die pyplyn te kan installeer, wat die gebruik van plofstof kan insluit. Vleie is nie net ekologiese brandpunte (hotspots) nie, maar ook hidrologiese brandpunte ten opsigte van die aanvulling en instandhouding van akwafere en ondergrondse water. Die gebied waar die geaffekteerde boere se plase geleë is, word as 'n semi-ariede gebied geklassifiseer, waar ondergrondse water uiters belangrik is vir die verskaffing van water aan mens en dier. Hulle is dus van mening dat daar ook aan die geo-hidrologiese impak van die projek aandag gegee moet word, met*

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				Dr Louis du Pisani **Specialist Agri Consultant: Rangeland, Livestock, Farm Economics** **Spesialis Landbou Konsultant: Vee, Veld, Geld**	*spesiale aandag aan die gesondheid van die akwafere en die aanvulling van die ondergrondse water.* Die projekspesifikasies kan opgestel word om enige plofstof binne 'n afstand van 100m (of soos deur die spesialiste aanbeveel) vanaf vleilande te verbied. Die slootuitgrawing sal dan met 'n "excavator" gebeur wat 'n rotsbreekpunt ("rock bucket") het om die rots te breek tot op die vereiste diepte van die sloot. *6) As daar wel staalpype gebruik gaan word, sal die pype waarskynlik aanmekaar gesweis moet word. Gesien teen die agtergrond van die aanbeveling dat die pypleiding verkieslik in die winter deur die vleie gelê moet word, sal hierdie aktiwiteit 'n baie groot brandgevaar tot gevolg hê.* Die werkswydte word skoongemaak voordat enige pyplyn geinstalleer word, dit sluit die verwydering van bogrond in. Die staalpype mag volgens spesifikasie slegs in hierdie werkswydte hanteer word en alle sweiswerk gebeur ook in hierdie skoongemaakte omgewing. Die persone verantwoordelik vir die sweiswerk moet gesertifiseer word volgens streng spesifikasies en is dus spesialiste op die gebied van sweiswerk. Sweiswerk kan ook nie gebeur wanneer die wind waai en daar stof is nie. Hierdie faktore behoort die risiko van enige brande te verminder. *7) Die geaffekteerdes het 'n voorstel van 'n moontlike alternatiewe roete vir die pyplyn voorgestel, wat die vleie op hul plase heeltemal sal vermy. Sien die Google Earth kmz-lêer aangeheg. Dit sal waardeer word as julle dit onder die aandag van Zutari sal bring.* Zutari neem kennis van die voorgestede alternatiewe roete. Die nuwe voorgestelde alternatiewe roete sal ook verskeie ander vleilande en riviere kruis, dus sal soortgelyke impakte bestuur moet word. Die roete wat tans voorgestel word is geindetifiseer deur verskeie faktore in ag te neem en is gevind om die mees redelike en haalbare opsie te wees. Die alternatiewe roete is 25.5km in lengte in vergelyking met die voorgestelde roete met 'n lengte van 20.4km. Die ekstra 5km pyplengte verhoog die kapitale koste van die projek met ten minste R250 miljoen en verhoog ook die pompkoste (elektrisiteit) as gevolg van die addisionele wrywingsverlies veroorsaak deur die langer pyplengte. Die alternatiewe roete het ook hoogtepunte van meer as 1500 m bo seëvlak in vergelyking met die voorgestelde roete waar die hoogste punt 1440 m bo seëvlak is – die impak van hierdie hoë punte op die hidroulika van die stelsel sal ondersoek moet word indien die alternatiewe roete oorweeg gaan word, maar dit is dikwels problematies in terme van verhoogde waterslagdrukke. Die voorgestelde aanjaerpompstasie is geleë ongeveer 4km Noord van die alternatiewe roete se afdraai na Rusplaas wat ook beteken dat die posisie van die pompstasie moet skuif, ingesluit die kragvoorsiening na die pompstasie. Die pompstasie posisie was so gekies om die werksdruk onder 160m te hou, maar die nuwe posisie gaan beteken dat die werksdruk 160m oorskrei – dit beïnvloed die keuse van pompe asook die drukklas van die pyplyn wat alles lei tot verhoogde kostes. Ter opsomming, die Basiese Invloedsbepalingsverslag het bepaal dat indien alle voorgestelde en versagtende maatreëls geimplementeer word, die

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					moontlike medium- en langtermynimpakte van die voorgestelde projek weglaatbaar sal wees. Vanaf omgewingsoogpunt is die huidige voorstel dus die mees haalbaarste voorstel vir DWS wie se mandaat is om aan basiese behoeftes (drinkwater) te moet voldoen**.** **Groete** **TRANSLATION FROM AFRIKAANS TO ENGLISH:** 1. The affected farmers make their living from their lands. This is their primary source of income. Zutari recognizes the agricultural value and dependence of the land for the landowners. Dr Johan van Tol (independent agricultural specialist) handled the impact study on the agricultural land and mitigating measures are contained in the Basic Impact Assessment Report. 2) The wetlands on their farms make up a substantial part of their lands' ability to produce their livestock products. Some of them also depend on the water from Holsloot in particular to provide drinking water to their livestock and to produce extra fodder under irrigation with the water. Although we could not agree on the sustainability of the Holsloot, the good quality of water it produces on a constant basis is non-negotiable for the affected farmers. Both the independent aquatic and biodiversity specialists have indicated that the pipeline, which will pass through wetlands in places, will not have any noticeable or measurable long-term negative impact on the wetlands. The pipeline will not impede or divert water flowing to the wetlands. 3) They agree with the conclusions in your reports that these marshes are extremely sensitive to disturbance, and are of the opinion that, if these marshes were to be destroyed for any reason, it would have a significant impact on their profit margins over a very long period of time. will have a long time. Zutari takes note. 4) The farmers have taken note of the recommendations in your reports regarding limiting the impacts of the project on their marshes. However, they are not convinced that the recommendations will be applied to the letter in current times. There are many examples in the recent past of poorly managed mitigation plans where the environment was damaged and the farmers got the short end of the stick. The Rustfontein-Mangaung water pipeline laid in the 2010s is a good example of that. It is unfortunate that the farmers suffered damage during previous project(s) and that restrictive plans/measures were not applied. Zutari's advice in this regard would be to report measures that have not been carried out to the appointed contractor, engineer and revenue authorities and find out how they can be rectified. **5**) According to information verbally provided to Dr Geofré Heyns by Zurtari during the public meeting in Trompsburg, the planned pipeline will be about 2m to 2.4m in diameter, the top of which will be laid about 7.5m underground. As passed on during the public meeting and as indicated on the background information document the following: The pipeline diameter is 1.8m and is laid with

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					a soil covering that varies between 1.25m and 2.5m. The bottom height of the pipeline can therefore be up to 4.5m deep. The aquatic and ecological studies that have been carried out take into account the impact down to a soil depth of 500mm to 600mm. The geology of the affected farmers' marshes is such that there are rock slabs at depths as shallow as 1 m. These slabs will need to be broken in some way in order to install the pipeline, which may include the use of explosives. Swamps are not only ecological hotspots, but also hydrological hotspots with regard to the replenishment and maintenance of aquifers and underground water. The area where the affected farmers' farms are located is classified as a semi-arid area, where underground water is extremely important for supplying water to humans and animals. They are therefore of the opinion that attention must also be paid to the geo-hydrological impact of the project, with special attention to the health of the aquifers and the replenishment of the underground water. The project specifications can be drawn up to prohibit any explosive within a distance of 100m (or as recommended by the specialists) from wetlands. The trench excavation will then be done with an "excavator" that has a rock breaking point ("rock bucket") to break the rock to the required depth of the trench. 6) If steel pipes are to be used, the pipes will probably have to be welded together. Seen against the background of the recommendation that the pipeline should preferably be laid through the marshes in winter, this activity will result in a very large fire hazard. The working width is cleared before any pipeline is installed, this includes the removal of topsoil. According to specification, the steel pipes may only be handled in this working width and all welding also happens in this cleaned environment. The persons responsible for the welding must be certified according to strict specifications and are therefore specialists in the field of welding. Welding also cannot happen when the wind is blowing and there is dust. These factors should reduce the risk of any fires. 7) The affected have proposed a possible alternative route for the pipeline, which would completely avoid the marshes on their farms. See the Google Earth kmz file attached. It would be appreciated if you would bring this to Zutari's attention. Zutari notes the pre-urban alternative route. The new proposed alternative route will also cross several other wetlands and rivers, so similar impacts will need to be managed. The route currently proposed has been identified by considering various factors and has been found to be the most reasonable and feasible option. The alternative route is 25.5km in length compared to the proposed route with a length of 20.4km. The extra 5km pipe length increases the capital cost of the project by at least R250 million and also increases the pumping costs (electricity) due to the additional frictional loss caused by the longer pipe length. The alternative route also has high points of more than 1500 m above sea level compared to the proposed route where the highest point is 1440 m above sea level - the impact of these high points on the hydraulics of the system will have to be investigated if the alternative route is considered will become, but this is often problematic in terms of increased water hammer pressures. The proposed booster pump station is located approximately 4km North of the alternative route's

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					turn-off to Rusplaas which also means that the position of the pump station must move, including the power supply to the pump station. The pump station position was chosen to keep the working pressure under 160m, but the new position will mean that the working pressure exceeds 160m - this affects the choice of pumps as well as the pressure class of the pipeline, all of which lead to increased costs. In summary, the Basic Impact Assessment Report determined that if all proposed and mitigating measures were implemented, the possible medium and long-term impacts of the proposed project would be negligible. From an environmental point of view, the current proposal is therefore the most feasible proposal for DWS whose mandate is to meet basic needs (drinking water).
			22/07/2024	**Email to Zutari:** Dear Me Taljaard and Steyn; messrs Zutari. Hereby attached find the expert report as underwritten/signed by Dr Louis Du Pisani. Kindly receive and distribute to your Zutari team and parties. I will appreciate your assistance in this regard Kind Regards Dr GF Heyns	**Email response: 24/07/2024** Dear Dr Heyns Thank you for providing Zutari with your additional study. Zutari welcomes any additional input into the environmental process. Although the high-level wetland delineations are insightful, Zutari can unfortunately not incorporate this study with those of the independent specialists. The specialists appointed for the Xhariep pipeline project are professionally registered with the South African Council for Natural Scientific Professions (SACNASP) in their respective fields. They completed their reports as per the requirements of the environmental legislation, both prerequisites for conducting specialist work that can be included in formal environmental processes. Furthermore, Zutari would not be able to defend the information provided by you due to us not knowing what methodology was used to reach the conclusions, and whether the methodology is up to date with the latest standards and requirements pertaining to wetland assessments and delineations. We trust you understand. Kind regards
12.	Prof PH Wessels **phwessels@mweb.co.za**	Krapfontein Farm Tierpoort	20/06/2024	**Email to Zutari:** Good day, May I please register my comment/complaint with the attached sized document? May I also humbly request that you send me confirmation of receipt, please? I thank you in advance! Paul Wessels Prof PH Wessels	**Email Response: 28/06/2024** Good Morning Prof. Wessels, Trust this mail finds you well. Please see attached response from the project team in reference to your email below dated 20 June 2024. Kind Regards

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				Krapfontein Farm Tierpoort BLOEMFONTEIN Cell no: 082 5692 131 *Saamspan Trust* *BTW Nr. IT1388/97 4220177358* *Eienaar: Prof PH Wessels* Posbus 28732 **DANHOF** 9310 Tel: 0825692131 Faks: 051-4368268 e-Pos: phwessels@mweb.co.za **TO WHOM IT MAY CONCERN** Dear Zutari / Mr Werner Griesel, I, Paul Hendrik Wessels, forward my objection to the draft model as presented on 11 June, 2024 at Trompsburg. The presentation by Mr Stephen Kleynhans was well executed and valuable. Attendees were also allowed to ask questions. I do however want to express my concerns in this regard. I represent Saamspan Trust and different farms under its control and management. These farms are directly or indirectly influenced by Schemes 1, 1B and 4. This land was acquired in 1997. Early 1988, following severe floods, a wetland moratorium was placed to prevent reconstruction of broken dam walls and weirs in order to allow the revival of natural wetlands. This had a direct influence on the value of land in the area. In the following three decades, natural springs and marshes recovered naturally. The proposed mainline water scheme 1, 1B and 4 will traverse these wetlands and marshes on my farm in a number of places. These marshes are not indicated or considered in the proposed draft as presented on 11 June 2024. The implementation plan and the time allowed for recovery span over a period of 20 years, leaving my farming enterprise with a potential lack of natural water, whick will undoubtedly lead to devaluation of the farms. I introduced solar and wind energy on my farm, some 25 years ago and the proposed water lines will devide this system, leading to the reservours and balancing	ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 zutari.com 27 June 2024 Prof PH Wessels Post Box 28732 DANHOF BLOEMFONTEIN-DISTRICT, 9301 Tell. no: 082 569 2131 Email: phwessels@mweb.co.za Dear Prof Wessels **Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State** Your letter dated 20 June 2024 has reference. Zutari notes that you are representing Saamspan Trust. According to our information the affected farms are: ▪ Krapfontein 2720 Portion 0 ▪ Krapfontein 2720 Portion 2 It is noted that these farms were acquired in 1997 whereafter severe flooding events impacted the land. A moratorium period followed the flooding events to allow for the natural restoration of the wetlands over the said period which according to your letter resulted in a devaluation of the land at the time. Thereafter approximately 30 years (3 decades) followed and allowed for natural springs and marches to recover. The following aspects have been raised. **1. Wetlands:** Your letter states that the proposed Xhariep Pipeline Project Scheme 1, 1B and 4 (the Xhariep pipeline project) will traverse these wetlands and marches in several places. It is noted by you that these wetlands and marches are not indicated or confirmed in the project proposal. On 11 June 2024 during the engagement meeting Zutari provided assurance that the said wetlands and marches were indeed part of the proposal, that the wetlands have been delineated by the various specialists and that mitigation measures in this regard have been captured in the Environmental Management Plan (EMPr). The EMPr will form part of the environmental authorisation should this be granted by the competent authority namely the Department of Forestry, Fisheries and the Environment (DFFE). Upon receiving your letter Zutari also obtained further comment from the various independent specialists for their specialist input in the matters raised. Please refer to the attached Annexure 1 (Memorandum) for the verbatim input from (i) Biodiversity and (ii) the Freshwater Specialist regarding the wetlands and marches. Zutari considered the input from the specialists and yourself and proposed to accommodate you with the amended route to follow the N1 as shown by the green line on the image below. The impact would be less on the mentioned wetland and marches. For the pipeline route to follow existing infrastructure, Zutari (Pty) Ltd | Reg No 1977/003711/07 | Board of Directors (03/2024) *NN Gwagwa (Chairperson), T Daka, *AC Discala, *PJ Hendricks, *NDL Motaze, J Ndala, *GT Rohde (*Non-Executive Director)

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				dams becoming obsolete. Two different title deeds are influenced by this proposal. Another point of concern is the influence on the farm Krapfontein, one of the ONLY farmsteads in the Central Free State NOT to be burned down during the Anglo Boer War (1899-1902). Construction of this magnitude and the effect on nature, natural indiginous trees (specifically on the proposed side of the S299 Road) and the landcape will undoubtedly have a severely negative effect on this precious farm. Currently there are NO Eskom Power lines, telephone lines, Cell Phone Towers or quarries on the farm! By taking this in consideration, it is urgently requested that exact route of the pipeline be reconsidered. I therefor object and register myself with the accompanying contact details: I kindly request your favourable consideration, specifically to personal direction which I am willing to supply on site. Yours sincerely, Prof PH Wessels ID:550430 5029 080 20 June 2024	ZUTARI is generally preferable from a disruption and maintenance perspective. It will, however, be more expensive due to the longer pipeline route, hence the original alignment.  **2. Devaluation:** Your letter states that that the proposed Xhariep pipeline project will leave your farming enterprise with a lack of natural water which will lead to devaluation of the farms. Please refer to Annexure 1 in reference to the matter addressing the lack of natural water. Furthermore, please note Zutari's appointment is for the detailed feasibility phase of the project, whereafter DWS will appoint a professional service provider to undertake the detailed design and construction supervision. However, in terms of engagements between landowners and DWS, the following processes are likely to be followed: ▪ The Sub Directorate: Land Rights Administration (LRA) is the unit within the Department of Water and Sanitation (DWS) responsible for all land-related matters nationwide. The LRA unit is situated in Pretoria. ▪ After a detailed feasibility phase is approved, an instruction is given to the LRA by the DWS Project Manager to acquire the land and servitudes needed for the project. The LRA will then obtain approval from the Minister of Water and Sanitation to engage affected landowners regarding the procurement of land and registration of servitudes. Once approval is granted, the LRA will appoint a professional registered valuer (at the project's cost), and a public meeting will be arranged, typically through an appointed social facilitator, with all affected owners/persons. ▪ At the meeting, the LRA and the appointed valuer will explain the acquisition and valuation processes. Following this meeting, one-on-one meetings will be held with all affected owners to further detail the processes. The valuer will then visit each affected owner on-site to conduct the valuation of the servitude or land affected by the project. ▪ During these one-on-one engagements, landowners will have the opportunity to raise conditions they may want to propose as part of the Agreement to be concluded between DWS and the landowner. Each condition/request will be evaluated based on merit before being agreed to. Project number 1002533, Letter to Prof Wessels Saamspan Trust_Zutari project team_Final.docx, 2024/06/27, Rev 0 2

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					ZUTARI ▪ After conducting market research and completing other necessary steps, the valuer will compile a valuation report for each owner and submit it to the LRA, which will handle the compensation as recommended by the valuer. **3. Heritage building on Farm Krapfontein** Your letter states that that the proposed Xhariep pipeline project will have a detrimental impact on farm in reference to Heriatge and cultural value as well as the indigenous trees along S299 Road. Please refer to the attached Annexure 1 for the verbatim input from the (iii) Heritage Specialist. Furthermore, please also refer to the EMPr (Annexure G) of the draft BAR. The EMPr details the information of the role players (Developer, Site Engineer, Environmental Site Agent, Record keeping) as well as safety and mitigation measures specifically aimed at the Heritage component. The following methodology will be followed during the installation of the pipeline: ▪ The pipeline route will be set out with markers by the contractor, whereafter the engineer and landowner will verify that the alignment is as per the approved design; ▪ The contractor will erect a temporary fence on the edge of the working area (typically a width of ±50m from the existing fence line on the edge of the road). This fence is to protect people and animals from entering the working area or falling into the pipe trench; ▪ The maximum length of open trench will be limited to 300m; ▪ Once the trench is backfilled, the completed work will be inspected by the engineer, whereafter the landowner will be asked to confirm that he/she is happy. Any further remedial work will be undertaken immediately by the contractor until the site has been reinstated to the same condition as prior to the commencement of construction; and ▪ An Environmental Control Officer (ECO) will be appointed to oversee that the construction activities are taking place in accordance with the EMPr. The ECO must submit monthly audit reports to DFFE (the competent authority) who will have the right to suspend the work if deemed necessary. The ECO must also maintain a complaint register, which must be submitted monthly to DFFE. **4. Eskom and power supply** It is mentioned in your letter that that there is currently no Eskom power, telephone lines or cell towers on the farm. 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. Should you want to discuss any additional measures you are welcome to contact Zutari in this regard so that it can be negotiated with the client for inclusion in the environmental authorisation and construction documentation. Yours faithfully Stephan Kleynhans Design Director Copies: vanjaarsvelds@dws.gov.za johannes@setalaenvironmental.co.za darius@dprecologists.co.za john.gribble@terramarearchaeology.com Project number 1002533, Letter to Prof Wessels Saamapan Trust_Zutari project team_Final.docx, 2024/06/27, Rev 0 3

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					ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 zutari.com **Memorandum** **To:** Setlala Environmental, DPR Ecologists & Environmental Services and Terramare Archaeology **From:** Zutari **Purpose:** To obtain input from the independent specialist in reference to matters raised by Saamspan Trust regarding the Xhariep pipeline project **Reference:** 1002533 **Date:** 2024-06-24 **Pages (including this page):** 5 **Subject:** Saamspan Trust (Letter dated 20 June 2024) (i) Independent Biodiversity Specialist: Setala Environmental (Verbatim) Firstly, thank you for taking the time to detail your queries and concerns regarding the pipeline project. As hopefully noted from the ecological studies, the protection and avoidance of all watercourses as far as possible, including wetlands, is a priority. However, having said that, it is difficult to be able to demarcate and avoid all wetlands and drainage lines across the entire length of the project especially small seasonal ones, but most of the significant and distinctive watercourses have been highlighted. The project is still in the initial feasibility stage and more fine-tuning will be done as the project progresses. The specialist studies do put forward a number of mitigating measures in an effort to reduce the potential negative impacts the project may have on watercourses, as well as other natural habitats and sensitive areas. These mitigating measures will become part of the actual conditions of environmental authorisations and other environmental management plans that must be implemented and monitored during the construction and operational phases of the project. Hereby, checks and balances are put in place to ensure levels of protection, avoidance and reduction in negative impacts on the natural environment. A water pipeline has a small, linear footprint that has minimal overall negative impact on the natural environment. For the most part the pipeline is going to be buried and the surface area will quickly recover to preconstruction levels and will not even be visible after a short period of time. During the construction phase special attention will be given to watercourse areas. Buffer zones and regulated zones have been demarcated. This means that there will be restricted and controlled access into these areas to limit negative impacts. The pipeline design in the area of watercourses (streams, rivers wetlands) will be given special attention, which may include the depth at which the pipe is buried. This is important to limit and avoid the pipe from impeding and impounding the surface flow and sub-surface flow of groundwater that is important for the maintenance of wetlands. Having worked on numerous pipeline projects across wetland areas, such as in the Mpumalanga Highveld and Free State, I would like to assure concerned landowners that a pipeline of this nature will have negligible to no negative impacts on the movement of surface stormwater and groundwater into wetlands and rivers. Mitigating measures and conditions put 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 1

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					ZUTARI forward prohibit the impeding and impounding of water flow. It is also a condition that the water presently feeding into a specific wetland, stream or river may not be diverted away and must still enter into those systems. In other words, after design and construction the wetlands of concern will still be adequately fed and sustained from 'upstream' surface and sub-surface stormwater flow. It is important that in these wetland areas the engineers ensure designs are implemented to ensure free flow and movement of stormwater. In other words, no large soil embankments / mounds may be constructed in these areas that will directly and clearly impeded water from feeding into and sustain existing natural wetlands. It has been shown that the sub-surface water moving through an area will easily bypass a buried pipe and still move in the original downstream direction. The comments from the Saamspan Trust mention a 20-year recover time period. In terms of the pipeline the recovery will be within one to two seasons. In other words, regrowth of surface grass will recover within the first season and by the second season minimal to no surface trace of the pipeline should be visible, if construction and rehabilitation processes have been properly followed. It is also for this reason that independent Environmental Control Offices (ECOs) will be assigned to the project to monitor and ensure full compliance. I can assure the concerned landowners that the project will definitely not lead to a lack of natural water as presently found on the farms and watercourses. Once again please note that the nature of the project is such that it will have negligible to no negative impact on the aquatic environment, and most if not all water presently flowing into streams, rivers, wetlands and farm dams will be maintained and not impacted. It should be noted that the initial pipeline servitudes are mostly along existing roads. This has been done in an effort to avoid farming areas and other natural grasslands and koppies (rocky outcrops). This further limits additional negative impacts on natural grasslands and wetlands. In the area of some of the farms the pipeline does cut across open grassland. It might be an option to consider moving some of this pipeline to follow existing roads. There are minimal indigenous trees along the pipeline route, being mostly within a grassland ecosystem. Where trees have been encountered, especially protected trees such as wild olive trees, these have been noted and mitigating measures recommended to avoid them as far as possible, and if not, to offset them by planting additional trees. However, no protected trees were observed in the open grassland areas. In the case of historical farm boundaries and homesteads where large, old gum trees (in particular) are standing additional fine-tuning and measures should be put in place to protect these as well. During further progress and fine-tuning of the project these trees, such as mentioned in the comments from the Saamspan Trust, should be highlighted and protected as far as possible. In summary: ▪ The pipeline will not result in the loss of natural wetlands, rivers and other watercourses as presently found along the route. ▪ Further identification and demarcation of wetlands, etc. as mentioned in comments should be undertaken to address the concerns of landowners. ▪ Special attention will be given in the final designs, layouts and routes to ensure that water feeding into existing wetlands will not be compromised, hereby ensuring their present ecological state and integrity. Please note, that this is also a central issue of the Department of Water & Sanitation (DWS) with such projects. ▪ The recovery rate of disturbed areas along the pipeline route will be one to two seasons at most and definitely not 20 years. ▪ The negative effect on the natural environment by the pipeline will be negligible, especially if it is buried and site-specific rehabilitation is implemented. There will be negligible to no visible negative impact either. I trust that this addresses the queries and concerns as received.

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					ZUTARI **(ii) Independent Freshwater Specialist: DPR Ecologists & Environmental Services (Verbatim)** I have reviewed the comments as received with regard to affected wetlands. You can consider the following comments and recommendations which can be taken into consideration regarding likely impacts and mitigation. Wetland systems as indicated has been subjected to comprehensive assessment and already included in the wetland assessment (dated March 2024). These wetlands have been listed as follows: ▪ #40 Holsloot – Tributary of Tierpoort River (Page 122 of report). ▪ #41 Channelled valley-bottom wetland – Tributary of Holsloot (Page 124 of report). ▪ #42 Channelled valley-bottom wetland – Tributary of Holsloot (Page 126 of report). ▪ #43 Stream and floodplain wetland – Tributary of Tierpoort River (Page 128 of report) – Additional assessment also included (refer to page 52). A description of each of these affected wetlands have also been provided which indicates that they are all significant systems with extensive wetland conditions. They are also still largely intact though impacts affecting them are significant and include several artificial impoundments (Farm dams) and existing road crossings (N1 as well as gravel road). These are however still regarded as important systems and accordingly the risk matrix indicates a Moderate Risk which will require significant mitigation in order to ensure that the proposed pipeline construction does not adversely affect them. Most important will be to ensure that these systems maintain flow during construction and that adequate and comprehensive rehabilitation is implemented. The following has been included within our assessment and will also be most relevant to these wetland areas as indicated (Also refer to page 163 of the report): ▪ The disturbance caused by construction will cause susceptible conditions for further establishment of exotics. It is therefore recommended that weed eradication be initiated at the construction site prior to construction and continued until rehabilitation of the pipeline route has been completed. ▪ 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. ▪ 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. ▪ 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. ▪ 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 Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/08/24 3

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					ZUTARI 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. ▪ Monitoring of construction and compliance with recommended mitigation measures must take place and should include biomonitoring of wetlands by using the WET-Health 2 indices while watercourses should be monitored by using the Index of Habitat Integrity indices. As indicated, though these affected wetlands are all important and sensitive systems and while concerns raised are valid, the following should also be considered: ▪ At the four indicated wetlands (#40, 41, 42, 43) which will be affected by the pipeline crossing, the existing N1 National Road and gravel road already cross over these system and therefore existing, similar impacts are already present, i.e. the pipeline will not entail a new impact. ▪ Similar bulk pipeline developments are common and has reliably shown that as long as adequate rehabilitation is undertaken, these pipeline crossings do not result in any long-term modification of wetlands, wetland vegetation is able to re-establish within a relatively short period (within 2-5 years) and no significant above-ground evidence of these pipelines remain visible. ▪ Belowground pipeline construction entails a temporary impact and the wetlands will only be affected for a short period during construction with complete rehabilitation occurring within 2-5 years after construction. ▪ Because pipelines are linear developments, it is not possible to completely avoid crossing of wetland systems and this is an inevitable impact which remains unavoidable. These wetlands will therefore have to be crossed somewhere and the indicated locations adjacent to the N1 National Road and gravel road will therefore be more suitable (existing road crossings are already present). ▪ If mitigation as indicated are implemented, especially in respect to maintaining adequate flow (see point 8 above), then downstream sections of these wetlands will not be affected to a significant extent in terms of flow regime. In other words, downstream sections will maintain functionality as they will continue receiving inflow from the upstream areas. Hopefully this will provide some clarity on the anticipated impacts on these wetlands. They have been subjected to comprehensive assessment and should indicate how and to what degree the pipeline will affect these wetlands. Please let me know if you require any more information or have any additional questions. **(iii) Independent Heritage Specialist: Terramare Archaeology (Verbatim)** Thank you for forwarding me the comment from Prof Wessels. My response below relates to the second point he makes: that regarding potential impacts from the project to the farm Krapfontein. In responding, I have assumed that the farm portions being referred to are Re 2720 and Portion 2 of 2720 Krapfontein. I note that Prof Wessels is concerned about the magnitude of the construction work and its effects on nature, indigenous trees along the S299 and on the landscape. I cannot comment on the natural environment impacts or on the possible impacts to the tress dotted along the S299 but can respond on the landscape question. The farm complex on Re 2720, which I assume is the one referred to by Prof Wessels as having survived the Anglo-Boer War, is situated more than 400m at its closest point from the proposed alignment of the pipeline and is largely screened by trees. Although there may be visual impacts within the landscape during the installation of the pipeline (the presence of machinery, vehicles, people and the pipe trench, Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/08/24 4

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					ZUTARI for example), the fact that the pipe will be a buried feature means that once the area has been rehabilitated post-installation, there should be few to no long-term or continuing visual impacts in or on the landscape. There will certainly be no direct impacts arising from the project as proposed to the farm complex itself. With respect to other heritage resources in proximity to the pipeline route on Krapfontein, we noted no obvious cultural heritage resources on either land parcel in proximity to the proposed pipeline route during our site visit. Best regards Project number 1002533 Annexure 1_ Xhariep Memorandum Specialist Input.docx, 2024/06/24 5
13.	Jack Morton **fslanduse@gmail.com**	Department of Agriculture & Rural Development	20/06/2024	**Email to Zutari:** Afternoon, Please find attached the completed form as requested.	**Email Response: 20/06/2024** Dear Mr Morton, Thank you for your email and your registration form.

<table>
<tr><th></th><th colspan="5">XHARIEP BASIC ASSESSMENT REPORT
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<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td></td><td></td><td></td><td></td><td>Regards
Jack Morton

ZUTARI

Registration and Comment Form:

Greater Mangaung Water Augmentation Project: Xhariep Pipeline, Mangaung Metropolitan Municipality, Free State

<table>
<tr><td>TITLE</td><td>Mr</td><td>FIRST NAME</td><td>Jack</td></tr>
<tr><td>INITIALS</td><td>JAS</td><td>SURNAME</td><td>Morton</td></tr>
<tr><td>ORGANISATION</td><td colspan="3">Department of Agriculture & Rural Development - Free State</td></tr>
<tr><td>YOUR INTEREST IN THE PROJECT</td><td colspan="3">(Please indicate whether for the BAR, the WULA, or both)
BAR</td></tr>
<tr><td>POSTAL & PHYSICAL ADDRESS</td><td colspan="3">LandCare Building, Glen College of Agriculture, GLEN</td></tr>
<tr><td></td><td colspan="2">POSTAL CODE</td><td></td></tr>
<tr><td>LANDLINE TEL NO</td><td>060 523 8915</td><td>CELL NO</td><td>060 523 8915</td></tr>
<tr><td>EMAIL ADDRESS</td><td colspan="3">fslanduse@gmail.com</td></tr>
</table>

COMMENTS (please use separate sheets if you wish)
<table>
<tr><td>Protection of Arable land and High Potential Agricultural land</td></tr>
<tr><td>Controlling of any invader plants and bush encroachment</td></tr>
<tr><td>Controlling of erotion</td></tr>
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THANK YOU FOR YOUR PARTICIPATION

Zutari and 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.

Greater Mangaung Water Augmentation Project: Xhariep Pipeline, Mangaung Metropolitan Municipality, Free State 6</td><td>Zutari has registered you on the I&AP list.

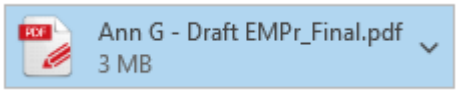
Please note that the attached EMPr (which is annexure G to the draft BAR) addresses the 3 points you have noted:

1. Protection of Arable land and High Potential Agricultural land: Section 5.1 - as per the mitigation measures obtained from the Agricultural Specialist,
2. Controlling of any invader plants and bush encroachment: Section 4, Section 5.6 and Section 6.1 and Appendix D Please also note that a final and formal Alien and Invasive Plant Management Plan will be developed by DWS, and
3. Controlling of erosion: Section 4 and Section 6.2.1.

Please do not hesitate to clarify any further questions.

Kind regards

Corlie Steyn

  </td></tr>
<tr><td>14.</td><td>Canny Mothapo
mothapoc@caa.co.za</td><td>South African Civil Aviation Authority</td><td>20/06/2024</td><td>Email to Zutari:

Good morning,

Thank you for the EIA notification, may you kindly resend the attachments to environment@caa.co.za and also delist all other SACAA email addresses on your database. Kindly save and send your environmental impact analysis reports/meeting requests and request for comments to environment@caa.co.za, going forward please.</td><td>Response: 20/06/2024

Zutari amended email addresses as requested on the I&AP list.</td></tr>
</table>

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				Regards Canny Mothapo	
15.	Pamela Madondo **MadondoP@caa.co.za**	South African Civil Aviation Authority	20/06/2024	**Email to Zutari:** Good day, Kindly find attached comments for the South African Civil Aviation Authority on the proposed development of the Xhariep water pipeline. Kind Regards Pamela Madondo 	**Email Response: 20/06/2024** Dear Pamela, Zutari received your comment (refer attached). We need to clarify the second paragraph with you: Can you please let us know whether it should read *"…formal obstacle assessment **way** need to be conducted…"* or whether it should rather read "*…formal obstacle assessment **may** need to be conducted…*" Kind regards Corlie Steyn

SOUTH AFRICAN CIVIL AVIATION AUTHORITY

Physical Address: Ikhaya Lokundiza, Treur Close, Waterfall Park, Bekker Street, Midrand
Postal Address: Private Bag X 73, Halfway House, 1685
Telephone Number: +27 0860 267 435
Fax Number: +27 11 545 1465
E-mail Address: mail@caa.co.za
Website Address: www.caa.co.za
Southern Region Office: PO Box 174, Cape Town International Airpo
Tel. Number: +27 21 934 4744
Fax Number: +27 21 934 1326

Aviation Environmental Compliance
Tel No: +27 11 545 1199
Email: environment@caa.co.za
Enquiries: Ms. Pamela Madondo

20 June 2024

5 Cannon Road
Plumstead
7800

Attention:

Dear Sir/ Madam

RE: COMMENTS ON XHARIEP PIPELINE, MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE

We acknowledge receipt of email dated 2 June 2024. The South African Civil Aviation Authority (CAA) is an agency of the Department of Transport (DoT). The Civil Aviation Act 13 of 2009 provides for the establishment of the CAA as a stand-alone authority mandated with controlling, promoting, regulating, supporting, developing, enforcing and continuously improving levels of safety and security throughout the civil aviation industry. The CAA exercises this mandate through the Civil Aviation Regulations (CARs).

Please see our comments below:

The proposed project may not have significant impacts on civil aviation activities and infrastructure. However, since the proposed site is very close to an aerodrome infrastructure a formal obstacle assessment way need to be conducted with Air Traffic Navigation Services (ATNS). Kindly note that SACAA has transferred all obstacle assessments and applications responsibilities to ATNS as published on the SACAA website: www.caa.co.za/industryinformation/obstacles/. The list and contact details of the approved obstacles assessment services providers can be obtained from the CAA website: www.caa.co.za.

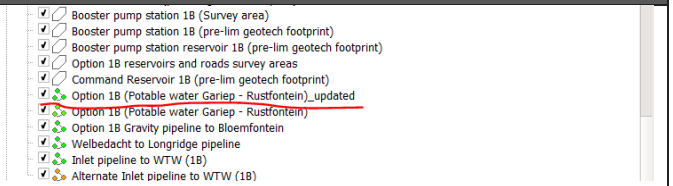
Yours sincerely,

Aviation Environmental Compliance Department

Board Members: Mr Ernest Khosa (Chairperson); Mr Suren Sooklal; Ms Bulelwa Koyana; Ms Tshitshi Phewa; Adv Mpoti Lebakeng and Mr Tshepo Peege
DCA: Ms Poppy Khoza; Company Secretary: Ms Nivashnee Naraindath

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			20/06/2024	**Email to Zutari:** Good day Corlie, Yes, it should read as “may need to be conducted” Kind regards, Pamela Madondo	**Email Response: 03/06/2024** Hi Pamela, Thank you so much for the clarification. Can you perhaps furthermore confirm whether this assessment (if deemed necessary) can be conducted post the EIA process? Zutari’s appointment is for the detailed feasibility phase of the project and EIA process, whereafter DWS (the client) will appoint a professional service provider to undertake the detailed design and construction supervision. It is our opinion that a further study, (if deemed necessary) should rather be conducted once the final design of the project has been done. Please let us know what you recommend. Kind regards Corlie Steyn
			21/06/2024	**Email to Zutari:** Good day Corlie, I would highly recommend that Air Traffic Navigation Service (ATNS) be included in the public participation process to provide comments on the proposed development. They will be able to guide you through the process better. Typically, this type of project would not require such an assessment, however due to its locality and being close to an aerodrome facility ATNS will need to be involved. Kind regards, Pamela Madondo	
16.	Mr MJ Tepanyekga **Modubi.Tepanyekga@dalrrd.gov.za**	The National Department of Agriculture, Land Reform and Rural Development (DALRRD)	20/06/2024	**Email to Zutari:** Dear Marianna Taljaard **RE: XHARIEP WATER PIPELINE/ WATERPYPLYN: Notification/ Kennisgewing: Public Participation Process/Publieke Deelnameproses: DFFE Ref No/ Verw Nr: 14/12/16/3/3/1/2996** Your e-mail regarding the above, dated 20th June 2024, has reference. Please be informed that your enquiry has been forwarded to the relevant component. The Department will respond to you in due course. Should you wish to follow up on this matter, kindly contact Malebo Baloi. Tel: (012)312-8052. Email: **Malebo.Baloi@Dalrrd.gov.za** Kind regards, Mr. MJ Tepanyekga	
17.	Zutari to Obstacle Evaluation Team as per instruction from South African Civil Aviation Authority		21/06/2024		**Email Response: 21/06/2024** To Whom It May Concern Trust this mail finds you well. We’ve received feedback from SACAA (letter attached), advising that we inform ATNS of the Public Participation Period for the abovementioned project (see notification below sent to the public). Specifically relating to the potential

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					requirement to conduct an obstacles assessment for the project. Please find attached Background Information Document for a brief description of the project. In this regard, we would like to request ATNS to provide comment on the project and whether an obstacles assessment would be required. Comment can be submitted by responding to this email or by using the attached Registration and Comment Form. Please consider that the project is for the construction of an underground potable water pipeline and associated infrastructure (pumpstation, water treatment works (at Gariep) and reservoirs). Note that the project is currently in detailed feasibility and environmental impact assessment phase, and detailed designs for infrastructure has not been developed. We are of the opinion that an obstacles assessment, should it be found to be required, would perhaps be better suited at a later stage of the project when more detail regarding designs is available, however we will follow your guidance in this regard. We look forward to hearing from you and are available to discuss. Kind Regards Marianna Taljaard
18.	Obstacle Evaluation Team - Air Traffic Services BRUMA **obstacles@atns.co.za**		21/06/2024	**Email to Zutari:** Good day Please send a KMZ file of the proposed project. Kind regards	**Email Response: 21/06/2024** Good day, Please see attached the kmz (Site investigations) as well as a second kmz (affected landowners). Please let us know if you require any other information. Kind regards Corlie Steyn 
					Email Response: 26/06/2024 Good day, We are getting close to the end of our PP period on the Xhariep project. Input from landowners and specialists lead to a slight change in the route:(i) to accommodate the landowner, and ii) for the pipeline route to follow existing infrastructure, which is generally preferable from a disruption and maintenance perspective. It will, however, be a bit more expensive due to the longer pipeline route, hence the original alignment. Please see the new route attached (Krapfontein Farms_alternative image). Attached is also the new kmz. The new route alignment is underlined in red in the screenshot below, note that the old one is still part of the kmz file.

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					 The pipe length only changed by just under 500m: Total pipeline length went from 244.4km to 244.9km. The new details are: <table><tr><th>Component</th><th>Capacity (m³/s) (1)</th><th>Capacity (Ml/d) (1)</th><th>Estimated Footprint (m²)</th></tr><tr><td>Gariep Low Lift Pump Station</td><td>3.8</td><td>328.1</td><td>10,000</td></tr><tr><td>Gariep WTP</td><td>-</td><td>312</td><td>600,000</td></tr><tr><td>Gariep High Lift Pump Station</td><td>3.62</td><td>312.4</td><td>(included in WTP above)</td></tr><tr><td>Command Reservoir (3 sites)</td><td>-</td><td>80 Ml</td><td>112,500</td></tr><tr><td>Booster Pump Station</td><td>3.62</td><td>312.4</td><td>10,000</td></tr><tr><td>Gariep Pipeline (188.99 km, 1800 Ø)</td><td>3.62</td><td>312.4</td><td>7,559,600</td></tr><tr><td>Gravity Pipeline to Brandkop (31.37 km, 2000 Ø)</td><td>3.62</td><td>312.4</td><td>1,254,800</td></tr><tr><td>Gravity Pipeline to Rustfontein Pump Station (24.52 km, 1400 Ø)</td><td>2.43</td><td>209.8</td><td>980,800</td></tr><tr><td>Substation (2 sites)</td><td>-</td><td>-</td><td>45,000</td></tr><tr><td>Total (m²)</td><td></td><td></td><td>10,572,700</td></tr><tr><td>Total (ha)</td><td></td><td></td><td>1,057</td></tr><tr><td>Total excl. pipeline (m²)</td><td></td><td></td><td>777,500</td></tr><tr><td>Total excl. pipeline (ha)</td><td></td><td></td><td>78</td></tr></table> Please do not hesitate should you have questions. Kind regards Corlie Steyn
			11/07/2024	**Email to Zutari:** Good day Apologies for the late reply, could we schedule a Teams meeting with you to get clarity on your application. Please advise us on the dates and times that would best suit you. Regards **Obstacles Evaluation Team** | COO - Air Traffic Services BRUMA T: +2711 607 1000 E: obstacles@atns.co.za • W: www.atns.com	**Email Response: 11/07/2024** Good day Thank you for your response. Corlie has asked me to engage with you regarding this matter. We area available to meet tomorrow anytime between 0830 and 1200 and then again between 1300-1600. Please could you indicate your preferred time, and I will send the invite. If not tomorrow, please indicate your availability next week. Regards, Wynand Loftus
				Email to Zutari: Good evening, Could we schedule a meeting between 13:00 – 13:30 tomorrow. Regards	**Email Response: 12/07/2024** Good morning That is perfect, I will send the invite. Regards, Wynand Loftus

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Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
				Obstacles Evaluation Team | COO - Air Traffic Services BRUMA T: +2711 607 1000 E: obstacles@atns.co.za • W: www.atns.com	
			12/07/2024	**Email to Zutari:** Good day, Corlie Steyn, **RE: PROPOSED XHARIEP WATER PIPELINE/ WATERPYPLYN** The proposed XHARIEP WATER PIPELINE/ WATERPYPLYN is in close proximity to Gariep Dam airfield. ATNS does not oppose the establishment of the proposed Sasol Powerline Project SRK, however this does not serve as **an approval/no objection letter**, the applicant still needs to apply for a detailed obstacle assessment in order to obtain a letter of objection /no objection from ATNS and a conditional Approval from the South African Civil Aviation Authority. Please contact **obtacles@atns.co.za** for a detailed Obstacle Assessment application. Kind Regards **Obstacles Evaluation Team** | COO - Air Traffic Services BRUMA T: +2711 607 1000 E: obstacles@atns.co.za • W: www.atns.com	
19.	Albie Louw **LouwA1@ufs.ac.za**	University of the Free State	26/06/2024	**Email to Zutari:** Good day Attache find our comments pertaining to the draft Basic Assessment Report: Xhariep Water Pipeline project. Regards **Albie Louw** *Pr. Pln A1117/1999* Assistant Director: Property Management - University Estates PO Box 339, Bloemfontein, 9300, Republic of South Africa 051 4019207 LouwA1@ufs.ac.za	**Email Response: 01/07/2024** Good Day Albie, Trust this mail finds you well. Please see attached response from the project team in reference to your letter attached and email below dated 26 June 2024. Kind Regards Marianna Taljaard

XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)					
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				UNIVERSITY OF THE FREE STATE UNIVERSITEIT VAN DIE VRYSTAAT YUNIVESITHI YA FREISTATA UFS 26 June 2024 The Public Participation Facilitator Zutari Attention: G. de Waal By electronic mail: xhariep@zutari.com Dear Madam **RESPONSE TO REQUEST FOR COMMENTS: BASIC ASSESSMENT REPORT** **PROPOSED XHARIEP PIPELINE PROJECT** 1. The registration of the University of the Free State (UFS) as an interested and affected party and your public meeting in Bloemfontein on 11 June 2024 have reference. 2. The UFS is an interested and affected party, as a registered owner of properties that may be affected by the planned pipeline route 1B as well as the proximity of the proposed pipeline to the UFS Paradys Experimental Farm. 3. We acknowledge the fact that the construction of the Xhariep Water pipeline is a key priority / Strategic Infrastructure Project for your client (Department of Water and Sanitation). 4. Due to the scale and impact of the proposed project, diligent monitoring pertaining to the implementation of the *mitigating measures* as stipulated in each section of the Chapter 7 of the Basic Assessment Report; will be extremely important. We will appreciate it if the UFS can obtain access to the Environmental Management Plan and the contact details of the Environmental Control Officer (when available). 5. Kindly note that our internal procedure pertaining to the registration of servitudes over UFS properties, is an extensive process and subject to final approval by the Minister of Higher Education (in terms of the Higher Education Act). Your client thus needs to engage with the UFS as soon as possible regarding: • The exact route over UFS property/ies • Valuation and Solatium • Draft Servitude agreement(s) The UFS reserves the right to elaborate on this matter, should it become necessary. Yours faithfully Digitally signed by Albie Louw Date: 2024.06.26 13:01:16 +02'00' **Albie Louw** *Assistant Director: Property Management* *University Estates* *CC: Mr. N. Janse van Rensburg* 205 Nelson Mandela Drive/Rylaan Park West/Parkweg Bloemfontein 9301 South Africa/Suid-Afrika P.O. Box/Posbus 339 Bloemfontein 9300 South Africa/Suid-Afrika T: +27(0)51 401 9111 www.ufs.ac.za UNIVERSITY OF THE FREE STATE UNIVERSITEIT VAN DIE VRYSTAAT YUNIVESITHI YA FREISTATA *Page 1 of 1*	ZUTARI IMPACT. ENGINEERED. T +27 21 526 9400 E capetown@zutari.com A 1 Century City Drive Waterford Precinct Century City Cape Town South Africa P PO Box 494 Cape Town 8000 Docex: DX 204 **zutari.com** 28 June 2024 Albie Louw PO Box 339 BLOEMFONTEIN, 9300 Tell. no: 051 401 9111 Email: LouwA1@ufs.ac.za Dear Albie Louw **Greater Mangaung Water Augmentation Project: Xhariep Pipeline (Scheme 1B), Mangaung Metropolitan Municipality, Free State** Your letter dated 26 June 2024 has reference. Thank you for making the time to attend to engagement meeting on 11 June 2024 in Bloemfontein. Zutari would like to confirm the following in this regard. 1. The University of the Free State (UFS) has been registered as an Interested and Affected Party (I&AP) on the project database. 2. It is noted that the UFS is a registered owner of properties that may be affected by the planned pipeline route 1B as well as the proximity of the proposed pipeline to the UFS Paradys Experimental Farm. 3. Thank you for the acknowledgement of the importance of this key priority project. 4. Please note that Annexure G of the Draft BAR is the Draft Environmental Management Plan (EMPr) for the project. It has also been attached to this email for ease of reference. The Final EMPr will be submitted to the competent authority the Department of Forestry, Fisheries and the Environment (DFFE) and can also be shared with you at the time. It will be communicated to the client, Department of Water and Sanitation (DWS) to share the details of the Environmental Control Officer (ECO) with you when the person is appointed. 5. It is noted that the internal process at the UFS pertaining to the registration of servitudes over the UFS is an extensive process and subject to final approval of the Minister of Higer Education. DWS will be informed to engage the UFS as possible regarding the exact route over the UFS properties, Valuation and Solatium as well as Draft Servitude agreements. Furthermore, please note Zutari's appointment is for the detailed feasibility phase of the project, whereafter DWS will appoint a professional service provider to undertake the detailed design and construction supervision. However, in terms of engagements between landowners and DWS, the following processes are likely to be followed: i. The Sub Directorate: Land Rights Administration (LRA) is the unit within the Department of Water and Sanitation (DWS) responsible for all land-related matters nationwide. The LRA unit is situated in Pretoria. ii. After a detailed feasibility phase is approved, an instruction is given to the LRA by the DWS Project Manager to acquire the land and servitudes needed for the project. **Zutari (Pty) Ltd**	Reg No 1977/003711/07	**Board of Directors** (03/2024) *NN Gwagwa (Chairperson), T Daka, *AC Dicala, *PJ Hendricks, *NDL Mokwe, J Ndala, *GT Rohde (*Non-Executive Director)

XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)					
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					ZUTARI iii. The LRA will then obtain approval from the Minister of Water and Sanitation to engage affected landowners regarding the procurement of land and registration of servitudes. Once approval is granted, the LRA will commence engagements, which will include one-on-one meetings, with all affected owners/persons/institutions. Yours faithfully Stephan Kleynhans Design Director Copies: vanjaarsvelds@dws.gov.za Mr N Janse van Rensburg Project number 1002533, Letter to UFS_Zutari project team_Final.docx, 2024/06/28, Rev 0 2
			09/07/2024	**Email to Zutari:** Good day Marianna Duly noted. Kind regards **Albie Louw** *Pr. Pln A1117/1999* Assistant Director: Property Management - University Estates PO Box 339, Bloemfontein, 9300, Republic of South Africa 051 4019207 LouwA1@ufs.ac.za Inspiring excellence. Transforming lives. Inspireer uitnemendheid. Verander lewens.	

<table>
<tr><th></th><th colspan="5">XHARIEP BASIC ASSESSMENT REPORT
Comments and Response Register (PPP 3 June 2024 – 4 July 2024)</th></tr>
<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td>20.</td><td>MMatlala Rabothata
mrabothata@dffe.gov.za</td><td>Department of Forestry, Fisheries and Environment (DFFE)</td><td>26/06/2024</td><td>Email to Zutari:
Afternoon,
Please forward me the Biodiversity specialist studies.
Regards
Ms Mmatlala Rabothata</td><td>Email Response: 26/06/2024
Good afternoon Matlala,
Please see attached the Biodiversity specialist reports.
Kind regards
Corlie Steyn
Ann D.8.1_Xhariep Biodiversity (Fauna and Flora) Impact Assessment.pdf 14 MB
Ann D.8.2_Xariep Biodiversity Aquatic Assessment.pdf 6 MB</td></tr>
<tr><td>21.</td><td>Ephron Maradwa
EMaradwa@dffe.gov.za</td><td>Department of Forestry, Fisheries and Environment (DFFE)</td><td>27/06/2024</td><td>Email to Zutari:
Good day.
Please find herein the attached letter for the above mentioned.
Please do not respond to this mailbox with any queries related to the decision been issued. All queries on the attached decision must be directed to official whose contact details is listed as enquiries.
I hope you find all in order.</td><td>Response to Final BAR:
<table>
<tr><th colspan="3">DFFE:
COMMENTS AND RESPONSES ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE</th></tr>
<tr><th>No</th><th>Listed Activities, Application Form and Project Description</th><th>Sections in the Amended Application form and in the Final BAR</th></tr>
<tr><td>1</td><td>It is noted that the project description pertaining to the proposed development is not clear and understandable. Therefore, you are requested to provide the project description in a point form in order to for the Department to understand when reviewing this application. For instance, it has been noted that the proposed development will include reservoirs and pumpstations, however, it is unclear as to how many reservoirs and pumpstations are required. As such, you are required to indicate number of reservoirs required, threshold and their coordinates.</td><td>Section 5 of the Amended Application Form
Please refer to Section 5 for the project description in point form as well as the number of infrastructure components required (e.g. 3 pumpstations etc.) for the proposed Xhariep Pipeline Project Scheme 1B.
Section 5 of the Final BAR
Please refer to Section 5.2 for the project description in point form.
Please refer to Section 5.3, Table 10 for the detailed description of the pipeline route and each component and layout maps for the proposed Xhariep Pipeline Project Scheme 1B.</td></tr>
<tr><td>2</td><td>Flowing from above, you are required to describe the route of the proposed pipeline and provide the coordinates of this pipeline (start, middle and end) as well as the tie-points as indicated in the application form.</td><td>Section 5 of the Amended Application Form
Please refer to Table 2 under Section 5 for the co-ordinates of all infrastructure, (start, middle and end) as well as the tie-points as indicated in the application form.
Section 5 of the Final BAR
Please refer to Section 5.3.1 for the Pipeline route description as well as the start, middle and end co-ordinates as well as the tie-points.</td></tr>
<tr><td>3</td><td>Page 9 of 67 of the application form indicate that “ancillary infrastructure is also required and must be included in the environmental authorisation application which includes power supply (Eskom confirmed that the network can accommodate the project and that in time the application will be done by the relevant applicant), access roads and borrow pits (if applicable, to be</td><td>Section 5 of the Amended Application Form and Appendix 15.3
Please refer to the final project description in Section 5.
1. This application is for the Xhariep pipeline project only.
2. Eskom will undertake an EIA separately.
3. The Xhariep pipeline project will not be in operation until Eskom</td></tr>
</table></td></tr>
</table>

XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)							
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**		
				forestry, fisheries & the environment Department: Forestry, Fisheries and the Environment **REPUBLIC OF SOUTH AFRICA** Private Bag X 447· PRETORIA · 0001· Environment House ·473 Steve Biko Road, Arcadia,· PRETORIA **DFFE Reference:** 14/12/16/3/3/1/2996 **Enquiries:** Ms Olivia Letlalo **Telephone:** (012) 399 8815 **E-mail:** oletlalo@dffe.gov.za Mr Corlie Steyn Zutari (Pty) Ltd P.O. Box 509 George **6530** Telephone Number: 044 805 5400 Cell phone: 082 5757 415 Email Address: Corlie.steyn@zutari.com **PER MAIL / E-MAIL** Dear Mr Steyn **COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE** The draft Basic Assessment Report (BAR) dated 24 May 2024 and received by this Department on 30 May 2024, refer. This letter serves to inform you that the following information must be included to the final BAR: **Listed Activities, Application Form and Project Description** • It is noted that the project description pertaining to the proposed development is not clear and understandable. Therefore, you are requested to provide the project description in a **point form** in order to for the Department to understand when reviewing this application. For instance, it has been noted that the proposed development will include reservoirs and pumpstations, however, it is unclear as to how many reservoirs and pumpstations are required. As such, you are required to indicate number of reservoirs required, threshold and their coordinates. • Flowing from above, you are required to describe the route of the proposed pipeline and provide the coordinates of this pipeline (start, middle and end) as well as the tie-points as indicated in the application form. • Page 9 of 67 of the application form indicate that *"ancillary infrastructure is also required and must be included in the environmental authorisation application which includes power supply (Eskom confirmed that the network can accommodate the project and that in time the application will be done by the relevant applicant), access roads and borrow pits (if applicable, to be determined during the geotechnical investigation)"*. However, it is unclear what type of power supply is required. Please clarify and specify? Should the power supply trigger listed activity/ies, then the listed activity must be included in the application form and adequately assessed.		determined during the geotechnical investigation)". However, it is unclear what type of power supply is required. Please clarify and specify? Should the power supply trigger listed activity/ies, then the listed activity must be included in the application form and adequately assessed.	obtained authorization for the power supply. 4. No listed activity that's has to do with power supply forms part of this application. 5. Reference to *'ancillary infrastructure'* and power supply have been removed. 6. This has been discussed with your department. Please refer to Appendix 15.5 for the email correspondence. This same email correspondence has also been captured in the CRR of the Final BAR (Annexure C.2) under Entry number 24. The motivation for the 2 separate EIA processes is based on the difference in implementation timeframes. The following will be applicable to the Eskom process: • DWS submit application for connections to Eskom & processing of application = 2 months • Site visit by Eskom = 1 week • Eskom to prepare quotation for design = 2 – 3 months • Eskom to undertake design to finalise routes and infrastructure requirements = 12 – 18 months • Eskom environmental authorisation = 8 – 12 months • Construction of infrastructure = 2 years • Total period for implementation = 4 – 5 years The following will be applicable to the Xhariep pipeline 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 commence by = July 2028 • Construction completed by = June 2032 • Commissioning of infrastructure completed by = October 2032 The gap between the two "projects" is expected to be a minimum of three years and could even be longer. This is mainly

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				Chief Directorate: Integrated Environmental Authorisations • For all the listed activities applied for, on page 29 to 34 of 67 of the application form (section 8), please indicate the applicable sub-activity(ies) on the column named "**activity no(s)**". for example, activity 24 (ii). • It is noted that activity 14 of listing notice (LN) 1 has been applied for, due to the storage of dangerous goods, however, it has been mentioned in the description of the project that "*combined capacity will not exceed 500 cubic metres but will be more than 80 cubic metres*". Please indicate the exact capacity and type of the dangerous goods to be stored and **indicate the location of the dangerous goods on the layout map**. The Department acknowledges that "*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 Water Treatment Plant (WTP) on-site chemical storage and volume will depend on the type of treatment required, which is still being investigated*". Please refrain from using the word such as "**may be**" since it creates uncertainty pertaining to the applicability of this listed activity and ensure that the revised application form and final BAR provide clear detailed information for decision making. Failure to provide such information it will put this application at risk. • It has been noted that activity 24 (ii) of LN 1 has been applied for the development of new roads which will be over 1km in length and wider than 8m. Please be advised that for this activity to be triggered the proposed road with reserve must be wider than 13,5 meters, or where no reserve exists where the road must be wider than 8 meters. Please ensure that this activity exact width information is included in the amended application form in order to determine the applicability of this activity • For activity 27 of LN 1, it is indicated that "*the total clearance in reference to the non-linear infrastructure will be less than 20 ha*". Please indicate the exact amount of indigenous vegetation to be cleared for the non-linear infrastructure. • For activity 2 of LN 3 it has been mentioned that *"construction of the reservoirs will occur outside of urban areas and within areas indicated as CBA"*. Please indicate if it is CBA 1 or 2. • For applicability of activity 4 of LN 3 it has been mentioned that "*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*". Please indicate the exact dimensions of the proposed road and then existing road reserve and the type of CBA (either 1 or 2). • For activity 12 of LN 3 it is not clear why this listed activity is triggered since the applicable sub activities have not been mentioned. • For all listed activities of LN 3, please ensure that the sub activities are included in the description of the portion of the proposed project to which the applicable listed activity relates. • It has been noted that the activity 2, 4, 10, 14 and 18 of LN 3 have been applied. Please indicate the type of **CBA** which is going to be affected by the proposed development and furthermore indicate if the systematic biodiversity plans or the bioregional plans have been adopted by the competent authority in order to determine the applicability of these listed activities. Proof of such must be obtained from the relevant CA and be submitted with the amended application form and final report. • It has been noted that the word such as "**may/likely"** have been used while describing the applicability of the activities applied for. It is drawn to your attention that the use of such word(s) creates uncertainty, therefore, you are advised to refrain from using such words and further ensure that the applicability of the triggered activities is clear in the amended application form and final BAR. • Kindly be advised that listed activities are not based on a precautionary approach. Please ensure that all the listed activities in the amended application form and final BAR are clear and final for decision making purposes. • Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. Only activities applicable to the development must be applied for and assessed. • If the activities applied for in the application form differ from those mentioned in the final BAR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following linkhttps://www.environment.gov.za/documents/forms. DFFE Reference: 14/12/16/3/3/1/2996 2 Comments on the draft basic assessment report for the proposed greater Mangaung water augmentation project: Xhariep pipeline (scheme 1b), Mangaung Metropolitan Municipality, Free State Province			
							due to the magnitude of the Xhariep infrastructure (± 250 km of pipelines, a water treatment works, three pump stations and two reservoirs with an estimated capital cost of more than R 10 billion) compared to the relatively minor extensions required to the Eskom infrastructure.
					4	For all the listed activities applied for, on page 29 to 34 of 67 of the application form (section 8), please indicate the applicable sub-activity(ies) on the column named "activity no(s)". for example, activity 24 (ii).	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for, starting on page 34 up to page 40 where all applicable sub-activities have been indicated. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					5	It is noted that activity 14 of listing notice (LN) 1 has been applied for, due to the storage of dangerous goods, however, it has been mentioned in the description of the project that "combined capacity will not exceed 500 cubic metres but will be more than 80 cubic metres". Please indicate the exact capacity and type of the dangerous goods to be stored and indicate the location of the dangerous goods on the layout map. The Department acknowledges that "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 Water Treatment Plant (WTP) on-site chemical storage and volume will depend on the type of treatment required, which is still being investigated". Please refrain from using the word such as "may be" since it creates uncertainty pertaining to the applicability of this listed activity and ensure that the revised application form and final BAR provide clear detailed information for decision making. Failure to provide such information it will put this application at risk.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for the amendment to this activity as well as the location of where the dangerous good will be stored portrayed in Annexure I.1.7 appended to the Final BAR. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form and the proposed layout for the WTW and location where the dangerous goods will be stored. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					6	It has been noted that activity 24 (ii) of LN 1 has been applied for the development of new roads which will be over 1km in length and wider than 8m. Please be advised that for this activity to be triggered the proposed road with reserve must be wider than 13,5 meters, or where no reserve exists where the road must be wider than 8 meters.	This activity has been removed from the Amended Application Form. The road width will not exceed 8m and that the final servitude width will be 13m or less.

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				Chief Directorate: Integrated Environmental Authorisations **Layout and Sensitivity Maps** • The CA acknowledges the layout maps submitted with the amended draft BAR. • Ensure that the 32m buffer zone around each watercourse recommended by the aquatic specialist is implemented and shown in the layout and sensitivity maps. All buffers recommended by all specialists must be depicted in the final layout plan for decision making purposes. • You are therefore requested to provide a layout map which indicates the following: ➢ The development area. ➢ Position of all proposed and associated infrastructure as per section 5 of the application form (i.e. project description) but not limited to: ✓ The low lift pump station, ✓ A WTP with sludge lagoons with a high lift pump station, ✓ A command reservoir, ✓ A booster pump station and suction reservoir, ✓ A 2nd command reservoir, and, ✓ The pipeline route from the Gariep Dam to the connection points at Bloemfontein and Rustfontein pump Station. ➢ All supporting onsite infrastructure e.g., roads (existing and proposed). ➢ All existing infrastructure on the site. ➢ The location of sensitive environmental features on site e.g., CBAs, ESAs, heritage sites, wetlands, drainage lines etc. that will be affected. ➢ Buffer areas of the above sensitive areas. ➢ All "no-go" areas. • Please ensure that the above map has a clear legend that communicates with details of the map. • The above map must be overlain with a sensitivity map and a cumulative map which shows all the components of the proposed development as well as neighbouring renewable energy developments and existing grid infrastructure. All available biodiversity information must be used in the finalisation of the map and infrastructure must not encroach on highly sensitive areas as far as possible. • Ensure that similar colours are not used to differentiate between infrastructure. i.e., items must be easily distinguishable on the legend. • Google maps will not be accepted for decision-making purposes. **Alternatives** • According to the terrestrial biodiversity impact assessment specialist submitted with the draft BAR as (annexure D 8.1), the proposed development will affect areas considered as five veldtypes / ecosystems, two of which are threatened with a status of 'Vulnerable'. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the aforesaid veldtypes / ecosystems, by the proposed development. • Map 1 of the sensitive areas (appendix B1. A3) shows that the pipeline will cross several CBAs, watercourses and other sensitive areas. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the CBAs. • Map 2 of the sensitive areas (appendix B2. A3) shows that the pipeline and reservoir no 2 will cross several CBAs, watercourses and other sensitive areas. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the CBAs. • It has been indicated on page on page 73 of the draft BAR that no feasible or reasonable alternatives have been identified. • Please note that Appendix 1(3)(1)(h)(x) of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, requires that "if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such" must be included in the final BAR. You are therefore required to provide a motivation should other alternative sites, routes, layouts, and technologies not be considered. *Should there be no site or location alternative considered, you are advised to ensure that the proposed* DFFE Reference: 14/12/16/3/3/1/2996 3 Comments on the draft basic assessment report for the proposed greater Mangaung water augmentation project: Xhariep pipeline (scheme 1b), Mangaung Metropolitan Municipality, Free State Province			
						Please ensure that this activity exact width information is included in the amended application form in order to determine the applicability of this activity	
					7	For activity 27 of LN 1, it is indicated that "the total clearance in reference to the non-linear infrastructure will be less than 20 ha". Please indicate the exact amount of indigenous vegetation to be cleared for the non-linear infrastructure.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for, starting on page 34 up to page 40 where all applicable sub-activities have been indicated. The exact amount will equate to 6.77 ha **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					8	For activity 2 of LN 3 it has been mentioned that "construction of the reservoirs will occur outside of urban areas and within areas indicated as CBA". Please indicate if it is CBA 1 or 2.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for indication of the type of CBA. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					9	For applicability of activity 4 of LN 3 it has been mentioned that "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". Please indicate the exact dimensions of the proposed road and then existing road reserve and the type of CBA (either 1 or 2).	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for the exact dimensions of the proposed road, existing road reserve and the type of CBA (either 1 or 2). **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					10	For activity 12 of LN 3 it is not clear why this listed activity is triggered since the applicable sub activities have not been mentioned.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for the applicable sub activities. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					11	For all listed activities of LN 3, please ensure that the sub activities are included in the description of the portion of the proposed project to which the applicable listed activity relates.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application for the applicable sub activities. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					12	It has been noted that the activity 2, 4, 10, 14 and 18 of LN 3 have been applied. Please indicate the type of CBA which is	**Section 8 of the Amended Application Form**

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				Chief Directorate: Integrated Environmental Authorisations *development avoid the abovementioned sensitive area in the final layout to be submitted with the final development.* • A description of the process followed to reach the preferred alternative within the site as per Appendix 1(3)(1)(h)(i) of the EIA Regulations (2014), as amended, must be incorporated into the final BAR. **Screening tool report** • It has been noted that there are no compiler signatures on the screening tool reports (page 1 of 15). Please submit the signed screening tools with the amended application form and final BAR. **Specialist Assessments** • Please ensure that specialist studies as identified in the screening tool, comply with the requirements of GN 320 of 20 March 2020 and GN 1150 of 30 October 2020, unless proof is provided that indicates that the specialist study was commissioned within 50 days after the date of gazetting of the notice i.e., 20 Mach 2020 and was commissioned prior to 30 October 2020 respectively. Failure to comply with the abovementioned notices presents a risk to this application. • Please note further that the protocols require certain specialists' to be registered with SACNASP. Refer to the relevant protocols in this regard. • Specialist Declaration of interest forms must be attached for all specialist studies to be conducted in the final BAR. The forms are available on Department's website (please use the Department's template). • Specialist studies to be conducted must provide a detailed description of their methodology, as well as indicate the locations and descriptions of proposed rehabilitation, and all other proposed structures that they have assessed and are recommending for authorisations. • The specialist studies must also provide a detailed description of all limitations to their studies. All specialist studies must be conducted in the right season and providing that as a limitation, will not be accepted. • Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice. • Please include a table in the final BAR summarising the specialist studies required by the Screening Tool, a column indicating whether these studies will be conducted or not, and a column with motivation for any studies that will not be undertaken. Please note that if any of the specialists' studies and requirements recommended in the Department's Screening Tool are not commissioned, motivation for such must be provided in the report, as per the requirements of the Protocols. • Should it be determined that there is a need for additional specialist studies to be undertaken based on the outcome of public participation, these must be commissioned and be included in the draft EIA reports for public comment. **Public Participation Process** • The final BAR must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development, including but not limited to Kopanong Local Municipality, Mangaung Metropolitan Municipality, Xhariep District Municipality, Free State Department: Community Safety, Roads and Transport, National Department: Agriculture, Land Reform and Rural Development (DALRRD), Free State Department of Health, Free State Department of Public Works and Infrastructure, South African National Defence Force: Tempe Military Base: Bloemfontein, South African Civil Aviation Authority, South African National Roads Agency (SANRAL), Free State Department of Rural Development and Land Reform, Wildlife and Environment Society of South Africa (WESSA), Birdlife Africa, Department of Water and Sanitation (DWS), Endangered Wildlife Trust (EWT), South African Heritage Resources Agency (SAHRA), SANBI, Department of Sports, Art, Culture and Recreation, South African Department of Defence, South African Civil Aviation Authority (CAA), Air Traffic and Navigation Services (ATNS), BirdLife South Africa, Wildlife and Environment Society of South Africa (WESSA), South African National Parks, Department of Environmental Affairs: Protected Areas and the Department of Forestry, Fisheries and the Environment (DFFE): Biodiversity Conservation (BCAdmin@environment.gov.za). DFFE Reference: 14/12/16/3/3/1/2996 4 Comments on the draft basic assessment report for the proposed greater Mangaung water augmentation project: Xhariep pipeline (scheme 1b), Mangaung Metropolitan Municipality, Free State Province			
						going to be affected by the proposed development and furthermore indicate if the systematic biodiversity plans or the bioregional plans have been adopted by the competent authority in order to determine the applicability of these listed activities. Proof of such must be obtained from the relevant CA and be submitted with the amended application form and final report.	Please refer to Section 8 of the Amended Application for the type of CBA (either 1 or 2). **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final BAR for the listed activities applied for in the Amended Application Form. **Annexure D.8.1 Final Biodiversity Assessment** Section 9.4 of the Biodiversity Assessment Report for the detail and proof of the tools, biodiversity plans and data sets as accepted by the relevant CA.
					13	It has been noted that the word such as "may/likely" have been used while describing the applicability of the activities applied for. It is drawn to your attention that the use of such word(s) creates uncertainty, therefore, you are advised to refrain from using such words and further ensure that the applicability of the triggered activities is clear in the amended application form and final BAR.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application. Words like "may/likely" have been removed. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					14	Kindly be advised that listed activities are not based on a precautionary approach. Please ensure that all the listed activities in the amended application form and final BAR are clear and final for decision making purposes.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application. Listed activities are clear and final. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					15	Please ensure that all relevant listed activities are applied for, are specific and can be linked to the development activity or infrastructure as described in the project description. Only activities applicable to the development must be applied for and assessed.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application. Only Listed activities pertaining to the Xhariep Pipeline Project Scheme 1B has been applied for. Eskom will undertake an EIA separately. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
					16	If the activities applied for in the application form differ from those mentioned in the final BAR, an amended application form must be submitted. Please note that the Department's application form template has been amended and can be downloaded from the following linkhttps://www.environment.gov.za/documents/forms.	**Section 8 of the Amended Application Form** Please refer to the Amended Application Form. The most recent Application Form, dated Aug 2023 as per the website information, has been submitted.
						Layout and Sensitivity Maps	**Response**

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				Chief Directorate: Integrated Environmental Authorisations • Proof of correspondence with the various stakeholders must be included in the amended BAR. This must indicate that this draft BAR has been subjected to 30 days' public participation process, stating the start and end date of the PPP. Should you be unable to obtain comments, proof must be submitted to the Department of the attempts that were made to obtain comments. • Please ensure that all issues raised, and comments received during the circulation of the draft BAR from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the final BAR. • A comment and response report which contains all comments received and responses provided to all comments and issues raised during the public participation process for the draft BAR. Please note that comments received from this Department must also form part of the comment and response report. • The Public Participation Process must be conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended. **Cumulative Assessment** • Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: ➢ Assess the cumulative impacts of the proposed (not yet authorised), authorised (not yet constructed) and existing facilities in the area. ➢ Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. ➢ The cumulative impacts significance rating must also inform the need and desirability of the proposed development. ➢ A cumulative impact environmental statement on whether the proposed development must proceed. **Environmental Management Programme (EMPr)** • Kindly ensure that the EMPr complies with the content of the EMPr in terms of Appendix 4 of the Environmental Impact Assessment Regulations, 2014, as amended. • It has been noted that the proposed development will include power supply. Should this power supply trigger activity 11 of LN 1 a generic EMPr must be submitted with the final BAR. **Specific Comments** • Just to reiterate, the final BAR must include a list providing a clear description of the infrastructure associated with the development. • All associated infrastructure must be clearly indicated in the final BAR under project description and its associated layout plans. • When submitting the final BAR and future documents kindly name each of the documents and attachments according to the information it contains e.g., instead of only naming it Appendix A, it must be Appendix A: Maps, Appendix B: EAP Declaration etc. • **The EAP must provide an outline of where in the final BAR each of this Department's comments are addressed. This must be a separate document and must submitted as an appendix to the final BAR.** **General** You are further reminded to comply with Regulation 19(1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that: *"Where basic assessment must be applied to an application, the applicant must, within 90 days of receipt of the application by the competent authority, submit to the competent authority – (a) a basic assessment report, inclusive of any specialist reports, an EMPr, a closure plan in the case of a closure activity and where the application is a mining application, the plans, report and calculations contemplated in the Financial* DFFE Reference: 14/12/16/3/3/1/2996 5 Comments on the draft basic assessment report for the proposed greater Mangaung water augmentation project: Xhariep pipeline (scheme 1b), Mangaung Metropolitan Municipality, Free State Province			
					17	The CA acknowledges the layout maps submitted with the amended draft BAR.	Please note Zutari submitted a draft BAR and not an amended BAR as stated in the comment.
					18	Ensure that the 32m buffer zone around each watercourse recommended by the aquatic specialist is implemented and shown in the layout and sensitivity maps. All buffers recommended by all specialists must be depicted in the final layout plan for decision making purposes.	**Annexure I of the Final BAR** Please refer to the layout and sensitivity maps with a 32m buffer zone around each water course as well as the final layout plans which are appended as Annexure I.
					19	You are therefore requested to provide a layout map which indicates the following: • The development area. • Position of all proposed and associated infrastructure as per section 5 of the application form (i.e. project description) but not limited to: • The low lift pump station, • A WTP with sludge lagoons with a high lift pump station, • A command reservoir, • A booster pump station and suction reservoir, • A 2nd command reservoir, and, • The pipeline route from the Gariep Dam to the connection points at Bloemfontein and Rustfontein pump Station. • All supporting onsite infrastructure e.g., roads (existing and proposed). • All existing infrastructure on the site. • The location of sensitive environmental features on site e.g., CBAs, ESAs, heritage sites, wetlands, drainage lines etc. that will be affected. • Buffer areas of the above sensitive areas. All "no-go" areas.	**Annexure I of the Final BAR** Please refer to Annexure I for the final layout maps inclusive of: • The development area. • Position of all proposed and associated infrastructure as per section 5 of the application form (i.e. project description) but not limited to: • The low lift pump station, • A WTP with sludge lagoons with a high lift pump station, • A command reservoir, • A booster pump station and suction reservoir, • A 2nd command reservoir, and, • The pipeline route from the Gariep Dam to the connection points at Bloemfontein and Rustfontein pump Station. • All supporting onsite infrastructure e.g., roads (existing and proposed). • All existing infrastructure on the site. • The location of sensitive environmental features on site e.g., CBAs, ESAs, heritage sites, wetlands, drainage lines etc. that will be affected. • Buffer areas of the above sensitive areas. • All "no-go" areas.
					20	Please ensure that the above map has a clear legend that communicates with details of the map.	Annexure I of the Final BAR The map provides a clear legend.
					21	The above map must be overlain with a sensitivity map and a cumulative map which shows all the components of the proposed development as well as neighbouring renewable energy developments and existing grid infrastructure. All available biodiversity information must be used in the finalisation of the map and infrastructure	Please note that the proposed project does not constitute a renewable energy development. The sensitivity layers have been overlayed with the layout of the proposed Xhariep Pipeline Project and is included in Annexure I to the Final BAR.

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Provisioning Regulations, which have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority".

Should there be significant changes or new information that has been added to the BAR or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are required to comply with Regulation 19(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states: *"the applicant must, within 90 days of receipt of the application by the competent authority, submit to the competent authority – (b) a notification in writing that the documents contemplated in sub-regulation 1(a) will be submitted within 140 days of receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the documents which changes or information was not contained in the original documents consulted on during the initial public participation process contemplated in sub-regulation (1)(a) and that the revised documents will be subjected to another public participation process of at least 30 days."*

Should you fail to meet any of the timeframes stipulated in Regulation 19 of the NEMA EIA Regulations, 2014, as amended, your application will lapse.

You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental Authorisation being granted by the Department.

Yours sincerely

Dr Sabelo Malaza
Chief Director: Integrated Environmental Authorisations
Department of Forestry, Fisheries and the Environment
Letter signed by: Mahlatse Shubane
Designation: Deputy Director (Acting): Priority Infrastructure Projects
Date: 27 June 2024

cc:			
	Mrs Sanet van Jaarsveld	Department Water and Sanitation	E-mail: vanjaarsvelds@dws.gov.za
	Mr Marshall Madolo	Kopanong Local Municipality	E-mail: Marshall.mmm@gmail.com
	Ms G Mkhosana and Acting Director Dr Sandile Fuku	Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)	E-mail: masweltsodi@destea.gov.za and fuku@destea.gov.za

	must not encroach on highly sensitive areas as far as possible.	
22	Ensure that similar colours are not used to differentiate between infrastructure. i.e., items must be easily distinguishable on the legend.	Maps were compiled the Zutari project team and legends of the maps are visible. Please note that the zoom in function can be actioned in order to see clearly.
23	Google maps will not be accepted for decision-making purposes.	Maps were compiled by the Zutari GIS project team, and no Google maps are included for decision making purposes.
	Alternatives	**Response**
24	According to the terrestrial biodiversity impact assessment specialist submitted with the draft BAR as (annexure D 8.1), the proposed development will affect areas considered as five veldtypes / ecosystems, two of which are threatened with a status of 'Vulnerable'. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the aforesaid veldtypes / ecosystems, by the proposed development.	**Section 6 of the Final BAR** Please refer to Section 6 of the Final BAR for the discussion of the alternatives. **Section 7.3 of the Final BAR** Please refer to Impact Assessment. The impact on these ecosystems have been rated as *negligible* to non-measurable (non-existent). **Annexure D8.1 of the Final BAR** Please refer to finding as captured Specialist Report re the affected ecosystems: *The overall terrestrial biodiversity sensitivity was verified (confirmed) to be a mix of 'Very High' and 'Low' as per the screening tool. The high sensitivity is related to ideal bird grassland habitat, along with NPAES grassland focus areas, critical biodiversity areas (CBAs) and threatened status of two of the grassland veldtypes (i.e. Bloemfontein Dry Grassland and Central Free State Grassland). There are small areas here and there that can be disputed due to high levels of veld degradation, but for practicality and the large scope of the project these will not be considered significant. Furthermore, due to the nature of the proposed project, which as a very narrow, linear footprint, the overall negative impact on these areas will be negligible to non-measurable (non-existent). After the construction phase the biodiversity will recover very quickly to pre-construction levels.*
25	Map 1 of the sensitive areas (appendix B1. A3) shows that the pipeline will cross several CBAs, watercourses and other sensitive areas. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the CBAs.	**Section 6.1 of the Final BAR** Please refer to Section 6.1 of the Final BAR for the discussion of the alternatives and process followed re the routing Alternatives to reach the proposed route for Scheme 1B. Various alternatives for Scheme 1B (e.g. different locations and elevations of Command Reservoir No 2, as well as different booster pump station

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							positions), but those were all screened based on technical considerations. Please refer to the closure paragraph of Section 6.1 of the Final BAR (italics below) *A site visit was undertaken in January 2024, to evaluate the various infrastructure sites in terms of topography, impact on farming activities, location relative to existing access roads and powerlines as well as any other observations that could impact the feasibility of the sites. Operational aspects were also considered, e.g. preference will be given to configurations where demands can be met under gravity flow, rather than being pumped. Based on the findings of the site visit and accounting for operational considerations, it is recommended that the design and environmental authorisation processes proceed based on Configuration 1B1(A) – referred to as Scheme 1B in this application for simplicity. Schemes 1, 2 and 3 are not seen as reasonable or feasible alternatives for comparative assessment purposes as they have been eliminated through a consultive process as described above, leaving only the preferred alternative and the No Go option*
					26	Map 2 of the sensitive areas (appendix B2. A3) shows that the pipeline and reservoir no 2 will cross several CBAs, watercourses and other sensitive areas. Considering the above, the Competent Authority advise that an evaluation of alternative site layouts and locations should be considered to avoid the CBAs.	**Section 6.1 of the Final BAR** Please refer to Section 6.1 of the Final BAR for the discussion of the alternatives and process followed re the routing Alternatives to reach the proposed route for Scheme 1B. Various alternatives for Scheme 1B (e.g. different locations and elevations of Command Reservoir No 2, as well as different booster pump station positions), but those were all screened based on technical considerations. **Section 7.3 of the Final BAR** Please refer to Section 7 for the Impact Assessment as well as Table 8-6 which provides the summary table of the biodiversity impacts and their significance pre and post mitigation, ranging from negligible to moderate. Please also note that all applicable listed activities are being applied for that effects CBAs to provide the basic need of drinking water supply to Bloemfontein and surrounding areas.

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					27	It has been indicated on page on page 73 of the draft BAR that no feasible or reasonable alternatives have been identified.	**Section 6.1 of the Final BAR** Please refer to Section 6.1 of the Final BAR for the discussion of the alternatives and process followed re the routing Alternatives to reach the proposed route for Scheme 1B. Various alternatives for Scheme 1B (e.g. different locations and elevations of Command Reservoir No 2, as well as different booster pump station positions), but those were all screened based on technical considerations. **Section 6.3 of the Final BAR** Please refer to the motivation under Section 6.3 of the Final BAR for the motivation as to why no other alternatives were considered for assessment in the BAR process that was followed.
					28	Please note that Appendix 1(3)(1)(h)(x) of the Environmental Impact Assessment (EIA) Regulations, 2014, as amended, requires that "if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such" must be included in the final BAR. You are therefore required to provide a motivation should other alternative sites, routes, layouts, and technologies not be considered. *Should there be no site or location alternative considered, you are advised to ensure that the proposed development avoid the abovementioned sensitive area in the final layout to be submitted with the final development.*	**Section 6.3 of the Final BAR** Please refer to the motivation under Section 6.3 of the Final BAR for the motivation as to why no other alternatives were considered for assessment in the BAR process that was followed.
					29	A description of the process followed to reach the preferred alternative within the site as per Appendix 1(3)(1)(h)(i) of the EIA Regulations (2014), as amended, must be incorporated into the final BAR.	**Section 6.1 of the Final BAR** Please refer to Section 6.1 of the Final BAR for the discussion of the alternatives and process followed re the routing Alternatives to reach the proposed route for Scheme 1B. Various alternatives for Scheme 1B (e.g. different locations and elevations of Command Reservoir No 2, as well as different booster pump station positions), but those were all screened based on technical considerations.
						Screening tool report	**Response**
					30	It has been noted that there are no compiler signatures on the screening tool reports (page 1 of 15). Please submit	**Appendix of the Amended Application Form**

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						the signed screening tools with the amended application form and final BAR.	Please refer to Appendix 14 to the Amended Application Form for the final signed reports. **Annexure E of Final BAR** Please refer to annexure E to the Final BAR for the final signed reports.
						Specialist Assessments	**Response**
					31	Please ensure that specialist studies as identified in the screening tool, comply with the requirements of GN 320 of 20 March 2020 and GN 1150 of 30 October 2020, unless proof is provided that indicates that the specialist study was commissioned within 50 days after the date of gazetting of the notice i.e., 20 Mach 2020 and was commissioned prior to 30 October 2020 respectively. Failure to comply with the abovementioned notices presents a risk to this application.	**Annexure J of the Final BAR** Relevant protocols were referred to and all specialists that are required to the registered with SACNSAP fulfil the criteria. Registration numbers are captured in the declaration forms.
					32	Please note further that the protocols require certain specialists' to be registered with SACNASP. Refer to the relevant protocols in this regard.	**Annexure J of the Final BAR** Relevant protocols were referred to and all specialists that are required to the registered with SACNSAP fulfill the criteria. Registration numbers are captured in the declaration forms.
					33	Specialist Declaration of interest forms must be attached for all specialist studies to be conducted in the final BAR. The forms are available on Department's website (please use the Department's template).	**Annexure J of the Final BAR** The Department's most recent forms were used, and independent specialists signed these forms which are appended to the Final BAR as Annexure J.
					34	Specialist studies to be conducted must provide a detailed description of their methodology, as well as indicate the locations and descriptions of proposed rehabilitation, and all other proposed structures that they have assessed and are recommending for authorisations.	**Annexure D of the Final BAR** Each specialist study contains a detailed description of methodology, locations and descriptions of proposed rehabilitation, and all other proposed structures that they have assessed and are recommending for authorisations.
					35	The specialist studies must also provide a detailed description of all limitations to their studies. All specialist studies must be conducted in the right season and providing that as a limitation, will not be accepted.	**Annexure D of the Final BAR** Each specialist study contains a detailed description of limitations. All Studies were done during the appropriate season and this has been confirmed in the specialist studies.
					36	Should the appointed specialists specify contradicting recommendations, the EAP must clearly indicate the most reasonable recommendation and substantiate this with defendable reasons; and where necessary, include further expertise advice.	**Section 7.1.4, 7.2.4, 7.3.4. 7.4.2, 7.5.2, 7.6.4, 7.7.4, and 7.8.5 of the Final BAR** These sections provide all the mitigation measures and recommendations as provided by the independent specialists. No contradicting recommendations were specified. **Section 8.1.1 – 8.1.9 of the Final BAR** Section 8.1.1. – 8.1.9 of the Final BAR provided the specialist impact

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							statements. No contradicting statements were received.
					37	Please include a table in the final BAR summarising the specialist studies required by the Screening Tool, a column indicating whether these studies will be conducted or not, and a column with motivation for any studies that will not be undertaken. Please note that if any of the specialists' studies and requirements recommended in the Department's Screening Tool are not commissioned, motivation for such must be provided in the report, as per the requirements of the Protocols.	**Appendix 15. 2 of the Amended Application Form** Please refer to Appendix 15.2 for the SSVR. **Final BAR** Please refer to Section 1.2 Table 1-1 of the Final BAR for the list of specialists as well as Table 2-3 for the relative theme, finding of the DFFE screening tool, the outcome of the site verification, the identified specialist and the determination of a compliance statement or specialist study as per the NEMA protocols/. Please also refer to Annexure E.9 of the Final BAR for the SSVR.
					38	Should it be determined that there is a need for additional specialist studies to be undertaken based on the outcome of public participation, these must be commissioned and be included in the draft EIA reports for public comment.	The PPP based on the Draft BAR determined that no additional studies had to be undertaken. Please note this application is for a BAR process.
						Public Participation Process	**Response**
					39	The final BAR must provide evidence that all identified and relevant competent authorities have been given an opportunity to comment on the proposed development, including but not limited to Kopanong Local Municipality, Mangaung Metropolitan Municipality, Xhariep District Municipality, Free State Department: Community Safety, Roads and Transport, National Department: Agriculture, Land Reform and Rural Development (DALRRD), Free State Department of Health, Free State Department of Public Works and Infrastructure, South African National Defence Force: Tempe Military Base: Bloemfontein, South African Civil Aviation Authority, South African National Roads Agency (SANRAL), Free State Department of Rural Development and Land Reform, Wildlife and Environment Society of South Africa (WESSA), Birdlife Africa, Department of Water and Sanitation (DWS), Endangered Wildlife Trust (EWT), South African Heritage Resources Agency (SAHRA), SANBI, Department of Sports, Art, Culture and Recreation, South African Department of Defence, South African Civil Aviation Authority (CAA), Air Traffic and Navigation Services (ATNS), BirdLife South Africa, Wildlife and Environment Society of South Africa	**Annexure C of the Final BAR** Please refer to Annexure C.5 for the Final list of I&APs inclusive of all the competent authorities listed in the comment from DFFE. Please note all I&APs of the previous EA were also included. Additional competent authorities were also identified and included in the PPP.

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						(WESSA), South African National Parks, Department of Environmental Affairs: Protected Areas and the Department of Forestry, Fisheries and the Environment (DFFE): Biodiversity Conservation (BCAdmin@environment.gov.za).	
					40	Proof of correspondence with the various stakeholders must be included in the amended BAR. This must indicate that this draft BAR has been subjected to 30 days' public participation process, stating the start and end date of the PPP. Should you be unable to obtain comments, proof must be submitted to the Department of the attempts that were made to obtain comments.	**Annexure C of the Final BAR** Please refer to the Final Public Participation Report in Annexure C to the final BAR, inclusive of all proof of the advertisements, web uploads, written notifications, proof to elicit comments, site notices, hard copies of the draft BARs at various locations, engagement meetings and presentation and the PPP and the CRR as well as all original comment and responses.
					41	Please ensure that all issues raised, and comments received during the circulation of the draft BAR from registered I&APs and organs of state which have jurisdiction (including this Department's Biodiversity Section) in respect of the proposed activity are adequately addressed in the final BAR.	**Annexure C of the Final BAR** Please refer to the final CRR appended as Annexure C.2 of the Final BAR. All comments have been addressed, inclusive of the comments obtained from the Department's Biodiversity Section. Refer to Entry No 11 and No 12 of the CRR for slight layout change in the pipeline route to accommodate landowners. All specialists confirmed that this amendment did not need additional assessments. Updated Specialist reports are appended as Annexure D to the Final BAR. To address further comments from a landowner a meeting was arranged between the landowner and two independent specialists (outside of the PP comment period) to accommodate further queries relating to the marsh areas. Refer to Section 11.2 of the CRR.
					42	A comment and response report which contains all comments received and responses provided to all comments and issues raised during the public participation process for the draft BAR. Please note that comments received from this Department must also form part of the comment and response report.	**Annexure C of the Final BAR** Please refer to Annexure C.2 for the Final Comments and Response Report. The CRR includes the comments of the DFFE as well as the response thereto.
					43	The Public Participation Process must be conducted in terms of Regulations 39, 40, 41, 42, 43 & 44 of the EIA Regulations 2014, as amended.	**Annexure C of the Final BAR** Please refer to the Final Public Participation Report in Annexure C to the final BAR, inclusive of all proof of the advertisements, web uploads, written notifications, proof to elicit comments, site notices, hard copies of the draft BARs at various locations, engagement meetings and presentation and the PPP and the CRR as well as all original comment and responses.

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					44	Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: • Assess the cumulative impacts of the proposed (not yet authorised), authorised (not yet constructed) and existing facilities in the area. • Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of cumulative impacts and when the conclusion and mitigation measures were drafted for this project. • The cumulative impacts significance rating must also inform the need and desirability of the proposed development. • A cumulative impact environmental statement on whether the proposed development must proceed.	A similar project means a project that will achieve the same objective as the Xhariep pipeline project, which is to increase the supply to the Greater Bloemfontein Water Supply System. The DWS has confirmed in the email / letter dated that no other similar project is being applied for.  water & sanitation Department: Water and Sanitation REPUBLIC OF SOUTH AFRICA Attention: Ms Olivia Letlalo Department: Forestry, Fisheries and the Environment Integrated Environmental Authorisations Environment House Steve Biko Road Arcadia Pretoria 0001 Dear Ms Letlalo DFFE REFERENCE: 14/12/16/3/3/1/2998 COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE PROJECT (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE The comments from your department on the draft Basic Assessment (BAR) dated 24 May 2024 has reference. Zutari, the appointed independent environmental consultant on the project, has drawn our attention to the following comment on page 5: Cumulative Assessment • Should there be any other similar projects within a 30km radius of the proposed development site, the cumulative impact assessment for all identified and assessed impacts must be refined to indicate the following: • Assess the cumulative impacts of the proposed (not yet authorised), authorised (not yet constructed) and existing facilities in the area. • Detailed process flow and proof must be provided, to indicate how the specialist's recommendations, mitigation measures and conclusions from the various similar developments in the area were taken into consideration in the assessment of NDP NATIONAL DEVELOPMENT PLAN Our Future - make it work Please refer to Annexure B.5 for this letter. Furthermore, please refer to Section 7 of the Final BAR for the cumulative assessments pertaining to the Xhariep Pipeline Project.
						Environmental Management Programme (EMPr)	**Response**
					45	Kindly ensure that the EMPr complies with the content of the EMPr in terms of Appendix 4 of the Environmental Impact Assessment Regulations, 2014, as amended.	**Annexure G of the Final BAR** The final EMPR in Annexure G of the Final BAR complies with the content of the EMPr in terms of Appendix 4 of the Environmental Impact Assessment Regulations, 2014, as amended. Table 1 on page 6 refence each section of the requirements of the EMPR.
					46	It has been noted that the proposed development will include power supply. Should this power supply trigger activity 11 of LN 1 a generic EMPr must be submitted with the final BAR.	**Section 8 of the Amended Application Form** Please refer to Section 8 of the Amended Application. Only Listed activities pertaining to the Xhariep Pipeline Project Scheme 1B has been applied for. Eskom will undertake an EIA separately. **Section 2.2 of the Final BAR** Please refer to Section 2.2 of the Final for the listed activities applied for in the Amended Application Form.
						Specific Comments	**Response**
					47	Just to reiterate, the final BAR must include a list providing a clear description	**Section 5 of the Amended Application Form**

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						of the infrastructure associated with the development.	Please refer to Section 5 for the project description in point form as well as the number of infrastructure components required (e.g. 3 pumpstations etc.) for the proposed Xhariep Pipeline Project Scheme 1B. **Section 5 of the Final BAR** Please refer to Section 5.2 for the project description in point form. Please refer to Section 5.3, Table 10 for the detailed description of the pipeline route and each component and layout maps for the proposed Xhariep Pipeline Project Scheme 1B. The Final BAR includes a clear description of the infrastructure associated with the development.
					48	All associated infrastructure must be clearly indicated in the final BAR under project description and its associated layout plans.	**Section 5 of the Amended Application Form** Please refer to Section 5 for the project description in point form as well as the number of infrastructure components required (e.g. 3 pumpstations etc.) for the proposed Xhariep Pipeline Project Scheme 1B. **Section 5 of the Final BAR** Please refer to Section 5.2 for the project description in point form. Please refer to Section 5.3, Table 10 for the detailed description of the pipeline route and each component and layout maps for the proposed Xhariep Pipeline Project Scheme 1B.
					49	When submitting the final BAR and future documents kindly name each of the documents and attachments according to the information it contains e.g., instead of only naming it Appendix A, it must be Appendix A: Maps, Appendix B: EAP Declaration etc.	**Final BAR (All annexures)** All documents have been named according to content.
					50	The EAP must provide an outline of where in the final BAR each of this Department's comments are addressed. This must be a separate document and must submitted as an appendix to the final BAR.	**Annexure B and Annexure C.2 (Appendix 23 Entry 21) of the Final BAR** This document provides a response and outline of where in the final BAR each of this Department's comments are addressed. This document is appended as part of Annexure Authority communication Annexure B to the Final BAR (for ease of reference). This document forms part of the CRR (Appendix C2) of the Final BAR as requested in comment No 42 of the DFFE. The comments and responses are captured as Appendix 23 (Entry 21) to the CRR.

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	General	Response
51	You are further reminded to comply with Regulation 19(1)(a) of the NEMA EIA Regulations, 2014, as amended, which states that: *"Where basic assessment must be applied to an application, the applicant must, within 90 days of receipt of the application by the competent authority, submit to the competent authority – (a) a basic assessment report, inclusive of any specialist reports, an EMPr, a closure plan in the case of a closure activity and where the application is a mining application, the plans, report and calculations contemplated in the Financial Provisioning Regulations, which have been subjected to a public participation process of at least 30 days and which reflects the incorporation of comments received, including any comments of the competent authority"*.	The Applicant is aware of this legislation.
52	Should there be significant changes or new information that has been added to the BAR or EMPr which changes or information was not contained in the reports or plans consulted on during the initial public participation process, you are required to comply with Regulation 19(1)(b) of the NEMA EIA Regulations, 2014, as amended, which states: *"the applicant must, within 90 days of receipt of the application by the competent authority, submit to the competent authority – (b) a notification in writing that the documents contemplated in sub-regulation 1(a) will be submitted within 140 days of receipt of the application by the competent authority, as significant changes have been made or significant new information has been added to the documents which changes or information was not contained in the original documents consulted on during the initial public participation process contemplated in sub-regulation (1)(a) and that the revised documents will be subjected to another public participation process of at least 30 days."*	No significant changes or new information has been submitted to the Final BAR without notifying all I&APs. Refer to Entry 11 and 12 of the CRR for slight layout change in the pipeline route to accommodate landowners. All specialists confirmed that this amendment did not need additional assessments. Updated Specialist reports are appended as Annexure D to the Final BAR.
53	Should you fail to meet any of the timeframes stipulated in Regulation 19 of the NEMA EIA Regulations, 2014, as amended, your application will lapse.	The Applicant is aware of this legislation.
54	You are hereby reminded of Section 24F of the National Environmental Management Act, Act No. 107 of 1998, as amended, that no activity may commence prior to an Environmental	The Applicant is aware of this legislation and will not commence with any activity prior to an Environmental Authorisation being granted by the Department

<table>
<tr><th></th><th colspan="5">XHARIEP BASIC ASSESSMENT REPORT
Comments and Response Register (PPP 3 June 2024 – 4 July 2024)</th></tr>
<tr><th>Ref</th><th>Source Name</th><th>Source Organisation</th><th>Date Received</th><th>Comment</th><th>Response + Date</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>Authorisation being granted by the Department.</td></tr>
<tr><td>22.</td><td>Nicole Abrahams
AbrahamsN@nra.co.za</td><td>SANRAL</td><td>03/07/2024</td><td>Email to Zutari:
Dear Marianna
Is there more information (BID) available please.
Regards
Nicole Abrahams
Environmental Coordinator
Western Region
Bellville,7530,
T: 021 957 4602 | M:062 215 8945
AbrahamsN@nra.co.za www.sanral.co.za
Fraud Hotline Number - 0800 204 558
SANRAL 30 YEARS OF FREEDOM</td><td>Email Response: 03/07/2024
Good day Nicole,
Please see the BID attached.
Please be informed that Zutari (Pty) Ltd has been appointed by the Department of Water and Sanitation (DWS) to undertake the environmental authorisation application is required in terms of the National Environmental Management Act (Act No. 107 of 1998) (NEMA) via a Basic Assessment (BA) process, per the 2014 EIA Regulations, as amended, as well as a Water Use Licence application (WULA) in terms of the National Water Act (Act No. 36 of 1998) for the Xhariep pipeline as part of the Greater Mangaung Water Augmentation Project (see Background Information Document attached).
DWS is proposing to construct a potable water pipeline from the Gariep Dam wall, connecting to the existing bulk water distribution system for the Greater Bloemfontein Water Supply System (GBWSS). The proposed scheme will traverse the Xhariep District Municipality and the Kopanong Local Municipality, as well as the Mangaung Metropolitan Municipality. The project has three key (internal) stakeholders: (i) DWS Head Office (ii) Vaal Central Water Board, and (iii) Mangaung Metropolitan Municipality. The project falls into the ambit of Strategic Integrated Projects (SIPS) 18 and 19, namely Water and Sanitation Infrastructure. Zutari (Pty) Ltd are the independent environmental consultants who are undertaking the environmental authorisation and water use licence applications. The competent authority is the Department of Forestry, Fisheries and the Environment (DFFE). The proposed route is known as Scheme 1B and will be a potable water pipeline from Gariep Dam to Bloemfontein (mostly along the N1) and Botshabelo / Thaba Nchu, consisting of:
▪ Tie-in at existing pipeline downstream of Gariep Dam
▪ A low-lift pumpstation at or near the connection to the Gariep Dam
▪ A water treatment works (WTW) with a high-lift pumpstation
▪ A command reservoir
▪ A booster pumpstation
▪ A second 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 listed activities in the regulations that are triggered by this proposed project are as follows:
<table><tr><th>National Environmental Management Act - BA
Competent Authority – DFFE</th><th>National Water Act - WULA
Competent Authority - DWS</th></tr><tr><td>• Listing Notice 1, Activity 9, 11, 12, 13, 14, 19 and 27 (Activities which require authorisation via a Basic Assessment)
• Listing Notice 3, Activity 4, 10 and 12 (Activities that are geographically bound, and which require authorisation via a Basic Assessment)</td><td>• 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.</td></tr></table>
The draft Basic Environmental Assessment Report is available for comment for a period of 30 days, from the 3rd of June 2024 to the 4th of July 2024, at the following locations:</td></tr>
</table>

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					▪ Hard copies at: Gariepdam Library - 11 Patrys Street; Edenburg Library - 16 Church Street; Trompsburg Library – 78 Voortrekker Street; Lourierpark Library - Cnr Doringkiaat & Nanabessie Streets, Lourier Park, Bloemfontein ▪ Electronic copy at: **https://geoverse.zutari.com/portal/apps/experiencebuilder/experience/?id=2f48681c19a24836bcfc03da3c653c3a** or **https://www.dws.gov.za/projects.aspx** **Comments on the water use licence application may be submitted for a period of 60 days, from 3rd of June 2024 to the 5th of August 2024.** **If you wish to register as an Interested and Affected Party and/or submit comments or concerns, please do so in writing by either using the online registration and comment form at these links:** https://survey123.arcgis.com/share/592a24050e154524b919d662e9a37b3e?portalUrl=https://geoverse.zutari.com/portal **or by sending an email to** xhariep@zutari.com **If necessary, you may also register telephonically during office hours with Marianna Taljaard at +27-44-805-5410.** --- Geagte geïdentifiseerde Belanhebbende en/of Geïnterreseerde Party Neem asseblief kennis dat Zutari (Edms) Bpk is deur die Departement Water en Sanitasie (DWS) aangestel om die omgewingsmagtigingsproses vir die Xhariep Pyplyn as deel van die Groter Mangaung Water Aanvullingskema, in terme van die Nasionale Wet op Omgewingsbestuur (WNOP, Wet Nr. 107 van 1998, soos gewysig), te onderneem, deur middel van ‘n Basiese Invloedbepalingsproses (BIBP), ingevolge die 2014 Omgewingsinvloedbepalings (OIB) Regulasies, soos gewysig. ‘n watergebruikslisensie aansoek (WA) in terme van die Nasionale Waterwet (Wet Nr. 36 van 1998) word ook gevolg (sien aangehegte Agtergrond Inligtingsdokument). DWS beoog om ‘n drinkwaterpyplyn wat deel vorm van ‘n water aanvullingskema vanaf die Gariep Damwal, te bou. Die pyplyn sal ‘n aansluitingspunt hê by die bestaande grootmaat waterverspreidingstelsel vir die Groter Bloemfontein Watervoorsieningstelsel (GBWSS). Die voorgestelde skema deurkruis die Xhariep Distrikmunisipaliteit en die Kopanong Plaaslike Munisipaliteit, sowel as die Mangaung Metropolitaanse Munisipaliteit. Die projek bestaan uit drie sleutel (interne) belanghebbendes: (i) DWS Hoofkantoor (ii) Vaal Sentrale Waterraad, en (iii) Mangaung Metropolitaanse Munisipaliteit. Die projek val in die bestek van die Strategiese Geïntegreerde Projekte (SIPS) 18 en 19, naamlik Water en Sanitasie Infrastruktuur. Zutari (Edms) Bpk is die onafhanklike omgewingskonsultante wat die omgewingsmagtigings- en watergebruikslisensie

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					aansoeke onderneem. Die Departement van Bosbou, Visserye en die Omgewing (DBVO) is die bevoegde owerheid wat die aansoek sal oorweeg. Die voorgestelde roete staan bekend as Skema 1B en sal 'n drinkwaterpypleiding wees vanaf die Gariep Dam tot by Bloemfontein (meestal langs die N1) en Botshabelo/ Thaba Nchu. Dit sal bestaan uit die volgende infrastruktuur: ▪ Aansluiting by bestaande pyplyn, stroomaf van die Gariep Dam ▪ 'n Lae-lig pompstasie by, of naby, die aansluiting met die Gariep Dam ▪ 'n Watersuiweringswerke (WTW) met 'n hoë-lig pompstasie ▪ 'n Bulk reservoir ▪ 'n Aanjaerpompstasie ▪ 'n Tweede bulk reservoir ▪ Die pyplynroete vanaf die Gariep Dam tot by die aansluitingspunte in Bloemfontein asook naby Rustfontein WTW (verskaf water aan Botshabelo / Thaba Nchu) Die gelyste aktiwiteite in die regulasies van toepassing tot die projek is as volg: **Nasionale Omgewingswet - BIBP** / **Bevoegde Owerheid: DBVO** • Lysingkennisgewing 1, Aktiwiteite 9, 11, 12, 13, 14, 19 en 27 (Aktiwiteite wat bemagtiging vereis deur middel van 'n Basiese Invloedbepalingsproses) • Lysingkennisgewing 3, Aktiwiteite 4, 10 en 12 (Aktiwiteite wat geografies gebonde is en wat bemagtiging vereis deur middel van 'n Basiese Invloedbepalingsproses) **Nasionale Waterwet - WA** / **Bevoegde Owerheid: DWS** • Gedeelte 21 (a): Onttrekking van water vanuit 'n waterbron • Gedeelte 21 (b): Waterberging • Gedeelte 21 (c): Belemmering en afleiding van die vloei van 'n rivier. • Gedeelte 21 (i): Die verandering van die beddings, banke, loop en elenskappe van 'n rivier. • Gedeelte 21 (g): Wegdoen van afval in so 'n manier wat 'n nadelige impak op 'n waterhulpbron kan hê **Die Konsep Basiese Invloedbepalingsverslag (KIBV) is beskikbaar vir kommentaar vir 'n tydperk van 30 dae, vanaf 3 Junie 2024 tot 4 Julie 2024, by die onderstaande plekke:** ▪ Harde kopieë by: Gariepdam Biblioteek - Patrysstraat 11; Edenburg Biblioteek - Kerkstraat 16; Trompsburg Biblioteek – Voortrekkerstraat 78; Lourierpark Biblioteek – Hoek van Doringkiaat- & Nanabessiestrate, Lourierpark, Bloemfontein ▪ Elektroniese afskrif by: **https://geoverse.zutari.com/portal/apps/experiencebuilder/experience/?id=2f48681c19a24836bcfc03da3c653c3a** of **https://www.dws.gov.za/projects.aspx** **Kommentaar kan op die watergebruikslisensie aansoek gelewer word vir 'n periode van 60 dae, vanaf 3 Junie 2024 tot 5 Augustus 2024.** **Indien u as 'n Belanghebbende en Geaffekteerde Party (B&GP) wil registreer en/ of kommentaar wil lewer, word u uitgenooi om dit asseblief skriftelik te doen, óf deur die gebruik van die aanlynregistrasie en kommentaarvorm as u ondergenoemde aanlynskakels volg:** https://survey123.arcgis.com/share/592a24050e154524b919d662e9a37b3e?portalUrl=https://geoverse.zutari.com/portal

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					of per epos na xhariep@zutari.com **Indien nodig, kan u ook binne kantoorure telefonies by Marianna Taljaard registreer, op +27-44-8055410.** Kind regards Corlie Steyn Background Information Document_Xariep_Final.pdf 975 KB
23.	Dirk Van Heerden **Alcunet.pty@gmail.com**	Alcunet (Pty) Ltd	11/06/2024	**Registration and Comment Form Received:**	**Email Response: 04/07/2024** Dear Mr. Van Heerden Trust this mail finds you well. Thank you for attending the public meeting on the 11th of June 2024, and completing the "Registration and Comment Form" (copy attached). Herewith feedback w.r.t your comments/concerns raised: - **Interruption to farming activities:** • There would naturally be an impact on the normal farming activities which cannot be avoided, however this can be managed by the contractor through engagements with the landowner. • The construction site must be fenced off and will prevent animals from straying into the construction site. The boundary fence will also be temporarily moved for the duration of construction. During the construction phase there will thus be an impact, however farming activities like grazing can still commence due to the fence that will be moved. • During operation all farming activities can commence, including grazing and even tilling of the soil. There will be 1.2m soil on top of the pipe, measured from the top point of the pipe. - **Stock theft and loss:** • This concern is acknowledged by the team. • Similar to above, the boundary fence will be shifted, and a new fence will be erected to prevent stock theft. • For the construction period a community liaison office will be appointed and will be the contact person for the public to raise issues. • It would however be up to the landowner to consider his/her risk in this regard, however there are mechanisms that can deal with incidents.

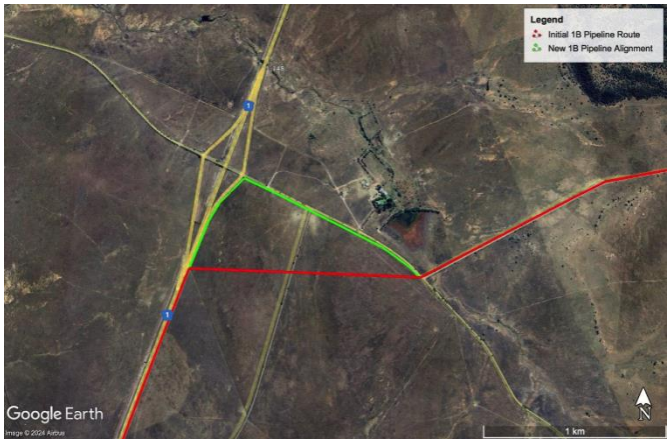
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				ZUTARI **Registration and Comment Form:** **Greater Mangaung Water Augmentation Project: Xhariep Pipeline, Mangaung Metropolitan Municipality, Free State** TITLE: MR; FIRST NAME: DIRK INITIALS: DD; SURNAME: VAN HEERDEN ORGANISATION: ALCUNET PTY LTD YOUR INTEREST IN THE PROJECT: (Please indicate whether for the BAR, the WULA, or both) POSTAL & PHYSICAL ADDRESS: PO BOX 135, Bainsvlei, BLOEMFONTEIN/ROSCHERVILLE; POSTAL CODE: 9922 LANDLINE TEL NO: ; CELL NO: 081 533 4708 EMAIL ADDRESS: alcunet.pty@gmail.com COMMENTS (please use separate sheets if you wish) CONCERNS: INTERRUPTION TO FARMING ACTIVITIES STOCKTHEFT & STOCKLOSS DUE TO PROJECT VELD FIRES SOIL REHABILITATION LITTERING SUGGESTION: FIREBREAK ROAD TO BE MAINTAINED BY GOVERNMENT/OTHER THANK YOU FOR YOUR PARTICIPATION *Zutari and 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.* Greater Mangaung Water Augmentation Project: Xhariep Pipeline, Mangaung Metropolitan Municipality, Free State 6	- **Veld fire:** • The risk of veld fires was mentioned due to fire already generating from the N1. • Fire management practices are addressed in the EMPr – Please refer to Section 4. - **Soil rehabilitation:** • Please refer to Section 6 of the EMPr attached. - **Littering:** ○ Please refer to Section 6 of the EMPr attached. Please do not hesitate should you have questions. Kind regards Marianna Taljaard Ann G - Draft EMPr_Final.pdf 3 MB
24.	Zutari to Olivia Letlalo at DFFE **OLetlalo@dffe.gov.za**	Department of Forestry, Fisheries and Environment (DFFE)			**Email Response: 02/07/2024** Dear Olivia, Thank you so much for making the time to discuss the Xhariep project pipeline application. The comment below, as received from your department on 27 June 2024, has reference: *Page 9 of 67 of the application form indicate that "ancillary infrastructure is also required and must be included in the environmental authorisation application which includes power supply (Eskom confirmed that the network can*

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					accommodate the project and that in time the application will be done by the relevant applicant), access roads and borrow pits (if applicable, to be determined during the geotechnical investigation)". However, it is unclear what type of power supply is required. Please clarify and specify? Should the power supply trigger listed activity/ies, then the listed activity must be included in the application form and adequately assessed. In clarifying the above comment, based on our conversation, I am confirming that the current Xhariep pipeline project application has nothing to do with Eskom and the power supply for the Xhariep project. Eskom will submit a separate application to DFFE to seek approval for the power supply for the Xhariep pipeline project at a later stage. The current Xhariep application form does not mention any listed activities in relation to Eskom and this will be acceptable to DFFE. Zutari will capture this conversation in the CRR which will form part of the Final BAR. Kind regards Corlie Steyn
	Olivia Letlalo **OLetlalo@dffe.gov.za**	Department of Forestry, Fisheries and Environment (DFFE)	03/07/2024	**Email to Zutari:** Good morning Corlie, As indicated during our conversation, please be clear that this application is only for Xhariep pipeline and for power supply, Eskom will undertake an EIA separately. This means that the Xhariep project will not be in operational until Eskom obtain an environmental authorisation for the power to this project. In addition, ensure listed activity that has to do with electricity or power supply does not form part of this application. Please ensure this response is clear in the CRR in answering our comments. Regards Olivia	**Email Response: 03/07/2024** Good morning Olivia, Your email below is noted and much appreciated. Zutari will do as stipulated. Zutari will also share this email correspondence with DWS. Kind regards Corlie Steyn
25.	Ms Mmatlala Rabothata **MRABOTHATA@dffe.gov.za**	Department of Forestry, Fisherries and the Environment Directorate: Biodiversity Conservation	04/07/2024	**Email to Zutari:** Dear Sir/Madam, Kindly find the attached comments from Directorate: Biodiversity Conservation for your implementation. Regards Ms Mmatlala Rabothata Department of Forestry Fisheries and the Environment Environment House 473 Steve Biko Road Arcadia **PRETORIA** 0083 Tel: 012 399 9174	**Email Response: 18/07/2024** Dear Me Rabothata, Your comment on the Draft BAR is noted. Please note that your recommendations have been captured in the Final EMPr that will be submitted to DFFE. Kind regards Corlie Steyn

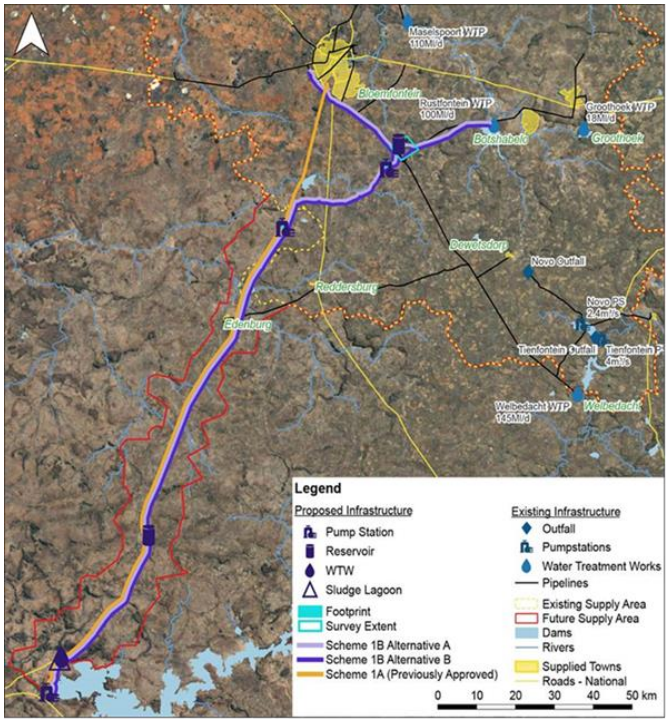
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				forestry, fisheries & the environment Department: Forestry, Fisheries and the Environment **REPUBLIC OF SOUTH AFRICA** Private Bag X447, Pretoria, 0001, Environment House, 473 Steve Biko Road, Pretoria, 0002 Tel: +27 12 399 9000, Fax: +27 86 625 1042 **Reference:** 14/12/16/3/3/1/2996 **Enquiries:** Ms M Rabothata **Telephone:** (012) 399 9174 **E-mail:** MRabothata@environment.gov.za Corlie Steyn Zutari (Pty) Ltd PO Box 494 **CAPE TOWN** 8000 Telephone Number: (+ 27) 21 526 9400 Email Address: capetown@zutari.com **PER E-MAIL** Dear Sir/Madam **COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE** The Directorate Biodiversity Conservation has reviewed and evaluated the Draft Report. It has been noted that the vegetation and ecosystems in which the project footprint is situated are mostly in fair condition to moderately degraded. 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 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. 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. 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. It is also likely that there are protected wild olive trees on the site of Command Reservoir No. 2. 2030 NDP ***Batho pele*- putting people first** 30 YEARS OF FREEDOM The processing of personal information by the Department of Forestry, Fisheries and the Environment is done lawfully and not excessive to the purpose of processing in compliance with the POPI Act, any codes of conduct issued by the Information Regulator in terms of the POPI Act and / or relevant legislation providing appropriate security safeguards for the processing of personal information of others. 1	

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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				COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE There are a few protected provincial orange data listed (ODL) plants of *Ledebouria* growing in the proposed footprint of the water treatment works (WTW) and Sludge Lagoons. Given the above, the Directorate Biodiversity Conservation does not have objections to the proposed development. However, to minimize possible loss to biodiversity the following recommendations including those mentioned in the report and EMPR must be adhered to and implemented: • Development must take place on degraded land with low sensitivity and No development within vegetation unit 3 (seasonal stream) and its associated buffer zones is recommended. • Sensitive habitats in close proximity to the development footprint must be avoided or demarcated as No-Go area (i.e. Drainage lines, Hills). • Permit must be obtained from relevant National or Provincial Authorities prior to removal or damage of any protected plant species. • Alien Invasive Plant Species Management Plan and Rehabilitation Plan must be developed and submitted as part of the final report to mitigate on habitat degradation due to erosion and alien plant invasion. • Appropriate buffer recommended by the specialist must be established around medium sensitive habitats (i.e. watercourses). All Public Participation Process documents related to Biodiversity EIA review and any other Biodiversity EIA queries must be submitted to the Directorate: Biodiversity Conservation at Email: BCAdmin@environment.gov.za for attention of **Mr Seoka Lekota.** Yours faithfully **Mr. Seoka Lekota** **Control Biodiversity Officer Grade B: Biodiversity Conservation** **Department of Forestry, Fisheries & the Environment** **Date: 04/07/2024** ***Batho pele*- putting people first** 2	

	XHARIEP BASIC ASSESSMENT REPORT Comments and Response Register (PPP 3 June 2024 – 4 July 2024)				
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				COMMENTS ON THE DRAFT BASIC ASSESSMENT REPORT FOR THE PROPOSED GREATER MANGAUNG WATER AUGMENTATION PROJECT: XHARIEP PIPELINE (SCHEME 1B), MANGAUNG METROPOLITAN MUNICIPALITY, FREE STATE The subject must be in the header of the second and the next pages if the content of the letter takes more than one page. Number the pages should you have more than one (1) page. If only one (1) page, remove the page number from page one (1) ***Batho pele*- putting people first** 3	
			18/07/2024	**Email to Zutari:** Thank you	**Email Response: 18/07/2024** Dear Me Rabothata, Please see attached the addendum to the Biodiversity Report. After discussions and feedback from I&APs it was decided to amend a small section of the route in an area just south of the Tierpoort Dam. The new alignment does not cross through any critical biodiversity areas (CBAs) or ecological support areas (ESAs). The route does not infringe on any national priority areas including protected areas and NPAES focus areas. It also does not

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					cross over any watercourses, including distinctive drainage lines or seasonal streams.  Kind regards Corlie Steyn Ann D.8.3_ Addendum to Biodiveristy Reports.pdf 682 KB
26.	Thembisile Mnisi **TMnisi@dffe.gov.za**	Department of Forestry, Fisheries and the Environment (DFFE)	02/07/2024	**Email to Zutari:** Dear Corlie We would like to come for a site visit on the week of the 15-19 of July 2024. For the XHARIEP PIPELINE (SCHEME 1B). kindly indicate a suitable day for the site visit. Regards Thembisile Cell 067 417 3849	**Email Response: 02/07/2024** Dear Thembisile, Thank you for your email. The client, DWS, would also like to attend. We will confirm the date as soon as we receive confirmation form DWS. Kind regards Corlie Steyn
			02/07/2024	**Email to Zutari:** Thanks	**Email Response: 04/07/2024** Dear Thembisile, As per our conversation please see the dates for the site visit below: **16 July**: Arrive in Bloemfontein (try and get an early flight) so that you can drive through and sleep at Gariep Dam **17 July:** Start and Gariep Dam and follow the pipeline route and see where the various infrastructure components will be based. I have copied Werner Griessel into this email. He is an Engineer in our Bloemfontein Office who will accompany you. The client: DWS will not attend the site visit. Please also let us know how many people from DFFE will attend the site visit.

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					Contact numbers: Thembisile Mnisi: 067 417 3849 Corlie Steyn: 082 5757 425 Werner Griesel: 072 048 7866 We will inform the necessary Farmer's Associations that that the site visit will take place on these dates. Please let us know if there is anything else we can assist with. Kind regards Corlie Steyn
27.					

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
1.	Zutari to Mr Tsepo Selepe				**Email Response: 17/05/2024** Good afternoon Mr Tsepo Selepe, Thank you for taking my call earlier. The Department of Water and Sanitation (DWS) is proposing the construction of a potable water pipeline from the Gariep Dam wall to Bloemfontein and surrounding areas. This project aims to alleviate the severe water shortages frequently experienced in the Greater Mangaung Metropolitan area. The proposed pipeline route, shown in purple on the map below (scheme 1B), will traverse the Xhariep District Municipality (XDM), the Kopanong Local Municipality (KLM), and the Mangaung Metropolitan Municipality (MMM).  The following towns are of critical importance, and we would like to apply for wayleaves along the pipe route at the following towns: 1. Gariep 2. Springfontein 3. Trompsburg 4. Edenburg You mentioned that you will be able to assist in the process and I am hereby enquiring on the way forward. What do you require from us?

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					Your assistance in this regard would be highly appreciated. Kind regards **Werner Griessel**
					Email Response: 20/05/2024 Good afternoon Mr Selepe, I hope this email finds you well. I am following up on our previous request for your feedback for the application of wayleaves sent on Friday, 17 May. As we are currently pressed for time, we urgently need your input to ensure we can proceed without delays. Your prompt attention to this matter would be greatly appreciated. If you have any questions or require further information, please do not hesitate to reach out to me. Thank you for your understanding and cooperation. Kind regards Werner Griessel
					Email Response: 22/05/2024 Good morning Mr Selepe, I am following up on the trailing wayleave application request. Do you perhaps have any feedback in this regard? Your assistance would be highly appreciated. Kind regards Werner Griessel
					Email Response: 31/05/2024 Good afternoon Mr Selepe, Thank you for taking my call earlier today. We discussed the following matters: 1. I followed up with regards to your assistance with wayleave applications as per the below correspondence. 2. You indicated that you have begun the process but unfortunately due to strike action, you were not able to progress further. 3. Hopefully by next week we can have an answer on the way forward. We take note of the current situation, but due to current time constraints I request your guidance in this regard. Is there anything else you require from my side to expedite the application? Your prompt response would be highly appreciated. Kind regards Werner Griessel
					Email Response: 13/06/2024 Good afternoon Mr Selepe,

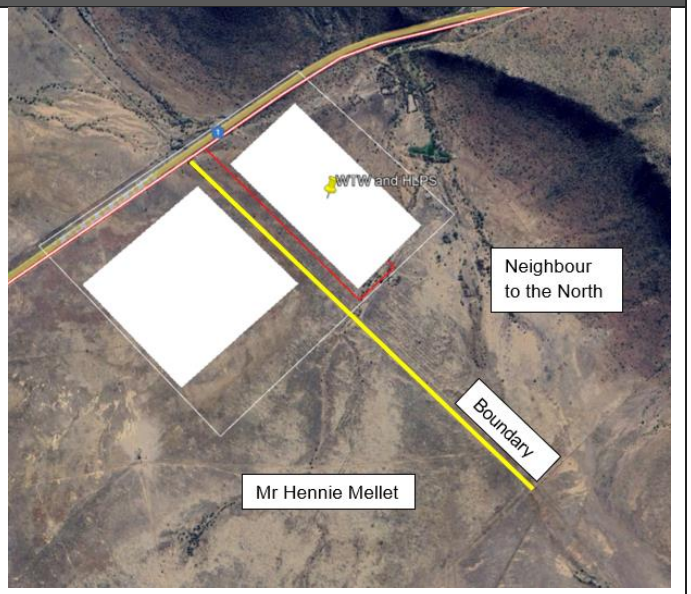
	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					I hope my email finds you well. Herewith I would like to follow up regarding the status of the below wayleave application. It is of utmost importance that we finalise this application, considering we have very tight time constraints. Your prompt response will be highly appreciated. Thank you in advance. Kind regards Werner Griessel
					Email Response: 21/06/2024 Good morning Mr Selepe, I hope my email finds you well. I tried contacting you yesterday, with no avail. Herewith I would like to follow up regarding the status of the below wayleave application. It is of utmost importance that we finalise this application, considering we have very tight time constraints. Your prompt response will be highly appreciated. Thank you in advance. Kind regards Werner Griessel
					Email Response: 25/06/2024 Good afternoon Mr Selepe, I am urgently following up on the status of the below wayleave application. 1. Additionally, it has come to our attention that the site where we want to construct a command reservoir, near Springfontein, is on Municipal property. **Can you confirm this?** 2. We would like to conduct a geotechnical investigation on the terrain, and we would like to apply for approval thereof also. **Would you be able to assist with that?** 3. Attached is a .kmx location of the proposed reservoir site. The below image depicts the reservoir.

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					 I have tried contacting you on your cell phone but to no avail. It is critical that we finalise this application as soon as possible due to very tight time constraints. Your prompt response is essential and will be greatly appreciated. Thank you for your attention to this matter. Kind regards, Werner Griessel
					Email Response: 27/06/2024 Good morning Mr Selepe, I hope you are well. Herewith I would like to follow up regarding the trailing correspondence. It is of utmost importance that we finalise this application, considering that time is running out before the geotechnical contractor is appointed. Your urgent response will be highly appreciated. Thank you in advance. Kind regards Werner Griessel
					Email Response: 03/07/2024 Good afternoon Mr Phakamile Jonas, Thank you for reaching out to us regarding our wayleave application. Relating to our telephonic conversation I want to outline a few details of our application: 1. We are applying for wayleaves to conduct a geotechnical investigation and not for construction at this stage.

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
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					2. The geotechnical investigation will mainly consist of test pit excavations. These investigations are intended at regular intervals along the pipe route within the road reserve. Additionally, we intent to conduct investigations at all critical points, i.e. WTW, High and Low Lift Pump Stations, and Command Reservoirs. 3. The pipeline will be routed all along the N1 from the Gariepdam towards Bloemfontein, on the right-hand side, and will deviate from the N1 about 5.5km before Tierpoort Dam onto the S299. Currently we are responsible for a feasibility study, and we intend to design the pipeline approximately 25m from the fence line into the respective land property. 4. It is deemed important for Kopanong LM to indicate the presence of services near the entrance of the towns from the N1. The following towns are of critical importance: a. Gariep b. Springfontein c. Trompsburg d. Edenburg 5. The first Command Reservoir site near Springfontein is apparently Municipal property. Can you confirm this? If Kopanong LM is the property owner, may we request consent to conduct geotechnical investigations on the site around the proposed reservoir? Attached please find the following: i. Topographical maps indicating the pipe route. As stated above the pipeline is designed on the right-hand side of the road when going to Bloemfontein from Gariepdam. ii. Google Earth .kmz file depicting the pipe route. iii. Google Earth .kmz file depicting the first Command Reservoir near Springfontein. Also see the image below:  Should any additional information be required, do not hesitate to contact me.

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					Thank you very much for your assistance and your favourable response would be highly appreciated. Kind regards Werner Griessel
					Email Response: 11/07/2024 Good morning Mr Phakamile Jonas, I hope you are well. Herewith I would like to follow up regarding the trailing correspondence relating to our wayleave application. Your urgent response will be highly appreciated. Thank you in advance. Kind regards Werner Griessel
					Email Response: 12/07/2024 Good afternoon Mr Selepe and Mr Jonas, I hope this email finds you well. Herewith a quick update from our side: 1. The appointment of the geotechnical contractor was confirmed by DWS earlier today. To prevent delays and expedite progress regarding the investigation, it is of utmost importance that we receive approval for our wayleave application without further delay. Your immediate feedback on this matter is crucial. Thank you for your prompt attention to this urgent request. Kind regards, Werner Griessel
2.	Zutari to Mr Hennie Mellet				**Email Response: 14/06/2024** Good afternoon Mr Hennie Mellet, I hope this email finds you in good faith. I'm reaching out regarding the Xhariep Pipeline feasibility study we are conducting. Thank you for taking my call earlier today. We discussed the following: 1. I requested approval to enter your farm property where the proposed water treatment works, and high lift pump station are planned to be constructed. 2. A geotechnical investigation is required at the proposed site, and it is essential to excavate test pits to incorporate geotechnical findings into our designs. T**hank you for giving us your consent and allowing the investigation to proceed accordingly.** The proposed area is depicted in the image below:

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
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					 I acknowledge your concerns regarding wildlife roaming in the specific camp. I will inform the geotechnical contractor to take this into consideration while on your property. I will update you further as soon as we have more clarity on appointment and the geotechnical contractor's programme. Your cooperation is highly appreciated. Kind regards Wermer Griessel
					Email Response: 21/06/2024 Good morning Mr Hennie Mellet, I hope you are well and that this email finds you in good faith. My previous email came back undelivered thus I refer you to the trailing email correspondence relating to the Xhariep Pipeline from the Gariepdam to Bloemfontein. In addition to our discussions would it be possible to furnish us with your neighbour to the north's contact information. For a detailed approach to our design, it would be ideal if we can conduct a geotechnical investigation on his side of the boundary between the two properties as well. Refer to the image below for clarity:

	XHARIEP BASIC ASSESSMENT REPORT (GEOTECH) Comments and Response Register				
Ref	**Source Name**	**Source Organisation**	**Date Received**	**Comment**	**Response + Date**
					 Again, your cooperation is highly valued. For any additional information, do not hesitate to contact me. Kind regards Werner Griessel
					Email Response: 27/06/2024 Good morning Mr Hennie Mellet, I hope you are well and that this email finds you in good faith. I would like to follow up regarding the below correspondence, especially relating to the following: 1. We need the contact details for your neighbour as depicted in the image below. We would greatly appreciate it if you could furnish us with such information. Awaiting your favourable response. Kind regards Werner Griessel
					Email Response: 03/07/2024 Good afternoon Mr Hennie Mellet, I hope this email finds you in good faith. Thank you for taking my call earlier today. As discussed, please find the below explanation relating to the process going forward.

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					Zutari's appointment is for the detailed feasibility phase of the project, whereafter DWS will appoint a professional service provider to undertake the detailed design and construction supervision. However, in terms of engagements between landowners and DWS, the following processes are likely to be followed: The Sub Directorate: Land Rights Administration (LRA) is the unit within the Department of Water and Sanitation (DWS) responsible for all land-related matters nationwide. The LRA unit is situated in Pretoria. After a detailed feasibility phase is approved, an instruction is given to the LRA by the DWS Project Manager to acquire the land and servitudes needed for the project. The LRA will then obtain approval from the Minister of Water and Sanitation to engage affected landowners regarding the procurement of land and registration of servitudes. Once approval is granted, the LRA will appoint a professional registered valuer (at the project's cost), and a public meeting will be arranged, typically through an appointed social facilitator, with all affected owners/persons. At the meeting, the LRA and the appointed valuer will explain the acquisition and valuation processes. Following this meeting, one-on-one meetings will be held with all affected owners to further detail the processes. The valuer will then visit each affected owner on-site to conduct the valuation of the servitude or land affected by the project. During these one-on-one engagements, landowners will have the opportunity to raise conditions (e.g., water off-take point from the WTW) they may want to propose as part of the Agreement to be concluded between DWS and the landowner. Each condition/request will be evaluated based on merit before being agreed to. After conducting market research and completing other necessary steps, the valuer will compile a valuation report for each owner and submit it to the LRA, which will handle the compensation as recommended by the valuer. Zutari will record your request for possible wastewater usage from the WTW as part of the records of the public participation process. This will ensure that this information can be passed on to the LRA when they commence the one-on-one meetings. Lastly you indicated that Mr Fanie Griessel is the contact person renting the property to the north. Please would you be so kind and furnish us with his contact information. I hope this provides you with more clarity on the way forward. Do not hesitate to contact me should you require any additional information. Kind regards Werner Griessel
END OF COMMENTS AND RESPONSE REPORT					