Draft Environmental Impact Assessment Report

DAERL REFERENCE NO: NC/EIA/01/FB/MAG/WAR1/2026

PROPOSED WASTEWATER TREATMENT WORKS, WARRENTON NORTHERN CAPE PROVINCE

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1 REPORT DETAILS

DAERL reference number:	NC/BA/01/FB/MAG/WAR1/2026
Document purpose	This Draft Environmental Impact Assessment (EIA) forms part of the Environmental Impact Assessment process being undertaken for the proposed Warrenton Wastewater Treatment Works, located within the Northern Cape Province. In accordance with the 2014 NEMA Environmental Impact Assessment Regulations, as amended, the purpose of this draft environmental impact assessment is to: (a) determine the compliance of the activity with regards to the policy and legislative context within which the activity is located. (b) describe the need and desirability of the proposed activity in the context of its footprint. (c) account for the preferred location and configuration with recourse to an assessment of the impacts and risks of alternatives based on the geographical, physical, biological, social, economic, heritage and cultural aspects of the environment (d) determine, rank and account for the risks associated with the activity including the degree to which they can be avoided, managed or mitigated. This Draft EIA further: • Defines the scope and methodology of the Environmental Impact Assessment phase to ensure that all significant impacts are assessed in detail. The Draft EIA will be made available to all Interested and Affected Parties and relevant authorities for review for the prescribed commenting period in terms of the NEMA EIA Regulations (GN R 982 of 2014, as amended). All comments received during the review period will be incorporated into the preparation of this Final Scoping Report and will be included in the comments and responses report appended thereto.
Project title	Proposed wastewater treatment works, Warrenton Northern Cape Province
Prepared by	Environmental Management Group (Pty) Ltd
Lead EAP	CW Vermeulen, EAPASA 2019/1521 cwv@envmgp.com
Assisted by:	Ivan Coertze, Ivan@envmgp.com

Applicant	Magareng Local Municipality
Report Status	Environmental Impact Assessment
Submission Date	18 June 2026

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3 GLOSSARY

Acronyms	Description
AEL	Atmospheric Emission Licence
AIP	Alien Invasive Plants
AMSL	Above Mean Sea Level
ASAPA	Association of Southern African Professional Archaeologists
BCEA	Basic Conditions of Employment Act
BI	Biodiversity Importance
BOD	Biological Oxygen Demand
CARA	Conservation of Agricultural Resources Act
CBA	Critical Biodiversity Area
CI	Conservation Importance
CLO	Community Liaison Officer
COD	Chemical Oxygen Demand
CRR	Comments and Responses Register
CTMP	Construction Traffic Management Plan
DAERL	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform, Competent Authority
DFFE	Department of Forestry, Fisheries and the Environment
DSR	Draft Scoping Report
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
EAPASA	Environmental Assessment Practitioners Association of South Africa
ECA	Environment Conservation Act
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
ELWU	Existing Lawful Water Use
EMG	Environmental Management Group
EMPr	Environmental Management Programme
EN	Endangered ecosystem
ESA	Ecological Support Area
FI	Functional Integrity
GA	General Authorisation in terms of the National Water Act
GHG	Greenhouse Gas
GIS	Geographic Information System
GNR	Government Notice Regulation
GVA	Gross Value Added
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
LC	Least Concern ecosystem status
LLPP	Local Labour and Procurement Plan
MEC	Member of the Executive Council
ML/day	Megalitres per day
NCRs	Noise Control Regulations
NDP	National Development Plan
NEMA	National Environmental Management Act, Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act, Act 39 of 2004

NEMBA	National Environmental Management Biodiversity Act, Act 10 of 2004
NEMPAA	National Environmental Management Protected Areas Act, Act 57 of 2003
NEMWA	National Environmental Management Waste Act, Act 59 of 2008
NFEPA	National Freshwater Ecosystem Priority Areas
NHRA	National Heritage Resources Act, Act 25 of 1999
NPAES	National Protected Area Expansion Strategy
NWA	National Water Act, Act 36 of 1998
OHSA	Occupational Health and Safety Act, Act 85 of 1993
PAJA	Promotion of Administrative Justice Act, Act 3 of 2000
PHRA	Provincial Heritage Resources Authority
PPP	Public Participation Process
PPE	Personal Protective Equipment
R	Resilience
RE	Renewable Energy
SACAD	South African Conservation Areas Database
SACNASP	South African Council for Natural Scientific Professions
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SANS	South African National Standard
SAPAD	South African Protected Areas Database
SCC	Species of Conservation Concern
SDF	Spatial Development Framework
SDGs	Sustainable Development Goals
SEI	Site Ecological Importance
SPLUMA	Spatial Planning and Land Use Management Act, Act 16 of 2013
SSVR	Site Sensitivity Verification Report
TOPS	Threatened or Protected Species
TSS	Total Suspended Solids
UAV	Unmanned Aerial Vehicle
VU	Vulnerable ecosystem status
*vu	Vegetation Unit
WUL	Water Use Licence
WULA	Water Use Licence Application
WWTW	Wastewater Treatment Works

4 EXECUTIVE SUMMARY

Development type	Waste Water Treatment Works and associated bulk infrastructure
Associated infrastructure	Pipelines, Pump stations, Treated effluent irrigation system / management system
Broad-scale locality	Northern Cape Province
Fine-scale locality	**Farm Name, Number and Portion:** Doornfontein No. 12, Portions 7 (primary WWTW site). Other portions will be affected by the linear infrastructure. (Ikhutseng Township and Warrenton Township) **21-Digit Surveyor General Code:** C03700000000001200007 - Doornfontein No. 12 Portion 7 C03700000000001200009 - Doornfontein No. 12 Portion 9 C03700000000001200012 - Doornfontein No. 12 Portion 12 C03700000000001200018 - Doornfontein No. 12 Portion 18 C03700000000001200023 - Doornfontein No. 12 Portion 23

4.1 BACKGROUND

Magareng Local Municipality, hereafter referred to as the Applicant, has appointed BVi Consulting as the Consulting Engineers for the project. BVi Consulting has in turn appointed Environmental Management Group, EMG, as the independent Environmental Assessment Practitioner to undertake the required Scoping and Environmental Impact Assessment process for the proposed Warrenton Wastewater Treatment Works and associated bulk sewer infrastructure. The Applicant proposes the construction of a new Wastewater Treatment Works with a design capacity of 3.2 megalitres per day on Portion 7 of the farm Doornfontein No. 12, situated approximately 2 kilometres west of Warrenton in the Northern Cape Province.

The associated linear sewer infrastructure will traverse and affect several additional properties, including Portions 7, 9, 12, 18, and 23 of Doornfontein No. 12, as well as the established townships of Ikhutseng and Warrenton.

The proposed WWTW will operate as a pond-based treatment system comprising anaerobic, facultative, and maturation ponds for primary and secondary treatment. A final polishing stage will be incorporated through constructed reedbeds. After a final chlorination treatment, the treated effluent will be reused for irrigation purposes via a pivot irrigation system. Associated infrastructure includes approximately 18.3 kilometres of new gravity sewer lines, 0.8 kilometres of rising mains, and a new pump station to integrate the towns of Warrenton, Ikhutseng, and Warrenvale into the upgraded treatment system. Upon successful commissioning (and not before) of the new WWTW, the existing wastewater treatment facility located within the residential area of Warrenton will be decommissioned and rehabilitated. The decommissioning of the existing facility will be addressed under a separate environmental process and will only commence once the proposed WWTW is fully operational.

4.2 PROJECT NEED

The proposed development for the construction of a new WWTW and associated bulk infrastructure West of Warrenton stems from the inadequacy of the current WWTW to adequately accommodate the effluent inflow. Further growth projections of the community further contribute to its necessity. The current operation entails visible effluent overflow from the WWTW, pump houses and, periodically, manholes. This overflow has given rise to numerous socio-environmental risks in adjacent areas and has likely contributed to polluting the Vaal River situated 1.1 km downhill from the current WWTW. Before any the old dysfunctional facility can be decommissioned and any pollution sustainably remediated, a new operation is urgently required. The new operation must be able to function within the socio-environmental and economic context of the Warrenton area which it must service.

4.3 LICENSING TRIGGERS

4.3.1 NEMA (ACT 107 OF 1998)- EIA REGULATION LISTING NOTICE TRIGGERS

The proposed development triggers activities listed under Listing Notices 1, 2, and 3 of the NEMA EIA Regulations (GN R 982 of 2014 as amended) and therefore requires a full Scoping and Environmental Impact Assessment process. The following activities were identified to be implicated by the development.

Listed Activity No.	Listed Activity Description
Listing Notice 1 (GN R 983, 4 December 2014 as amended by GN R 517 of 2021).	
19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.*
12 (ii)(a)(c)	*The development of —* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*
25	*The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.*
28 (ii)	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*
46 (i)(ii)(a)(b)	*The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—* *1. has an internal diameter of 0,36 metres or more; or* *2. has a peak throughput of 120 litres per second or more; and* *(a) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(b) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;*
Listing Notice 2 (GN R 985, 4 December 2014 as amended by GN R 517 of 2021).	
15	*The clearance of an area of 20 hectares or more of indigenous vegetation.*
Listing Notice 3 (GN R 985, 4 December 2014 as amended by GN R 517 of 2021).	

12 (g) (ii)	*The clearance of an area of 300 square metres or more of indigenous vegetation…* *(g) Northern Cape* *(ii) Within critical biodiversity areas identified in bioregional plans*

4.3.2 NWA (ACT 36 OF 1998)- WULA TRIGGERS

The proposed development triggers a several water use licensing process under section 21 of the National Water Act (Act 36 of 1998). The anticipated water uses identified implicates the following:

Section 21 Activity	Description
C and I	impeding or diverting the flow of water in a watercourse. altering the bed, banks. course or characteristics of a watercourse.
E	engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).
G	disposing of waste in a manner which may detrimentally impact on a water resource.

4.4 PUBLIC PARTICIPATION PROCESS (PPP)

An additional public participation process in being held in line with the EIA regulations (GN R982 of 2014, as amended by GN 517 of 2021) in continuation with that of the scoping report (NC/EIA/01/FB/MAG/WAR1/2026).

This entails:

- The circulation of Background Information Documents.
- Distribution of hard copies of Background Information Documents to landowners without email access.
- A Public Information Session in which the project scope, EIA process and 30-day commenting period was explained.

The 30-day commenting period will be initiated with the submission of this draft EIA to competent authorities, stakeholders and interested and affected parties. The draft EIA will also be published on the environmental consultant's website.

4.5 PROJECT ALTERNATIVES

In an assessment of topographical, geographic, economic and pragmatic considerations, the proposed preferred layout, location and technological solution entails:

- an oxidation pond system coupled with a series of horizontal reedbeds
- situated at a topographical low point on Farm Doornfontein Portion 7
- in close proximity to the pivot circles which would utilise the treated effluent for irrigation.

This option utilises natural gradients to facilitate drainage, minimises predicted offence caused to communities given its isolated location, entails fairly self-sufficient technologies that minimises maintenance complexity and costs. It thus promises to be the most sustainable alternative considered.

This option was weighed against an alternative location nearer to the town, alternative technologies, and pond reedbed configuration alternatives.

4.6 IMPACTS ASSESSED

The envisioned impacts which the proposed development would have on seven different themes identified pertinent to the project context was assessed. These were namely ecological impacts, water resources, heritage, aesthetics, socio-economic, air quality and waste.

In the assessment of these impacts, it became apparent that the risk is primarily concentrated to the themes of water resources, aesthetics, socio-economic, air quality and waste. Given that the identified risks were concentrated to the operational rather than the construction phase (in a pre-mitigation scenario) it became apparent that the primary mitigation required to reduce the associated risk is the implementation of a monitoring and maintenance plan for the WWTW and associated bulk infrastructure. Some residual socio-economic risks were also identified which are inherent to the development entailing construction in built up areas. These risks were, however, already pre-emptively minimised through strategic realignments (See section 9: In the Incidence of Deviation to the Approved Scoping Report) and can be further minimised through adequate public engagement throughout the construction process itself.

Table 1: List of Impacts Assessed with the relative associated risk scores.

Impact Type	Phase	Status	Significance pre-mitigation	Significance post-mitigation
Ecological Impacts				
Habitat Loss	Construction	Negative	2	1
	Operation	N/A	N/A	N/A
Loss of indigenous floral and faunal diversity	Construction	Negative	4	1
	Operation	Negative	4	1
Loss of floral and faunal species of conservation concern	Construction	Negative	2	1
	Operation	N/A	N/A	N/A
Loss of CBAs and ESAs	Construction	Negative	4	1
	Operation	N/A	N/A	N/A
Water Resources				
Surface Water Quality	Construction	Negative	3	1
	Operation	Negative	16	4
Ground Water Quality	Construction	Negative	3	1
	Operation	Negative	16	4
Removal of Riparian Vegetation	Construction	Negative	5	2
	Operation	Negative	2	1
Excavation and Backfilling of Trenches	Construction	Negative	5	2
	Operation	Negative	2	1
Heritage				
Archaeological, palaeontological and Heritage Resources	Construction	Negative	6	N/A
	Operation	N/A	N/A	N/A
Aesthetics				
Construction of Infrastructure	Construction	Negative	6	2
	Operation	Negative	16	1
Socio-economic				
Job creation and the influx of job seekers	Construction	Negative	6	2
	Operation	Negative	2	1
Impacts on affected landowners	Construction	Negative	25	6
	Operation	Negative	12	2

Air Quality				
Generation of exhaust fumes and particulate matter	Construction	Negative	5	2
	Operation	Negative	9	4
Noise and Vibrations	Construction	Negative	6	1
	Operation	Negative	5	3
Waste				
General Solid and Liquid Waste	Construction	Negative	6	2
	Operation	N/A	N/A	N/A
Organic Waste	Construction	Negative	6	2
	Operation	Negative	16	2

4.7 EAP RECOMMENDATION

The negative impacts (both direct and cumulative), emergent negative secondary and tertiary impacts associated with the proposed development were assessed. This was informed by several specialist studies, when weighed against not only the positive impacts of the development, but also the significant ramifications of the no-go alternative, the **proposed development should be permitted**. No fatal flaws were identified which ought to bar the proposed preferred configurations, layouts, locations and technologies. Concerns raised in the specialist reports are mitigatable as outlined in the EMPr (Appendix 6).

5 CONTENT REQUIREMENTS OF AN EIA

Section in the EIA Regulations (GN R982 in GG 38282)	Description / Requirement	Corresponding Report Section
Appendix 3 **Section 3(1)(a):**	*Details of:* *(i) the EAP who prepared the report; and* *(ii) (ii) the expertise of the EAP, including a curriculum vitae*	Section 5: The Environmental Assessment Practitioner and Specialist. Appendix 1: EAP CV
Appendix 3 **Section 3(1)(b):**	*the location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:* *(i) the 21 digit Surveyor General code of each cadastral land parcel;* *(ii) where available, the physical address and farm name; and* *(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;*	Section 8: Introduction Appendix 2: Maps
Appendix 3 **Section 3 (1)(c):**	*a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-* *(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;* *(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;*	Section 11: Layout Alternatives. Appendix 2: Maps
Appendix 3 **Section 3(1)(d):**	*a description of the scope of the proposed activity, including-* *(i) all listed and specified activities triggered and being applied for; and* *(ii) a description of the associated structures and infrastructure related to the development;*	Section 6: Introduction Section 10: Legislative Context
Appendix 3 **Section 3(1)(e):**	*a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;*	Section 10: Legislative Context
Appendix 3 **Section3 (1)(f):**	*a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;*	Section 14: Project motivation

Appendix 3 Section 3(1)(g):	*a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;*	Section 11: Alternatives Considered
Appendix 3 Section 3(1)(h):	*a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:*	Section 11: Alternatives Considered
	(i) details of the development footprint alternatives considered;	Section 11: Alternatives Considered
	(ii) details of the public participation process undertaken in terms of regulation 41 of the regulations, including copies of the supporting documents and inputs;	Section 15: Public Participation Process Appendix 5: Public Participation Process Report
	(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;	Section 15: Public Participation Process Appendix 5: Public Participation Process Report
	(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 11: Alternatives Considered
	(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts- *(aa) can be reversed;* *(bb) may cause irreplaceable loss of resources; and* *(cc) can be avoided, managed or mitigated;*	Section 17: Impact Assessment
	(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;	Section 17: Impact Assessment
	(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;	Section 17: Impact Assessment
	(viii) the possible mitigation measures that could be applied and level of residual risk;	Section 17: Impact Assessment
	(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and	Section 11: Alternatives Considered

	(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;	Section 11: Alternatives Considered
Appendix 3 Section 3 (1)(i):	*a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including-* *(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and* *(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;*	Section 17: Impact Assessment
Appendix 3 Section 3(1)(j):	*an assessment of each identified potentially significant impact and risk, including-* *(i) cumulative impacts;* *(ii) the nature, significance and consequences of the impact and risk;* *(iii) the extent and duration of the impact and risk;* *(iv) the probability of the impact and risk occurring;* *(v) the degree to which the impact and risk can be reversed;(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and* *(vii) the degree to which the impact and risk can be mitigated;*	Section 17: Impact Assessment
Appendix 3 Section 3(1)(k):	*where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;*	Section 17: Impact Assessment Appendix 4: Specialist Reports and declarations
Appendix 3 Section 3(1)(l):	*an environmental impact statement which contains-* *(i) a summary of the key findings of the environmental impact assessment:*	Section 16: Environmental Impact Assessment Findings
	(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers; and	Section 16: Mapping of Sensitivities Appendix 1: Maps
	(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;	Section 17: Impact Assessment Section 18: Environmental Impact Assessment Findings

Appendix 3 Section 3(1)(m):	*based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;*	Section 17: Impact Assessment Section 18: Environmental Impact Assessment Findings Appendix 6: EMPr
Appendix 3 Section 3(1)(n):	*the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;*	Section 11: Alternatives Considered
Appendix 3 Section 3(1)(o):	*any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;*	Section 18: Environmental Impact Assessment Findings
Appendix 3 Section 3(3)(p):	*a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;*	Section 5: Assumptions and Limitations
Appendix 3 Section 3(1)(q):	*a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;*	Section 16: Environmental Impact Assessment Findings
Appendix 3 Section 3(1)(r):	*where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;*	Section 16: Environmental Impact Assessment Findings
Appendix 3 Section 3(1)(s):	*an undertaking under oath or affirmation by the EAP in relation to-* *(i) the correctness of the information provided in the reports;* *(ii) the inclusion of comments and inputs from stakeholders and I&APs;* *(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and* *(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;*	Section 19: Declaration of Information Accuracy Section 15: Public Participation Process Appendix 5: Public Participation Process Report
Appendix 3 Section 3(1)(u):	*an indication of any deviation from the approved scoping report, including the plan of study, including-* *(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and* *(ii) a motivation for the deviation;*	Section 9: In the incidence of deviation from approved scoping report
Appendix 3 Section 3(1)(v):	*any specific information that may be required by the competent authority; and*	Section 15: Public Participation Process Appendix 5: Public Participation Process Report

Appendix 3 **Section 3(1)(w):**	*any other matters required in terms of section 24(4)(a) and (b) of the Act.*	Section 15: Public Participation Process Appendix 5: Public Participation Process Report
Appendix 3 **Section3(2):**	*Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to an environmental impact assessment report the requirements as indicated in such notice will apply.*	Section 8: Legislative Context

6 THE ENVIRONMENTAL ASSESSMENT PRACTITIONER AND SPECIALIST

6.1 THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

According to Appendix 3 s3(1)(a)(i-ii):

"3(1) An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-

(a) details of-
(i) the EAP who prepared the report)
(ii) *the expertise of the EAP, including a curriculum vitae;"*

Environmental Management Group (Pty) Ltd. (EMG) is an active company working in conjunction with other private companies, government departments, municipalities and parastatals to promote sustainable development and sound environmental management principles. The proposed development's lead Environmental Assessment Practitioner (EAP) is Mr. CW Vermeulen, who is assisted by several authors.

A detailed *curriculum vitae* (CV) of the lead EAP is presented in **Appendix 1**. Refer to the summary below for a brief overview of qualifications, registrations, and associations held by the lead EAP.

Table *1*: Summary of associations, registrations and qualifications held by the EAP and supporting team.

Lead EAP name	**Mr. CW Vermeulen**
Contact information	+27 51 412 6350/ 082 824 9308 cwv@envmgp.com
Company	Environmental Management Group (Pty) Ltd.
Role(s)	General Director and Senior Environmental Assessment Practitioner
Qualifications	BSc Environmental and Biological Sciences
Professional registrations	EAPASA: 2019/1521
Assisted By:	**Mr. Ivan Coertze**
Contact information	071 371 8825 ivan@envmgp.com
Role(s)	Junior Environmental Assessment Practitioner

6.2 THE TEAM OF EXPERTS

As part of the EIA process, specialist studies have been commissioned to investigate key environmental aspects and potential impacts that require detailed assessment. A list of the specialist studies incorporated into the findings of this EIA are included in the table below.

Table 2: Summary of relevant qualifications and registrations held by the team of experts.

Specialist Member	Type of Assessments	Qualifications and registrations
Mr. Lloyd Rossouw	Phase One Heritage Impact Assessment	• Ph.D. Plant Sciences, Dept. of Plant Science • M.Sc. Quaternary Vertebrate Palaeontology (cum laude) • B.A. (Hons.) Archaeology • Member of Association for South African Professional Archaeologists (ASAPA) • Member of the Palaeontological Society of Southern Africa (PSSA)
Mr. Joshua Giddy	Terrestrial Ecological Assessment (Lead Author)	• M.Sc. Majoring in Botany • B.Sc. Hons Botany • B.Sc. Majoring in Botany
Mr Ricus Nel	Terrestrial Ecological Assessment (Reviewer)	• B.Sc. Hons Botany • B.Sc. Majoring in Botany and Zoology • SACNASP Pr Eco Sci 144943 • SAAB No 800
Mr Darius van Rensburg	Aquatic Biodiversity Assessment	• M.Sc Majoring in Ecology • SACNASP Pr Sci Nat 400284/13
Mr Dirk Moolman	Geohydrological Assessment	• M.Sc Geohydrology • B.Sc (Hons.) Geohydrology • B.Sc Environmental Sciences • SACNASP Reg. no. 115614

7 ASSUMPTIONS AND LIMITATIONS

According to Appendix 3 s3(1)(b):

"a description of any assumptions, uncertainties and gaps in knowledge which relate to the assessment and mitigation measures proposed;"

The findings and assessments within this Environmental Impact Assessment Report are based on the project information available. Consequently, certain assumptions and limitations apply. These include:

- It is assumed that the Magareng Local Municipality will successfully secure the necessary land rights and permits for the entire project footprint, and all pipeline servitudes, prior to commencement of construction.
- It is assumed that the Department of Water and Sanitation will grant a Water Use Licence (WUL) for the proposed activities The WUL application process is running concurrently with the EIA (See Appendix 10: Additional Information).
- Technical information in this report is based on the technical information, preliminary design layouts, and process description provided by the Applicant and their engineers (BVi Consulting Engineers).
- The assumptions and limitations made in the various specialist reports have also been integrated into this report in the sections informed by the specialist reports (See Appendix 4: Specialist Reports and Declarations).

8 INTRODUCTION

8.1 PROJECT BACKGROUND

According to Appendix 3 s3(1)(b):

"The location of the development footprint of the activity on the approved site as contemplated in the accepted scoping report, including:

(i) the 21-digit Surveyor General code of each cadastral land parcel;

(ii) where available, the physical address and farm name; and

(iii) where the required information in items (i) and (ii) is not available, the coordinates of the boundary of the property or properties;"

And according to Appendix 3 s3(1)(b):

Appendix 3 s3(1)(d):

"a description of the scope of the proposed activity, including-
(ii) a description of the associated structures and infrastructure related to the development;"

Magareng Local Municipality, hereafter referred to as the Applicant, has appointed BVi Consulting as the Consulting Engineers for the project. BVi Consulting has in turn appointed Environmental Management Group, EMG, as the independent Environmental Assessment Practitioner to undertake the required Scoping and Environmental Impact Assessment process for the proposed Warrenton Wastewater Treatment Works and associated bulk sewer infrastructure.

The Applicant proposes the construction of a new Wastewater Treatment Works with a design capacity of 3.2 megalitres per day on Portion 7 of the farm Doornfontein No. 12, situated approximately 2 kilometres west of Warrenton in the Northern Cape Province. The associated linear sewer infrastructure will traverse and affect several additional properties, including Portions 9, 12, 18, and 23 of Doornfontein No. 12, as well as the established townships of Ikhutseng and Warrenton.

Table 3: Property details

Fine-scale locality	**Farm Name, Number and Portion:** Doornfontein No. 12, Portion 7 (primary WWTW site). Other portions will be affected by the linear infrastructure. (Ikhutseng Township and Warrenton Township). **21-Digit Surveyor General Code:** C03700000000001200007 - Doornfontein No. 12 Portion 7 C03700000000001200009 - Doornfontein No. 12 Portion 9 C03700000000001200012 - Doornfontein No. 12 Portion 12 C03700000000001200018 - Doornfontein No. 12 Portion 18 C03700000000001200023 - Doornfontein No. 12 Portion 23

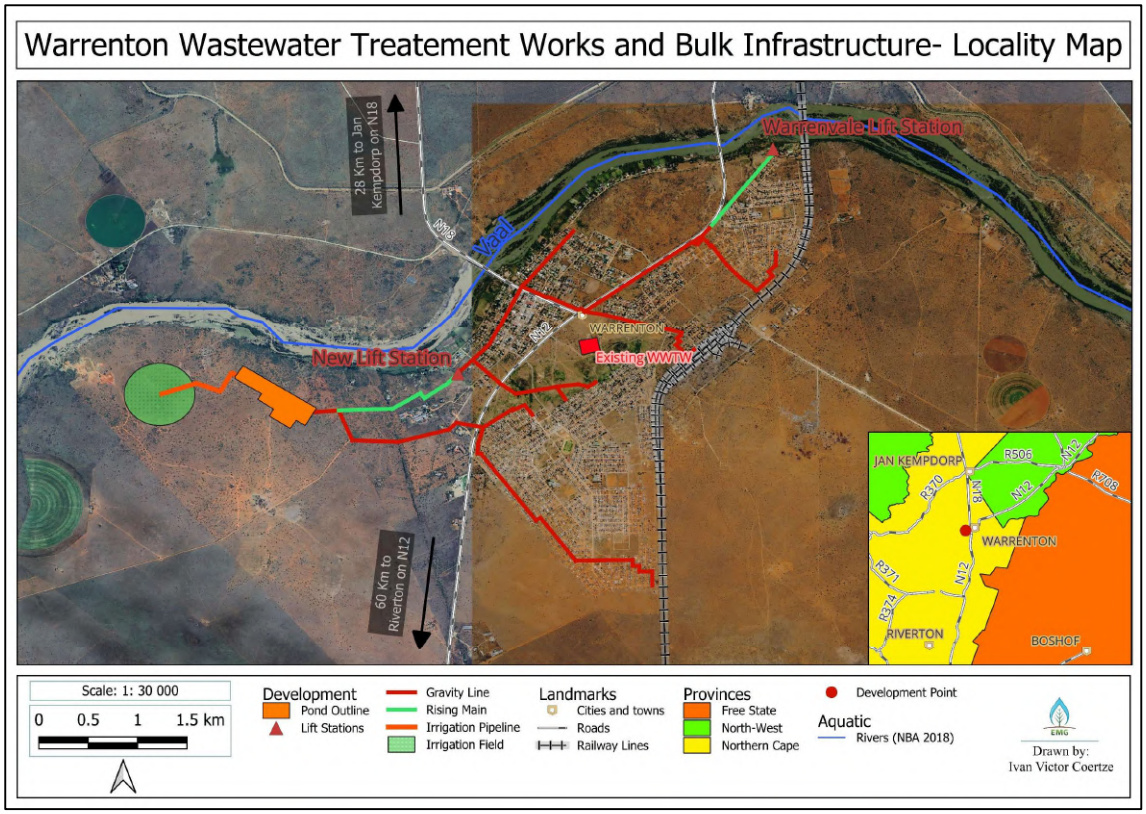


Figure 1 Locality map indicating the new Warrenton WWTW on Portion 7 of farm Doornfontein No 12.

The proposed WWTW will operate as a pond-based treatment system comprising anaerobic, facultative, and maturation ponds for primary and secondary treatment. A polishing stage will be incorporated through constructed reedbeds, after which the treated effluent will undergo a final chlorination process before being reused for irrigation purposes via a pivot irrigation system.

Associated infrastructure includes approximately 18.3 kilometres of new gravity sewer lines, 0.8 kilometres of rising mains, and a new pump station to integrate the towns of Warrenton, Ikhutseng, and Warrenvale into the upgraded treatment system.

Upon successful commissioning of the new WWTW, the existing wastewater treatment facility located within the residential area of Warrenton will be decommissioned and rehabilitated. The decommissioning of the existing facility will be addressed under a separate environmental process and will only commence once the proposed WWTW is fully operational.

The proposed development triggers activities listed under Listing Notices 1, 2, and 3 of the NEMA EIA Regulations, 2014 as amended, and therefore requires a full Scoping and Environmental Impact Assessment process. The project would also require authorisation under the National Water Act (Act No 36 of 1998). Currently the Water Use Authorisation process is underway with the Department of Water and Sanitation.

8.2 PROJECT DETAILS

The proposed development comprises several integrated infrastructure components required to provide a sustainable, long term wastewater management solution for the greater Warrenton area. Each component forms part of a unified system designed to collect, treat, polish, and beneficially reuse municipal wastewater.

8.2.1 NEW WASTEWATER TREATMENT WORKS:

The primary component of the proposed development is the construction of a new Wastewater Treatment Works with a design capacity of 3.2 megalitres per day. The facility will be located on Portion 7 of the farm Doornfontein No. 12, approximately 2 kilometres west of Warrenton.

The proposed WWTW will operate as a pond based biological treatment system. The process design includes sequential anaerobic, facultative, and maturation ponds. These units are designed to progressively reduce organic load, suspended solids, and pathogen concentrations through natural biological processes supported by solar energy and extended hydraulic retention times.

The treatment process will typically include:

- Inlet works incorporating screening and flow control
- Anaerobic ponds for primary breakdown of organic material
- Facultative ponds for further biological stabilisation
- Maturation ponds for pathogen reduction and final treatment
- Constructed reedbeds providing tertiary polishing prior to reuse
- A final disinfection step involving dosing with sodium hypochlorite

The selection of a pond-based system is considered appropriate for the climatic conditions of the Northern Cape, where high solar radiation and evaporation rates support biological treatment processes. The system is mechanically simple, operationally robust, and suitable for municipalities with limited technical maintenance capacity.

The footprint of the WWTW will include pond embankments, internal access roads, monitoring infrastructure, and ancillary structures required for safe operation. Earthworks will be required to construct the pond basins and embankments. The final layout has been designed to optimise gravity flow between treatment units and minimise pumping requirements.

Figure 2: Layout of the proposed new WWTW near Warrenton on Doornfontein No. 12 Portion 7.

8.3 NEW BULK SEWER PIPELINES

The project includes the installation of approximately 18 kilometres of new bulk sewer pipelines, consisting primarily of gravity sewers and a limited length of rising mains where required by topographical constraints.

The bulk sewer network is intended to consolidate wastewater flows from Warrenton, Ikhutseng, and Warrenvale and convey these flows to the new WWTW. The infrastructure will include:

- Excavation of trenches for pipeline installation
- Installation of manholes at regular intervals
- Backfilling and surface reinstatement
- Integration with existing municipal reticulation systems

Where feasible, pipelines will follow existing road reserves or disturbed corridors to minimise environmental disturbance and avoid unnecessary fragmentation of natural areas. Trench excavation will temporarily disturb soil and vegetation along the alignment. These impacts will be localised and temporary in nature, subject to appropriate rehabilitation measures.

Special attention will be required where pipeline crossings intersect watercourses or drainage lines, as these would require authorisation under both NEMA and the NWA.

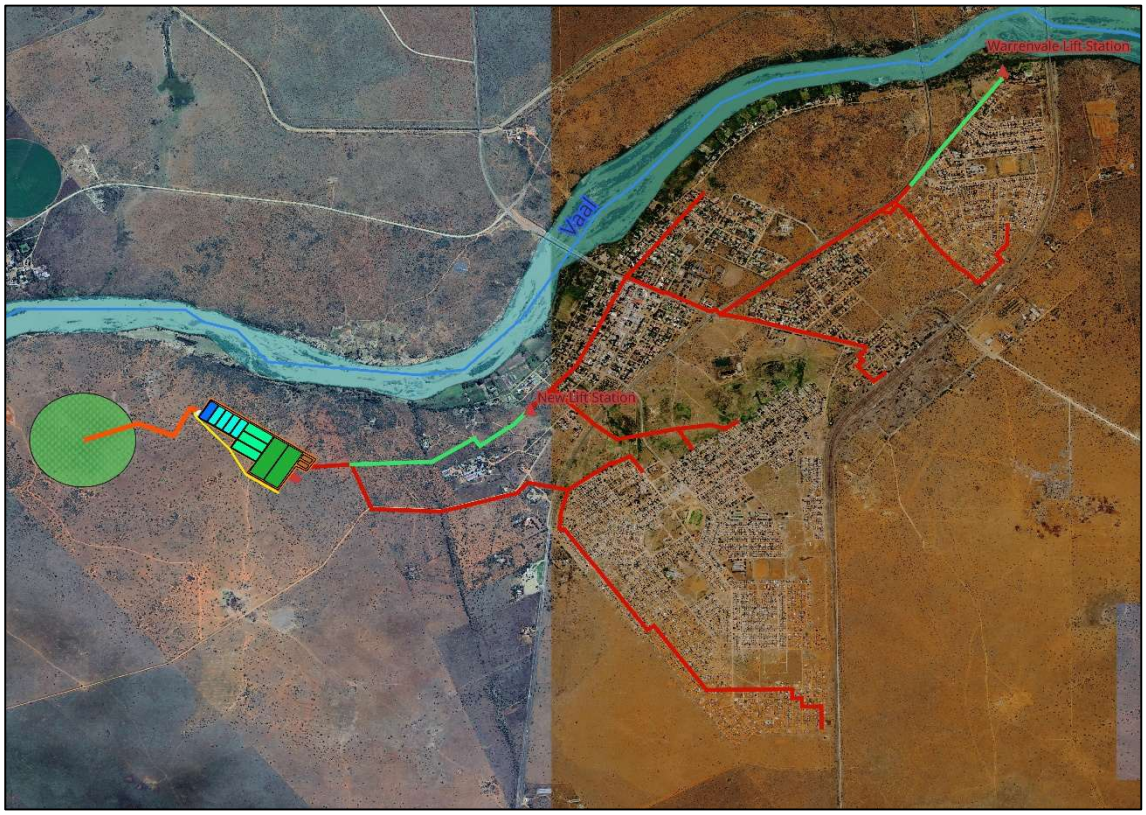


Figure 3: Layout of the Proposed Bulk Infrastructure Associated with the New WWTW. Pump lines are indicated in green, whilst bulk gravity lines are indicated in red.

8.4 NEW LIFT PUMP STATION

Due to topographical constraints within certain parts of the service area, gravity flow alone is not sufficient to convey wastewater to the new WWTW. A new lift pump station will therefore be constructed to elevate wastewater from lower lying areas into the gravity system.

Figure 4: Example of a fenced lift station:

The lift station will comprise:

- Wet well structure
- Submersible pumps
- Rising main connection
- Electrical control panel and backup power provisions
- Access and security infrastructure

The pump station will be designed to accommodate current flows and projected future growth within the municipal service area. The location of the lift station has been selected to optimise hydraulic efficiency while minimising proximity to sensitive receptors.

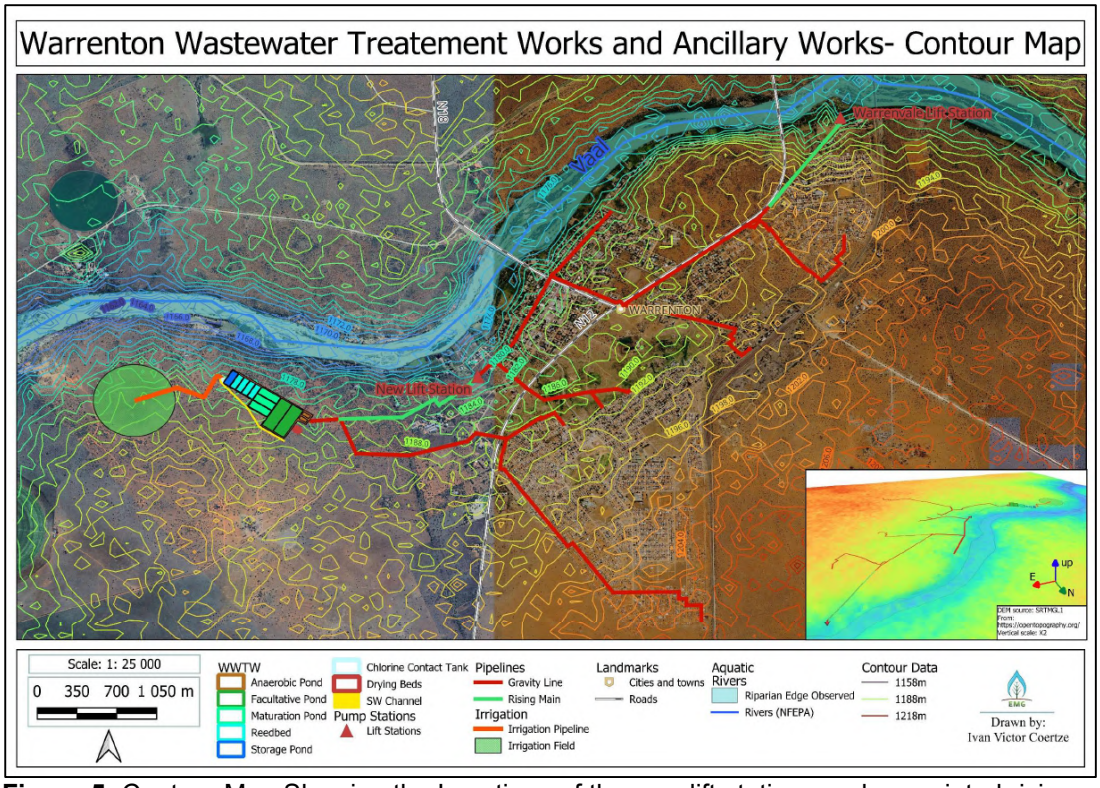


Figure 5: Contour Map Showing the Locations of the new lift stations and associated rising mains.

8.5 REPURPOSING OF EXISTING PIVOT AREA AND IMPLEMENTATION OF TREATED EFFLUENT IRRIGATION SYSTEM

A central component of the proposed development is the beneficial reuse of treated effluent generated by the new Wastewater Treatment Works. As part of an integrated municipal water reuse strategy, the municipality intends to repurpose an existing, currently unused irrigation area located approximately 600 metres southwest of the proposed WWTW for the irrigation of selected grass species.

This initiative supports both environmental compliance objectives and municipal service delivery through practical and sustainable reuse of treated effluent.

8.5.1 STRATEGIC RATIONALE FOR EFFLUENT REUSE

The reuse of treated effluent aligns with national water conservation and demand management principles and supports the objectives of the National Strategy for Water Reuse developed under the National Water Resource Strategy. Rather than discharging treated effluent directly into a water resource, the proposed approach promotes beneficial reuse in a controlled land application system.

The reuse strategy offers the following advantages:

- Reduction in reliance on potable water for irrigation
- Decreased pressure on receiving surface water resources
- Productive use of nutrients contained in treated effluent
- Improved municipal operational efficiency

The proposed reuse system demonstrates a closed loop municipal resource recovery approach, converting wastewater by products into beneficial inputs for land rehabilitation and grass production.

8.5.2 GRASS IRRIGATION FOR MUNICIPAL OPERATIONAL SUPPORT

Several options have been put on the table for possible use in the irrigation system. Kikuyu, Bermuda and ryegrass are potential species proposed for this system. These species were selected based on their adaptability, nutrient uptake capacity, and potential municipal utility.

The irrigated grassland will serve multiple purposes:

Operational Support for Sewer Infrastructure

In certain areas of Warrenton, windblown sand infiltrates sewer manholes and infrastructure, resulting in recurring blockages and maintenance interventions. Establishing grass cover in exposed areas can stabilise soil surfaces and act as a natural barrier against sand movement. This reduces infrastructure damage and operational callouts, particularly in areas adjacent to residential layouts.

Winter Viability

Although Kikuyu grass becomes partially dormant in colder months, perennial and annual ryegrass thrives during winter conditions. Even during periods of reduced growth, controlled application of treated effluent can maintain vegetative cover and prevent soil exposure. This ensures year-round ground stabilisation and reduces erosion and dust generation.

8.5.3 UTILISATION OF SLUDGE AS SOIL AMENDMENT

In addition to effluent irrigation, dewatered sludge generated from the wastewater treatment process may be beneficially applied to irrigated grassland areas, subject to sludge classification and regulatory approval.

Stabilised sludge contains organic matter and essential nutrients that improve soil structure, fertility, and moisture retention. Application of sludge to grassland areas can:

- Enhance grass growth and resilience
- Improve microbial activity and soil health
- Provide a compliant and cost-effective sludge management route

Application rates will be monitored to comply with Department of Water and Sanitation sludge management guidelines and to avoid nutrient accumulation or environmental risk.

8.5.4 PROPOSED IRRIGATION INFRASTRUCTURE

The irrigation system will operate through gravity fed infrastructure where feasible. A 110-millimetre diameter uPVC main pipeline will convey disinfected effluent from a storage sump that functions as a balancing reservoir.

8.5.4.1 Currently proposed methodology

Due to the relatively short distance and gentle slope between the WWTW and irrigation area, gravity flow can be utilised to minimise energy requirements. One potential method to utilise this is through the employment of a self-propelled crawling irrigator.

These types of self-propelled crawling irrigator systems would typically operate by utilising water pressure from the WWTW sump pump and turning it into mechanical horizontal movement. The crawling irrigator is particularly suited to rural and semi urban municipalities with limited technical maintenance capacity. It provides a cost effective and robust mechanism for distributing treated effluent across large, grassed areas which makes it an attractive potential method of irrigation.

Figure 6: Example of a self-propelled crawling irrigator which may be utilised.

9 IN THE INCIDENCE OF DEVIATION FROM APPROVED SCOPING REPORT

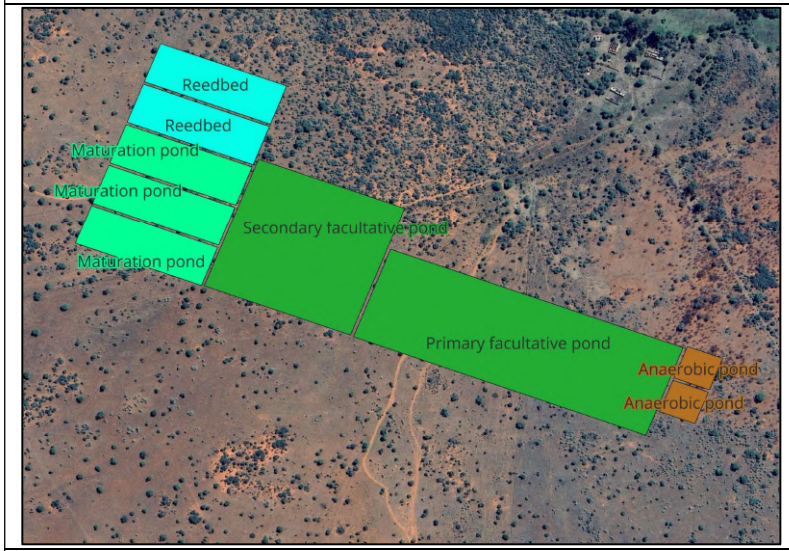
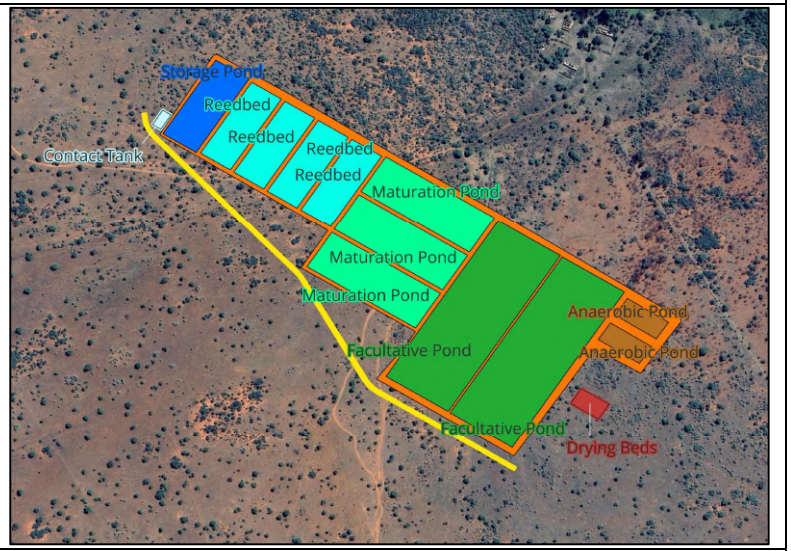
9.1 NATURE AND SCOPE OF DEVIATION

According to Appendix 3 s3(1)(u):

"an indication of any deviation from the approved scoping report, including the plan of study, including-
(i) any deviation from the methodology used in determining the significance of potential environmental impacts and risks; and
(ii) a motivation for the deviation;"

Subsequent to the submission and acceptance of the Final Scoping Report 2 April 2026 (NC/BA/01/FB/MAG/WAR1/2026), there have been two minor alterations to the layout as explicated in the scoping report. This pertains to the WWTW configuration as well as the sewer network.

Table 2: The layout of the proposed development as articulated in the Final Scoping Report and the deviations thereto.

WWTW Configuration:	
Previous layout configuration	**Updated layout configuration**
	
The layout of the WWTW as articulated in the Final Scoping Report.	The updated finalised layout of the WWTW as articulated in the design report.
Discussion: The overall location of the proposed WWTW as well as the anticipated surface area remains largely unchanged. The changes to the configuration of the WWTW entails an orientation change of some of the pond structures, the addition of the two horizontal flow reed beds, a chlorine contact tank and storage pond. While not technically an alteration to the original layout, the storage location of the drying beds has also been finalised since the submission of the Final Scoping report. Additionally, it is proposed to construct a stormwater channel in a South-East to North-Westerly direction. **Net Risk:** The engineering problem which the amended configuration, as well as the stormwater channel proposes to solve entails further enhancing the projected treated water quality through the addition of the two reed horizontal reed beds. This is	

anticipated to reduce the organic load (and thus chemical oxygen demand), suspended solids and nitrogen even further than initially projected.

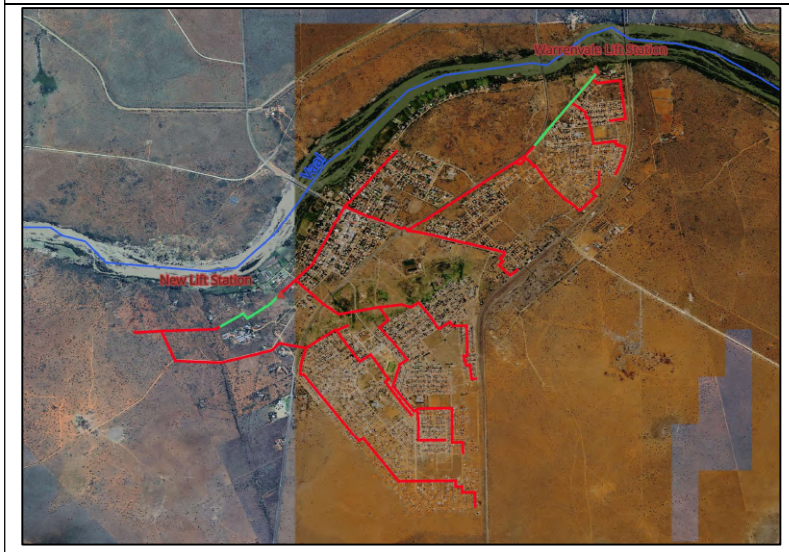
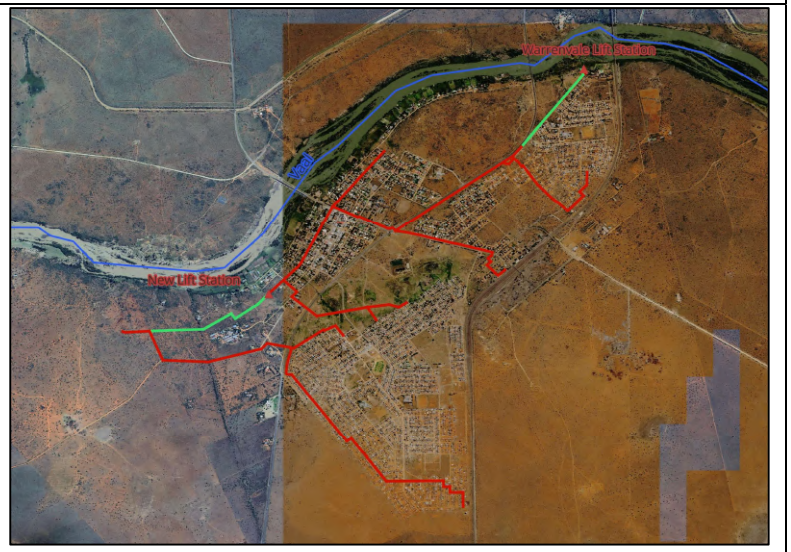
The addition of a chlorine contact tank adds a final disinfection step in which the faecal coliform is further reduced to what was initially projected in the scoping report.

The stormwater channel is designed to ensure that surface runoff during rainfall events does not enter into the WWTW and is instead conveyed around it, adhering to the principle of ensuring that clean water and dirty water is always kept separate.

As the treated effluent is anticipated to be utilised for irrigation, the **net risk** of the new configuration is thus anticipated to be **lower** (ie, the updated configuration presents fewer risks). There is no significantly greater surface area disturbed and cleared of vegetation seeing as the surface area has been conserved in the amended configuration.

There are no new inherent risks proposed to the new configuration associated with site as the same site will be utilised (28° 7' 18" S, 24° 49' 20" E).

Bulk Infrastructure:

Previous layout- overall configuration	Updated layout- overall configuration
	
The layout of the bulk infrastructure as articulated in the Design Report.	The updated finalised layout of the bulk infrastructure.

Discussion:

The initial layout of the bulk infrastructure is anticipated to comprise of approximately 26km of pipelines. In both the initially planned layout as well as the amended layout the sewer network would comprise of gravity mains and rising mains, in a configuration in which gravitation is utilised as far possible for the conveyance of sewage to reduce, maintenance requirements in terms of both cost and complexity. This approach would further replace the need for the utilisation of more complicated technologies which tend to be more prone to failure and more difficult and costly to maintain. The updated layout, however, would entail less extensive pipework utilising approximately 18km of pipe. There are no new areas implicated in the amended layout compared to the original layout, instead areas identified for laying pipes was rather excluded from the proposed development scope in the updated layout.

Net Risk:

As both the initial and updated configuration of pipes are anticipated to be positioned largely in the servitudes of existing roads. As the entirety of the difference in configuration is limited to only those areas in which the pipes are proposed to be laid in the servitudes of existing roads, it is **not anticipated** that there should be **any significant net risk** either detrimentally or beneficially to the reduced updated layout.

Previous layout- Masjid Cemetery	**Updated layout- Masjid Cemetery**
	
The layout of the bulk infrastructure as articulated in the Design Report.	The updated finalised layout of the bulk infrastructure.

Discussion:

In the Phase 1 Palaeontological and Archaeological Assessment, a cemetery associated with the Masjid was noted to be potentially affected by the proposed development. Given the inherent risk associated with the cemetery, it was recommended that an alternative layout be pursued, should construction activities encroach on the cemetery. Upon a further site inspection to determine the viability of suitable buffer areas it was determined that the presence of numerous graves situated in close proximity to the proposed layout not in configuration with other easily distinguishable graves renders a clear delineation of the cemetery impossible. As such, it could not be definitively determined whether a buffer

area that permits sufficient area for construction activities and vehicle movement would be possible. Accordingly, an alternative layout was pursued and agreed upon by the engineers.

Net Risk:

As the updated layout thoroughly avoids all identified heritage resources by diverting to another road entirely. Furthermore, the updated layout entails a greater distance of pipeline being routed to the existing gravel roads. The impacts on both heritage resources and vegetation (albeit admittedly deteriorated already) entails a **lower net risk**.

Previous layout- Row of Houses	**Updated layout- Row of Houses**
	
The layout of the bulk infrastructure as articulated in the Design Report.	The updated finalised layout of the bulk infrastructure.

Discussion:

One stretch of pipeline extending into Ikhutseng which initially had the potential to directly impact 24 properties was slightly redirected further West overlapping an existing gravel road instead. Initially construction activities would entail minimally destruction to fencelines and maximally destruction to property requiring temporary rehousing. Given the risks to property and livelihoods as well as the costs associated with compensation an alternative layout was sought. The alternative layout

which was confirmed by the consulting engineers entailed that the pipeline would be redirected further Westward overlapping a gravel road. This would be entail that the development footprint is accessible without need for any foreseeable damages to property.

Net Risk:

Given that the minor realignment entails that the initially impacted properties would no longer be foreseeably impacted constitutes a **lower net risk.**

Previous layout- Two Houses in Ikhutseng	**Updated layout- Two Houses in Ikhutseng**
	
The layout of the bulk infrastructure as articulated in the Design Report.	The updated finalised layout of the bulk infrastructure.

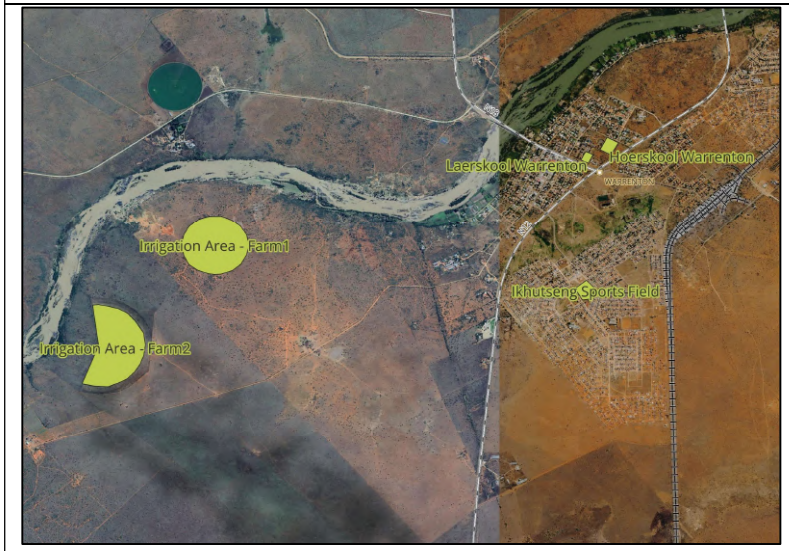
Discussion:

In the assessment of viable alternative routes which would not compromise on addressing the social-environmental problem which the proposed development aims to address, it was found that at least two houses would still be passed in very close proximity. While the layout would initially transect the buildings entirely, a minor readjustment ensures that the potential of property damages is minimised as far as possible. Further inevitable risks will be mitigated through the

EMPr. Communication will be maintained with the property owners and any risks associated with construction activities communicated to them. A Community Liaison Officer (CLO) will be utilised for community engagement to ensure that any impacted community member's interests are represented.

Net Risk:

While there is still some inherent net risk, given the unavoidable proximity to the two houses in Ikhutseng, the minor redirection of the pipeline entails a **lower net risk**.



The layout of the WWTW as articulated in the Final Scoping Report.

The updated finalised layout of the bulk infrastructure as articulated in the design report.

Discussion:

Numerous potential areas were identified for the utilisation and safe disposal of the finally treated effluent which included two pivot circles, the Ikhutseng sports field, Warrenton Laerskool sports grounds and Warrenton Hoërskool sports ground. Each of the respective sports fields would require its own respective mechanism of conveying the treated effluent to the various locations. One such possibility was to entail an additional network of pipelines from the WWTW to the various locations. After an assessment of projected volumes, rainfall rates, evapotranspiration rates and water usage by different

crops, it was determined that the volume produced by the WWTW could be safely absorbed by a single crop circle in close proximity to the proposed location for the new WWTW. This would entail the benefit of simplicity, short conveyance routes and easy monitoring which holistically reduces the environmental and societal risk compared to conveying the treated wastewater to the different locations around Warrenton. As proposed in section 8.5.2: Grass Irrigation for Municipal Operational Support the irrigated grass is proposed to be transplanted throughout the municipality. This gives an additional safeguard in allowing inspection before relocation and usage, which would not be possible in the initially proposed sports grounds.

Net Risk:

As the amended option poses greater simplicity, shorter conveyance routes between the WWTW and destination, fewer areas to inspect and monitor and also allows for the option of additional inspection between irrigation of grasses grown and utilisation thereof it is anticipated that the **net risk** will be **lower.**

10 LEGISLATIVE CONTEXT

10.1 INTRODUCTION

According to Appendix 3 s3(1)(d)(i) and s3(1)(e):

"3(1) An environmental impact assessment report must contain the information that is necessary for the competent authority to consider and come to a decision on the application, and must include-

(d) a description of the scope of the proposed activity, including-
(i) all listed and specified activities triggered and being applied for;
(e) a description of the policy and legislative context within which the development is located and an explanation of how the proposed development complies with and responds to the legislation and policy context;"

The proposed development is subject to various legislative requisites in relationship with the South African environmental legislation. This section provides a brief overview of relevant legislation and their applicability to the proposed development. The proposed development's construction and operation must adhere to all applicable legal requirements pertaining to environmental management. The following acts and policies and their relevance to the proposed development are briefly summarised (amendments were used where required):

- National Environmental Management Act (Act 107 of 1998)
- The Constitution of the Republic of South Africa Act, 1996 (Act 108 of 1996)
- The National Water Act, 1998 (Act 36 of 1998)
- National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
- National Environmental Management: Air Quality Act (Act 39 of 2004)
- The National Heritage Resources Act (Act 25 of 1999)
- National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
- National Environmental Management Protected Act (Act 57 of 2003)
- Environmental Conservation Act, (Act 73 of 1989)
- The Spatial Planning and Land-Use Management Act (Act 16 of 2013)
- Hazardous Substances Act (Act 15 of 1973)
- Disaster Management Act (Act 57 of 2002)
- Occupational Health and Safety Act (Act 85 of 1993)
- Basic Conditions of Employment Act (Act 75 of 1997)
- The Conservation of Agricultural Resources Act (Act 43 of 1983)
- The Northern Cape Nature Conservation Act (Act 9 of 2009)

10.2. NATIONAL ENVIRONMENTAL MANAGEMENT ACT 1998 (ACT 107 OF 1998), AS AMENDED

The National Environmental Management Act (NEMA), 1998 (Act No. 107 of 1998, as amended) facilitates cooperative environmental governance in South Africa. This Act establishes foundational principles guiding environmental decision-making, promoting cooperative governance, and implementing procedures for harmonizing the responsibilities of state organs in environmental matters. It seeks to balance the need for development with environmental protection through a regulated framework that integrates environmental considerations into various stages of development projects.

Under NEMA, Integrated Environmental Management (IEM) serves as a guiding philosophy ensuring that environmental impacts are fully considered in all phases of project development. This approach emphasizes a balance between conservation and development, supporting sustainable, socially, and environmentally responsible decision-making.

10.1.1 NEMA LISTING NOTICES

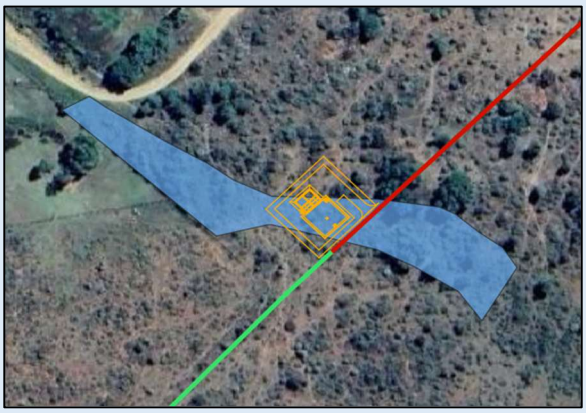
Under sections 24(2), 24(5), 24(D) and 44 of NEMA, the minister (or MEC with the approval of the minister) may identify and publish activities listed under specific regulatory notices. These inform whether developments require either a Basic Assessment Report (BAR) (per GN R327 and 324 of 2014, as amended in GN R517 in 2021) or a more comprehensive Scoping and Environmental Impact Assessment (per GN R 325 of 2014, as amended in GN R 517 in 2021). Specifically, those presented in table 4 below.

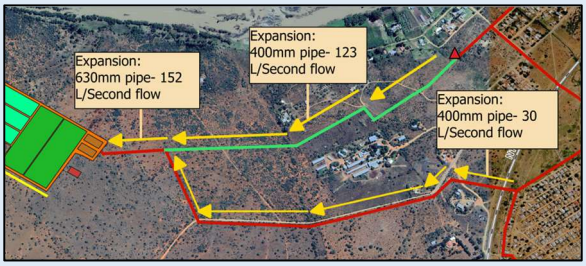
Table 3 EIA Regulation notices as published under NEMA

Government Notice:		
Government Notice R 327 in Government Gazette No. 38282 (2014), as amended in GN R 517 on 11 June 2021.	**Listing Notice 1**	Identifies those activities identified in GNR 983 in Government Gazette No. 38282 of 4 December 2014 as amended in GN R 517 in GG 44701 of 11 June 2021, for which a basic assessment ("BA") must be undertaken by the procedure set out in sections 19 and 20 in GN R. 982 in GG 38282 of 4 December, as amended in GN R. 517 of 11 June 2021.
Government Notice R 545 in Government Gazette No. 3306 (2010), as amended in GN R 517 on 11 June 2021.	**Listing Notice 2**	Identifies those activities for which a scoping and environmental impact reporting ("S&EIR") must be undertaken in accordance with the procedure set out in in sections 20 to 24 in GNR 326 in Government Gazette No. 40772 of 07 April 2017 ("GNR 326").
Government Notice R 324 in Government Gazette No. 38282 (2014), as amended in GN R 517 on 11 June 2021.	**Listing Notice 3**	Identifies those activities Identifies those activities identified in GNR 985 in Government Gazette No. 38282 of 4 December 2014 as amended in GN R 517 in GG 44701 of 11 June 2021, within specific geographical areas for which a BA must be undertaken in accordance with the procedure set out in sections 19 and 20 in GN R. 982 in GG 38282 of 4 December, as amended in GN R. 517 of 11 June 2021.

10.1.2 NEMA LISTED ACTIVITIES

Listed Activity No.	**Listed Activity Description**	**Relevance to the Project**
Listing Notice 1 (GN R 983, 4 December 2014 as amended by GN R 517 of 2021)		
19	*The infilling or depositing of any material of more than 10 cubic metres into, or the dredging,*	The construction of the sewer network and associated infrastructure will involve the excavation and backfilling via trenches

	excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.	where the infrastructure crosses a small drainage line. The largest portion of excavation here will be required for the instalment of the internal underground sump tank associated with the low lift pump station. Here it is anticipated that a material volume ranging between than 500 m^3 – 600 m^3 is going to be excavated from the watercourse. See below screenshot for illustration.  Refer to maps (Appendix 2) for a larger view.
12 (ii)(a)(c)	*The development of —* *(ii) infrastructure or structures with a physical footprint of 100 square metres or more;* *where such development occurs—* *(a) within a watercourse;* *(c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse;*	The following infrastructure will have to be built within a small drainage line: - A portion of the incoming gravity sewer line - The new lift pump station - A portion of the outgoing rising main sewer line The fenced-up area of the pumpstation is roughly 680 m^2, whilst the actual physical building footprint will be around 200m^2. Equating for pipeline infrastructure and the underground sump, the total anticipated infrastructure surface area will range between 700-800m^2.
25	*The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.*	The new Warrenton WWTW is designed to treat 3.2Ml of raw sewerage per day.

28 (ii)	*Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development:* *(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare;*	The proposed development entails the construction of a new Wastewater Treatment Works on Portion 7 of the farm Doornfontein No. 12. The property is currently zoned for agricultural purposes and is situated outside the defined urban edge of Warrenton. The land has historically been used for agricultural activities. A Wastewater Treatment Works constitutes as industrial infrastructure, as it is designed for the treatment and management of municipal sewage at a significant operational scale. The proposed facility will occupy approximately 19 hectares, which exceeds the 1-hectare threshold prescribed under this activity.
46 (i)(ii)(a)(b)	*The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure—* *3. has an internal diameter of 0,36 metres or more; or* *4. has a peak throughput of 120 litres per second or more; and* *(c) where the facility or infrastructure is expanded by more than 1 000 metres in length; or* *(d) where the throughput capacity of the facility or infrastructure will be increased by 10% or more;*	Although the majority of the proposed development entails the construction of new bulk sewer infrastructure, certain components involve the upgrade and expansion of sections of the existing municipal sewer network within Warrenton. These upgrades include extensions branching from the existing sewer system, as well as the replacement or upsizing of existing pipelines. In several instances, the proposed internal pipe diameter will be 0.36 metres or greater, and in some cases both the internal diameter and the design flow capacity will exceed the applicable thresholds prescribed in the relevant Listing Notices.  Refer to maps (Appendix 2) for a larger view. The figure above identifies some of those sections of the existing sewer network where expansions are proposed, and where the resulting internal pipe diameter and or flow

		rate exceed the prescribed thresholds under the EIA Regulations. These sections are therefore considered to trigger the applicable listed activities.
Listing Notice 2 (GN R 985, 4 December 2014 as amended by GN R 517 of 2021)		
15	*The clearance of an area of 20 hectares or more of indigenous vegetation.*	Two components of the proposed development will require vegetation clearance, namely the repurposed pivot irrigation area of approximately 42 hectares and the new WWTW footprint of approximately 19 hectares. Although the pivot area was historically cultivated, it has remained fallow for more than ten years and has naturally regenerated, thereby constituting indigenous vegetation in terms of DFFE definitions. The combined clearance area exceeds 20 hectares, triggering the applicable listed activity under the EIA Regulations.
Listing Notice 3 (GN R 985, 4 December 2014 as amended by GN R 517 of 2021)		
12 (g) (ii)	*The clearance of an area of 300 square metres or more of indigenous vegetation…* *(g) Northern Cape* *(ii) Within critical biodiversity areas identified in bioregional plans*	The majority of the newly proposed WWTW is located within a CBA 1 area as per the Northern Cape Spatial Biodiversity Plan 2024. Seeing that the WWTW will require a clearance area of approximate 19 ha, this listing notice will be triggered.

10.2 CONSTITUTION OF THE REPUBILIC OF SOUTH AFRICA

The constitution of any country is the supreme law of that country. The Bill of Rights in Chapter 2 Section 24 of the Constitution of South Africa Act (Act No. 108 of 1996) makes provisions for environmental issues and declares that

"Everyone has the right -
a) to an environment that is not harmful to their health or well-being; and
b) to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:
i. prevent pollution and ecological degradation;
ii. promote conservation; and
iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development".

Relevance to the proposed development:

Section 24 of the Constitution guarantees the right to an environment that is not harmful to health or wellbeing and requires reasonable measures to prevent pollution and promote sustainable development.

The proposed Warrenton Wastewater Treatment Works supports this constitutional mandate by improving wastewater treatment capacity, protecting water resources from contamination, and safeguarding public health. The Scoping and EIA process further ensures that environmental impacts are properly assessed and mitigated in line with constitutional principles of sustainable development. Furthermore, the job creation involved in particularly the construction phase of the development in line with sustainable development considerations will entail the promotion of justifiable economic and social development.

10.3 NATIONAL WATER ACT, 1998 (ACT 36 OF 1998):

The National Water Act (NWA, Act 36 of 1998) administered by DWS aims to manage and protect the national water act resources to achieve sustainable water use for the benefit of all water users. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, and managed in ways that consider:

- Promoting equitable access to water;
- Redressing the results of past racial discrimination;
- Promoting the efficient, sustainable, and beneficial use of water in the public interest;
- Facilitating social and economic development;
- Providing for the growing demand water use;
- Protecting aquatic and associated ecosystems their biological diversity;
- Reducing and preventing pollution and degradation of water resources;
- Meeting international obligations;
- Promoting dam safety; and
- Managing floods and drought.

Section 21 of the NWA sets out water uses that may require registration or licencing. In terms of the NWA, water uses include any activity involving the following:

a) Taking water from a water resource.
b) Storing water.
c) Impeding or diverting the flow of water in a watercourse.
d) Engaging in a stream flow reduction activity contemplated in section 36.
e) Engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).
f) Discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.
g) Disposing of waste in a manner which may detrimentally impact on a water resource.
h) Disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
i) Altering the bed, banks, course or characteristics of a watercourse.
j) Removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
k) Using water for recreational purposes.

Section 39 of the NWA outlines a procedure that enables the responsible authority to allow specific water uses by publishing a GA in the Gazette. A GA can be restricted to a specific water resource, a category of persons, a defined geographical area for a period of time.

Relevance to the proposed development:

The proposed Warrenton WWTW and associated sewer infrastructure will involve water uses as defined in Section 21 of the NWA, including:

- Section 21(c) Impeding or diverting the flow of water in a watercourse
- Section 21(i): Alteration of watercourses during pipeline crossings and construction within the regulated area of the Vaal River and its tributaries.
- Section 21(g) Disposing of waste in a manner which may detrimentally impact on a water resource
- Section 21(f): Discharge of treated effluent for irrigation reuse.
- Section 21 (e) Engaging in a controlled activity.

A Water Use Licence (WUL) application has been submitted to the DWS to authorise these water uses. The WUL process is running concurrently with the Environmental Impact Assessment (EIA) process, and any conditions imposed by the WUL will be integrated into the project's Environmental Management Programme (EMPr) to ensure compliance and sustainable water resource management. The project's commitment to effluent reuse for agricultural irrigation aligns with the NWA's objectives of promoting beneficial water use and reducing pollution of water resources

10.4 NATIONAL ENVIRONMENTAL MANAGEMENT: WASTE ACT, 2008 (ACT 59 OF 2008), AS AMENDED:

The National Environmental Management: Waste Act (NEM:WA, Act 59 of 2008) aims to reform the law regulating waste management to protect health and the environment. This is achieved by:

- Providing reasonable measures for the prevention of pollution, ecological degradation and, securing ecologically sustainable development;
- providing for the national norms and standards for regulating the management of waste by all spheres of government;
- providing for specific waste management measures;
- providing for the licensing and control of waste management activities;
- providing for the remediation of contaminated land;
- providing for the national waste information system; and
- providing for compliance and enforcement thereof.

The NEM:WA indicates that certain waste management activities must be licensed, and according to Section 44 of the Act, the licensing procedure must be integrated with an environmental impact assessment process per the EIA Regulations promulgated in terms of the NEMA. Government Notice 921 as amended, published in Government Gazette No. 37083, on 29 November 2013, lists the waste management activities that require licensing. A distinction is made between Category A waste management activities, which require a Basic Assessment, and Category B waste management activities, which require the S&EIr process to be followed. For Category C activities, operators are not required to obtain a formal waste management license but must comply with specific norms and standards set by the Minister. These standards provide detailed guidelines to ensure that waste management activities are

conducted in an environmentally responsible manner without the need for a full licensing process.

Relevance to the proposed development:

The construction and operation of the proposed Warrenton WWTW will involve waste management activities regulated under NEMWA. The primary waste stream will be sewage sludge generated from the treatment process. The handling, storage, drying, and potential beneficial reuse of this sludge must comply with the Waste Classification and Management Regulations (GNR 634). The sludge will be classified according to SANS 10234. If the dried sludge is reused off-site as a soil conditioner, its management must adhere to the General Duty of Care provisions of the Act.

Construction activities will also generate typical construction and demolition waste (e.g., packaging, excess soil, concrete). Furthermore, operational activities will involve the use and potential disposal of certain hazardous substances (e.g., laboratory chemicals, maintenance oils).

The project's Environmental Management Programme (EMPr) will incorporate a detailed Sludge Management Plan and Construction & Operational Waste Management Plan. These plans will ensure compliance with NEMWA through measures such as on-site sludge drying and conditioning, waste minimization, segregation, and disposal via licensed service providers where required. The integration of waste management planning into the EMPr fulfils the requirement for a coordinated approach as envisaged by Section 44 of NEMWA within the EIA process

10.5 NATIONAL ENVIRONMENTAL MANAGEMENT: AIR QUALITY ACT (ACT 39 OF 2004)

The National Environmental Management: Air Quality Act (NEM: AQA, Act 39 of 2004) was enacted to protect and improve air quality across South Africa to promote sustainable development and safeguard public health and well-being. The Act provides a framework for monitoring, managing, and mitigating air pollution by setting air quality standards, regulating emissions, and overseeing activities that could impact air quality. "*The objective of the act is* –

(a) To protect the environment by providing reasonable measures for-
  (i) The protection and enhancement of the quality of air in the Republic;
  (ii) The prevention of air pollution and ecological degradation; and
  (iii) Securing ecologically sustainable development while promoting justifiable economic and social development; and
(b) Generally, to give effect to Section24(b) of the constitution in order to enhance the quality of ambient air for the sake of securing an environment that is not harmful to the health and well-being of people."

Key components of the legislation encompass robust control measures aimed at reducing pollution, the adoption of cleaner technologies, and the implementation of cleaner production practices to manage industrial emissions effectively. This Act is applicable to the entire landmass of South Africa and extends to its exclusive economic zone and continental shelf, which underscores a collective governmental responsibility at all levels.

The legislation delineates various strategies to attain its objectives, which include establishing National Ambient Air Quality Standards, setting emission standards for designated activities,

and implementing control measures for specific emission sources identified as "controlled emitters" and "controlled fuels." Essential planning and management tools include the designation of "priority areas" that exhibit significant air quality concerns, the necessitation of pollution prevention plans, and the requirement for atmospheric impact assessments. Additional protective measures address issues related to dust, noise, and odour control, and mandate the rehabilitation of mining areas to mitigate pollution.

Relevance to the proposed development:

The proposed Warrenton WWTW will utilise a passive, pond-based biological treatment system. This process does not involve the combustion of fuel or high-temperature thermal processes that are typically associated with listed activities under NEMAQA requiring an Atmospheric Emission Licence (AEL). The proposed activities do not trigger any listed activities in GN 37054.

The primary air quality consideration for this facility is the potential generation of odours, particularly from the anaerobic ponds, which is regulated under Section 29 of NEMAQA. The project has a duty to prevent the generation of offensive odours that constitute air pollution or a nuisance. The selected pond-and-reedbed technology, along with careful design considerations (including buffer distance from residential areas), is intended to minimise odour generation.

Standard mitigation and operational management measures to control potential odour will be prescribed within the Environmental Management Programme (EMPr) for the operational phase. Furthermore, the anaerobic biological processes will generate methane (CH_4), a potent greenhouse gas, the management of which will also be addressed through the EMPr. During construction, standard dust and vehicle emission control measures will be implemented as part of the site management plan.

10.6 NATIONAL HERITAGE RESOURCES ACT (ACT 25 OF 1999):

The National Heritage Resources Act (NHRA, Act 25 of 1999) introduces an integrated and interactive system for managing national heritage resources. The NHRA also includes landscapes and natural features of cultural significance as heritage resources.

Section 38 of the NHRA indicates that *"any person who intends to undertake a development categorised as-*

a) the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300 m in length;
b) the construction of a bridge or similar structure exceeding 50 m in length;
c) any development or other activity which will change the character of the site –
    i). exceeding 5000 m^2 in extent, or
    ii). involving three or more erven or subdivisions thereof; or
    iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    iv). the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
d) the costs of which will exceed a sum set in terms of regulations by SAHRA, or a provincial resources authority;
e) any other category of development provided for in regulations by SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating

such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development."

Relevance to the proposed development:

The proposed site is located within 2 kilometres of a registered Grade II Provincial Heritage Site. In accordance with the NHRA and the associated regulations, a Heritage Impact Assessment (HIA) has been conducted as a specialist study within this EIA process. This assessment evaluated potential impacts on both tangible and intangible heritage resources and recommended appropriate mitigation measures.

10.7 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 OF 2004):

National Environmental Management Biodiversity Act, 2004 (NEMBA, Act No. 10 of 2004): The Biodiversity Act provides for the conservation and management of South Africa's biodiversity. It has been developed in alignment with NEMA for the conservation of species and ecosystems that warrant national protection, sustainable use of indigenous biological resources and fair and equitable sharing of benefits arising from bioprospecting involving indigenous biological resources. By recognising that biodiversity conservation must also occur outside of protected areas, the Biodiversity Act introduces tools including:

- Development of a National Biodiversity Framework (NBF)
- Development and publishing of bioregional plans to map and identify Critical Biodiversity Areas (CBAs); and provide guidelines for land-use planning and decision-making in these areas.
- Development and publishing of Biodiversity Management Plans (BMP) for an ecosystem, an indigenous species, or a migratory species.
- Publishing of threatened ecosystems and species in the Government Gazette, and the requirement for permits for carrying out a restricted activity involving a threatened species.
- Prevention of the spread, and eradication of, invasive alien species.

10.7.1 THREATENED OR PROTECTED ECOSYSTEMS AND SPECIES(TOPS):

NEM:BA states that biodiversity loss through habitat loss, degradation or fragmentation must be avoided, minimised, or remedied. The loss of biodiversity includes the loss of threatened or protected species and the loss of localised endemics. Chapter 4 of the NEM:BA deals with threatened or protected ecosystems and species, and its purpose is *"to—*

a) *provide for the protection of ecosystems that are threatened or in need of protection to ensure the maintenance of their ecological integrity;*
b) *provide for the protection of species that are threatened or in need of protection to ensure their survival in the wild;*
c) *give effect to the Republic's obligations under international agreements regulating international trade in specimens of endangered species; and*
d) *ensure that the utilisation of biodiversity is managed in an ecologically sustainable way."*

Aspects concerning the loss of biodiversity through the loss of localised endemics, the loss of localised species diversity, the loss of ecological functions which support biodiversity are discussed in the ecological assessment report.

10.7.2 BIOREGIONAL SPATIAL PLANNING:

CBA Maps are provided with formal legal status through the National Environmental Management: Biodiversity Act (Act 10 of 2004), which introduced several new legislative tools to assist with conserving and managing South Africa's biodiversity. One of these is the declaration of "bioregions" and the publication of bioregional plans. Guidelines for the development of bioregional plans were developed by SANBI at DFFE's (then DEA) request and were published in the Government Gazette in 2009 as the "*Guideline regarding the determination of bioregions and the preparation and publication of bioregional plans*", referred to for short as the Guideline for Bioregional Plans (DFFE, 2009).

According to the Guideline for Bioregional Plans, the purpose of a bioregional plan is to provide a map of CBAs and ESAs with accompanying land-use guidelines, to inform land-use planning, environmental assessment and authorisations, and natural resource management by a range of sectors whose policies and decisions impact on biodiversity. A CBA Map is thus the core component of a bioregional plan. See below a summary of conceptual framework for CBA maps.

Table 5: Conceptual framework for CBA maps.

Map category	Landscape-level purpose	Broad management objective
Protected areas	Formal long-term protection for important biodiversity and landscape features. Together with CBAs, ensures that a viable representative sample of all ecosystem types and species can persist.	Must stay in largely natural ecological condition. Details determined by the management plan that is required for each protected area.
CBA: Critical Biodiversity Areas	Together with protected areas, ensures that a viable representative sample of all ecosystem types and species can persist.	Must stay in largely natural ecological condition.
ESA: Ecological Support Areas	Ensures the long-term ecological functioning of the landscape as a whole.	Must retain ecological processes, which often requires at least semi-natural ecological condition.
ONA: Other Natural Areas	Allows for range of other land uses, including intensive land uses.	Determined by other spatial planning tools (e.g. SDFs).
NNR: Areas with No Natural Habitat Remaining	Areas already severely or irreversibly modified by intensive land uses.	Determined by other spatial planning tools (e.g. SDFs).

10.7.3 ALIEN AND INVASIVE SPECIES (AIS):

The Alien and Invasive Species Lists are promulgated under the NEMBA with the aim of protecting indigenous biodiversity. Declared invasive species in South Africa are categorised as follows and require control or removal:

- **Category 1a Listed Invasive Species:** Species that must be combated or eradicated. Any form of trade or planting is prohibited.
- **Category 1b Listed Invasive Species:** Species that must be controlled. They may not be owned, moved, or planted.
- **Category 2 Listed Invasive Species:** Species that require a permit to carry out a restricted activity within a specified area.
- **Category 3 Listed Invasive Species:** Species that are subject to exemptions and prohibitions as specified in the Notice.

Relevance to the proposed development:

Several biologically focused specialist studies have been conducted to assess the potential environmental impacts resulting from the proposed development. These include a:

- Wetland Assessment, and a
- Site sensitivity and terrestrial ecological assessment report

These assessments are integral to the EIA process and are designed to provide relevant mitigation measures aimed at reducing the overall environmental impact. The detailed findings of these studies can be found in **will be presented in the EIA phase.**

The proponent is responsible for ensuring the implementation of low-impact development practices, managing flora removal, and obtaining the necessary permits for plant relocation and removal.

10.8 NATIONAL ENVIRONMENTAL MANAGEMENT PROTECTED AREAS ACT, 2003 (ACT 57 OF 2003)

The National Environmental Management: Protected Areas Act (NEMPAA , Act 57 of 2003) serves to: *"provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascape; for the establishment of a national register of all national, provincial and local protected areas; for the management of those areas in accordance with national norms and standards; for intergovernmental co-operation and public consultation in matters concerning protected areas; for the continued existence, governance and functions of South African National Parks; and for matters in connection therewith."*

The objectives of this Act are –

a) to provide, within the framework of national legislation, including the National Environmental Management Act, for the declaration and management of protected areas;
b) to provide for co-operative governance in the declaration and management of protected areas;
c) to effect a national system of protected areas in South Africa as part of a strategy to manage and conserve its biodiversity;
d) to provide for a diverse and representative network of protected areas on state land, private land, communal land and marine water;
e) to promote sustainable utilisation of protected areas for the benefit of people, in a manner that would preserve the ecological character of such areas;
f) to promote participation of local communities in the management of protected areas, when appropriate; and
g) to provide for the continued existence of South African National Parks.

10.9 ENVIRONMENTAL CONSERVATION ACT, (ACT 73 OF 1989)

In terms of section 20 (1) of the Environmental Conservation Act, 1989, (ECA, Act 73 of 1989), waste can only be disposed of at a facility that has a permit issued by the Minister of Water Affairs and Forestry. The facility must be sited, designed, operated, and monitored strictly in accordance with the permit conditions. These conditions will include the requirements, standards and procedures set out in the DWS waste management series.

It should be noted that section 20 (1) of the Environmental Conservation Act, 1989, has been amended in terms of issuing waste disposal permits and exemptions, which is now the responsibility of the Minister of Environmental Affairs.

Section 24 of the Act allows the Minister to make regulations with respect to several waste management issues and include the following regulations:

- Disposal site application;
- Directions for control and management of general and small waste disposal sites;
- Noise, vibration and shock control regulations;
- Waste management regulations, such as classifying waste types, handling, storage, transport, and disposal; and
- Waste subject to a permit issued under section 20 of the ECA.

10.10 SPATIAL PLANNING AND LAND USE MANAGEMENT ACT (ACT 16 of 2013)

The Spatial Planning and Land Use Management Act (SPLUMA, Act 16 of 2013) has been in effect since July 2015. Essentially, SPLUMA applies to the governance of how land is used, which is significant for development applications. The objectives of the act are to:

- provide for a uniform, effective and comprehensive system of spatial planning and land use management for the Republic;
- ensure that the system of spatial planning and land use management promotes social and economic inclusion;
- provide for development principles and norms and standards;
- provide for the sustainable and efficient use of land;
- provide for cooperative government and intergovernmental relations amongst the national, provincial and local spheres of government; and
- redress the imbalances of the past and ensure that there is equity in the application of spatial development planning and land use management systems.

Relevance to the proposed development:

The proposed new WWTW site is located on agricultural land (farm Doornfontein) outside the urban edge. The development represents a change in land use from agriculture to a municipal services (utility) zone. The Magareng Local Municipality, as both the Applicant and the Planning Authority, will need to ensure the project aligns with its Municipal Spatial Development Framework (SDF) and that the necessary land use authorization is obtained in accordance with SPLUMA and its related municipal by-laws.

10.11 HAZARDOUS SUBSTANCES ACT (ACT 15 of 1973).

The Hazardous Substances Act (HAS, Act 15 of 1973) regulates the control of substances that may cause injury, ill health, or death due to their toxic, corrosive, irritant, strongly sensitising, or flammable nature. The Act provides for the classification, prohibition, and control of the importation, manufacture, sale, use, and disposal of such substances.

Relevance to the proposed development:

The operation of a WWTW involves the use of certain chemicals for process control and laboratory analysis (e.g., chlorine-based disinfectants, pH adjustment chemicals, laboratory reagents). The storage, handling, and disposal of these hazardous substances and their containers must comply with the requirements of the Hazardous Substances Act. An audit of all chemicals to be used will be conducted, and safe handling procedures will be established in the operational Environmental Management Programme (EMPr).

10.12 DISASTER MANAGEMENT ACT (ACT 57 OF 2002)

The Disaster Management Act (DSA, Act 57 of 2002) establishes a framework for disaster management across national, provincial, and municipal spheres of government. It requires municipalities to have disaster management centres and plans. The Act promotes a risk-averse approach and integrated coordination.

Relevance to the proposed development:

For this project, potential incidents such as a major pipeline failure, spillage of chemicals, or dam/pond wall integrity issues could constitute a local disaster. The Magareng Local Municipality's Disaster Management Centre must be consulted. The project's Environmental Management Programme (EMPr) will include the requirements of the contractor to develop an Emergency Preparedness and Response Plan that aligns with the municipal disaster management plan, ensuring coordinated action to protect public health, safety, and the environment in the unlikely event of a major incident.

10.13 OCCUPATIONAL HEALTH AND SAFETY ACT (ACT 85 OF 1993)

The Occupational Health and Safety Act (OHSA, Act 85 of 1993) provides for the health and safety of persons at work and in connection with the use of plant and machinery. It also aims to protect persons other than those at work from hazards arising out of work activities.

Relevance to the proposed development:

Worker safety during construction will be governed by the contractors' enforced safety plans, which must comply with OHSA. This includes comprehensive risk assessments, method statements, provision of personal protective equipment (PPE), and induction training. During operation, the municipality, as the employer, must ensure a safe working environment at the WWTW. This involves specific risk assessments for confined space entry (e.g., pipelines, wet wells), working near water, handling chemicals, and electrical safety. All operational procedures must comply with OHSA.

10.14 BASIC CONDITIONS OF EMPLOYMENT ACT (ACT 75 OF 1997)

The Basic Conditions of Employment Act (BCEA, Act 75 of 1997) gives effect to the constitutional right to fair labour practices. It establishes and regulates basic conditions of employment such as working hours, leave, remuneration, and termination of employment. The Act is fundamental to ensuring decent work standards.

Relevance to the proposed development:

Job opportunities will be made and employment opportunities created during the construction and operational phases of this project, whether through the municipality or appointed contractors, must adhere fully to the provisions of the BCEA. This ensures fair and equitable treatment of all workers involved in the project.

10.15 LABOUR RELATIONS ACT (ACT 66 OF 1995)

The Labour Relations Act (LRA, Act 66 of 1995) aims to promote economic development, social justice, labour peace and democracy in the workplace. It sets out to achieve this by fulfilling the primary objectives of the Act, which are to give effect to and regulate the fundamental rights conferred by section 23 of the Constitution, including the right to fair labour practices, to form and join trade unions and employer's organisations, to organise and bargain collectively, and to strike and lock out; to provide a framework for regulating the relationship between employees and their unions on the one hand, and employers and their organisations on the other hand. At the same time it also encourages employers and employees to regulate relations between themselves; and to promote orderly collective bargaining, collective bargaining at sectoral level, employee participation in decision-making in the workplace and the effective resolution of labour disputes.

Relevance to the proposed development:

Magareng Local Municipality, as the employer during the operational phase, and all appointed contractors during the construction phase, will need to ensure compliance with all provisions of this Act. This will involve upholding the right to fair labour practices, respecting the rights of employees to form or join trade unions, engaging in good-faith collective bargaining where applicable, and utilizing fair procedures for the resolution of any labour disputes. Compliance with the Labour Relations Act is fundamental to maintaining labour peace and ensuring fair working conditions for all personnel involved in the construction and long-term operation of the Warrenton WWTW.

10.16 CONSERVATION OF AGRICULTURAL RESOURCES ACT (ACT 43 OF 1983)

The Conservation of Agricultural Resources Act (CARA, Act 43 of 1983) aims to provide for the conservation of the natural agricultural resources of the Republic by the maintenance of the production potential of land, by the combating and prevention of erosion and weakening or destruction of the water sources, and by the protection of the vegetation and the combating of weeds and invader plants. In order to achieve the objectives of this Act, control measures related to the following may be prescribed to land users to whom they apply:

- The cultivation of virgin soil;

- The utilisation and protection of land which is cultivated;
- The irrigation of land;
- The prevention or control of waterlogging or salination of land;
- The utilisation and protection of vleis, marshes, water sponges, water courses and water sources;
- The regulating of the flow pattern of run-off water;
- The utilisation and protection of the vegetation;
- The prevention and control of veld fires;
- The control of weeds and invader plants;
- The restoration or reclamation of eroded land or land which is otherwise disturbed or denuded;
- The protection of water sources against pollution on account of farming practices; and
- The construction, maintenance, alteration or removal of soil conservation works or other structures on land.

Relevance to the proposed development:

The proposed Warrenton WWTW is situated on and will cross agricultural land, making the Conservation of Agricultural Resources Act (CARA) directly applicable. The project's construction activities, including major earthworks for ponds and pipelines, pose a risk of soil erosion that must be managed through strict mitigation and rehabilitation measures. A core project objective—to treat wastewater and protect the Vaal River from pollution aligns with CARA's mandate to safeguard water sources. The clearance of vegetation will be minimised and controlled, with active management to prevent the spread of invasive alien plants in disturbed areas. Furthermore, the beneficial reuse of treated effluent for irrigation must be carefully managed to prevent the long-term degradation of soil and water resources, such as salinisation. All necessary mitigation and management measures to ensure compliance with CARA will be detailed in the project's Environmental Management Programme (EMPr).

10.17 NORTHERN CAPE NATURE CONSERVATION (ACT 9 OF 2009)

The Northern Cape Nature Conservation Act (NCNCA, Act No. 9 of 2009) makes provision with respect to the protection and conservation of wildlife in the Northern Cape Province. It makes provision for, among other things, the protection of indigenous flora and fauna, the control of hunting, and the establishment and management of protected areas. The legislation defines protected species in its schedules and sets out specific rules relating to their disturbance. According to the relevant schedules, if any individuals of these protected plant or animal species are to be disturbed, permits must be obtained from the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAERL). A detailed assessment of floral and faunal species within the study area has been undertaken as part of the Terrestrial and Aquatic Ecological Impact Assessments during the EIA phase (see section 12.4- Terrestrial Biodiversity and Vegetation) to determine the potential need for such permits.

Relevance to the proposed development:

The proposed Warrenton WWTW and associated pipeline infrastructure are located within the Northern Cape Province, making the Northern Cape Nature Conservation Act (Act No.

9 of 2009) directly applicable. The project involves the clearance of indigenous vegetation and ground disturbance within an area identified as having high terrestrial sensitivity, which may provide habitat for protected floral and faunal species as defined in the Act's schedules. The legislation prohibits the disturbance of such protected species without a permit. The specialist Terrestrial and Aquatic Ecological Impact Assessments to be conducted will specifically survey for the presence of any protected plants or animals within the project footprint and corridors. If any protected species are confirmed and will be affected, the necessary permit applications will be submitted to the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform prior to commencement of activities. Furthermore, while the site is not within a formally declared protected area, the ecological assessments will also consider the project’s implications for broader wildlife conservation in the region. Mitigation measures to avoid or minimise impacts on protected species, along with the conditions of any required permits, will be incorporated into the project’s Environmental Management Programme

11 ALTERNATIVES CONSIDERED

According to Appendix 3 s3(1)(c):

"a plan which locates the proposed activity or activities applied for as well as the associated structures and infrastructure at an appropriate scale, or, if it is-

(i) a linear activity, a description and coordinates of the corridor in which the proposed activity or activities is to be undertaken;

(ii) on land where the property has not been defined, the coordinates within which the activity is to be undertaken;"

According to Appendix 3 s3(1)(g):

"a motivation for the preferred development footprint within the approved site as contemplated in the accepted scoping report;"

And according to Appendix 3 s3(1)(h):

"a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including:

(i) details of the development footprint alternatives considered;

(iv) the environmental attributes associated with the development footprint alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(ix) if no alternative development footprints for the activity were investigated, the motivation for not considering such; and

(x) a concluding statement indicating the location of the preferred alternative development footprint within the approved site as contemplated in the accepted scoping report;"

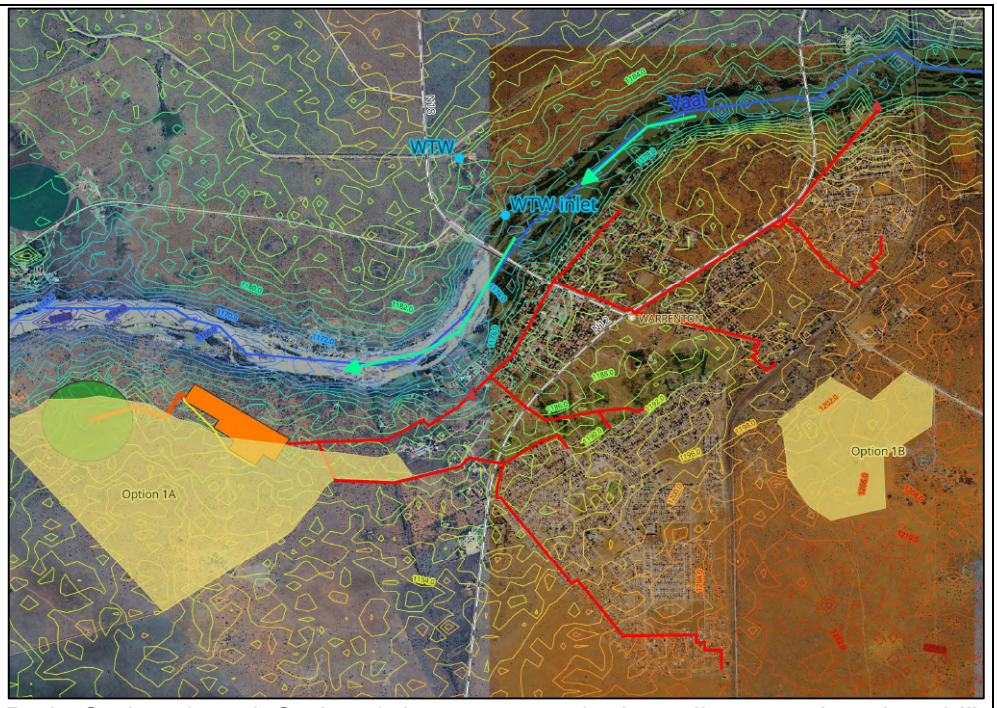
And according to Appendix 3 s3(1)(n):

"the final proposed alternatives which respond to the impact management measures, avoidance, and mitigation measures identified through the assessment;"

11.1 LOCATION ALTERNATIVES

Location Alternatives		
Option:	**Option 1: Preferred-** Doornfontein	**Option 2: Alternative considered-** Stand 1978
Figures:	 **Figure 7:** Two potential locations which were considered for development.	

Discussion	Option 1 (1A) is located on Portion 7 of the Farm Doornfontein No. 12, situated West of Warrenton. This site was identified as a feasible option due to its proximity to the existing municipal sewer network and its location outside the residential areas of Warrenton. The site is also situated on land that is already largely transformed and currently used for agricultural purposes, thereby limiting potential impacts on sensitive natural habitats.	Option 2 (1B) is located on Stand 1978 near the existing waste disposal site. While this location benefits from its proximity to certain existing infrastructure, it presents several engineering and operational constraints. The site is situated within a more complex topographic and servicing context, which would require longer sewer rising mains to convey wastewater to the facility. In addition, the alignment of the required infrastructure would necessitate the crossing of the railway line, which introduces additional technical, regulatory and safety considerations. The configuration of this option would also require the retention of a greater number of existing pump stations within the sewer network. This would increase both the energy requirements and long-term operational costs associated with the system. Furthermore, the reliance on multiple pump stations introduces a higher risk of mechanical failure and increased maintenance requirements over time.
Conclusion:	As there are no significant differences in terms of biological, social, economic, heritage or cultural aspects between the sites the determining factor which rendered the preferred site the significantly preferred outcome entailed geographic and topographic factors. The preferred location is situated further away from the townships of Ikhutseng, Warrenvale and Warrenton. The lower topography also maximises natural drainage allowing for fewer lifting stations being required allowing for reduced maintenance costs and requirements and thus reduced chances of operational failure. In reducing the chances of operational failure anticipated environmental and social impacts are thus also reduced. Option 1 also entails a closer proximity to an area where treated effluent can be safely disposed. This too enables the utilisation of simpler technologies with lower anticipated operational costs. A second point of consideration entails the relative location of the WWTW to the Warrenton Water Treatment Works.	



Both Option 1 and Option 2 lay on a gradual gradient running downhill Northwest. Option 1 lays further downstream to the inlet of the water treatment works (WTW) compared to Option 2. Thus, in the incidence of operational failure, option 1 would entail an insignificant probability of water contaminated with effluent entering into the WTW and thus an insignificant probability of contamination of Warrenton's potable water supply.

Option 2, however, which lays much closer to the inlet of the water treatment works would pose a much greater probability of water contaminated with effluent entering into the WTW and thus a greater probability of contamination of Warrenton's potable water supply.

Therefore Option 1 should be considered as the most feasible alternative. This option poses the least risk in terms of operational failure taking place due to unaffordable mounting maintenance and operational costs. It also poses the least risk of contamination of Warrenton's potable water supply in the incidence of operational failure.

11.2 TECHNOLOGY ALTERNATIVES

Technology Alternatives		
Option:	**Option 1: Preferred-** Conventional oxidation pond + reedbed system	**Option 2: Alternative considered-** Activated Sludge Process (ASP) + Extended Aeration system
Figures: *Note these are for illustrative purposes*		
Discussion	The preferred choice of technology entails a series of ponds that make use of heterotrophic and predatory organisms to stabilise wastewater. This would consist of an anaerobic pond, a facultative pond, followed by a series of maturation ponds. Long retention times allow for very good COD and pathogen removal, however, is less effective in removing nutrients and TSSs. This alternative thus proposes adding an additional reedbed stage which would facilitate in removing COD, TSS and nitrogen. This configuration benefits from a low technical manpower requirement with only the Inlet Works requiring operators. This configuration would have comparably lower capital costs, however greater projected operating costs. The sludge production anticipated with this process is slower compared to the ASP alternative. This implicates simpler sludge handling requirements than the ASP alternative. The preferred option does entail a larger footprint than the ASP alternative.	The technological alternative would comprise of activated sludge treatment without sedimentation, relying on prolonged aeration which oxidises organic matter. The prolonged retention times ensures the complete oxidation for organic matter reducing BOD and ammonia levels. This configuration would require technically skilled manpower for operation and maintenance. Operators would be required for most of the process units, and specialised skills would be required for the operation of the biological reactor, disinfection facilities and sludge treatment facilities. This configuration would have comparably higher capital costs, however lower projected operating costs. The sludge production anticipated with this process is faster compared to the preferred alternative. The ASP alternative entails a smaller footprint than the preferred alternative.
Conclusion	The context of the development entails significant cost constraints which carries ramifications in terms of choices between technologies projected operational costs, required number of operators and skill level required by operators. The fairly rural context in which the WWTW must sustainably operate imposes further constraints in terms of limitations in sustainable energy access for technologies that require it. The options considered must therefore utilise technologies that require the lowest operational costs, lowest projected maintenance and performs in a maximally self-sustainable	

	manner. These considerations are not simply to reduce expenditure but are vital to ensure long term sustainability. The preferred option outperforms the alternative in every one of these metrics, ensuring that with the additional horizontal reedbed polishing phase (and subsequent chlorination phase (as explicated in Section 8: Introduction) that the final effluent quality abides by the General Limit Values as required by the Department of Water and Sanitation. **Therefore Option 1 should be considered is the most feasible alternative**

11.3 TECHNOLOGY ALTERNATIVES (CONTINUED)

Technology Alternatives- concerning reedbed configurations		
Option:	**Option 1: Preferred-** Horizontal Subsurface Flow (HSSF).	**Option 2: Alternative considered-** Horizontal and Vertical Subsurface Flow (VSSF).
Figure:	The preferred layout would entail utilising 4 horizontal reedbeds in series.	The alternative would entail utilising a combination of horizontal and vertical reedbeds in series.
Discussion:	HSSF reedbeds consist of gravel-filled channels through which wastewater flows laterally, below the surface, from the inlet to the outlet. Microbial activity occurs within the root zone and media matrix, where pollutants are broken down. HSSF systems are simple to construct and require no electrical dosing or pumping, making them suitable for decentralised, off-grid installations. While they may be more prone to maintenance complications in ensuring that the inlet zone may become prone to clogging, general operational requirements are less stringent and the configuration more flexible to rural contexts compared to VSSF, when taking into consideration that this configuration does not require electrical dosing or pumping.	VSSF systems are engineered wetlands where pre-treated wastewater is applied intermittently to the surface of a planted gravel or sand bed. The water percolates vertically through the porous media and is collected at the base. This system benefits from enhanced oxygen transfer due to drying intervals between dosing events, which facilitates aerobic microbial activity. This configuration offers high removal rates for BOD, TSS and ammonium-nitrogen (NH_4^+-N).
Conclusion:	The choice of utilising 4 horizontal reedbeds rather than a combination of horizontal subsurface flow reedbeds and vertical subsurface flow reedbeds is largely due to similar constraints as to preferring utilising an oxidation system coupled to reedbeds rather than an ASP alternative. HSSF Reedbeds' simplicity coupled with their flexibility given their low technical requirements ensures that it is most adaptable to a rural context, minimising anticipated operational costs and chance of operation failure. This is thus the preferred alternative over and above VSSF, which would entail more complex dosing requirements.	

11.4 LAYOUT ALTERNATIVES

Layout Alternatives- concerning impacted houses and potential graves		
Option:	**Option 1: Preferred-** Red Line	**Option 2: Alternative considered-** Yellow Line
Figure:	 **Figure 8:** Pipeline layout (and alternative being considered) impacting houses.  **Figure 9:** Layout (and potential alternative) possibly impacting the Masjid cemetery.	

Discussion:	The preferred alternative implicates that that the pipeline would cross over numerous properties. The alternative was carefully chosen with topographical considerations in mind, ensuring maximal ease of drainage using the natural gradient of the land. This is to ensure that maintenance costs would be minimised, and that the probability of blockages would be minimised.	This alternative might be a potential but would need to undergo a thorough engineering assessment. As the preferred option was considered with topographical, long-term maintenance and chances of blockage (and subsequent overflow) in mind, this alternative would require thorough investigation if the preferred alternative cannot be employed.
Conclusion:	While the preferred alternative may cause greater immediate property damage, it may carry the benefit of long term operationality, reduced chances of blockage, resulting in reduced chances of effluent overflow and contamination. Furthermore, socio impacts may be mitigated by assessing the possibility of minor alignment alterations ensuring that the property damage is minimised possibly entailing that no relocation would be required. This would have to be discussed and negotiated through the public participation process in which engineers are consulted as to the extent that the alignment may be altered within the bounds of operationality. This will be finally established and explicated in the Final EIA. It will be ensured that no new environmental, social or heritage impacts are implicated ensuring that any amendment to the route would take place only in already established roads. From environmental perspective the difference in length of pipeline crossing areas with discernible vegetation constitutes only 30m further in the alternative pipeline than the preferred alternative. Given the noted degree of anthropogenic disturbance of the area, as well as the high predicted reversibility of impacts, this should not be considered to have significant additional environmental risks. The alternative would thus need to be finally determined with recourse to considerations of risk to heritage features.	

11.5 PREFERRED ALTERNATIVE CONCLUSION

In summary the topographical, geographic, economic and pragmatic considerations entails that an oxidation pond system coupled with a series of horizontal reedbeds situated at a topographical low point on Farm Doornfontein in close proximity to the pivot circles is the preferred option. This option utilises natural gradients to facilitate drainage, minimises predicted offence caused to communities given its isolated location, entails fairly self-sufficient technologies that minimises maintenance complexity and costs. It thus promises to be the most sustainable alternative considered.

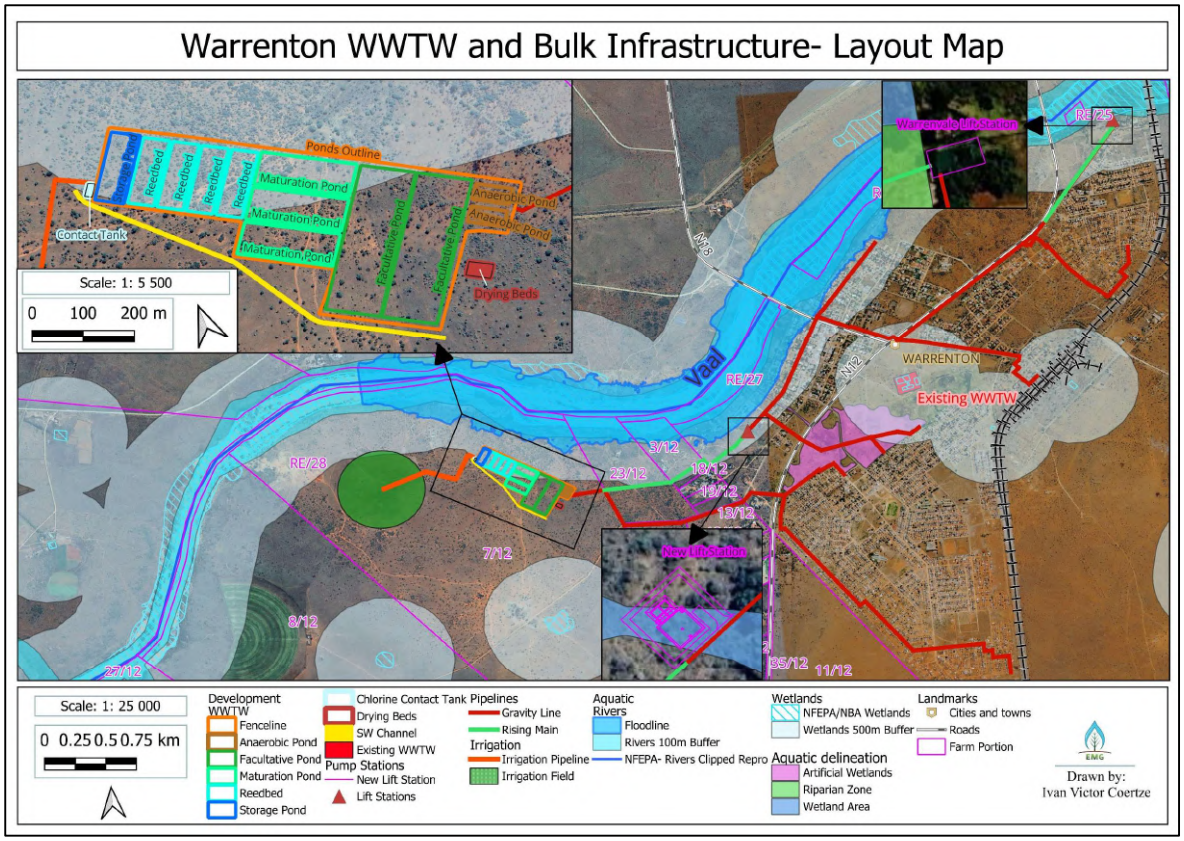


Figure 10: Layout Map of the Proposed Development.

12 THE *IN-SITU* ENVIRONMENT

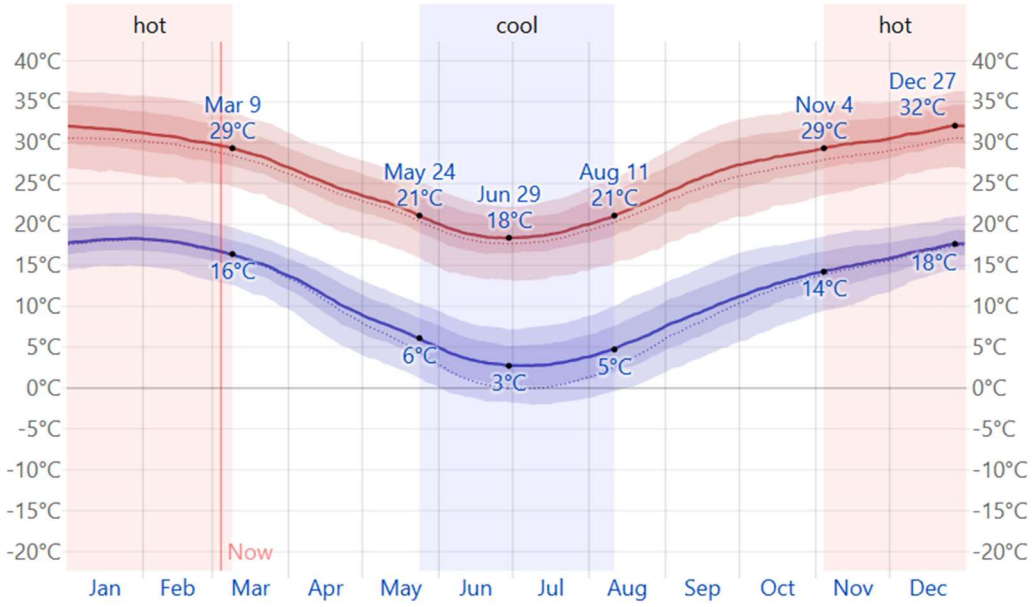
12.1 PHYSICAL CHARACTERISTICS:

12.1.1 CLIMATIC PROFILE

Temperature

During the summer months, from early November to early March, the average high-temperature peaks at 32°C. January and late December are the hottest months of the year, ranging between 31°C - 32°C.

During the winter months, from late May to early August, the average high temperature peaks at 6°C. July is considered to be the coldest month of the year with the lowest minimum temp of 3°C (Weather Spark).



The daily average high (red line) and low (blue line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures.

Average	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
High	32°C	31°C	29°C	25°C	22°C	19°C	19°C	22°C	26°C	28°C	30°C	31°C
Temp.	25°C	24°C	22°C	18°C	14°C	10°C	10°C	13°C	18°C	21°C	23°C	24°C
Low	18°C	18°C	15°C	11°C	7°C	3°C	3°C	6°C	10°C	13°C	15°C	17°C

Figure 11: Average temperature within the study area during the year (Source: Weather Spark).

Precipitation

Using a 31-day moving average Rainfall is highest during the summer months, peaking around February with approximately 65 mm, and gradually declining toward winter.

The driest period occurs in mid-winter, with rainfall reaching a minimum around July at approximately 3 mm, indicating very limited precipitation during this time. Rainfall begins to increase again from August into spring, eventually returning to higher levels toward the end of the year.

Overall, the pattern reflects a summer rainfall climate, where most precipitation occurs between November and March, while the winter months remain predominantly dry. This seasonal distribution is typical for the central interior of South Africa. Source (Weather Spark).

The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average snowfall.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	56.9mm	64.9mm	52.6mm	28.8mm	11.6mm	6.5mm	2.6mm	6.4mm	11.3mm	30.5mm	43.2mm	51.7mm

Figure 12 Average precipitation conditions over the study area.

Wind

Wind direction:

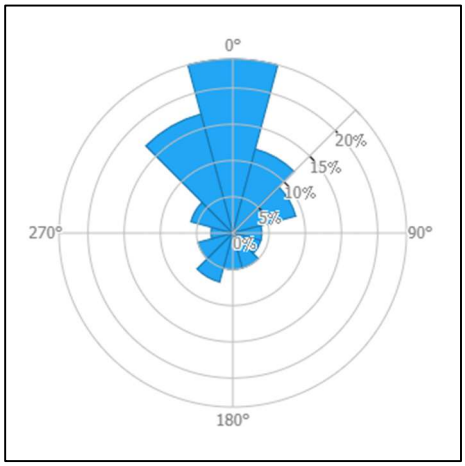


Figure 13: Wind Frequency Rose for the proposed development area (Davies *et al.*, 2023).

Wind speed:

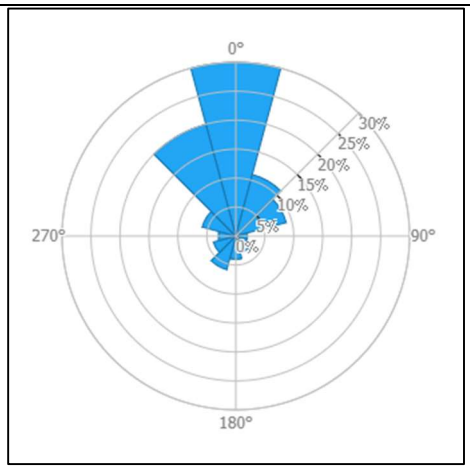


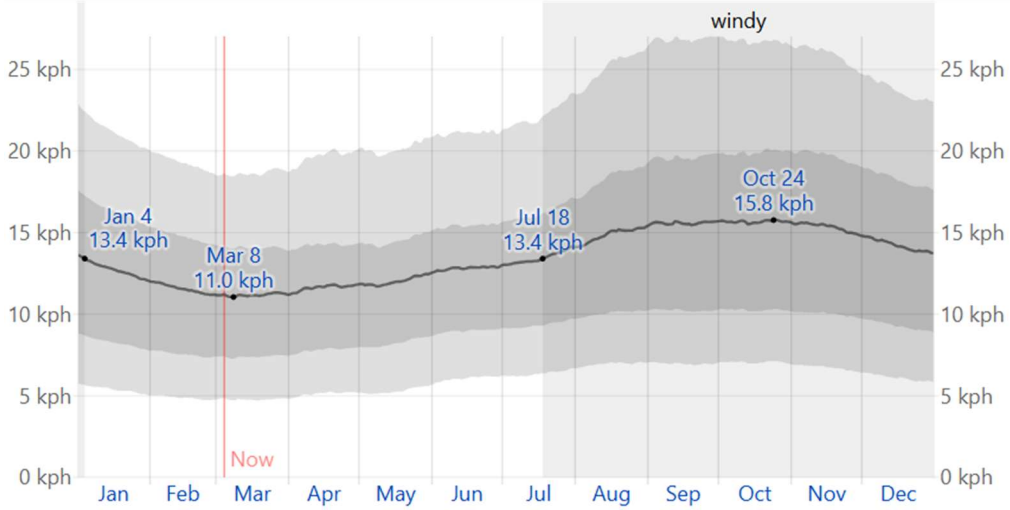
Figure 14: Wind Speed Rose for the proposed development area (Davies *et al.*, 2023).

Wind speeds are generally moderate, averaging between 11 km/h and 16 km/h over the course of the year.

The lowest wind speeds occur during late summer and early autumn, with the calmest conditions around March at approximately 11 km/h. Wind speeds gradually increase through winter and spring.

The windiest period occurs during spring, peaking around October at approximately 15.8 km/h, after which wind speeds gradually decline toward the summer months again.

Overall, the pattern indicates moderate winds throughout the year, with slightly calmer conditions in late summer and stronger winds developing toward spring.



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Wind Speed (kph)	12.8	11.6	11.2	11.6	12.1	12.8	13.5	14.9	15.6	15.7	15.3	14.2

Figure 15: Average wind for the study area during the year (Source: Weather Spark).

12.1.2 TOPOGRAPHY AND LANDSCAPE FEATURES

The landscape surrounding the proposed Warrenton Wastewater Treatment Works (WWTW) is characterised by a gently undulating terrain typical of the central interior of South Africa.

Elevation across the study area ranges from approximately 1 135 m to 1 255 m above sea level, with the lowest elevations occurring along the Vaal River and gradually increasing toward the surrounding upland areas.

The Vaal River forms the dominant landscape feature within the area, flowing from East to West along the northern portion of the site. The river occupies a relatively broad valley that is visibly lower than the surrounding terrain. This creates a natural topographic gradient where the land gently slopes downward toward the river channel.

South of the river, the landscape transitions into slightly elevated terrain consisting of rolling plains and shallow drainage features. These areas display gradual elevation changes rather than steep slopes, indicating a relatively stable and low relief landscape. The topography therefore supports the routing of gravity sewer lines from the surrounding settlement areas toward the proposed lift station and treatment works.

The proposed WWTW site is located on moderately elevated terrain south of the Vaal River, which provides sufficient separation from the immediate riparian zone while still allowing for hydraulic conveyance of wastewater from the existing network. The position of the proposed treatment works relative to the river also allows treated effluent to be directed toward the adjacent irrigation area while avoiding direct discharge into the river system.

Overall, the topography of the study area is favourable for the development of wastewater infrastructure. The gently sloping terrain allows for gravity driven flow across much of the network while the strategic placement of lift stations accommodates elevation changes where required. The relatively low relief landscape also provides suitable conditions for the development of the proposed treatment works and associated irrigation areas.

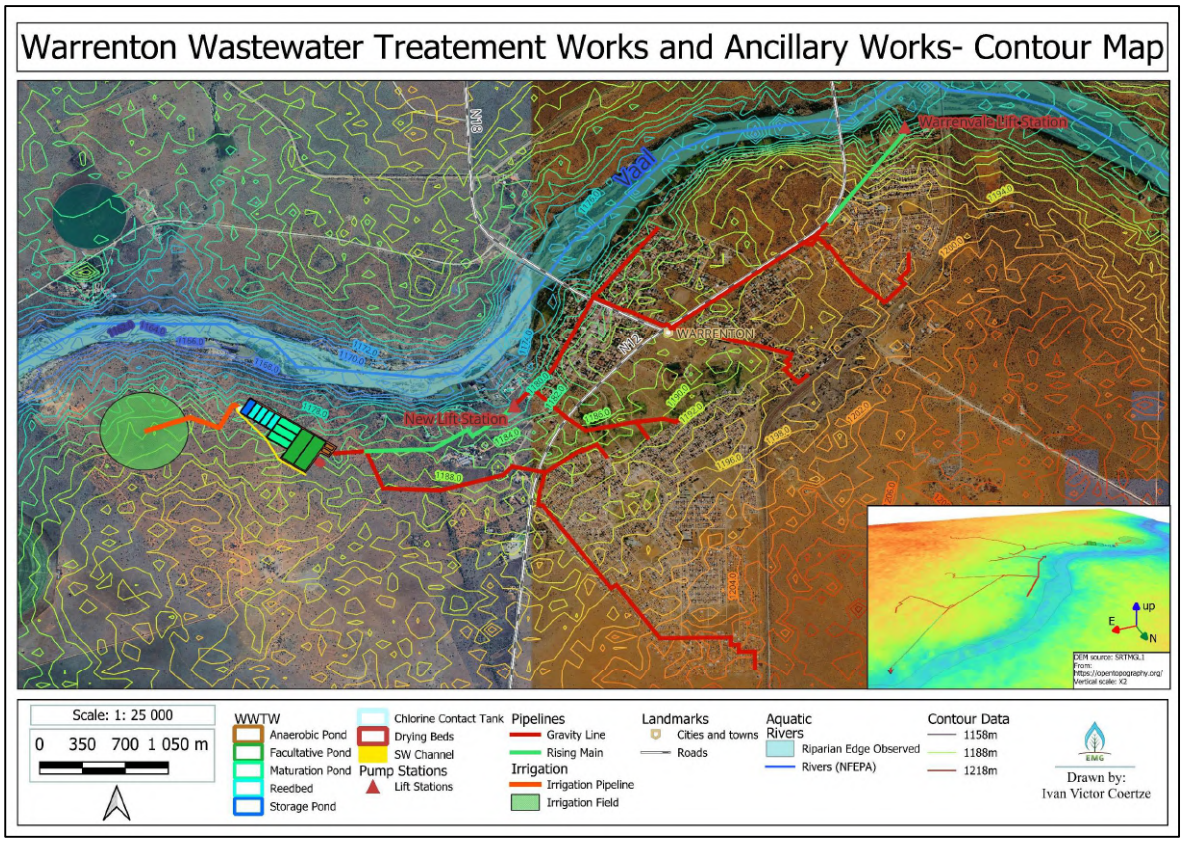


Figure 16: Contour Map of the Warrenton Area.

12.2 SOIL AND LAND CAPABILITY

Historically, the project area has been subjected to extensive agricultural transformation, including centre-pivot irrigation, grazing, and associated infrastructure. Approximately 80% of the broader project area has already been transformed through past and ongoing agricultural practices, with the remaining portions comprising disturbed near-natural thornveld associated with the Kimberley Thornveld vegetation type.

As a result, the intrinsic soil capability of the site has been significantly altered, and the land is no longer considered pristine or optimally productive in its current state.

Although soils will be disturbed during the construction, operational, and potential decommissioning phases of the project, the anticipated impact on soil resources is considered low. This is primarily because the proposed WWTW footprint is located within an area already influenced by agricultural activities and is not earmarked for future high-value agricultural use. Furthermore, topsoil management and rehabilitation measures will be implemented to limit soil degradation and erosion, in line with best practice and EMPr requirements

12.3 SURFACE WATER

A wetland assessment was conducted of the proposed development area in 2025 by Mr Darius van Rensburg. The findings were consolidated into a report: *Wetland Assessment for the proposed new Waste Water Treatment Works (WWTW) and associated sewer network situated in the town of Warrenton, Northern Cape Province* (See appendix 4: Specialist Reports and Declarations). Mr van Rensburg's findings are further discussed in section 17: Impact Assessment of this report (Van Rensburg, 2025).

12.3.1 LARGE PERENIAL WATERBODIES – VAAL RIVER

The most significant watercourse pertinent to the town of Warrenton consists of the Vaal River situated to the North of the town of Warrenton. The Vaal River at this location flows East to West. It is here a perennial system, albeit one which has been heavily modified in term of its flow and flooding regime by upstream containment dams (van Rensburg, 2025). The Vaal River is noted, in the region of Warrenton, to have a significant floodplain/ riparian zone which includes floodplain wetland areas (van Rensburg, 2025).

In the wetland assessment conducted, different distinguishable riparian zones were identified associated with the Vaal River.

These were divided into the following:

Marginal Zone: This refers to the lowest zone which is always present in River Systems. It is situated from the water level, up to features hydrologically activated for most of the year. In the context of this development, the marginal zone was well defined in the study area, characterised by the presence of a dense riparian and sedge layer. This zone is inundated annually. The breadth of the marginal zone was found to vary considerably on account of the braided nature of the Vaal River at the development location. Perennial wetland areas were observed in this riparian zone.

Lower Zone: The lower zone, which is not always present, however, was observed in the context of the site assessment, is characterised by seasonal features and extends from the marginal zone up to the area of marked elevation. In the context of the study site the lower zone was for the most part easily identifiable, with exceedingly steep regions with sudden

increases in slope over short distances whereafter the area levelled off into the upper zone. In some specific locations assessed, however, the floodplains were more extensive resulting in more gradual slopes with the boundaries between the zones becoming more difficult to discern. Inundation of the lower zone is infrequent.

Upper Zone:

The upper zone is characterised by ephemeral features, with the presence of both riparian and terrestrial species of vegetation. The upper zone stretches from the lower zone to the riparian edge. This zone contains geomorphic features which are activated on an ephemeral basis. This zone is easily discernible by the drastic reduction in slope gradient, the increase in woody vegetation and the marked increase in trees attaining greater heights. In the context of the assessed locations, this region was dominated by the *Vachellia karroo* (Sweetthorn), *Searsia lancea* (Karee), *Zizihus mucronata* (Buffalo thorn) and *Diospyros lycioides* (Bluebush).

12.3.2 OTHER IDENTIFIED WATERBODIES

The interior of the town of Warrenton itself does not contain many natural watercourses or wetlands, however some drainage lines are noted to be present. Additionally numerous artificial wetland areas have been identified and confirmed as having been formed by artificial human induced modifications. In their assessment they were found not to play any role in the surface drainage pattern of the area and therefore not considered to be of consequence to the development.

The proposed development itself is noted to be located largely outside of the riparian zone or floodplain of the river but does have a few sections of the sewer network which will occur in close proximity to or encroach into the floodplain of the river (See Section 17: Impact Assessment).

In the wetland assessment, the Vaal River was particularly assessed in two locations in at which points the proposed developments most closely approached the Vaal River. A further two locations were assessed, namely the drainage line associated with the new lift pump station, as well as the artificial wetlands induced by overflowing waste from the adjacent existing WWTW.

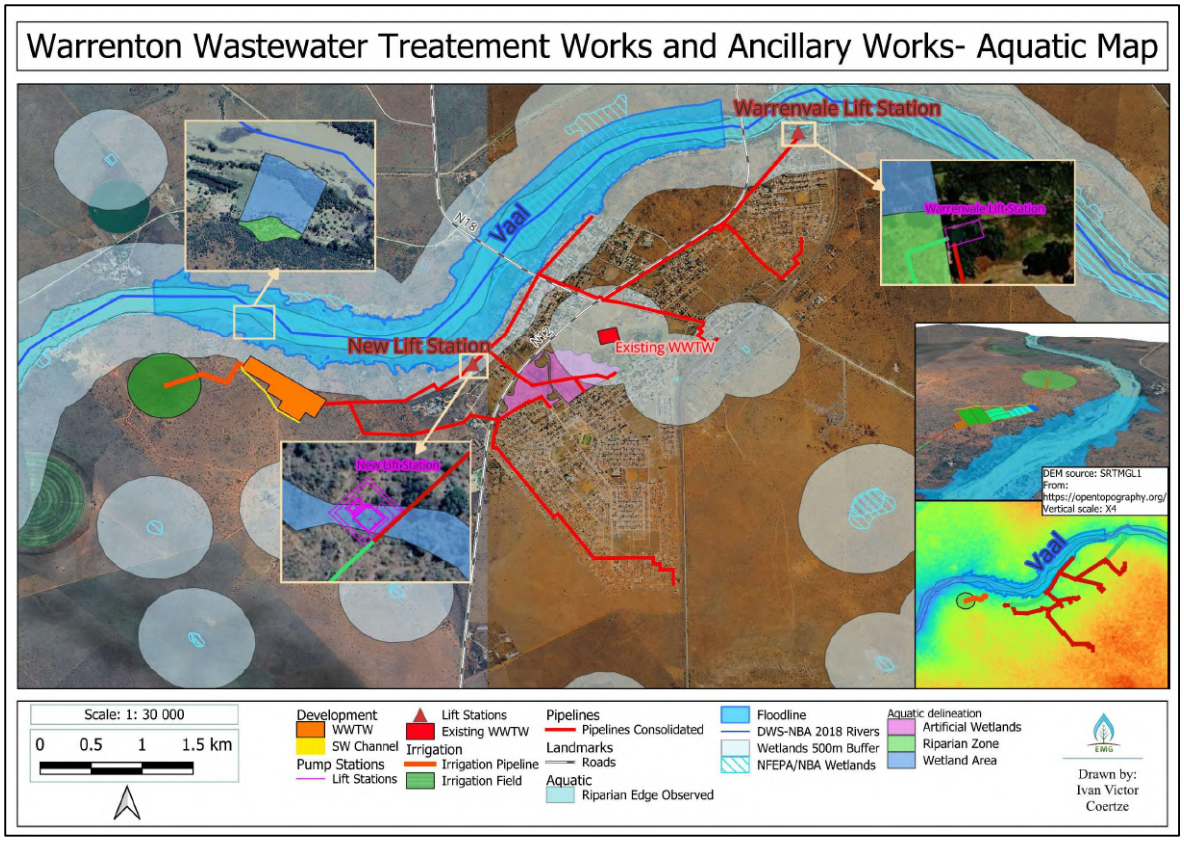
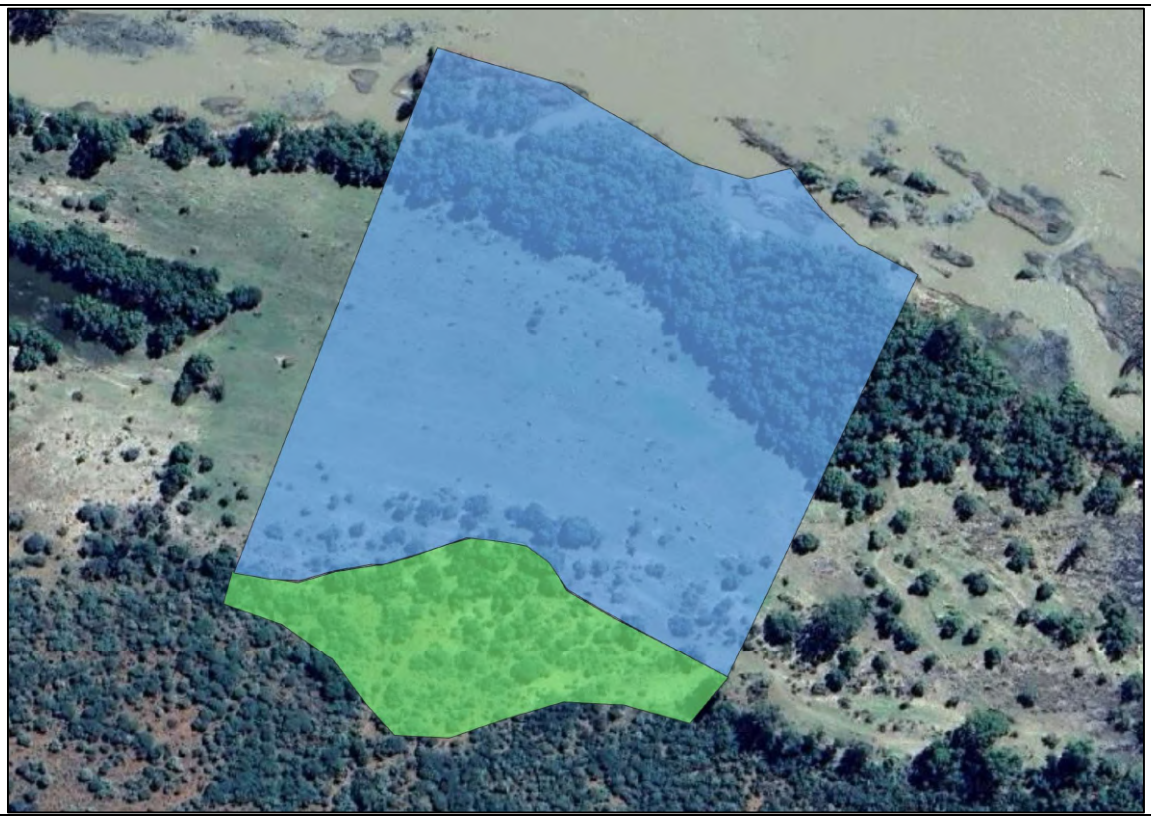


Figure 17: Map of the aquatic features observed (desktop study) and also assessed (wetland assessment) on site in Warrenton, Northern Cape.

Information, here reported, was obtained from: *Wetland Assessment for the proposed new Waste Water Treatment Works (WWTW) and associated sewer network situated in the town of Warrenton, Northern Cape Province.*

Location 1: Vaal River adjacent to proposed WWTW- 28° 6' 54" S, 24° 49' 9" E.



The riparian edge of the Vaal River most closely adjacent to the proposed development area of the proposed was assessed here. This location was approximately 250m away from the updated WWTW layout (See section 9).

Here the river is broad, with extensive wetland and backwater floodplain areas, flowing from east to west. The flow regime is perennial with a modified flow and flooding regime due to the upstream containment dam.

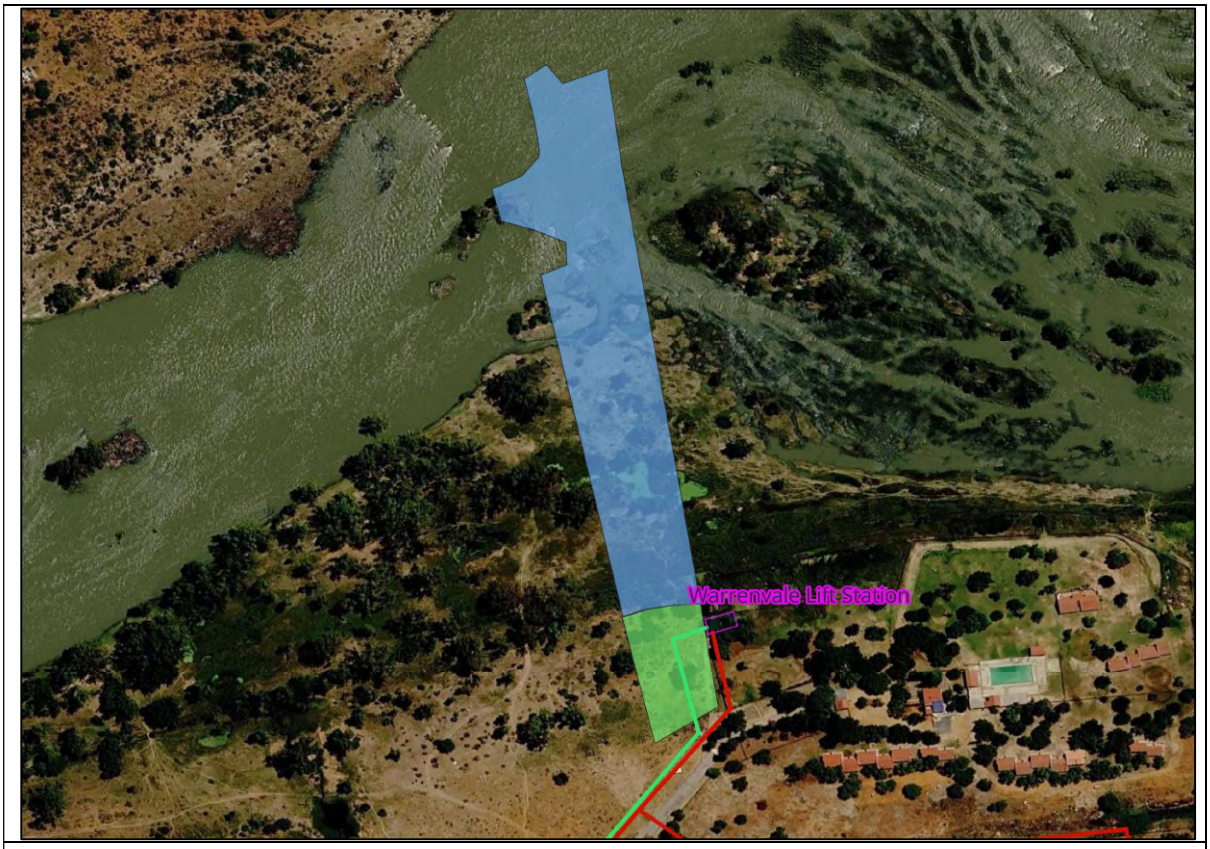
In this location more gradual slopes were noted associated with the lower and upper riparian zones. Accordingly, this is reflected in the riparian thicket which is here not as dense as in other locations. The riparian zones can still be distinguished, however, by the vegetation in which riparian trees are still present almost exclusively in the upper zones while the lower zones are characteristically dominated by a short grass layer. The lower zone being more gradual also entails that the large floodplain associated the marginal zone can also become much more extensive. This zone was dominated by hygrophilous grasses and sedges. Wetland conditions were noted to be abundant in the marginal zone with an extensive prominent backwater wetland running parallel to the main channel. This region is dominated by a grass layer with obligate wetland herbs and sedges also being abundant. Trees and shrubs are largely absent from this region. The backwater wetland contains a few Facultative- and one Obligate Wetland species. Soil samples also indicate a low grey matrix without distinctive mottling, which is considered indicative of a seasonal zone of wetness. It was note that it should be considered that the system as a whole played a vital role in terms of the functioning of the floodplain. The river at this site is affected by very high levels of overgrazing by domestic livestock, which have clearly affected the composition and

condition of the riparian vegetation. As a result, a low species diversity was recorded, with invasive species also being abundant.

Species list:

Riverbanks and backwater floodplain:	**Upper zone and riparian thicket:**
Phyla nodiflora *Cynodon dactylon* *Arctotis arctotoides* *Salix mucronata* *Cyperus sp.* **Obligate Wetland Species** *Cyperus marginatus (OW)* *Phragmites australis (OW)* **Invasive species:** *Argemone ochroleuca*	*Gymnosporia buxiifolia* *Cynodon dactylon* *Diospyros lycioides* *Vachellia karroo* *Asparagus larcinus* *Searsia lancea* **Invasive species:** *Eucalyptus camaldulensis* *Opuntia humifusa*

Location 2: Vaal River adjacent to the existing Warrenvale Lift Station- 28° 5' 46" S, 24° 52' 24" E.



The riparian edge of the Vaal River most closely adjacent to the existing Warrenvale lift station was assessed here. It is proposed that a rising main pipeline will be constructed conveying the effluent from the Warrenvale Lift Station first South away from the Vaal River then Southwest before connecting with gravity lines. A gravity pipeline is proposed to convey sewage from the Warrenvale area to the Warrenvale lift station which would follow in the same footprint (in the other direction) of the rising main (see Appendix 2- Maps and section 8).

Here the river is broad, with extensive wetland and backwater floodplain areas, flowing from east to west. The flow regime is perennial with a modified flow and flooding regime due to the upstream containment dam.

In this location more gradual slopes were noted associated with the lower and upper riparian zones. Accordingly, this is reflected in the riparian thicket which is here not as dense as in other locations. The riparian zones can still be distinguished, however, by the vegetation in which riparian trees are still present almost exclusively in the upper zones while the lower zones are characteristically dominated by a short grass layer. The lower zone being more gradual also entails that the large floodplain associated the marginal zone can also become much more extensive. This zone was dominated by hygrophilous grasses and sedges. Wetland conditions were noted to be abundant in the marginal zone with an extensive prominent backwater wetland running parallel to the main channel. This region is dominated by hygrophilous grasses and sedges also being abundant. This site is less affected by grazing than location 1, but exotic and alien invasive species are still noted to be present, indicative of disturbances.

Riverbanks and floodplain: *Cynodon dactylon*	**Upper zone and riparian thicket:** *Cynodon dactylon*

Arctotis arctotoides *Sonchus oleraceus* *Moraea simulans* *Cynodon transvaalensis* *Arctotis arctoptoides* **Obligate Wetland Species:** *Cyperus marginatus* *Cyperus sexangularis* *Ranunculus multifidus* *Juncus rigidus* *Typha caopensis* **Invasive Species:** *Pennisetum clandestinum* *Emex australis*	*Diospyros lycioides* *Vachellia karroo* *Asparagus larcinus* *Searsia lancea* *Searsia pendulina* **Invasive Species:** *Eucalyptus camaldulensis*

Location 3: The new proposed lift station in the town of Warrenton- 28° 7' 9" S, 24° 50' 28" E.

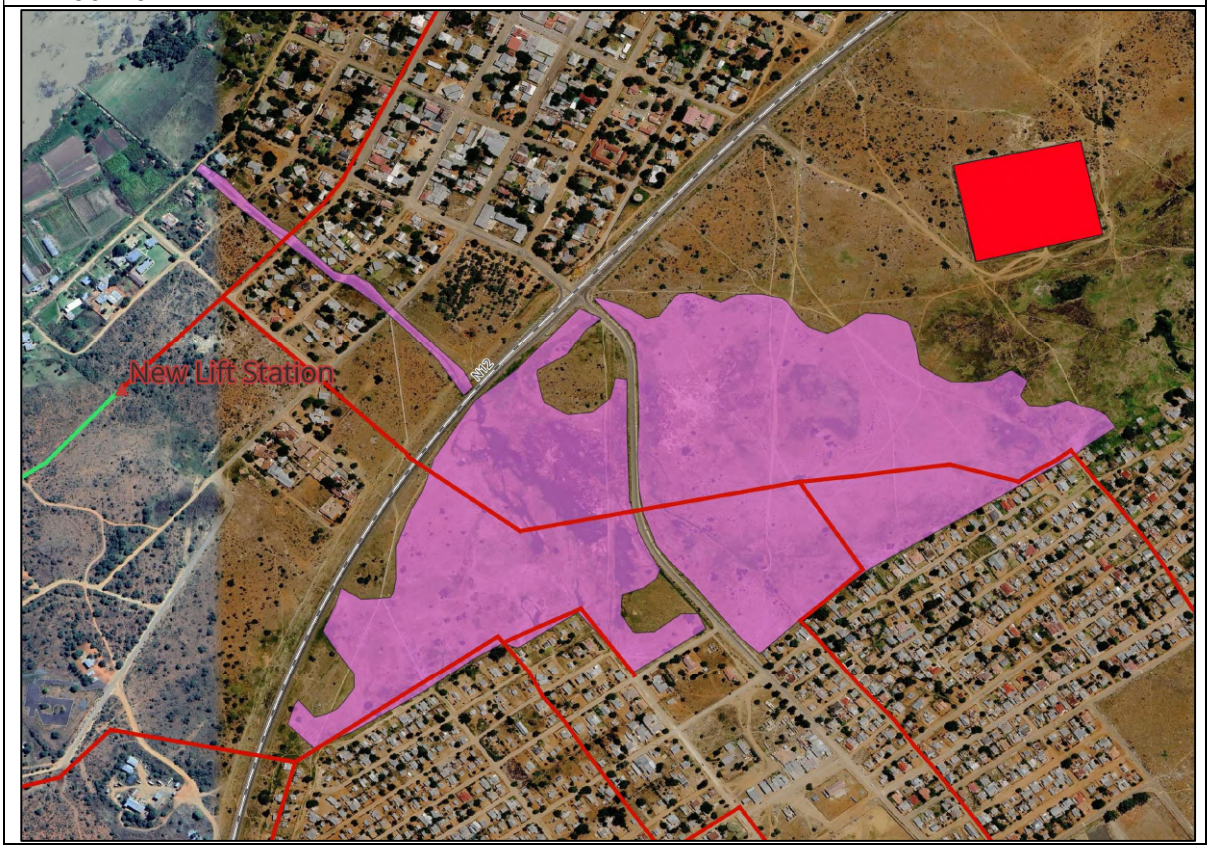
The sewer line will cross over the drainage line, while the new lift pump station will be constructed within it. The location of the proposed new lift station (and associated pipelines entering and leaving the pump station) was determined by the location being th e natural lowpoint. Pumping at this location is therefore necessitated to ensure that the sewage is conveyed from the low point, being pumped Westward to join the gravity fed line approximately 260m East of the proposed WWTW's location.

The impacted watercourse is a drainage line, approximately 100m in length which drains into the Vaal River approximately 350m downstream of the proposed new lift station site. The channel morphology of the drainage line is variable with a narrow defined channel in some places and a broad indistinct channel in others areas. The drainage line originates

near the urban area of Ikhusteng is, under normal conditions fed by runoff from the terrestrial catchment. Given, however the arid environment as well as the size of the drainage line, continuous flow would, under normal conditions only ever take place during large rainfall events, and only for short periods. The drainage line is thus strictly episodic or ephemeral under normal conditions.

However, wetland conditions were noted have begun forming associated with the drainage line. This was identified to have taken place on account of the stormwater and effluent generated by the urban area at its origin. This is noted to be a substantial departure from its natural condition. Furthermore, the presence of obligate wetland species was tied to the artificial inundation by continuous effluent discharge into the drainage line and is thus noted to be a significatn departure from the natural hydrology an flow regime.

Location 4: Areas of artificially created wetlands- 28° 7' 13" S, 24° 51' 4" E, 28° 7' 16" S, 24° 50' 49" E.



(Drone photo taken at the existing WWTW)

Several large artificial waterbodies were identified to the Southwest of the existing WWTW, proposed to be crossed by multiple gravity lines.

These artificial wetlands are confirmed as having been formed by human induced modifications to the landscape and nto to be regarded as wither natrual watercourse or wetlands. They are not considered to play any role in the surface drainage pattern of the area.

The areas are being artificially inundated (which is giving rise to the artificial wetland conditions) by the overflow of partially treated effleunt from the existing WWTW as well as stormwater and effluent discharge from adjacent urban areas.

These artificial sources result in slow surface water flow towards tbe N12 National Road. At this point they are concerntrated into a fairly large artificial canal which leads to the Vaal River. This canal too is noted to be entirely artificial and not a remnant of a natural system.

12.4 TERRESTRIAL BIODIVERSITY AND VEGETATION

A site sensitivity and terrestrial ecological assessment report was conducted of the proposed development area in 2026 by Mr Joshua Giddy. The findings were consolidated into a report: *Site Sensitivity and Terrestrial Ecological Assessment Report Compiled for the Proposed WWTW and Accompanying Infrastructure, on Portion 7 of Farm Doornfontein 12, Magareng Local Municipality, Northern Cape Province* (See appendix $: Specialist Reports and Declarations). Mr Giddy's findings are further discussed in section 17: Impact Assessment of this report.

The entirety of the proposed development which includes the pivot circle, the WWTW as well as the bulk infrastructure is located in the terrestrial vegetation type of Kimberley Thornveld (barring the regions which enter into the riparian habitat).

Kimberley Thornveld (SvK 4) is characterised by a well-developed tree layer dominated by *Vachellia erioloba*, *V. tortilis*, *V. karroo* and *Boscia albitrunca*. The vegetation type also contains a well-developed shrub layer dominated by dense stands of *Tarchonanthus camphoratus* and *Senegalia. mellifera*. The grass layer is noted to be often open with bare patches of soil. While the physical environment was noted to approximate SvK 4 as defined by Mucina and Rutherford (2004), the vegetation composition and structure observed in the majority of the study area was noted to not match SvK 4. Accordingly, the development area was noted have an approximate 20% similarity to SvK 4. The majority of the development area is, however, noted to have been altered by mean of agricultural and anthropogenic development or degraded beyond the point of resemblance to the vegetation type. The overall vegetation is thus described as being largely transformed with some areas of natural vegetation.

Portions of the proposed development area is recognised in the bioregional plan to constitute a CBA 1 while other portions are recognised as constituting natural areas. Further, the potential presence of species 257 is noted by the DFFE screening tool. A specialist assessment of the proposed development, however, noted that the CBA 1, covers only a section of the proposed development area and that the vegetation type has low conservation value. Species 257 (the cryptic species of conservation concern) was also noted be unlikely to occur in the development area. This was noted on account of its note preferential appearance salt pans and deep alluvial soils, which is not characteristic of the proposed development area. The presence of intensive agricultural practices attested to by the presence of cow dung, hoof marks, low biomass, soil compaction and livestock as observed during the site visit further reduces the likelihood of sensitive species 257 from occurring.

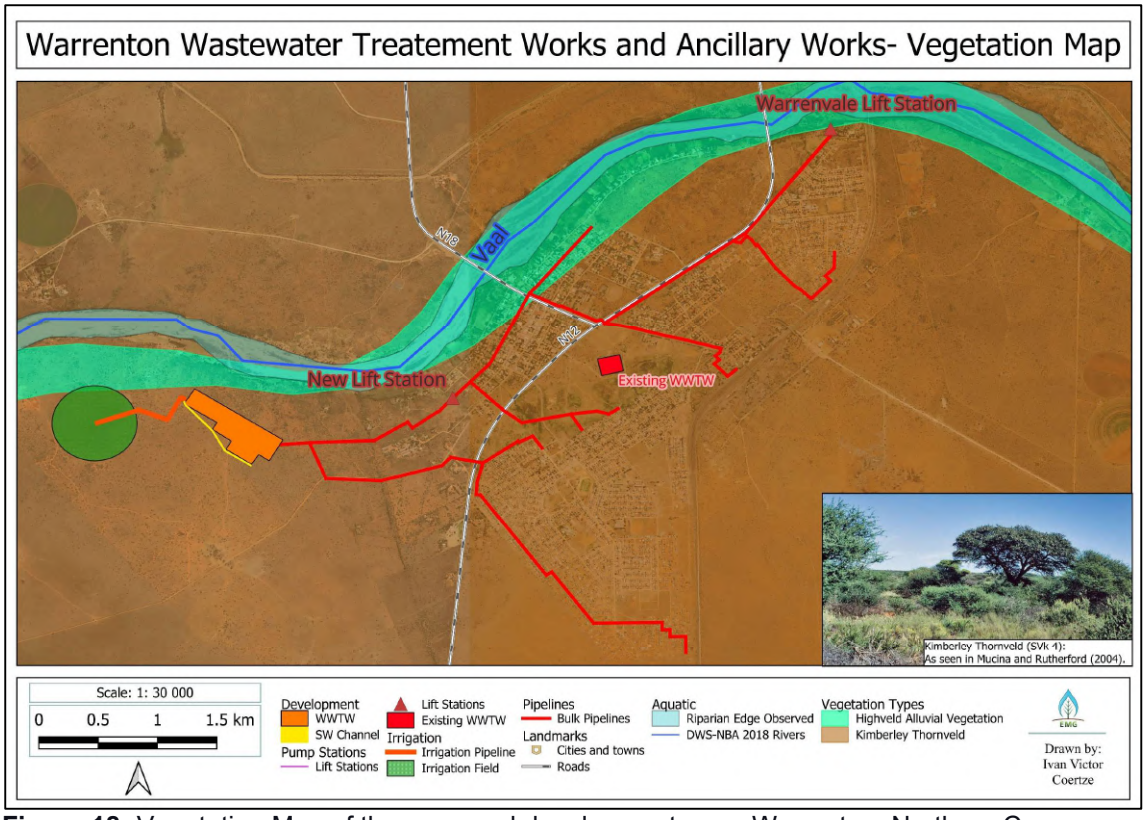


Figure 18: Vegetation Map of the proposed development area, Warrenton, Northern Cape.

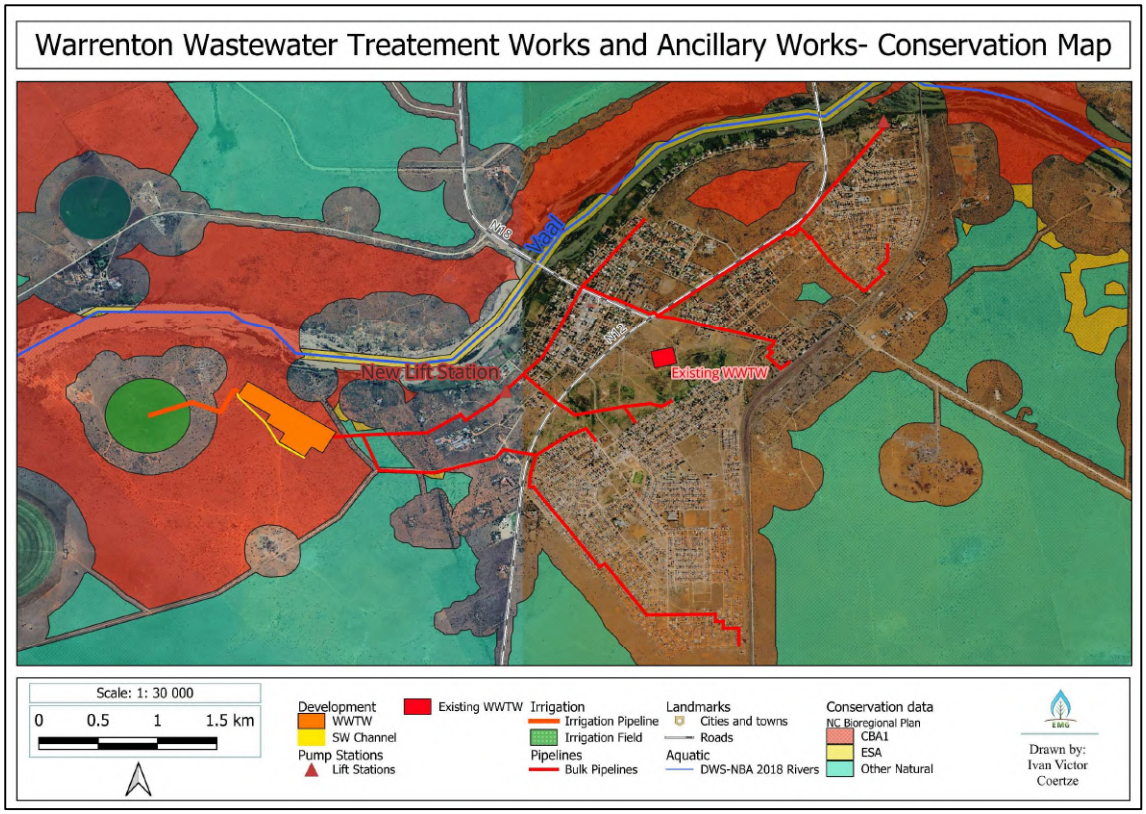


Figure 19: Conservation Map of the Proposed Development Area, Warrenton, Northern Cape.

Information, here reported, was obtained from: *Site Sensitivity and Terrestrial Ecological Assessment Report Compiled for the Proposed WWTW and Accompanying Infrastructure, on Portion 7 of Farm Doornfontein 12, Magareng Local Municipality, Northern Cape Province,* (Giddy, 2026).

It was identified that the proposed development effectively crossed three different vegetation units*, namely:

- Agriculturally transformed areas
- Near natural areas
- Built up areas

*(four were initially described, but one has been excluded from conservation as the area no longer falls in the proposed development area)

Agriculturally Transformed Areas

This comprises the area designated for irrigation. This area was previously utilised for agricultural fields (pivot irrigation) but has since fallen into disuse. The current use entails grazing fields for livestock.

The vegetation noted comprised of:

Grass layer: Overgrazed inflorescence likely resulted in a reduced species count.

Cynodon dactylon (dominant), *Sporobolus fimbriatus* (few occurrences), *Eragrostis racemosa* (few occurrences)

Shrub layer: This layer majorly dominated the area.

Selago densiflora, Solanum lichtensteinii, Tarchonanthus camphoratus

Forb layer:

Senna italica, Salvia disermas, Chaenostoma sp and Peliostomum leucorrhizum

Tree layer: This layer was poorly developed.

Searsia lancea

Invasive vegetation (*Argemone ochroleuca*) was also observed, concentrated particularly along the two-track path which runs through the area.

The extensive agricultural disturbances resulted in the ecological functioning in this region to be considered ***very poor***.

Near Natural Areas

The region of the proposed WWTW was regarded as being near-natural with some deviation from the natural state on account of agricultural influence indicating that the area is currently being utilised as grazing land.

Grass layer: these were interspersed with patches of bare soil.

Cynodon dactylon, Aristida canescens, A. congesta, Eragrostis racemosa, Schmidtia pappophoroides and Sporobolus fimbriatus.

Forb layer: *Senna italica, Salvia disermas, Chaenostoma sp and Peliostomum leucorrhizum.*

Tree and shrub layer: these layers dominated the vegetation unit.

Searsia lancea, Vachellia karroo, Senegalia mellifera and *Tarchonanthus camphoratus*.

In spite of the agricultural disturbances this vegetation still resembled a form of natural habitat and as such the ecological functioning is considered ***moderate***.

Built up Areas

The built-up areas were not extensively surveyed as they entailed the current use of being a developed town's roadside. As such little to no vegetation was observed, and when present comprised of almost exclusively alien invasive species such as those noted in previous sections.

These areas were described as being irreversibly modified, no longer resembling the surrounding any type.

12.5 CULTURAL AND HERITAGE RESOURCES

A Phase 1 Palaeontological and Heritage Impact Assessment was conducted of the proposed development area in 2025 by Dr Lloyd Rossouw. The findings were consolidated into a report: (See appendix 4: Specialist Reports and Declarations). Dr Rossouw's findings are further discussed in section 17: Impact Assessment of this report (Rossouw, 2025).

Two primary themes were assessed and discussed in the Phase 1 Palaeontological and Heritage Impact Assessment, namely those of the proposed development area's palaeontological sensitivity and the area's archaeological sensitivity. The following was discussed in the Phase 1 Palaeontological and Heritage Impact Assessment.

Palaeontology:

It was concluded by means of a site assessment looking at the palaeontological sensitivity of the area, that the areas traversed by the pipelines comprise of loose, unconsolidated sandy overburden (Kalahari Group). These were noted to be composed of predominantly cobble-grade conglomerates with granular to pebbly clasts.

A systematic walkthrough of the proposed pipeline footprints yielded the following results (as stipulated in the report:

- The alignments are underlain by volcanic rocks Ventersdorp Supergroup.
- In places, sections of the Gravity Line and Rising Main are unconformably capped by Quaternary river-terrace gravels, representing younger fluvial deposits with a potential (but variable) capacity to preserve vertebrate fossil material at depth
- No fossil-bearing gravels, bone fragments, or other diagnostic palaeontological indicators were identified in surface exposures during the survey.

As such no palaeontological resources were identified.

Archaeology:

It was concluded by means of a site assessment looking at the archaeological sensitivity of the area.

The broader Vaal River area is noted to have historically yielded numerous artefacts of archaeological significance:

- Fluvial gravels, shaped by repeated cycles of sediment accumulation and incision have repeatedly yielded Early Stone Age (Acheulian) artefacts- including handaxes, cleavers, and core-axes, preserved in both primary and reworked contexts.
- The lower levels of Hutton Sands that blanket the regional landscape have produced high densities of Fauresmith artefacts, particularly blades, indicating occupation during the technological transition between the Acheulian and the Middle Stone Age
- Stone Age artefacts are also widely distributed as open-air surface scatters across the Warrenton region. However, most of the artefacts are preserved in secondary or palimpsest contexts, resulting from fluvial reworking, deflation, and terrace erosion rather than intact occupation surfaces.
- Rock engravings have been documented within the broader Warrenton and lower Vaal River region, comprising motifs of human figures, animals, therianthropes, and geometric forms.
- The town itself also carries historical significance in its role through the nineteenth-century British colonial administration, diamond discoveries, and the Anglo-Boer War.

An assessment of the Pumping Main, Gravity Line and Rising Main pipeline footprints however indicate that the area traverses a largely transformed landscape characterised by flat to gently undulating terrain capped by shallow red sandy soils, mantling river terrace gravels and volcanic rocks.

A systematic walkthrough of the proposed pipeline footprints yielded the following results (as stipulated in the report):

Much of the proposed development footprint yielded comprises of areas extensively modified. Some areas were comprises of exposed ground which has indications of long-term surface

disturbance which include agricultural pivots. Much of the route follows or intersects existing access tracks, gravel and paved roads, utility servitudes, and cleared corridors, indicating a high degree of prior modification of the ground surface. Much of the proposed development also yielded indications of modern impacts which included surfaces heavily altered and associated with standing structures where the proposed development crossed into residential areas.

In spite of the historic disturbance three features of heritage significance were noted (see Figure 20):

- Sections of the Gravity Line and Rising Main traverse areas where the underlying substrate is locally mantled younger fluvial deposits which have a variable potential to contain Early Stone Age (ESA) Acheulean material. A single surface occurrence of an ESA LCT was recorded However, no additional diagnostic Stone Age indicators (e.g., cores, flakes, extensive knapping debris, or artefact scatters) were observed in the gravel surface exposures. On this basis, any Stone Age material that may be present is most likely to be localised and potentially reworked within the gravel body rather than preserved in primary depositional context.
- A ±100 m portion of the proposed Gravity Line is routed immediately adjacent to a cemetery apparently associated with the neighbouring Masjid located between Erasmus St. and the N12. The pipeline is here noted to pass within ~15 m of the burial ground boundary.
- A ±700 m section of the proposed Gravity Line runs through an established built-up area and parallels existing buildings along Van Wyk Street which includes buildings that may pre-date 1965 (i.e., >60 years old) and would therefore fall under the general protection for structures older than 60 years in terms of Section 34 of the National Heritage Resources Act (NHRA).

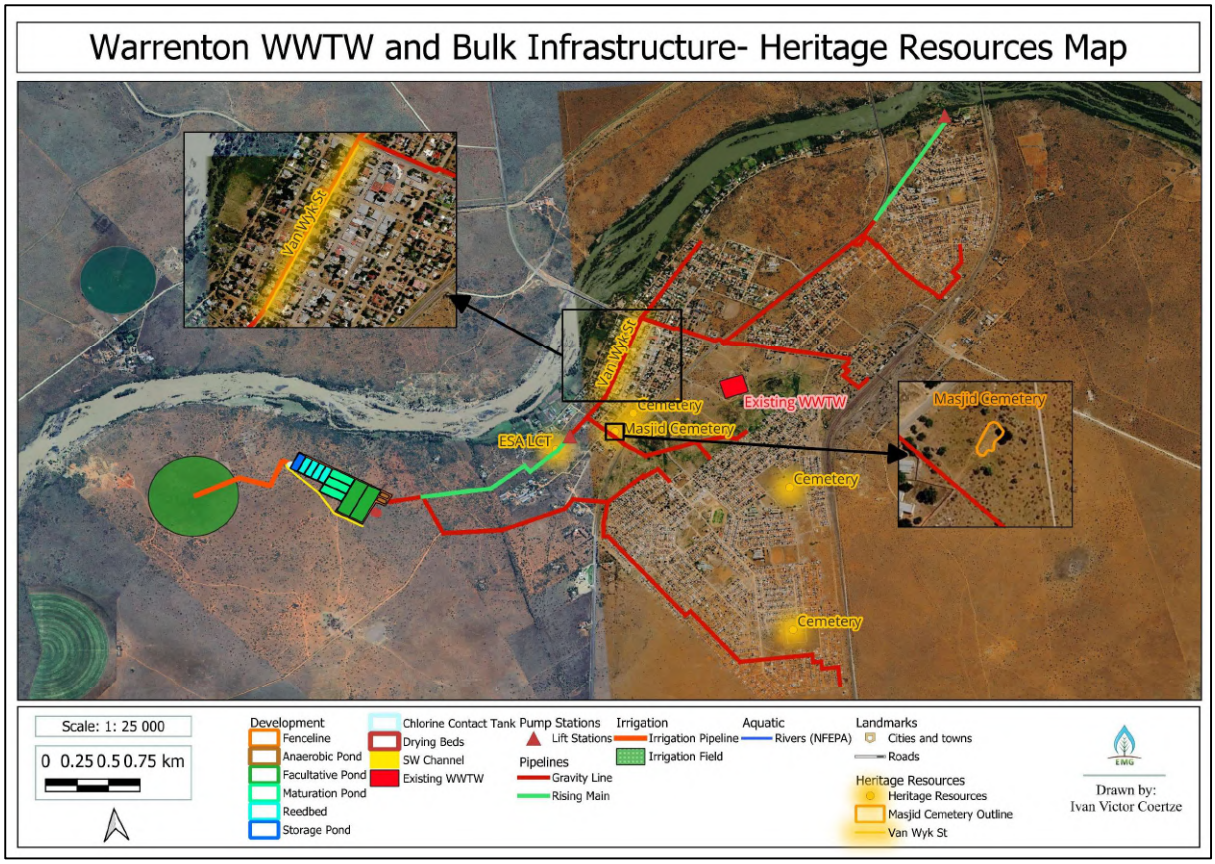


Figure 20: Map of Heritage Resources identified during the Phase 1 Palaeontological and Heritage Impact Assessment.

13 SOCIAL AND DEMOGRAPHICS

The proposed Warrenton Wastewater Treatment Works (WWTW) and associated bulk infrastructure are located within the jurisdiction of the Magareng Local Municipality (NC093) in the Northern Cape Province. Gamagara LM falls within the John Taolo Gaetsewe District Municipality.

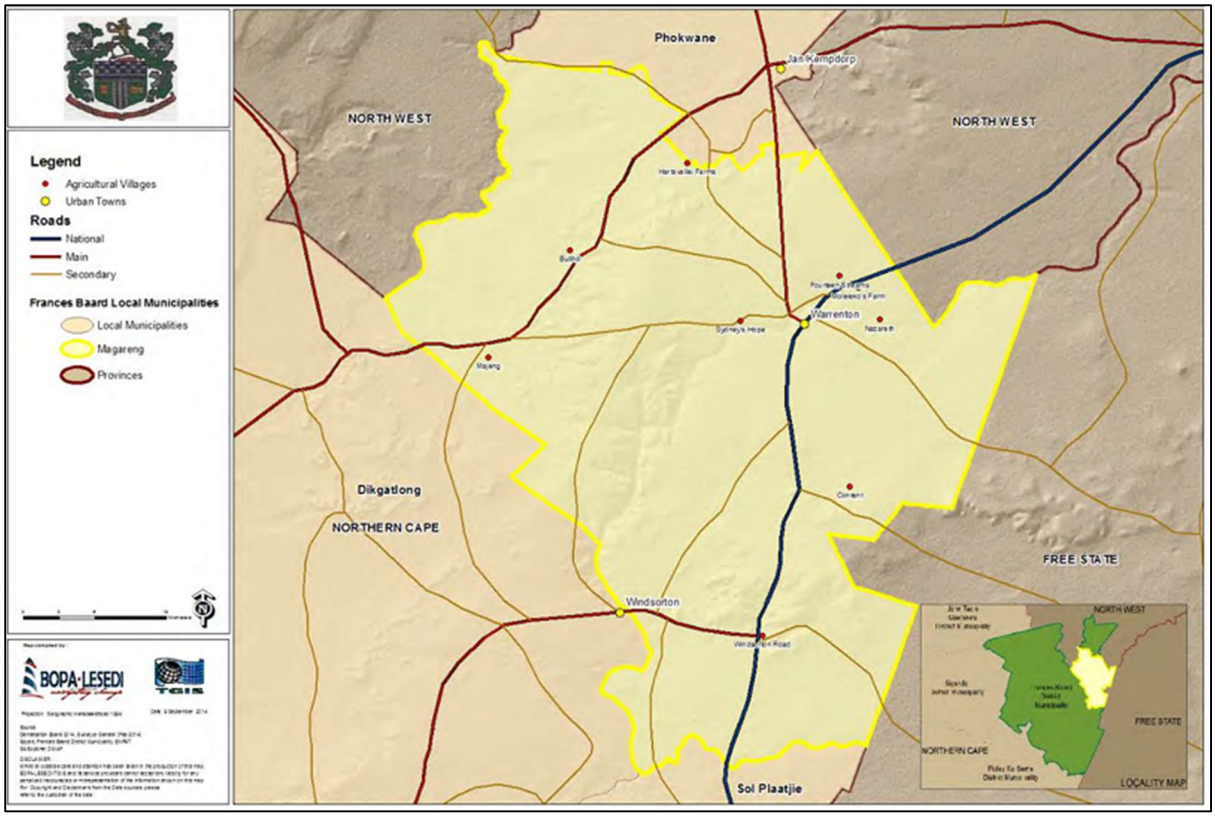


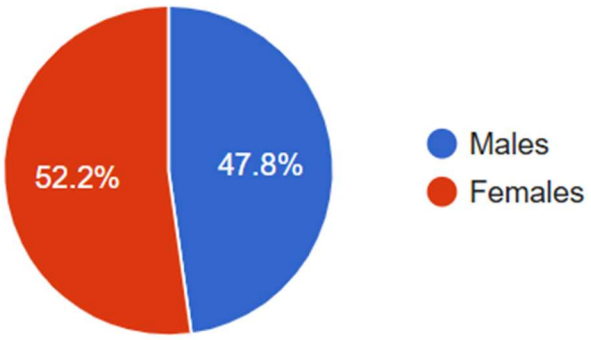
Figure 21: Locality map of Magareng Local Municipality (Magareng Local Municipality, 2024).

Warrenton serves as the administrative and economic centre of the municipality. The municipal area, covering approximately 1,542 km², is strategically positioned 75 km north of Kimberley on the banks of the Vaal River, with the N12 and N18 national routes and a major railway line passing through it, connecting the region to Gauteng and the Western Cape.

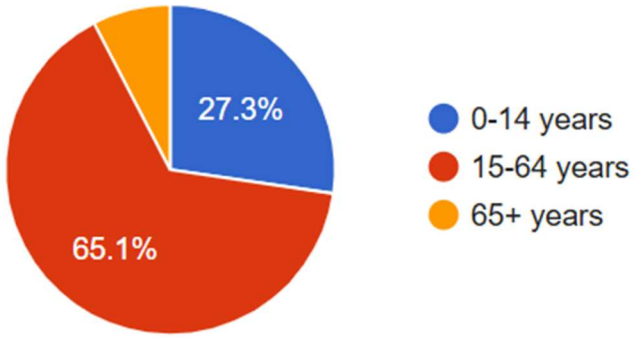
The municipality comprises urban nodes, including Warrenton, Warrenvale, and Ikhutseng, alongside several small agricultural villages and extensive mixed farming areas. According to Census 2022 data, the total population is approximately 26,816. The population is predominantly young, with a significant portion under the age of 35, which presents both a demographic opportunity and a challenge for job creation and service delivery.

The municipal area is divided into six wards. Wards 1 to 3 constitute Ikhutseng, Ward 4 is Warrenvale, and Ward 5 comprises Warrenton town and surrounding rural areas. The proposed WWTW site on Portion 7 of Farm Doornfontein 12 is located west of Warrenton, with the pipeline extending into the town, traversing multiple ward boundaries. Community needs, as captured in the Integrated Development Plan (IDP), are centred on basic service delivery, economic development, and infrastructure upgrades.

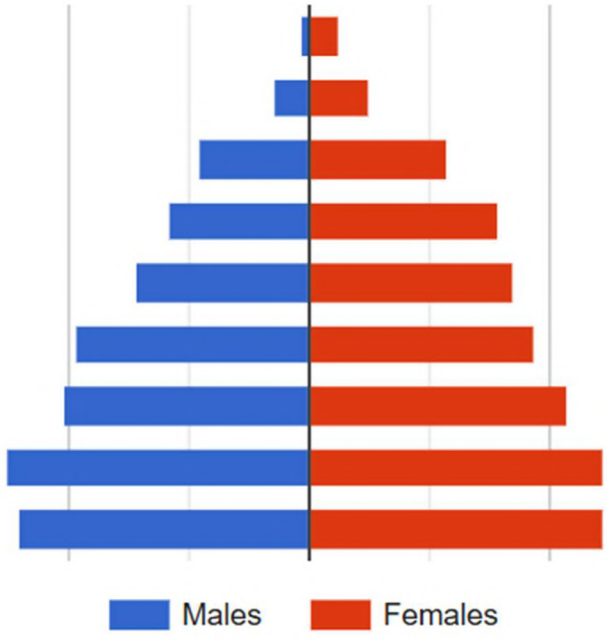
Table 4: Magareng Demographic Data (SA Census 2022).



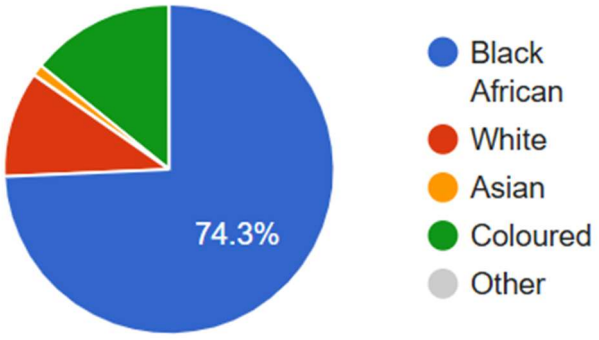
Gender (C 2022)	
Males	12,814
Females	14,002



Age Groups (C 2022)	
0-14 years	7,319
15-64 years	17,444
65+ years	2,050



Age Distribution (C 2022)	
80+ years	319
70-79 years	793
60-69 years	2,074
50-59 years	2,747
40-49 years	3,133
30-39 years	3,790
20-29 years	4,171
10-19 years	4,942
0-9 years	4,844



Population Group (C 2022)	
Black African	19,927
White	2,784
Asian	298
Coloured	3,800
Other group	6

Map Source: City Population from:
http://citypopulation.de/en/southafrica/admin/northern_cape/NC093__magareng/

Data Source: Statistics South Africa

13.1 POPULATION AND DEPENDENCY

The population profile indicates a pressing need for economic development to absorb the growing labour force. Educational attainment is a area of concern; only 18% of persons aged 20 years and older have completed Grade 12, and a further 7% have some higher education. About 17% have no formal education, which impacts employability and economic participation.

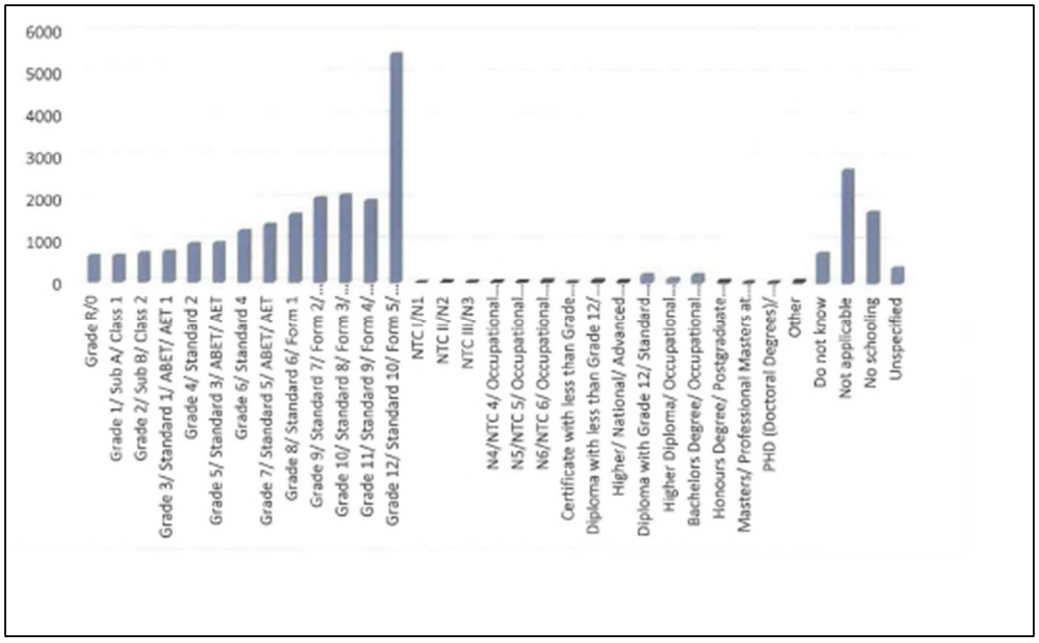


Figure 22: Education levels for persons aged 20+ in Magareng Local Municipality (Magareng Local Municipality, 2024).

Unemployment is historically high, with rates exceeding 40%. The local economy has been adversely affected by the decline in alluvial diamond mining and shifts in the agricultural sector, leading to economic leakage to regional service centres like Kimberley and Hartswater. The Gross Value Added (GVA) is dominated by community services, followed by transport, trade, and mining. Agriculture, while a significant land use, contributes only about 2% to GVA, highlighting an opportunity for agro-processing and value-addition development.

13.2 LIVING CONDITIONS AND SERVICE DELIVERY

Access to basic services remains a critical challenge and a top priority across all wards. The 2024/25 IDP consolidated priority list is led by water, roads, sanitation, land, and job creation. The state of municipal infrastructure is described as precarious, with systems old, dilapidated, and often non-compliant with current legislation.

Housing types are varied. The majority of dwellings are formal houses or brick structures, but a significant number of informal dwellings (shacks) are also present, both in backyards and in settlements.

While most urban households have access to piped water, the system is characterised by extreme financial and technical losses, with non-revenue water estimated at 84%. The sewerage network and the existing Warrenton WWTW are in a state of failure, leading to pollution incidents and directives from the Department of Water and Sanitation. This context makes the proposed new WWTW a critical infrastructure investment for the municipality.

Access to electricity is not universal, with backlogs noted, particularly in areas like Majeng. Solid waste management is another significant challenge, with the Warrenton waste disposal site operating under a regulatory directive due to non-compliance.

13.3 SOCIO-ECONOMIC IMPLICATIONS FOR THE PROJECT

The socio-demographic profile underscores the developmental importance of the proposed WWTW project. Its primary function is to address a critical service delivery failure and regulatory non-compliance, which directly impacts public health and environmental quality. Furthermore, the project has the potential to contribute to local economic development during both construction and operation phases.

The high unemployment rate and need for job creation, as repeatedly listed in ward priorities, suggest that the project's procurement and labour plans should maximise local employment and SMME development opportunities. The project aligns directly with the municipality's strategic objective to "eradicate backlogs in order to improve access to services" and can be a catalyst for improved public health and future economic growth in the Warrenton area. Effective stakeholder engagement and communication, considering the community's primary concerns, will be essential for the project's social license to operate.

14 PROJECT MOTIVATION

According to Appendix 3 s3 (1)(f):
"a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted scoping report;"

14.1 THE NEED AND DESIRABILITY FOR THE PROPOSED DEVELOPMENT:

The needs and desirability analysis component of the "Guideline on need and desirability in terms of the EIA Regulations (Notice 819 of 2014)" includes, but is not limited to, describing the linkages and dependencies between human well-being, livelihoods and ecosystem services applicable to the area in question, and how the proposed development's ecological impacts will result in socio-economic impacts (e.g., on livelihoods, loss of heritage site, opportunity costs, etc.). This section of the report provides the need and desirability for the proposed Warrenton WWTW.

The existing Warrenton Wastewater Treatment Works (WWTW) is located within a residential area and is currently outdated and operating beyond its original design capacity. As a result, the facility is increasingly unable to efficiently treat municipal wastewater generated by the growing population of Warrenton. The continued operation of an overburdened treatment facility poses potential risks to both public health and the surrounding environment, particularly with regard to the quality of treated effluent entering the Vaal River system.

Figure 23: Aerial view of the existing WWTW.

The Magareng Local Municipality is responsible for providing reliable sanitation services to its residents. The proposed development therefore seeks to address existing service delivery backlogs while also accommodating anticipated future population growth and increased wastewater volumes within the municipal area.

The proposed project involves the construction of a new Wastewater Treatment Works with a design capacity of approximately 3.2 ML/day, together with associated bulk sewer

infrastructure. The development will allow the municipality to modernise its wastewater treatment infrastructure and ensure compliance with current environmental management standards.

The proposed treatment system will consist of a pond and reedbed system, which will allow treated effluent to be reused for irrigation purposes, including fodder grass production and irrigation of sports and recreational fields. This approach promotes the efficient reuse of treated wastewater and reduces reliance on freshwater resources in a region characterised by limited water availability.

In addition, the relocation of the WWTW away from the existing residential area will allow for the decommissioning and rehabilitation of the current facility, thereby eliminating potential odour, nuisance and environmental risks currently experienced by nearby residents. It's important to note that the decommissioning of the existing facility should be seen as a separate project.

Should the proposed development not proceed, the existing WWTW would continue to operate beyond its design capacity, which may lead to a further deterioration in treatment efficiency and potential environmental pollution risks. The construction of the new WWTW is therefore considered necessary to ensure sustainable sanitation services, protect environmental resources and safeguard public health.

Table 5: Need, desirability, and benefits of the proposed project.

Securing ecological sustainable development and use of natural resources	
A	**How were the ecological integrity considerations considered in terms of:** Threatened Ecosystems, Sensitive and vulnerable ecosystems, Critical Biodiversity Areas, Ecological Support Systems, Conservation Targets, Ecological drivers of the ecosystem, Environmental Management Framework, Spatial Development Framework (SDF) and global and international responsibilities?
	Explanation: The proposed site and pipeline corridors were selected following a preliminary site screening process to avoid, where possible, areas of highest ecological sensitivity. The project triggers listed activities related to watercourses and vegetation clearance in Critical Biodiversity Areas (CBAs). As part of the EIA, specialist studies including Terrestrial Biodiversity, Aquatic and Wetland studies will be conducted. These studies will definitively identify sensitive receptors, assess impacts, and inform the final design and mitigation measures within the Environmental Management Programme (EMPr) to ensure ecological integrity is maintained.
B	**How will this project disturb or enhance ecosystems and / or result in the loss or protection of biological diversity?** What measures were explored to avoid these negative impacts, and where these negative impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?
	Explanation: The project will result in the permanent loss of approximately 19 ha of land for the pond system and temporary disturbance along pipeline corridors. The specialist studies will quantify impacts on indigenous vegetation. The mitigation hierarchy is being applied: the site was chosen to avoid major pristine ecosystems; design will minimise footprint; the reedbed component creates a new constructed wetland habitat.
C	**How will this development pollute and / or degrade the biophysical environment?** What measures were explored to either avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?

	Explanation: The core purpose of the project is to reduce pollution by replacing an inefficient plant. Potential construction impacts (dust, erosion, noise) and operational risks (effluent quality) are acknowledged. The EMPr will include strict controls for construction (e.g., silt fencing, water spraying) and operation (e.g., continuous monitoring, preventive maintenance). The reuse of effluent for irrigation prevents degradation of natural watercourses.
D	**What waste will be generated by this development?** What measures were explored to avoid waste, and where waste could not be avoided altogether, what measures were explored to minimise, reuse and / or recycle the waste? What measures have been explored to safely treat and/or dispose of unavoidable waste?
	Explanation: Construction waste will be managed via sorting and disposal at licensed facilities. The primary "waste" is sewage sludge, which will be dried on dedicated beds and reused as a soil conditioner, closing the waste loop. This avoids landfill disposal and creates a beneficial product.
E	**How will this project disturb or enhance landscapes and / or sites that constitute the nation's cultural heritage?** What measures were explored to firstly avoid these impacts, and where impacts could not be avoided altogether, what measures were explored to minimise and remedy the impacts? What measures were explored to enhance positive impacts?
	Explanation: A Heritage Impact Assessment is part of the EIA. If heritage resources are identified, avoidance is preferred. If unavoidable, a mitigation protocol (e.g., excavation by a qualified archaeologist) will be implemented. A Chance Find Procedure will be included in the EMPr for all construction workers.
F	**How will this project use and / or impact on non-renewable natural resources?** What measures were explored to ensure responsible and equitable use of the resources? How have the consequences of the depletion of the non-renewable natural resources been considered?
	Explanation: The project will use non-renewable resources like concrete, steel, and fuels for construction, with design optimization to minimize this initial material footprint. A core mitigating measure is the treatment and reuse of effluent water, whose primary purpose is the responsible disposal and repurposing of a waste stream; in this water-scarce region, this also conserves freshwater as a beneficial outcome. The investment in these resources is justified by creating a long-term, efficient system that reduces ongoing waste and operational demands, aiming for a net reduction in environmental burden over its lifespan.
G	**How will this project use and / or impact on renewable natural resources and the ecosystem of which they are part?** Will the use of the resources and / or impacts on the ecosystem jeopardise the integrity of the resource and / or system taking into account carrying capacity restrictions, limits of acceptable change, and thresholds?
	Explanation: The project uses land and water. The land is already in agricultural use. The water used is wastewater, which is treated and reused, thereby reducing the net abstraction of freshwater from the Vaal River for irrigation. This enhances the sustainable use of water resources within the region's carrying capacity.
H	**How were a risk-averse and cautious approach applied in terms of ecological impacts?**
	Explanation: The decision to conduct a full EIA with specialist studies demonstrates a cautious approach. The preliminary layout avoids sensitive areas where possible. The EMPr will establish monitoring triggers and response actions to manage unforeseen impacts.

I	**How will the ecological impacts resulting from this development impact on people's environmental right?**
	Explanation: Positive impacts dominate: improved water quality in the environment reduces health risks. Negative impacts (temporary construction nuisance) will be minimised through EMPr controls. The permanent improvement in sanitation directly enhances the community's right to an environment not harmful to health.
J	**Describe the linkages and dependencies between human wellbeing, livelihoods and ecosystem services applicable to the area in question and how the development's ecological impacts will result in socio-economic impacts?**
	Explanation: The current poor wastewater treatment degrades ecosystem services (clean water, disease regulation). This impacts human wellbeing (health) and livelihoods (potential impact on agriculture if river is polluted). The new WWTW will protect these services, leading to positive socio-economic impacts: improved public health, secure water for irrigation, and job creation. The temporary loss of some agricultural land is an opportunity cost mitigated by long-term benefits.
	Securing ecological sustainable development and use of natural resources
A	**What is the socio-economic context of the area?**
	Explanation: The Magareng Local Municipality faces challenges of unemployment and service delivery backlogs. The IDP prioritises infrastructure development. This project directly addresses a key IDP priority, stimulating local economic activity through job creation and improved public health, which supports other development goals
B	**Considering the socio-economic context, what will the socio-economic impacts be of the development?**
	Explanation: The impacts are overwhelmingly positive: job creation (temporary and permanent), skills development, improved public health, and more reliable basic service delivery. This will support local economic development and improve the quality of life.
C	**Q: How will this development address the specific physical, psychological, developmental, cultural and social needs and interests of the relevant communities?**
	Explanation: It addresses the fundamental physical need for safe sanitation. Removing the old plant from the residential area addresses psychological and social concerns (odour, nuisance). Public participation ensures community interests are heard and considered in final planning.
D	**Q: Will the development result in equitable impact distribution, in the short- and long-term?**
	Explanation: Yes. The entire community benefits from improved sanitation. Job opportunities will be equitably targeted (70-80% for previously disadvantaged individuals). The long-term burden of a failing system is replaced with a sustainable asset.
E	**In terms of location, describe how the placement of the proposed development will:**
E1	**Result in the creation of residential and employment opportunities in close proximity?**
	Explanation:

	The operational jobs are located at the new plant. While not in the town centre, it is within the municipal area, providing local employment.
E2	**Be in line with the planning for the area?**
	Explanation: The site is on municipal-owned land designated for this purpose, aligning with the SDF and IDP.
E3	**Optimise the use of existing resources and infrastructure?**
	Explanation: It connects to and upgrades parts of the existing sewer network. It makes use of existing municipal land and utilises an old pivot system for effluent water irrigation.

15 PUBLIC PARTICIPATION PROCESS

According to Appendix 3 s3 (1)(h):
(ii) details of the public participation process undertaken in terms of regulation 41 of the regulations, including copies of the supporting documents and inputs;

(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them;

And according to Appendix 3 s3 (1)(v):
"any specific information that may be required by the competent authority"

And according to Appendix 3 s3 (1)(w):
"any other matters required in terms of section 24(4)(a) and (b) of the Act."

15.1 OBJECTIVES OF THE PUBLIC PARTICIPATION PROCESS

Public Participation Process (PPP) forms an integral part of the application process. It provides people with the opportunity to raise their issues and concerns about the proposed development. The public participation process to which this EA process is subjected must *"give all potential or registered interested and affected parties, including the competent authority, a period of at least 30 days to submit comments."* In addition, the public participation *process "must provide access to all information that reasonably has or may have the potential to influence any decision with regard to an application."* Public participation must include *"consultation with—*

a) the competent authority.

b) every State department that administers a law relating to a matter affecting the environment relevant to an application for an environmental authorisation.

c) all organs of state which have jurisdiction in respect of the activity to which the application relates; and

d) all potential stakeholders, landowners, land users, where relevant, registered interested and affected parties."

In terms of the NEMA, the public participation process provides people who may be affected by the proposed development with an opportunity to provide comments and to raise issues of concern about the project or to make suggestions that may result in enhanced benefits for the project. Comments and issues raised during the scoping PPP has been captured, evaluated and included in a comments and responses register in Appendix 5: The Public Participation

Report of the EIA. Comments and issues raised during the EIA PPP will additionally be captured and incorporated into Appendix 5 as well.

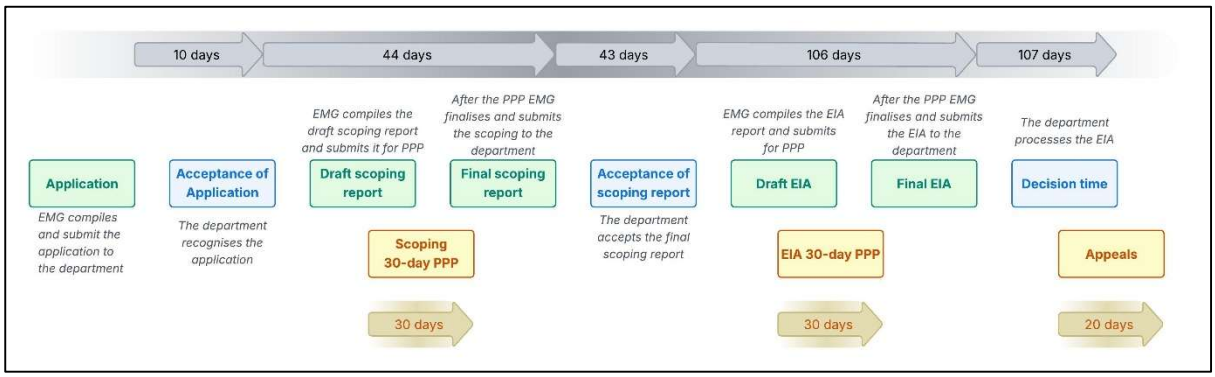


Figure 24: The scoping and EIA process timeline.

Table 6: Timeframes of the Scoping and EIA process

Process step	Responsible party	Date Completed
1. EAP to conduct a site investigation	EMG	18 August 2025
2. EAP to compile and submit an application for environmental authorization to the competent authority	EMG	11 December 2025
3. Authorizing authority to formally recognize the application.	Authorizing authority	09 January 2026
4. EAP to compile and submit the draft scoping report to the department and for I&APs (30-day PPP)	EMG	26 January 2026
5. End of draft scoping report 30-day PPP		26 February 2026
6. Department accepted an extension letter for submitting the final scoping report on a later date	Authorizing authority	19 February 2026
7. EAP to finalize scoping report and submit the final report (including comments) to the department	EMG	06 March 2026
8. Department accepts the final scoping report	Authorizing authority	02 April 2026
9. EAP to conduct and submit the draft EIA report to the competent authority and I&APs (30-day PPP)	EMG	***We are now here!***
10. EAP to finalize and submit final EIA to the competent authority (including comments)	EMG	-
11. Department to process and issue the decision on the environmental authorization	Authorizing authority	-

15.2 PRE-APPLICATION PUBLIC PARTICIPATION:

The involvement of Interest and Affected Parties is vital in environmental assessment projects. The announcement of the Scoping and EIA process and, consequently the invitation of

Interested and/or Affected Parties (I&APs) to participate was facilitated by the following methods:

- notification of the surrounding property owners of the EA process,
- placement of site notice boards,
- placement of newspaper advertisements, and
- the distribution of the Background Information Documents (BID),
- a public information session.

15.3 IDENTIFICATION OF STAKEHOLDERS:

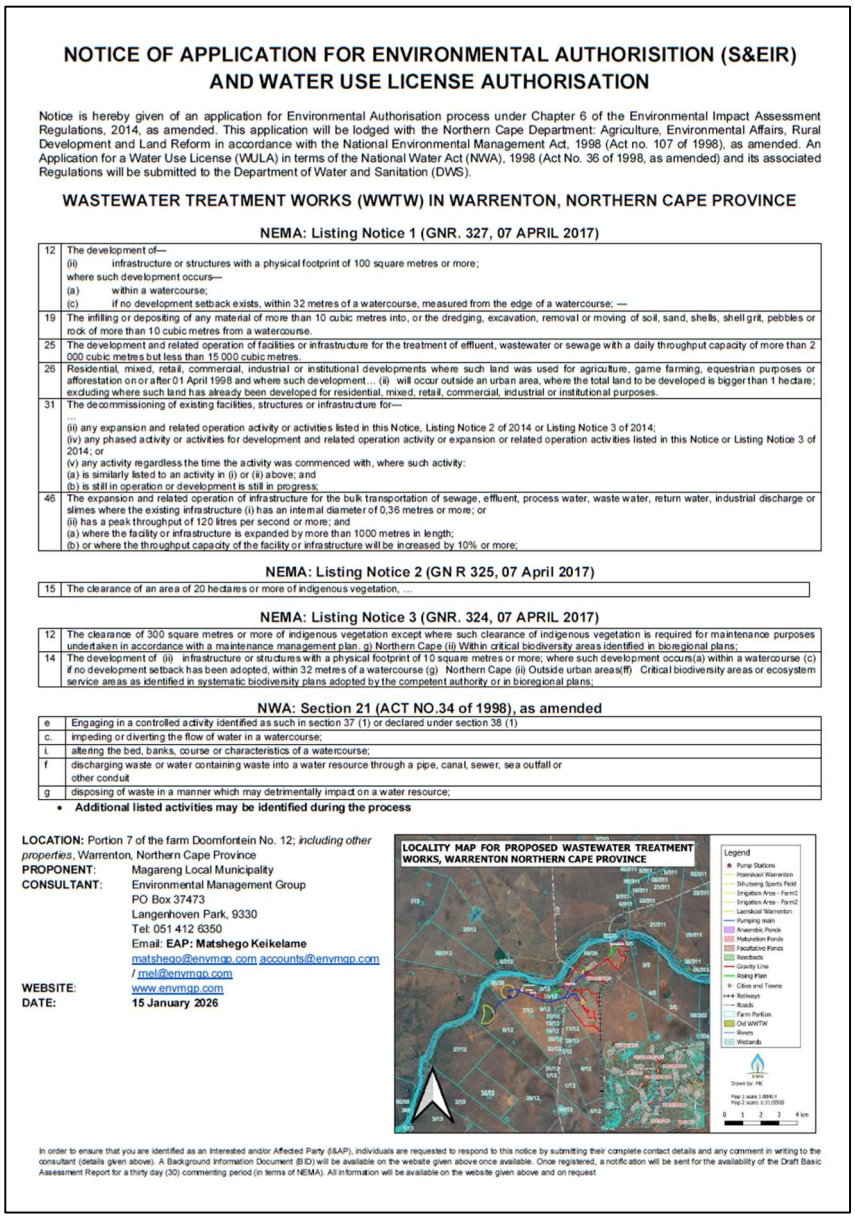
During the project's inception phase, I&APs and other key stakeholders were identified for the proposed development. This included identifying landowners, land occupants, service providers, farms associations, ward councillors and relevant governmental officials. Engagements with I&APs and other stakeholders is an ongoing process and will continue throughout the EA process.

15.4 NOTIFICATION OF THE EA PROCESS:

The public participation process was commenced through the issuance of initiation notification letters, the posting of site notices, the publication of advertisements in newspapers, the distribution of the BID to pre-identified I&APs and stakeholders and a public information session held. This process is fully described in Appendix 5: Public Participation Report.

15.4.1 SITE NOTICES:

Site Notice boards were placed in locations accessible to the public, on site as well as the site boundary. The site notice boards illustrated key details pertaining to the development. Steps for potential I&APs to register and contact information for EMG was clearly illustrated on the site notices.



NOTICE OF APPLICATION FOR ENVIRONMENTAL AUTHORISITION (S&EIR) AND WATER USE LICENSE AUTHORISATION

Notice is hereby given of an application for Environmental Authorisation process under Chapter 6 of the Environmental Impact Assessment Regulations, 2014, as amended. This application will be lodged with the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform in accordance with the National Environmental Management Act, 1998 (Act no. 107 of 1998), as amended. An Application for a Water Use License (WULA) in terms of the National Water Act (NWA), 1998 (Act No. 36 of 1998, as amended) and its associated Regulations will be submitted to the Department of Water and Sanitation (DWS).

WASTEWATER TREATMENT WORKS (WWTW) IN WARRENTON, NORTHERN CAPE PROVINCE

NEMA: Listing Notice 1 (GNR. 327, 07 APRIL 2017)

12	The development of— (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs— (a) within a watercourse; (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; —
19	The infilling or depositing of any material of more than 10 cubic metres into, or the dredging, excavation, removal or moving of soil, sand, shells, shell grit, pebbles or rock of more than 10 cubic metres from a watercourse.
25	The development and related operation of facilities or infrastructure for the treatment of effluent, wastewater or sewage with a daily throughput capacity of more than 2 000 cubic metres but less than 15 000 cubic metres.
26	Residential, mixed, retail, commercial, industrial or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development… (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare; excluding where such land has already been developed for residential, mixed, retail, commercial, industrial or institutional purposes.
31	The decommissioning of existing facilities, structures or infrastructure for— … (iii) any expansion and related operation activity or activities listed in this Notice, Listing Notice 2 of 2014 or Listing Notice 3 of 2014; (iv) any phased activity or activities for development and related operation activity or expansion or related operation activities listed in this Notice or Listing Notice 3 of 2014; or (v) any activity regardless the time the activity was commenced with, where such activity: (a) is similarly listed to an activity in (i) or (ii) above; and (b) is still in operation or development is still in progress;
46	The expansion and related operation of infrastructure for the bulk transportation of sewage, effluent, process water, waste water, return water, industrial discharge or slimes where the existing infrastructure (i) has an internal diameter of 0,36 metres or more; or (ii) has a peak throughput of 120 litres per second or more; and (a) where the facility or infrastructure is expanded by more than 1000 metres in length; (b) or where the throughput capacity of the facility or infrastructure will be increased by 10% or more;

NEMA: Listing Notice 2 (GN R 325, 07 April 2017)

15	The clearance of an area of 20 hectares or more of indigenous vegetation, …

NEMA: Listing Notice 3 (GNR. 324, 07 APRIL 2017)

12	The clearance of 300 square metres or more of indigenous vegetation except where such clearance of indigenous vegetation is required for maintenance purposes undertaken in accordance with a maintenance management plan. g) Northern Cape (ii) Within critical biodiversity areas identified in bioregional plans;
14	The development of (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs(a) within a watercourse (c) if no development setback has been adopted, within 32 metres of a watercourse (g) Northern Cape (ii) Outside urban areas(ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans;

NWA: Section 21 (ACT NO.34 of 1998), as amended

e	Engaging in a controlled activity identified as such in section 37 (1) or declared under section 38 (1)
c.	impeding or diverting the flow of water in a watercourse;
i.	altering the bed, banks, course or characteristics of a watercourse;
f	discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit
g	disposing of waste in a manner which may detrimentally impact on a water resource;

- **Additional listed activities may be identified during the process**

LOCATION: Portion 7 of the farm Doornfontein No. 12; *including other properties*, Warrenton, Northern Cape Province
PROPONENT: Magareng Local Municipality
CONSULTANT: Environmental Management Group
PO Box 37473
Langenhoven Park, 9330
Tel: 051 412 6350
Email: **EAP: Matshego Keikelame**
matshego@envmgp.com accounts@envmgp.com / mel@envmgp.com
WEBSITE: www.envmgp.com
DATE: **15 January 2026**

LOCALITY MAP FOR PROPOSED WASTEWATER TREATMENT WORKS, WARRENTON NORTHERN CAPE PROVINCE

In order to ensure that you are identified as an Interested and/or Affected Party (I&AP), individuals are requested to respond to this notice by submitting their complete contact details and any comment in writing to the consultant (details given above). A Background Information Document (BID) will be available on the website given above once available. Once registered, a notification will be sent for the availability of the Draft Basic Assessment Report for a thirty day (30) commenting period (in terms of NEMA). All information will be available on the website given above and on request

Figure 25: The site notice placed in several locations during the PP process.

15.4.2 DISTRIBUTION OF BACKGROUND INFORMATION DOCUMENTS:

The purpose of the BID is to ensure that all relevant information and processes are clearly outlined and accessible to a broad range of stakeholders. Additionally, registered I&APs receive the BID to keep them informed and engaged throughout the project. BIDs were sent out to I&APs along with invitations to the public information session. The BID was furthermore placed on the Environmental Consultant's website for inspection. Access to this was advertised in a local newspaper.

15.4.3 ADVERT:

As stated in the EIA regulations (GN R982 of 2014, as amended in GN R 517 of 2021), notices informing the public of the proposed development should not only be placed on site, but the project should also be advertised in a local newspaper. All stakeholders and I&APs were notified of the commencement of the environmental authorisation process as well as the availability to background information and how to register as an interested and affected party in a newspaper advert.

15.5 PUBLIC PARTICIPATION SUMMARY:

The public participation process for the proposed development is summarised in the table below. Refer to Appendix 5 for the full PPP report and the Comments and Response report. Please note that comments will be updated following the termination of the EIA public participation phase.

Table 7: Public participation process timeframe.

Phase	Requirement	Date
Inception Phase	Site notice	17 January 2026
	Advert	23 January 2026
Draft Scoping Report	Invitation to comment	23 January 2026
Draft EIA	Circulation of BID to landowners.	24 April- 28 June
	Invitation to public meeting	03 June 2026
	Public Meeting	10 June 2026
	Invitation to comment	***We are now here!***

16 MAPPING OF SENSITIVITY

According to Appendix 3 s3(1)(l):

"(ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred development footprint on the approved site as contemplated in the accepted scoping report indicating any areas that should be avoided, including buffers;"

Environmental sensitivity mapping provides a strategic overview of the environmental, cultural, and social assets in a region. The sensitivity mapping technique integrates numerous datasets (base maps and shapefiles) into a single consolidated layer using Geographic Information System (GIS) software and analysis tools (QGIS 3.44.3). Environmental sensitivity mapping is a rapid and objective method applied to identify areas which may be particularly sensitive to development based on environmental, cultural, and social sensitivity weightings – which is determined by specialists' input within each respective field based on aerial or ground-surveys. Therefore, the sensitivity mapping exercise assists in the identification of sensitive areas within and surrounding the proposed Wastewater Treatment Works (WWTW) site, associated bulk infrastructure sites and pipeline corridors. The sensitivity, composite maps integrate the findings of several specialist studies, namely:

- Site Sensitivity and terrestrial Ecological Assessment Report.
- Wetland Assessment.
- Heritage and Palaeontological Impact Assessment.
- Geohydrological Assessment.

This sensitivity mapping approach allows for the planning of proposed activities whilst protecting identified sensitive environmental features. Furthermore, environmental sensitivity is used to aid in decision-making during consultation processes, forming a strategic part of the Environmental Assessment. Refer to Figure 25 below for the combined sensitivity/composite map for the project. Due to the complexity of the interconnected themes, maps were drawn up isolating the consolidated sensitivity map into separate themes (Appendix A: Maps), namely:

- Aquatic
- Vegetation
- Conservation
- Heritage

It is clear from the preliminary mapping that the key environmental sensitivities for the project area include:

- **Aquatic Resources:** The Vaal River and associated drainage lines, including their riparian zones, which are sensitive to pollution and physical disturbance.
- **Biodiversity Areas:** The Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) identified in bioregional plans, which indicate areas of high conservation importance.
- **Heritage & Palaeontological Sensitivity:** Areas of potential archaeological or palaeontological significance, particularly along undisturbed ridges and near water sources.

- **Social and Land-Use Sensitivities:** Existing residential areas (Warrenton, Ikhutseng, Warrenvale) that may be sensitive to construction disruption, visual impacts, or potential odour; and productive agricultural land.

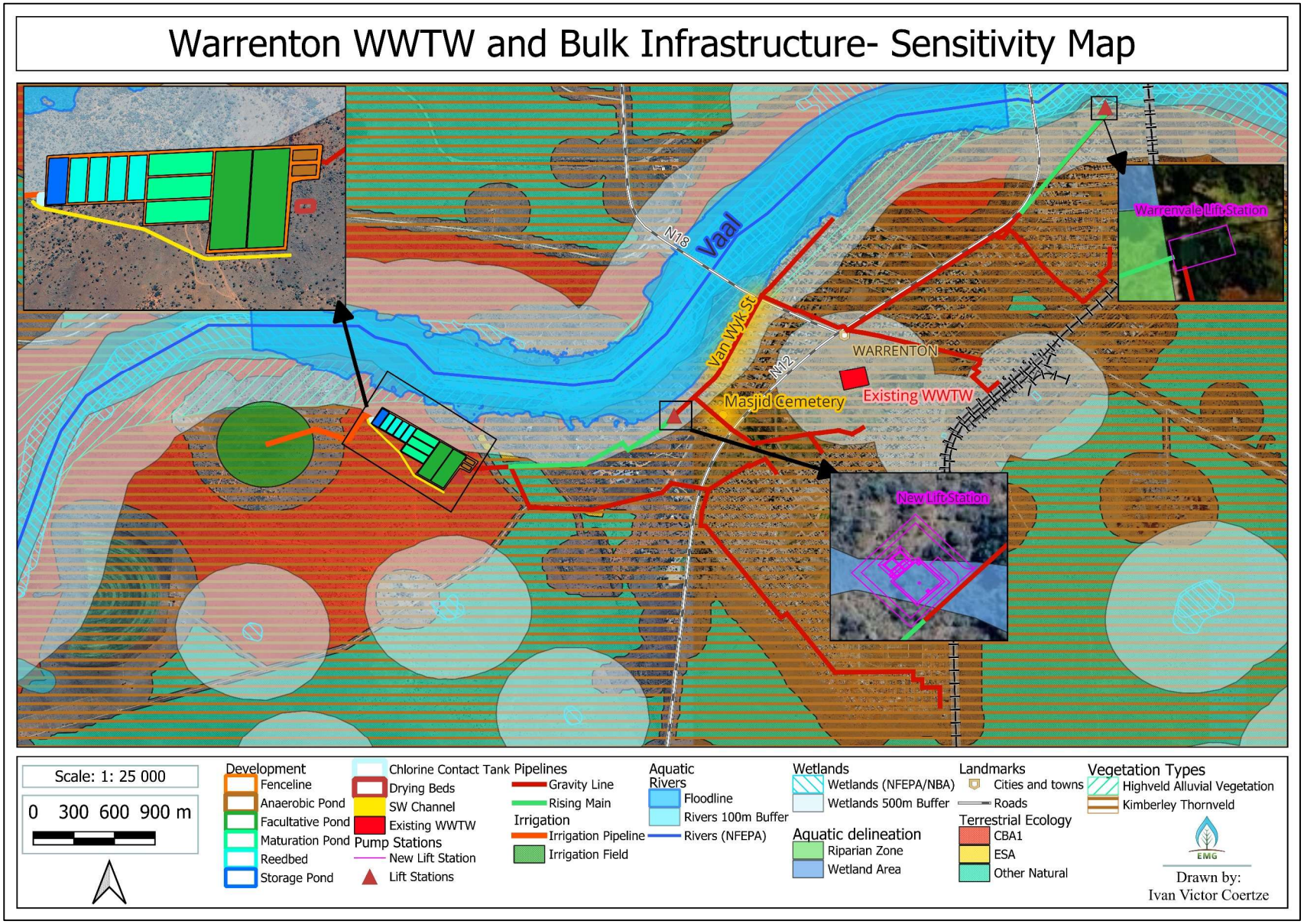


Figure 26: Sensitivity Map of the proposed development area in Warrenton, Northern Cape.

17 IMPACT ASSESSMENT

17.1 OVERVIEW OF SPECIALIST REPORTS

According to Appendix 3 s3(1)(h):

"a full description of the process followed to reach the proposed development footprint within the approved site as contemplated in the accepted scoping report, including

"(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts-

(aa) can be reversed;

(bb) may cause irreplaceable loss of resources; and

(cc) can be avoided, managed or mitigated;

(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks;

(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects;

(viii) the possible mitigation measures that could be applied and level of residual risk;"

And according to Appendix 3 s3(1)(i):

"a full description of the process undertaken to identify, assess and rank the impacts the activity and associated structures and infrastructure will impose on the preferred development footprint on the approved site as contemplated in the accepted scoping report through the life of the activity, including-

(i) a description of all environmental issues and risks that were identified during the environmental impact assessment process; and

(ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures;"

And according to Appendix 3 s3(1)(j):

"an assessment of each identified potentially significant impact and risk, including-

(i) cumulative impacts;

(ii) the nature, significance and consequences of the impact and risk;

(iii) the extent and duration of the impact and risk;

(iv) the probability of the impact and risk occurring;

(v) the degree to which the impact and risk can be reversed;(vi) the degree to which the impact and risk may cause irreplaceable loss of resources; and

(vii) the degree to which the impact and risk can be mitigated;"

And according to Appendix 3 s3(1)(k):

"where applicable, a summary of the findings and recommendations of any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final assessment report;"

And according to Appendix 3 s3(1)(l):

"an environmental impact statement which contains-

(i) a summary of the key findings of the environmental impact assessment:

(iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives;"

Appendix 3 s3(1)(m):

"based on the assessment, and where applicable, recommendations from specialist reports, the recording of proposed impact management outcomes for the development for inclusion in the EMPr as well as for inclusion as conditions of authorisation;"

Site Sensitivity and Terrestrial Ecological Assessment Report.

Conducted by: Mr Joshua Giddy

As reflected in the Ecological Assessment and Report, the assessment of the ecological functioning implicated dividing the site into three* areas and assessed due to the variability in degree of disturbance and ecological functioning. The findings of these areas were found to be:

- pivot area: **very poor**
- near natural thornveld: **moderate**
- built-up area: '***irreversibly modified'*,** therefore no ecological functioning was attributed.

The unit sensitivity at the level of the vegetation unit on site was assessed. No unit sensitivity was assessed for areas within the built-up areas as these were found to be irreparably modified and not reflect any vegetation type. Impact to vegetation in these areas were therefore found to be negligible.
The unit sensitivity (calculated by utilising the assessed resilience and biodiversity importance) was determined to be **low** for the **area**.
A **low conservation importance** was ascribed on account of the absence of SCCs observed on site as well as the noted improbability of them occurring.
In spite of this, a **high functional integrity** was ascribed to the vegetation unit on account of the good habitat connectivity to surrounding habitats and connection to the Vaal River.
A **medium biodiversity importance** (being determined by the conservation importance and the functional integrity) was ascribed.
Due to the habitat connectivity as well as the nature of the species found on site, the receptor habitat was determined to have a **high resilience**.

*initially four areas were assessed, however as one has been excluded from assessment (see Section 9: In the incidence of deviation from approved scoping report), three are here discussed).

Wetland Assessment for the proposed new Waste Water Treatment Works (WWTW) and associated sewer network situated in the town of Warrenton, Northern Cape Province.

Conducted by: Mr Darius van Rensburg

A specialist conducted a Wetland Assessment of the area of the proposed development to confirm, identify and delineate the watercourses that might be impacted by the proposed development in both the construction and operational phases. The potential risks were also determined and the appropriate mitigation measures identified.

Biodiversity Sensitivity Ratings were determined with recourse to numerous factors such as:

- Habitat diversity and species richness
- Presence of rare and endangered species

- Ecological function
- Degree of rarity/conservation value
- Percentage ground cover
- Vegetation structure
- Infestation with exotic weeds and invader plants
- Degree of grazing/browsing impact
- Signs of erosion
- Terrestrial animals

The Index of Habitat Integrity of the primary perennial watercourse in close proximity to the proposed development, the Vaal River, was assessed. The Vaal River was, at this point, found to have an Index of Habitat Integrity of D, which corresponds to being 'largely modified'. This was taken as being representative of the Present Ecological State (PES) of the system.

The Ecological Importance and Sensitivity (EI&S) was rated as being Moderate: Floodplains considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity was noted to not usually be sensitive to flow and habitat modifications.

It was further noted in the wetland assessment report that the recommended Ecological Class of the instream and riparian habitat should correspond to at least a D (or better) according to DWAF (2016). As the current PES was given a Category D, it was noted that the present state of the Vaal River must be maintained (or improved) to support the ecosystem purposes and to maintain property and recreational values.

A risk assessment was accordingly conducted to assess the impact of the proposed development on the Vaal River and associated floodplain, drainage lines and other wetland areas. The findings of this were compiled into a Risk Assessment Matrix (RAM) which informed the following impact assessment.

Phase 1 Palaeontological and Heritage Impact Assessment for Bulk Water Reticulation in Warrenton, Northern Cape Province.

Conducted by: Dr Lloyd Rossouw

In an assessment of the palaeontological sensitivity of the area, it was determined that the overall palaeontological sensitivity of the affected area assessed is low. This was informed by primarily three observations, namely:

- *"The Ventersdorp Supergroup volcanic rocks underlying most of the alignment are classified as palaeontologically insignificant, as these lithologies are non-fossiliferous.*
- *The overlying Kalahari Group aeolian sands are unconsolidated, late Quaternary in age, and generally of low fossil preservation potential, except where calcretised horizons or buried palaeosurfaces are present (none observed).*
- *Quaternary river-terrace gravels, where present, have a variable and generally low palaeontological significance, as vertebrate fossils—if present—are typically fragmented and occur in secondary depositional contexts. Any palaeontological material, should it occur, is most likely to be buried within the gravel package, localized, and potentially reworked rather than preserved in primary depositional context."*

In an assessment of the archaeological sensitivity of the area, it was noted that:

- Sections of the Gravity Line and Rising Main traverse areas where the underlying substrate is locally mantled younger fluvial deposits which have a variable potential to contain Early Stone Age (ESA) Acheulean material. A single surface occurrence of an ESA Large Cutting Tool was recorded; however, as no additional diagnostic Stone Age indicators were observed, any Stone Age material that may be present was noted to most likely be localised and potentially reworked within the gravel body rather than preserved in primary depositional context. The ESA artefact was thus determined to have a low to moderate scientific significance, likely representing an isolated surface occurrence with no associated artefact scatter or primary context integrity.
- A ±100 m portion of the proposed Gravity Line is routed immediately adjacent to a cemetery apparently associated with the neighbouring Masjid located between Erasmus St. and the N12. The pipeline is here noted to pass within ~15 m of the burial ground boundary. The burial grounds are considered to have high heritage significance and thus afforded strong protection under Section 36 of the NHRA regardless of age. It was recommended that the ±100 m cemetery-adjacent segment of the Gravity Line be re-routed (See Section 11: Layout alternatives).
- A ±700 m section of the proposed Gravity Line runs through an established built-up area and parallels existing buildings along Van Wyk Street which includes buildings that may pre-date 1965 (i.e., >60 years old) and would therefore fall under the general protection for structures older than 60 years in terms of Section 34 of the National Heritage Resources Act (NHRA). These structures were thus noted to carry a moderate to potentially high heritage significance, depending on confirmation of their age, integrity and historical associations. It was recommended that construction within this segment should be planned to avoid direct physical impacts to adjacent buildings that may be protected under Section 34.

Geohydrological Investigation for Proposed Wastewater Treatment Works, Warrenton Northern Cape Province.

Conducted by: Mr Dirk Moolman

A hydrocensus site investigation was conducted entailing a site assessment. This was to establish groundwater level depths and water quality at existing boreholes and surface water sites within a 1km radius of the proposed site. Two boreholes were identified and sampled for water quality analysis during the site assessment. A total number of 2 surface water sites (upstream and downstream) were identified within the Vaal River and sampled. This hydrocensus also confirmed limited dependence of groundwater resources within the 1km radius from the proposed WWTW.

During the geophysical investigation, interpretation of the geophysical data informed strategic locations of upstream and downstream monitoring boreholes. Specific emphasis was placed on identifying potential preferential flow paths that may facilitate the migration of groundwater contaminants and to be located above and down gradient for the facility.

An assessment of the aquifer system using the methodology outlined in An Aquifer System Management Classification (Parson, 1995) yielded that the aquifer underlying the proposed

site can be described as a 'Minor-Aquifer System' (score = 2) with a 'Medium Aquifer Vulnerability' (score = 2) and requiring a medium Level of Protection (score = 4).

The findings informed mitigations incorporated into the EMPr (Appendix 6: EMPr).

17.2 IMPACT ASSESSMENT METHODOLOGY

The main objective of this section is to provide independent and scientifically sound information on the impacts identified during the Scoping & EIA. Based on the requirements of the impact assessment, impacts identified, and issues and concerns raised are assessed with regard to their significance.

The impact assessment for the proposed Warrenton WWTW adheres to a structured, risk-based methodology aligned with the requirements of the EIA Regulations, 2014 (as amended). This process aims to systematically identify, evaluate, and mitigate potential environmental impacts associated with the project's construction and operational phases.

The assessment is applied comprehensively to all identified alternatives, ensuring a consistent, transparent, and regulatory-compliant evaluation. It integrates both quantitative and qualitative analyses to determine the significance of impacts, guiding the prescription of appropriate mitigation measures.

17.2.1 RISK-BASED ASSESSMENT FRAMEWORK

Management and risk assessment plays a key role in the proponent's business. Managing the risks must be integrated into day-to-day business-related processes to ensure that both operational and strategic decisions are risk-based. The risk management system provides a framework to identify both threats and opportunities. The system then compensates and initiates resources that are allocated to treat the risks. It is required to review the risks as an ongoing process and then proceed to review the efficacy of the controls.

The risk assessment comprises quantifying the magnitude of potential impacts and the likelihood of these impacts to occur. The Consequence (C) and Likelihood (L) matrix combine the qualitative and or semi-quantitative ratings of consequence and the likelihood that a specific consequence will occur to calculate a risk score and risk rating (Equation 1). Essentially, the greater a probability of an adverse impact occurring, the greater the risk level associated with it will be.

C = Overall consequence

L = Likelihood of occurrence

$$Environmental\ Significance = C \times L$$

17.2.2 DETERMINATION OF CONSEQUENCE

Consequence analysis is a combination of quantitative and qualitative information, and the outcome can be positive or negative. Several factors can be used to determine consequence. For the purpose of determining the environmental significance in terms of consequence, the following factors were chosen:

Severity/Intensity (*I*): The degree of harm or change to the biophysical and socio-economic environment.

Duration (*D*): The length of time the impact will persist without intervention.

Extent/Spatial Scale (E): The geographical area affected by the impact.

Each factor is assigned a rating between 1 to 5, as described in the tables below.

Determination of intensity:

Intensity relates to the nature of the event, aspect or impact to the environment and describes how intense a given aspect's impact on the biophysical and socio-economic environment will be.

Table 8 Rating criteria describing the intensity of a given aspect

Type of criteria	Rating				
	1	2	3	4	5
Quantitative	0-20%	21-40%	41-60%	61-80%	81-100%
Qualitative	Insignificant / non-harmful	Small / Potentially harmful	Significant / Harmful	Great / Very harmful	Disastrous Extremely harmful
Social/ Community response	Acceptable / I&AP satisfied	Slightly tolerable / Possible objections	Intolerable/ Sporadic complaints	Unacceptable / Widespread complaints	Totally unacceptable / Possible legal action
Irreversibility	Very low cost to mitigate/ High potential to mitigate impacts to level of insignificance / Easily reversible	Low cost to mitigate	Substantial cost to mitigate / Potential to mitigate impacts / Potential to reverse impact	High cost to mitigate	Prohibitive cost to mitigate / Little or no mechanism to mitigate impact Irreversible
Biophysical (Air quality, water quantity and quality, waste production, fauna and flora)	Insignificant change / deterioration or disturbance	Medium change / deterioration or disturbance	Significant change / deterioration or disturbance	Very significant change / deterioration or disturbance	Disastrous change / deterioration or disturbance

Determination of duration:

Duration refers to the amount of time the receiving environment will be exposed to a given aspect, risk or impact, given the absence of intervention/mitigation.

Table 9 Rating criteria for determination of duration

Rating	Description
1: Low	1 Month
2: Low-Medium	1 – 3 Months
3: Medium	More than 3 Months
4: Medium-High	5 – 10 Years
5: High	More than 10 Years

Determination of extent/spatial scale:

Extent refers to the spatial influence of an impact, be it contained to the immediate surroundings (site), extending to the surrounding area, regional (will have an impact on the region), national (will have an impact on a national scale) or international (impact across international borders).

Table 10 Rating criteria for the determination of extent/spatial scale

Rating	Description
1: Low	Immediate, fully contained area (site)
2: Low-Medium	Surrounding area
3: Medium	Regional
4: Medium-High	National
5: High	International

17.2.3 DETERMINATION OF ENVIRONMENTAL SIGNIFICANCE (ES)

- ***Determination of overall consequence:***

The overall consequence is determined by calculating the sum of all impact factors described above and those summarised below, divided by the total number of impact factors (three) (Equation 2).

I = Intensity

D = Duration

E = Extent

n **=** number of factors

Equation 1: Calculation of overall consequence.

$$Overal\ Consequence = \frac{\sum(\boldsymbol{I+D+E})}{\boldsymbol{n}}$$

- ***Determination of likelihood:***

Likelihood refers to the probability of a given aspect/impact to occur given that no mitigation measures are implemented.

Table 11: Rating Criteria for the determination of likelihood.

Rating	Description
1: Low	< 30% chance of occurrence
2: Low-Medium	30% - 50% chance of occurrence
3: Medium	50% - 70% chance of occurrence
4: Medium-High	70 – 90% chance of occurrence
5: High	>90% of occurrence

17.2.4 QUANTITATIVE ANALYSIS OF THE OVERALL ENVIRONMENTAL SIGNIFICANCE:

The overall environmental significance is determined by multiplying the overall consequence **(C)** by the likelihood of occurrence **(L)** (Equation 1). The rationale of the overall environmental significance relates to identifying and quantifying the sum of environmental impacts arising from the proposed development and the recommendation of appropriate mitigation measures.

Table 12: Environmental significance evaluation score sheet.

Aspect Specific Environmental significance	Low	Low-Medium	Medium	Medium-High	High
Overall Consequence x Overall Likelihood *(Equation 1)*	1-5	6-10	11-15	16-20	21-25

- ***Qualitative description or magnitude of the environmental significance:***

The qualitative description of environmental significance attempts to provide an indication of the nature and or magnitude associated with the proposed development. It also guides the prioritisation and decision-making process related to this event, aspect or impact.

Table 13: Rating criteria for impact significance.

Significance	Low	Low-Medium	Medium	Medium-High	High
Impact Magnitude	Impact is of very low order and therefore likely to have very little real effect. Acceptable.	Impact is of low order and therefore likely to have little real effect. Acceptable.	Impact is real, and potentially substantial in relation to other impacts. Can pose a risk to the company	Impact is real and substantial in relation to other impacts. Pose a risk to the company and environment. Unacceptable	Impact is of the highest order possible. Unacceptable. Fatal flaw.
Action Required	Maintain current management measures. Where possible improve.	Maintain current management measures. Implement monitoring and evaluate to determine potential increase in risk. Where possible improve	Implement monitoring. Investigate mitigation measures and improve management measures to reduce risk, where possible.	Improve management measures to reduce risk.	Implement significant mitigation measures or implement alternatives.

17.3 NEGATIVE IMPACTS

17.3.1 TERRESTRIAL ECOLOGICAL IMPACTS:

Ecological impacts refer to those impacts that affect the natural biological, physical and chemical processes and interactions in the environment. These impacts result in alterations to ecosystem resilience (the ability to absorb future disturbances) and ecosystem services (such as air purification, water purification, food sources, recreational etc). Impacts may take the form of destruction of components (habitat loss), disruption of processes (chasing away of fauna) or even the introduction of foreign elements (alien and invasive species infestation). These impacts not only result in direct alteration of ecosystem functioning and provision of services but also cascade into indirect impacts (See section 17.4: Cumulative Impacts). It is thus imperative to prevent, wherever possible, and minimise, where not preventable, ecological impacts to preserve ecosystem functioning (including the ability to absorb disturbance events without subsequent ecosystem collapse).

Habitat loss							
Impact	Permanent alteration and destruction of natural habitats leading to impaired ecological functioning.						
Activities	• Physical clearance of vegetation • Habitat fragmentation leading to edge effects • Trampling • Accidental events such as fire • Loss of protected species • Introduction of alien and invasive species • Soil compaction reducing re-establishment success • Soil erosion • Reduced biodiversity • Disrupted general animal behaviour						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	2	2
Mitigation	• Removal of indigenous flora should be kept at a minimum. • No collection of plants other than for holding for use in rehabilitation is allowed. • Disturbance-related activities may only occur in the authorised area. • Vehicle movement should strictly be kept on designated dirt/gravel roads and/or bypasses. • Soil erosion mitigation measures need to be implemented. • Post-development open/barren areas should be revegetated and kept free of exotic plant species. • Construction vehicles may only move within the demarcated space of the development area.						
After Mitigation		Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	N/A					
Mitigation	Not applicable due to loss of definitive characteristics of habitats in the construction phase. Additionally, no greater impact during operation can occur than those impacts occurring during construction.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	N/A					
Cumulative Impacts	Loss of local biodiversity. Incremental development leading to the eventual destabilisation of the ecosystem through the gradual loss of environmental units. Eventual ecological breakdown.						

Additional Notes:	The terrestrial ecological report did not mention mitigations during the operational phase of the development. While it is agreed and acknowledged that the development itself will not generate new risks to be mediated during its operational phase per se, mitigation measures should be implemented in the incidence of maintenance.

Habitat loss and fragmentation is the leading cause of the global biodiversity crisis. The removal of crucial environmental units will lead to the destabilisation of the entire ecosystem and, eventually, ecological breakdown. This project will result in an overall loss of biodiversity through habitat destruction and reduction of species diversity.

The assessment to habitat destruction was informed by:

- Consideration of the protection status afforded to the vegetation type (Kimberley Thornveld) which was noted to be 'least concern'.
- The proposed size of the development
- Visible past disturbances which included multiple direct anthropogenic disturbances such as development of infrastructure, creation of roads, agricultural activities. Secondary disturbances, such as infestation of alien invasive vegetation were also noted.

A low risk was awarded to both the pre and post mitigation scenario given that the proposed vegetation unit is not unique regarding vegetation type or structure, that a significant proportion of the proposed development will take place in the ecologically irreparably altered town area and that the majority of the development is entailed to be a linear development.

It is stressed, however, that mitigation measures must still be implemented to reduce the risk associated with the development.

Loss of indigenous floral and faunal diversity							
Impact	Loss of indigenous vegetation and subsequent stable networks of energy transfer. Loss of localised fauna.						
Activities	• Physical clearance of vegetation • Loss of protected species • Trampling • Habitat fragmentation. • Accidental events such as fire, oil spills etc • Unlawful harvesting of plants • Unlawful hunting/ poaching of animals • Road mortalities • Introduction of unnatural competitors, i.e. alien and invasive species • Reduced fecundity through reduced reproductive ability and success • Reduced survivability • Disrupted general animal behaviour • Disrupted circadian rhythms • Noise pollution (construction phase)						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	2	2	2	4
Mitigation	• Development may only occur within the clearly demarked area. • Monitoring for the emergence of exotic species should be conducted. • Vehicle movement should remain within the authorised boundary. • A comprehensive rehabilitation plan must be adhered to. • No unnecessary destruction or removal of vegetation is allowed. • Wildlife elements such as nests and burrows should be carefully inspected, and animals responsibly removed by a relevant specialist.						

	• Post-development open areas should be revegetated and kept free of exotic plant species by way of an alien and invasive management plan (AIMP). The AIMP should be developed to avoid the possibility of invasions and supply eradication techniques should they arise in the development area. • Quarterly alien and invasive species monitoring should take place according to the AIMP. • Any other relevant recommendations listed in this report should be implemented.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	2	4
Mitigation	• Care should be taken to reduce edge effects caused by anthropogenic movement. • On-going maintenance should be done with consideration for their effects i.e. vegetation burning or clearance within the WWTW may affect the surrounding vegetation by causing fires etc. • Quarterly alien and invasive species monitoring should take place according to the AIMP. • Any other relevant recommendations listed in this report should be implemented						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Cumulative Impacts	Disturbance of established ecosystems. Deterioration of ecosystem functioning. Loss of biodiversity.						
Additional Notes:	The mitigations referred to concerning the operational phase of the development is envisioned to address rehabilitation of areas affected during construction. As mentioned in the other fauna and flora categories, it is not envisioned that significant impact could occur associated with the operational phase of the development.						

Given that the importance of indigenous vegetation to conservation is informed largely by the stable networks for energy transfer that have evolved as result of their adaptation to their surrounding habitats, the presence of large amounts of alien and invasive vegetation that were recorded in parts of the study area indicate a notable disruption of this balance and thus a reduction in their conservation value.

The area where the WWTW is proposed to be situated is, however, a notable exception to this, constituting predominantly indigenous vegetation. Taking these factors into consideration along with the vegetation type and vegetation resilience (see section 17.1: Overview of specialist findings), it was determined that both a pre-mitigation and post mitigation scenario would implicate a **'low'** risk to indigenous floral diversity. Operation and maintenance of the proposed development was also predicted to have a **'low'** risk associated in both a pre- and post-mitigation scenario (mitigation measures still being instructed to further reduce the associated risk).

Loss of floral and faunal species of conservation concern	
Impact	Destruction of species of conservation concern. Loss of biodiversity
Activities	• Clearance of vegetation • Loss of protected species • Habitat fragmentation • Poaching, unlawful hunting and gathering of plants and animals • Careless and reckless behaviour • Trampling • Accidental events such as fire
Constructional Phase	

Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	4	1	2	1	2
Mitigation	Prior to development • Due to the confidential nature of the SCC, only trained specialists briefed under nondisclosure should be responsible for identifying SCC individuals during site clearance. • Specialist led searches should be done in order to possible locate and apply the recommended buffer area for that SCC/protected species. • If SCC/protected species are confirmed present, then vegetation removal should not be started without a qualified botanist present. • Protected plant species should be located and demarcated. • Removal or relocation of the SCC are prohibited without the appropriate permits. • DAERL should be consulted with regard to the feasibility of transplanting or removing provincially protected species. • Removal or transplant permits from DAERL must be obtained for all provincially protected flora. • If DAERL indicates transplant or relocation of some of the provincially protected flora, a formal relocation management plan should be drafted and implemented. Construction phase: • All construction staff should be informed on SCC and protected species or species of special conservation concern. • A relevant specialist should be notified when the mentioned SCC and protected flora are observed during construction. • All disturbance-related activities must be restricted to the authorised development boundary. • No illegal harvesting of plant material is allowed. • Any other relevant recommendations listed in this report should be implemented.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	N/A					
Mitigation	Not applicable due to loss of definitive characteristics of habitats in the construction phase. Additionally, no greater impact during operation can occur than those impacts occurring during construction.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	N/A					
Cumulative Impacts	The loss of rare and vulnerable species. Loss of biodiversity. Secondary deterioration and loss of species engaging in species specific interactions with species of conservation concern.						
Additional Notes:	The terrestrial ecological report did not mention mitigations during the operational phase of the development. While is it agreed and acknowledged that the development itself will not generate new risks to be mediated during its operational phase per se, mitigation measures should be implemented in the incidence of maintenance.						

In the desktop assessment of the site of the proposed development area, it was noted that SCC Species number 257 may occur.

It is acknowledged that rare, threatened and or protected species should always evoke a conservative approach regarding land use management (especially concerns species declared as species of conservation concern due to various population declining factors). However, it was noted that not only was species 257 not identified during the site assessment, but given that:

- species 257 was noted to be identified only in salt pans and deep alluvial soils. Conditions which are not descriptive of the assessed area,
- the site area is noted to have significant agricultural disturbances and a general lack of an herbaceous layer,

it is rendered highly unlikely that the SCC would be present in the proposed development area. While this entails an associated **'low'** risk for both a pre- and a post mitigation scenario, strict mitigation measures were, however, still emphasised to lower the overall potential risk further.

Loss of CBAs and ESAs							
Impact	The deterioration of habitats leading to the impaired functioning of ecological support areas (ESAs) and in turn CBAs (critical biodiversity areas), leading to a loss of particularly sensitive areas vital for ecosystem functioning.						
Activities	• Physical clearance of vegetation • Loss of protected species • Habitat fragmentation • Accidental events such as fire • Increased anthropogenic movement • Loss of biomass and biodiversity • Introduction of alien and invasive species • Soil compaction reducing re-establishment success • Soil erosion • Thinning of local genetic diversity • Increased ecological disturbance • Loss in ecological functionality						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	2	2	2	4
Mitigation	• Limit the removal of vegetation in these CBA/ESA areas. • Vegetation and topsoil must be kept for use in rehabilitation. • Topsoil storage must be prevented from contamination and invasion by alien and invasive species. • Any excavated ground should be separated into piles of topsoil, subsoil and other material. • General works should, where possible, take place from the edge of the existing road to the side opposite a watercourse. • No heavy machinery or material storage should occur on the side closest to a water course or within 100m of a watercourse. • A comprehensive fire management plan needs to be drafted prior to construction • Removal of indigenous flora should be kept at a minimum. • Disturbance related activities may only occur in the authorised area. • No unnecessary clearance of vegetation or topsoil may take place outside of the development area. • No other activity than that authorised may be taken within the authorised area. • Post-development open areas should be revegetated and kept free of exotic plant species. • Vehicles may only move within the demarcated space of the development area. • Any other relevant recommendations listed in this report should be implemented.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	N/A					
Mitigation	Not applicable due to loss of definitive characteristics of habitats in the construction phase. Additionally, no greater impact during operation can occur than those impacts occurring during construction.						
After	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance

Mitigation	Negative	N/A
Cumulative Impacts	The deterioration of ESAs leading to the subsequent deterioration of CBAs. The loss of ecosystem services offered by either CBAs or ESAs. Deteriorated resilience of the ESAs and CBAs. Subsequent alteration of surrounding ecosystems and habitats. Loss of biodiversity.	
Additional Notes:	The terrestrial ecological report did not mention mitigations during the operational phase of the development. While is it agreed and acknowledged that the development itself will not generate new risks to be mediated during its operational phase per se, mitigation measures should be implemented in the incidence of maintenance.	

In an assessment of the likely impact on CBAs and ESAs, the spatial extent which the proposed development crosses into the CBA/ESAs as outlined by the Northern Cape Bioregional data was assessed.

Further, the condition of the noted CBAs and ESAs was established in the field assessment. Per the Technical Guidelines for CBA Maps, CBAs are areas which must remain largely in a natural ecological condition whilst ESAs require at least semi natural ecological condition (SANBI, 2017).

Considering:

- the proposed development's occurrence on previously negatively affected areas,
- the relative surface areas of the CBA/ESAs traversed compared to areas remaining,
- that the areas assessed in the field assessment shows deviation to the minimum standards required to constitute a CBA/ESA,

the proposed development was noted to likely have a significantly lessened negative effect of loss of CBA and ESA areas. The necessity for mitigation measures was, however stressed to further minimise the risk of the loss of CBAs/ESAs. Thus, a pre and post mitigation scenario was envisioned to have a **'low'** risk.

17.3.2 WATER RESOURCES:

Impacts on water sources include those that affect both perennial and non-perennial watercourses observed on site, Given the foundational role that watercourses play in ecosystems, impacts on water courses quickly entail secondary impacts on vegetation, flora and fauna. Mitigation measures focussing on the protection on the integrity of watercourses are thus critical to ensure that proposed developments do not impair proper ecological functioning.

Surface Water Quality							
Impact	The proposed WWTW will be situated further than 200 metres from the delineated riparian zone of the Vaal River and is therefore unlikely to have any direct impacts on it. However, should leakages occur this may contaminate surface water, which will then eventually seep into the Vaal River, thus affecting its water quality.						
Activities	• Cement mixing. • Operational activities (various stages of water purification and sludge maintenance) entailing water containing waste diluted to varying degrees being temporarily retained in various structures. • Conveyance of sewage against gravity at topographical low points (lift stations).						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	3	3

<table>
<tr><td>Mitigation</td><td colspan="7">• Where concrete is utilised, the detrimental impacts of uncured cement on surface water and watercourses must be taken into consideration.
• The construction footprint along the watercourses should be kept to a minimum.
• Construction of the sewer network through any of the watercourses should preferably be undertaken during the winter months when the groundwater level will be at its lowest (June to September).
• When excavating through 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 placed in disturbed areas requiring rehabilitation. This topsoil should then be placed on top of the installed sewer pipeline. Where topsoil is perceived to be absent, a seedbank will still be present, even if this may only be a few centimetres thick, and should still be retained, as this will greatly aid in successful rehabilitation. Subsoil should be used as backfilling and not as top dressing. Only removed topsoil should be utilised to rehabilitate the watercourse crossing.
• After construction of the sewer network the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed or distributed evenly over the terrain to represent a natural environment. Compacted areas must be ripped. Construction roads not being utilised must afterwards be rehabilitated.
• No littering must be allowed, and all litter must be removed from the site.</td></tr>
<tr><td rowspan="2">After Mitigation</td><td>Status</td><td>Severity</td><td>Duration</td><td>Extent</td><td>Consequences</td><td>Likelihood</td><td>Significance</td></tr>
<tr><td>Negative</td><td>1</td><td>2</td><td>1</td><td>1</td><td>1</td><td>1</td></tr>
<tr><td colspan="8">Operational Phase</td></tr>
<tr><td rowspan="2">Before Mitigation</td><td>Status</td><td>Severity</td><td>Duration</td><td>Extent</td><td>Consequences</td><td>Likelihood</td><td>Significance</td></tr>
<tr><td>Negative</td><td>4</td><td>4</td><td>3</td><td>4</td><td>4</td><td>16</td></tr>
<tr><td>Mitigation</td><td colspan="7">• A maintenance plan must be implemented for the operation of the facility.
• Regular inspections must be conducted of the irrigation area to ensure that no surface runoff escapes the irrigation area.
• Irrigation must cease (provided sufficient storage capacity) during heavy rainfall events.
• In the incidence of spillage, the relevant authorities and downstream water users must be made aware of the spillage (DWS and VOCMA).
• All maintenance must be accord with NEMA section 28 Duty of care principles.
• All mitigation measures instructed by the relevant water use licenses must be adhered to.</td></tr>
<tr><td rowspan="2">After Mitigation</td><td>Status</td><td>Severity</td><td>Duration</td><td>Extent</td><td>Consequences</td><td>Likelihood</td><td>Significance</td></tr>
<tr><td>Negative</td><td>1</td><td>2</td><td>2</td><td>2</td><td>2</td><td>4</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Cumulative Impacts</td><td colspan="7">The deterioration of water quality by introduction of pollutants associated with construction and sedimentation associated with the deposition of contaminants will lead to the decline of aquatic organisms as well as organisms which depend on them (food sources, pollination etc.). Impaired aquatic community structures will reduce the watercourses capacity to buffer disturbances and provide ecosystem functions. Significant long term nutrient loading can result in eutrophication of stagnant downstream water bodies.</td></tr>
<tr><td colspan="8"></td></tr>
<tr><td>Additional Notes:</td><td colspan="7">The anticipated activity discussed in the aquatic report speaks to waste resulting from leakage from the oxidation ponds. These ponds will per the proposed methodology, however, not be filled until post construction and assessment. Therefore, this scenario is reworked to consider seepage from spills associated with the construction works themselves.</td></tr>
</table>

Three primary activities were noted in the risk assessment matrix compiled in line with the Department of Water & Sanitation's requirements for risk assessment and the provisional Risk Assessment Matrix for Section 21(c) & (i) water use. These were:

- possible groundwater contamination associated with the construction of the WWTW,
- excavation and backfilling of trenches,
- the removal of riparian vegetation.

The primary risks associated with ground water contamination during the construction phase noted in the aquatic assessment concerned the construction of the WWTW itself.

This was noted to have a low anticipated risk predominantly on account of the distance between the site location and the Vaal River (>200m). A **'low'** risk was thus ascribed to this activity and accordingly reflected in the impact assessment. Several mitigation measures were still, however, instructed to reduce the associated risk further, which would still entail being categorised as a **'low'** risk. These will be of particular importance in areas in which construction activities approach (and traverse) ephemeral watercourses (drainage lines) and have accordingly been integrated into the EMPr (See Appendix 6: EMPr). Mitigation measures are here directed towards preventing excessive destruction of the sensitive riparian environments as well as the potential of construction activities to result in contamination of water resources. This could take place through the deposition of hazardous building materials such as wet cement and concrete involved in the construction of not only the WWTW but also the pipelines and lift stations.

The operation of the proposed development, however, will entail the conveyance, treatment and disposal of organic waste produced by the townships of Ikhutseng, Warrenvale and Warrenton as well as utilising the treated effluent for irrigation purposes. Given the span of the operation, several pressure points exist where risk is considered to be **'medium'**. These include the numerous pipelines (especially during maintenance activities), the two lift stations as well as the pivot circle which will be irrigated using treated waste. The lift stations are singled out as pressure points given that they approach and traverse riparian habitats and a drainage line. While it is acknowledged that their locations are constrained by the inherent engineering problem which they must overcome, i.e. be situated in topographical low points, such as drainage areas, to pump effluent to higher points, this does implicate that mitigation measures will need to be stringently followed. Runoff must be monitored from the irrigation area to ensure that no surface runoff escapes the field demarcated for irrigation (ground water impacts are discussed below). If these mitigation measures are adequately implemented it is anticipated that the associated risk would be a **'low'** risk.

Ground Water Quality							
Impact	The proposed WWTW will be situated further than 200 metres from the delineated riparian zone of the Vaal River and is therefore unlikely to have any direct impacts on it. However, should leakages or seepage occur this may contaminate groundwater, which will then eventually seep into the Vaal River, thus affecting its water quality.						
Activities	• Cement mixing. • Operational activities (various stages of conveyance, water purification and sludge maintenance) entailing water containing waste diluted to varying degrees being temporarily conveyed and retained in various structures. This could.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	3	3
Mitigation	• Ensure the appropriate disposal of toilet waste at a licensed facility. • Mix cement in impermeable containers. • Ensure that runoff from cleaning cement mixing equipment is contained.						

After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	4	4	3	4	4	16
Mitigation	• Implement best practices from the Stormwater Management Plan to safeguard the aquifer. • Surface and groundwater quality must be sampled quarterly and analysed by an SANAS accredited laboratory according to the proposed monitoring network listed in the EMPr (Appendix 6). • It is imperative that the irrigation water quality complies with the prescribed limits and standards set by the relevant regulatory authorities. Compliance with these water quality requirements will ensure that irrigation practices do not negatively affect or degrade the groundwater quality within the aquifer. • Continue surface and groundwater monitoring to detect potential future leaks and establish trends in water quality, following the guidelines in the EMPr. • A maintenance plan must be implemented for the operation of the facility. • Irrigation must cease (provided sufficient storage capacity) during heavy rainfall events. • Establish and maintain a secure database for all groundwater data to enable long-term trend analysis and ensure monitoring continues until post-closure recovery to baseline levels. • Prohibit on-site disposal of sludge or waste due to shallow groundwater levels that may allow seepage. • Construct all waste handling and storage areas with impermeable surfaces to prevent infiltration. • Divert and manage stormwater to avoid contact with waste or contaminated areas. • Regularly inspect and maintain all pipes and infrastructure to prevent leaks and system failures. • In the incidence of spillage, the relevant authorities and downstream water users must be made aware of the spillage (DWS and VOCMA). • All maintenance must be accord with NEMA section 28 Duty of care principles. • All mitigation measures instructed by the relevant water use licenses must be adhered to.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	2	2	2	4
Cumulative Impacts	The deterioration of ground water quality by seepage of pollutants associated with seepage from the various conveyance structures and treatment ponds leading to the deterioration of the aquifer and subsequent loss of critical environmental services.						

During the geophysical investigation an assessment of the aquifer system using the methodology outlined in An Aquifer System Management Classification (Parson, 1995) yielded that the aquifer underlying the proposed site can be described as a 'Minor-Aquifer System' (score = 2) with a 'Medium Aquifer Vulnerability' (score = 2) and requiring a medium Level of Protection (score = 4).

While the operational phase of the proposed development would entail minimal potential sources for groundwater contamination even in an unmitigated scenario, basic housekeeping practices and risk averse concrete mixing and handling procedures would further minimise

any associated risk. Thus, the risk category for both the pre and post mitigation scenario during the construction phase was ascribed an associated **'low'** risk.

The operational phase, however, which entails the conveyance, temporary storage, handling and disposal of waste and water containing waste to various degrees, inherently entails great risk, ascribed a score corresponding to at least a **'medium-high'** risk category. This envisions a scenario in which spillages and leakages from broken structures and inadequate linings takes place, deteriorating the water quality of the aquifer over a long period. Long term irrigation using water containing waste could also (if concentrations of pollutants are too high to be absorbed by the local ecosystem associated with the pivot circle) steadily deteriorate ground water quality. If the engineering designs are followed, routine testing of pipes take place prior to development, and continual monitoring of groundwater quality takes during operation, it is anticipated that the risks can be suitably mitigated to reduce the associated risk to a **'low'** risk category.

Removal of Riparian Vegetation								
Impact	The deterioration of biodiversity through the direct removal of riparian species and the accidental introduction of alien and invasive species which outcompete indigenous fauna (at lift stations).							
Activities	• Removal of riparian and wetland vegetation will promote erosion and sedimentation of the watercourses. • Disturbance and removal of vegetation will create conditions susceptible to the establishment of exotic weeds.							
Constructional Phase								
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	3	2	2	2	4	8	5 (Amended)
Mitigation	• In order to stabilise the watercourses after construction and to prevent long-term disturbance, wetland vegetation must be re-established where it was removed. This can most easily be attained by implementing adequate topsoil management. • The watercourse morphology (banks and channel) should be re-instated as far as possible, which will also speed up the stabilisation of the affected area. Removal of vegetation within any of the watercourses should also be kept to a minimum. • Monitoring and eradication of exotic weeds and invasive species on and around the WWTW should be implemented and maintained throughout the operation of the WWTW. This should also specifically target the highly invasive *Prosopis glandulosa* trees in the area. • When excavating through 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 placed in disturbed areas requiring rehabilitation. This topsoil should then be placed on top of the installed sewer pipeline. Where topsoil is perceived to be absent, a seedbank will still be present, even if this may only be a few centimetres thick, and should still be retained, as this will greatly aid in successful rehabilitation. Subsoil should be used as backfilling and not as top dressing. Only removed topsoil should be utilised to rehabilitate the watercourse crossing. • After construction of the sewer network the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed or distributed evenly over the terrain to represent a natural environment. Compacted areas must be ripped. Construction roads not being utilised must afterwards be rehabilitated.							
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	1	2	1	1	2	2	
Operational Phase								
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	1	1	1	1	2	2	

Mitigation	• Weed eradication should be initiated at the construction site prior to construction and be continued until rehabilitation of the riparian habitats has been completed. This should be especially targeted at *Prosopis glandulosa*. Trees in the area.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Cumulative Impacts	Grubbing and clearing in the riparian and immediate terrestrial habitats will result in the loss of aquatic biodiversity. The disturbance of soils may result in the proliferation of alien and invasive vegetation. The loss of biodiversity through active clearing as well as the indirect loss of biodiversity by introducing greater competition for resources in the form of alien and invasive vegetation, will result in impaired ecosystem function. This will make the aquatic ecosystems less capable of absorbing disturbances and less capable of supporting ecosystem functions.						
Additional Notes:	Significance during construction activities has been amended to reflect the specialist's findings which indicated a low risk.						

In the assessment of the impact that the removal of riparian vegetation would have on the associated watercourses the primary points of consideration entailed:

- the promotion of erosion by reduced soil stabilisation,
- creating conditions susceptible to infestation by alien and invasive vegetation.

This was noted to be primarily associated with the two lift stations.

Given that:

- the old Warrenvale lift station would be situated in the same location and not entail a significant expansion of disturbed surface area,
- the new pump station is located in an ephemeral watercourse where continuous flow would only take place during large rainfall events,
- the distance between the proposed WWTW and the Vaal River edge is significant (>200m),

the anticipated impact associated with the clearance of riparian vegetation is anticipated to be **'low'**.

Anticipated risks of riparian vegetation clearance during the operation of the facility are envisioned to only take place during maintenance of the facility. Standard operation of the facility is not noted to have any significant impact on the riparian vegetation. Accordingly, the pre- and post-mitigation scenarios are envisioned to have a **'low'** associated risk.

Mitigations are, however, instructed for both the construction and operational phases of development to ensure that risks remain minimal.

Excavation and Backfilling of Trenches							
Impact	Impeding the natural drainage patterns of the area. Contamination of runoff and subsequently also the Vaal River.						
Activities	• Excavation of trenches will impede flow while trenches are open. • Disturbance of the bed and banks will promote sedimentation. • Use of concrete casing may also affect the Vaal River floodplain and associated small drainage line.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	2	2	4	8 / 5 (amended)
Mitigation	• An adequate storm water management system must be implemented for the WWTW, which should mainly consist of a low berm around the perimeter of the WWTW. This is						

	also a standard management practice at WWTWs. This berm should then enable contaminated water to be retained within the operational area and keep it separate from clean water around the site. • The watercourse morphology (banks and channel) should be re-instated as far as possible, which will also speed up the stabilisation of the affected area. • The timeframe for construction through the watercourses should also be kept to a minimum. • Construction of the sewer network through any of the watercourses should preferably be undertaken during the winter months when the groundwater level will be at its lowest (June to September). • When excavating through 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 placed in disturbed areas requiring rehabilitation. This topsoil should then be placed on top of the installed sewer pipeline. Where topsoil is perceived to be absent, a seedbank will still be present, even if this may only be a few centimetres thick, and should still be retained, as this will greatly aid in successful rehabilitation. Subsoil should be used as backfilling and not as top dressing. Only removed topsoil should be utilised to rehabilitate the watercourse crossing. • After construction of the sewer network the area must be rehabilitated. This includes removal of all construction material. Excavated rock may not be left in heaps and must be removed or distributed evenly over the terrain to represent a natural environment. • Compacted areas must be ripped. Construction roads not being utilised must afterwards be rehabilitated.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Mitigation	• Duty of care principles must be employed in the incidence of maintenance activities taking place.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Cumulative Impacts	Long term trenching activities and redirection of surface runoff would result in the gradual alteration of drainage patterns. This may give rise to artificial wetlands in certain areas and alteration of drainage lines in other areas. Contaminated runoff entering into the Vaal River would lead to the deterioration of water quality as well as the secondary impacts associated therewith.						
Additional Notes:	Significance during construction activities has been amended to reflect the specialist's findings which indicated a low risk.						

In the assessment of the impact that excavation and backfilling would have on the associated watercourses the primary points of consideration entailed:

- causing an increase in sedimentation through the disturbance of the bed and banks of implicated watercourses,
- impacting surface runoff during rainfall events through the creation of trenches and berms i.e. stockpiles redirecting runoff,

While this was noted to be primarily associated with the two lift stations which are in close proximity to (and in some areas crosses into) riparian habitats and a drainage line, it is also relevant to the pipelines that connect with the pumpstations.

Given (as stated in the previous theme of 'removal of riparian vegetation'), that:

- the lift stations would not implicate a significant additionally disturbed area- given that one of the lift stations is already established,

- the watercourse anticipated to be crossed is strictly ephemeral- and only anticipated to have continuous flow during large rainfall events,

the anticipated risk associated with excavations and backfilling is anticipated to be **'low'**. Mitigation measures are, however, instructed to reduce the associated risk further.

17.3.3 HERITAGE:

Heritage resources refer to any places or objects which hold cultural significance. This may take the form of, amongst others, buildings, graves, cultural or palaeontological artefacts. The risk associated with development imposed on these resources are assessed through a phase 1 palaeontological and heritage impact assessment.

Archaeological, palaeontological and Heritage Resources							
Impact	Destruction of archaeological and heritage resources such as remains, buildings and graves.						
Activities	• Grubbing • Trenching						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	5	2	3	2	6
Mitigation	• Reroute any pipelines which are found to encroach upon any heritage resources, such as buildings older than 60 years (as explicated in the HIA/PIA report). This includes encroaching on the immediate settings of the heritage features (See Section: Layout Alternatives). • Implement a chance finds procedure for all construction works. Should any archaeological material be uncovered during construction, work must immediately cease and the heritage resources authority must be notified immediately.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Mitigation	N/A						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Cumulative Impacts	The gradual loss of artefacts, buildings and graves of value to both local and national heritage.						
Additional Notes:							

In the Phase 1 Palaeontological and Archaeological Assessment, two primary areas were noted to carry particular importance to heritage which may be affected by the proposed development. These were:

- several old buildings in van Wyk street,
- the cemetery apparently associated with the neighbouring Masjid.

The buildings in van Wyk street were noted to be of moderate to potentially high heritage significance while the cemetery was noted to carry an inherently high heritage significance.

Minor rerouting options and caution in construction methods are considered sufficient for the protection of the structures adjacent to the proposed pipeline route through Van Wyk st.

Given the inherent risk associated with the cemetery, however, it was recommended, should construction activities encroach on the cemetery, that an alternative layout be pursued. Upon

a further site inspection to determine the viability of suitable buffer areas it was determined that the presence of numerous graves situated in close proximity to the proposed layout not in configuration with other easily distinguishable graves renders a clear delineation of the cemetery impossible. As such, it could not be definitively determined whether a buffer area that permits sufficient area for construction activities and vehicle movement would be possible. Accordingly, an alternative layout was pursued and agreed upon by the engineers. This is also discussed in Section 9: In the Incidence of Deviation from Approved Scoping Report. The new layout poses no discernible risk to heritage resources.

Given the nature of the heritage features identified, in the absence of any mitigation measures (including public consultation) the anticipated risk associated with development is envisioned to be at least **'medium-high'**. If the mitigation measures are implemented, however, **no conceivable risk** is anticipated to be imposed on any heritage resources.

As the footprint of the WWTW and the associated bulk infrastructure will be fixed after development, no further risk is anticipated during the operational phase of development.

17.3.4 AESTHETICS:

The aesthetic theme is focused on the alteration of the visual characteristics of the area and overall impact on landscape appreciation. Landscape appreciation is inherently subjective with few metrics allowing for an objective impact assessment. However, several aspects concerning visual impacts associated with developments may be objectively assessed. These include development size, deterioration of natural features due to construction, and line of sight.

Construction of Infrastructure							
Impact	A newly constructed WWTW and lift station in an area where has not yet been one resulting in a change in appearance and character of the area. Temporary visual disturbance related to activities associated with construction.						
Activities	• Grubbing and clearing. • Trenching. • Stockpiling. • Movement of construction vehicles. • Erection of new structures.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	3	2	2	3	6
Mitigation	• Limit construction activities to the development footprint. • Implement house-keeping practices in which attention is given to neat storage of materials. • Do not grub or clear beyond the operational area. • Implement rehabilitation methods where possible during construction activities. • Implement good house-keeping practises						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	5	5	2	4	4	16
Mitigation	• Institute a maintenance plan for the upkeep of the WWTW and bulk infrastructure to prevent aesthetic deterioration associated most directly with the appearance of the structures themselves, as well as the secondary (albeit more significant) deterioration of the surrounding area in the incidence of operational failure.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1

Cumulative Impacts	The aesthetic quality of the area would be reduced leading to a decrease in quality of living for the local residents and commuters.

The construction phase of the proposed development is proposed to entail construction in three primary components:

- the WWTW itself (as well as the infrastructure leading to the pivot plot),
- pipelines,
- lift stations.

Given that the most significant construction will be located on government property outside of the more densely populated areas, and that the construction of the pipelines entails a narrow surface area, it is not anticipated that construction should implicate significant offense from an aesthetic point of view. Furthermore, one of the pumpstations will undergo refurbishment rather than complete demolition and reconstruction. Given these two considerations, it is anticipated that a pre-mitigation scenario should not have more than a **'low-medium'** sensitivity. Mitigation measures should still be employed, however, to reduce the risk further.

While the facility itself is not anticipated to pose an inherent significant risk to the aesthetics of the area (given its isolation and that the bulk infrastructure will be buried), a pre mitigation scenario which envisions unmitigated blockages and disrepair will result in at least a **'medium'** risk. This risk can be easily mitigated and reduced to a **'low'** risk through the compilation and implementation of a maintenance plan to ensure that any blockages are promptly resolved, before they cause significant overflow and deterioration of the surrounding area.

17.3.5 SOCIO-ECONOMIC:

Socio-economic impacts focus on the effects the development will have on the economic drivers in the surrounding area as well as emphasising the integration of economic development concerning the needs of the people. It also looks at the potential ramifications that the proposed development may have on the well-being and livelihoods of communities and individuals impacted directly and indirectly by the proposed development.

Job creation and the influx of job seekers							
Impact	Dissatisfaction of community members and opposition to the development on account of the impression of unfair recruitment and procurement practices.						
Activities	• Procurement Practices • Recruitment Practices						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	2	1	2	3	6
Mitigation	• Ensure fair recruitment practices in which where locals workers and service providers are utilised wherever possible.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	2	2
Mitigation	• Ensure fair recruitment practices in which where locals workers and service providers are utilised wherever possible in the maintenance of the roads.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	1	1

Cumulative Impacts	Deterioration in trust and communication between community members, local service providers, and the local municipality, which may lead to retardation of future community developments and programmes compromising prompt service delivery.
Additional Notes:	While workers and service providers are not required for the daily functioning of the proposed development, employment opportunities may arise in the periodic maintenance of the roads.

Socio-economic impacts can be multifaceted depending on how the employment and procurement process is conducted. The development, if employing as far as possible local employees and service providers, would be a definite positive impact to the local community. If driven in a way perceived as unfair by the local community, however, the perception of the development can be a negative impact resulting in resistance from community members, which would be regarded as negative socio-economic impact. Given that protest action over the perception of unfair recruitment practises may result in delayed development, this could hold at least a **'low-medium'** risk. This can be readily reduced to a **'low'** anticipated risk, however, by utilising local workers and service providers wherever possible.

Given that there would be fewer implicated employees during the operational phase of the development the associated risks outlined would be considerably **'low'**. This can, however, still be reduced further through ensuring fair recruitment and procurement practises.

Impacts on affected landowners								
Impact	Potential temporary relocation of individuals.							
Activities	• Initiating the process of obtaining the required way leave agreements, and the temporary relocation of lawful occupiers of land (if required) while construction takes place in multiple erven in which one of the layouts are anticipated to cross (See Section 11.4: Layouts Alternatives). • Timely reparations for any damages to property/loss of work etc.							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	5	3	1	3	3	9	25 (amended)
Mitigation	• Adequate public participation. • Fair appraisal of property worth and timeous compensation. • Provision of an alternative living arrangement. • Keeping records of affected property owners throughout construction.							
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	5	3	1	3	2	6	
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	5	3	2	3	4	12	
Mitigation	• Implement a maintenance plan to ensure that the infrastructure does not deteriorate into disrepair, resulting in secondary social and environmental consequences.							
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	1	1	1	1	2	2	
Cumulative Impacts	A significant detrimental impact on living standards of affected community members. Potential loss of income associated with relocation. Lengthy negotiations concerning compensatory costs which would result in expensive delays.							
Additional Notes:	Due to the unsure nature of the problem, it must be cautioned that risk is awarded with great uncertainty. The risk associated with the process of obtaining the relevant permissions will be significantly improved with the suggested mitigation measures. Alternative layouts might, however, still be implemented which would functionally reduce the risk to negligible, provided that there are not safety or engineering constraints imposed by such alternatives.							

As discussed in Section 9: In the Incidence of Deviation from the Approved Scoping Report), numerous properties were initially either traversed or approached by the proposed development bulk infrastructure. Given the significant inherent risk to the community members, an alternative layout was determined which would minimise the number of houses traversed as far as possible. This reduced the number of potentially implicated houses to two units. The pipeline was in this location further slightly adjusted to entail minimal disturbance to the two potentially implicated units. While mitigation measures are implicated as far as possible the layout could still implicate relocation of community members during construction, destruction of properties and walls. This could carry the secondary impacts of loss of income to community members. It is critical to minimise the risks posed as far as possible through transparent communication with impacted landowners, clear communication of risks, and ensuring that all losses are reasonably compensated. This might include providing temporary alternative living arrangements, compensation to work loss.

Due to the significant potential loss of income and livelihood to community members as well as potential upset that the development may cause to community members a **'high'** associated risk is envisioned in an unmitigated scenario. Due to inherent unpredictability in social relations and secondary impacts, at least a **'low-medium'** risk will be implicated post mitigation.

The impacts during the operational phase on landowners and community members envisions a scenario in which inadequate maintenance leads to failure of infrastructure, leading to spillages and backed-up pipes and manholes. Taking this into consideration with failsafe methods implemented in the lift stations would implicate at least a **'medium'** risk. The mitigation measures would be simple to implement encompassing the compilation and implementation of a maintenance plan. This would entail that the associated risks are reduced to a **'low'** risk.

17.3.6 AIR QUALITY:

Consideration of predicted air quality and noise produced assessments are based upon the type of equipment anticipated to be used during a specific activity and the degree of disturbance that will occur. This will have repercussions to the surrounding vegetation, wildlife, domestic animals and people.

Mitigation	**Generation of exhaust fumes and particulate matter**							
Impact	The degradation of air quality on account of gases from construction vehicles and aerosolized particulate matter. Road accidents associated with obstruction of view.							
Activities	• Dust generation associated with construction activities. • Exhaust fume generation associated with construction vehicle activity. • Odours produced by the operationality of the proposed development.							
Constructional Phase								
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance	
	Negative	2	2	2	2	3	6	5 (amended)

Mitigation	• Dust suppression methods such as watering down of bare surfaces. • Regular maintenance of construction vehicles to ensure minimal exhaust emissions. • Minimising the clearance of vegetation to the active construction area. • Implement a curfew of only operating between the hours of 7:00 and 17:00. • Active revegetation of cleared areas immediately after construction.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	2	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	5	2	3	3	9
Mitigation	• Implement maintenance practises at both the WWTW and pump stations, to ensure the minimisation of the production of foul odours and to prevent and leakages associated with deteriorating infrastructure. • Overflow ponds must be promptly cleaned after being employed in emergency situations.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	5	1	2	2	4
Cumulative Impacts	The reduction in air quality could lead to respiratory ailments of people and fauna, as well as a decline in vegetation (in the incidence of excessive particulate matter) during construction. Foul odours associated with operationality could result in offence to people in close proximity of the new WWTW leading to reduced standards of living.						

Minimal odours and dust are anticipated to be produced during the construction phase of the proposed development. This is as the layout where approaching population dense areas is anticipated to encompass primarily linear structures spread out over a large area rather than intensive construction works situated in a single location. The WWTW itself which might produce a larger amount of airborne dust particles will be situated on a farm portion outside of the townships of Ikhusteng, Warrenvale and Warrenton and thus not anticipated to significantly impact the local communities during the construction phase of the development. Thus, in spite of the high probability of dust being generated in a pre-mitigation scenario it is not likely to generate more than a **'low'** risk. This can be easily further reduced, however, (especially where construction takes place in the town itself) through mitigation measures.

While the WWTW is not situated in close proximity to the communities, a pre-mitigation scenario in which adequate maintenance is not employed, still carries the risk of generating foul odours from the WWTW itself as well as from backed-up manholes. This would correspond to at least a **'low-medium'** associated risk. This can be easily mitigated, however, by through the compilation and implementation of a maintenance plan.

Noise and Vibrations							
Impact	Noise generated associated with construction activities causing a disturbance to local residents resulting in reduced standards of living.						
Activities	• Noise associated with construction vehicles. • Noise associated with construction activities. • Noise associated with motorists.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	2	1	2	3	6

Mitigation	• Implement a curfew of only operating between the hours of 7:00 and 17:00. • Ensure regular maintenance of construction vehicles and equipment to limit noise produced. • Plan activities to minimise the time required in any given location when constructing the pipelines.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	1	1
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	2	1	1	1	5	5
Mitigation	• Implement a maintenance plan to ensure the proper operationality of the pumps in the lift stations. • Keep the doors of the lift stations closed during operationality.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	5	5 / 3 (amended)
Cumulative Impacts	The degradation of standard of living associated experienced by local residents on account of excessive noise.						

While there is not significant risk anticipated with the construction activities of the WWTW itself, given the distance from the local communities, construction activities in the town itself carries a greater risk, corresponding to **'low-medium'** given their location within the town itself. This can be reduced to a **'low'** risk, however through the implementation of working schedules that limit noisy activities to certain hours and careful planning to maximise efficiency in the construction of the pipes.

Minimal noise generation is anticipated during the operation of the WWTW. Some noise, however, is anticipated to be generated by the pump stations. This is not, however, anticipated to be significant and as such is not anticipated to generate a significant risk, hence being awarded a risk of **'low'** risk. This can be further reduced through simple maintenance of machinery and ensuring the pump house structures are themselves constantly closed and locked when not being maintained.

17.3.7 WASTE:

Waste generated on site during the construction and operational phase can take many forms and can if inappropriately handled and disposed entail a myriad of repercussions to the natural environment as well as to surrounding communities. Consideration and accounting for the potential risk factors associated with waste production, storage and disposal thus eliminates many potential long-lasting detrimental impacts. Organic waste in the instance of WWTW developments have particular relevance to the operational phase of development in which large volumes of organic waste is conveyed, treated and disposed of.

General Solid and Liquid Waste							
Impact	Litter generated by construction workers strewn in the area, which gets dispersed further by wind and stormwater resulting in the degradation of the aesthetic quality of the area. Osmotically active chemicals in construction materials leaching into soil and watercourses leading to the deterioration of soil and river health.						
Activities	• Litter production. • Solid construction waste material production. • Liquid waste produced. • Inadequate storage and disposal of construction material.						
Constructional Phase							
Before	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance

Mitigation	Negative	2	2	2	2	3	6
Mitigation	• Receptacles should be made available for the construction workers to dispose of litter into the receptacles. • Waste should be disposed of at a licenced landfill on at least a monthly basis. • Secure waste receptacle bins with lids to prevent wind-blown litter. • Any hazardous waste must be stored separately out of direct sunlight and out of rain in the incidence of precipitation. • Any liquid waste generated must be stored in watertight containers. • Any construction material with leachable material must be covered and secured with impermeable tarp in the incidence of rain. • Any leftover construction material after the construction phase has terminated must be disposed of at a licenced landfill facility.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Mitigation	• No waste (other than organic waste) is anticipated to be produced during the operational phase.						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Cumulative Impacts	The accumulation of solid waste, as well as the chemicals that leach into the soil and water courses from construction material will result in the aesthetic degradation of the area, death and deformation of vegetation and fauna who ingest the toxins either directly (water borne) or indirectly (bioaccumulation).						

While no solid waste is anticipated to be generated during the operation of the facility itself, solid waste is anticipated to be generated during the construction of the facility.

This would take the form of primarily construction and general waste. While it is not anticipated that significant volumes of waste would be generated, cementitious waste and cement bags do carry an inherent environmental risk and as such a **'low-medium'** risk is anticipated for the construction of the WWTW and associated bulk infrastructure. This can be easily mitigated, however, through good house-keeping practises and disposal methods, thereby reducing the risk to a **'low'** risk.

Organic Waste							
Impact	The subsequent socio-environmental impacts produced by the spillage of organic waste produced by construction workers. The subsequent socio-environmental impacts produced by the spillage of organic waste conveyed from Warrenton, Warrenvale and Ikusteng.						
Activities	• The production, temporary storage and subsequent disposal of organic waste produced by construction workers. • The conveyance and treatment of organic waste conveyed from Warrenton, Warrenvale and Ikhutseng during the operationality of the WWTW. • Sludge production and handling during operations.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	3	2	2	2	3	6
Mitigation	• Ensure that licensed toilet service providers are contracted before the commencement of construction. • Ensure that all portable toilets are stored further than 100m from any watercourses. • Portable toilets must be placed and secured upright on even ground. • Portable toilets must be emptied and cleaned on a weekly basis.						

After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	5	5	2	4	4	16
Mitigation	• Institute a maintenance plan for the upkeep of the WWTW and bulk infrastructure to prevent operational failure and the subsequent overflow of effluent from, the pump stations and WWTW, the blockages and subsequent overflow of effluent from manholes, and inundation of soils from broken pipes. • Institute an emergency response plan in the incidence of spillages. • Conduct routine inspections of all structures associated with the WWTW. • Sludge management should be done in accordance with an approved sludge management plan. **Sludge Management should at minimum comply with the following:** • Sludge should be transferred to designated drying beds that are appropriately designed and maintained to prevent seepage, runoff, and contamination of surrounding soils and groundwater. • Sludge accumulation should be monitored and managed to ensure that storage capacities are not exceeded. • Sludge should be sampled, analysed, and classified in accordance with the Department of Water and Sanitation's *Guidelines for the Utilisation and Disposal of Wastewater Sludge*, including the determination of microbiological, stability, and pollutant classifications. • The suitability of sludge for beneficial reuse, agricultural application, rehabilitation purposes, or disposal should be determined based on the classification results. • No sludge should be disposed of, applied to land, or beneficially reused unless it has been appropriately tested, classified, and authorised in accordance with the applicable DWS requirements. • Records of sludge generation, storage volumes, testing results, transport, reuse, and disposal should be maintained and made available for auditing purposes. • Contingency measures should be included to address situations where sludge does not meet the required classification standards for the intended reuse or disposal option						
After Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Negative	1	1	1	1	2	2
Cumulative Impacts	Contamination of ground and water resources leading to altered and impaired ecosystem dynamics. Nutrient build-up in stagnant downstream water courses leading to eutrophication. Alterations in plant growth leading to the deterioration of the vegetation type (Kimberley Thornveld). Deterioration of health of fauna (and surrounding communities) associated with utilising contaminated water.						

The primary generator of organic waste during the construction phase is anticipated to be associated with the construction workers, themselves. Given the possibility of spillage during the collection, temporary storage and disposal of organic waste thus carries a **'low- medium'** associated risk. This can be mitigated through the proactive provision of toilet services, planning the locations of the portable toilets themselves as well as ensuring that qualified toilet service providers are consulted for the appropriate disposal of waste. The associated risk can thus be reduced to a **'low'** risk.

The operation of the WWTW and associated bulk infrastructure entails the conveyance, treatment, temporary storage and disposal of organic waste. In a pre-mitigation scenario given

the multiple junctures at which spillage may occur, as well as the significance should spillage occur, entails at a **'medium-high'** risk. This can, however, be easily mitigated through the compilation and implementation of a maintenance plan for the facility, as well as the compilation and implementation of a sludge management plan to ensure that sludge is appropriately disposed of.

17.4 CUMULATIVE IMPACTS

Cumulative impact refers to a combination of environmental impacts of a new development when considering the past, present and future developments. These impacts, which have the potential to gradually degrade the environment, can be synergistic, additive, or incremental. The assessment of cumulative impacts is a legislative requirement in terms of NEMA (Act No. 107 of 1998) which mandates that environmental decision-making consider the broader, long-term consequences of a proposed development. According to DEAT (2004), cumulative impacts can be assessed with consideration of the following underlying principles:

Type	Characteristic
Time crowding	Frequent and repetitive effects.
Time lags	Delayed effects.
Space crowding	High spatial density of effects.
Cross-boundary	Effects occur away from the source.
Fragmentation	Change in landscape pattern.
Compounding effects.	Effects arising from multiple sources or pathways.
Indirect effects	Secondary effects.
Triggers and thresholds	Fundamental changes in system functioning and structure.

(DEAT (2004) Cumulative Effects Assessment, Integrated Environmental Management, Information Series 7, Department of Environmental Affairs and Tourism (DEAT), Pretoria.)

Due to the multifaceted nature of cumulative impacts, implications of a particular activity cannot be neatly isolated into a particular theme or sensitivity However, interconnectedness can be approximated by tracing the anticipated risks from development through to tertiary impacts. The types of impacts can then be further categorised in terms of the aforementioned characteristics to better understand how they may be mitigated.

In the context of the proposed development the following activities and impacts were identified:

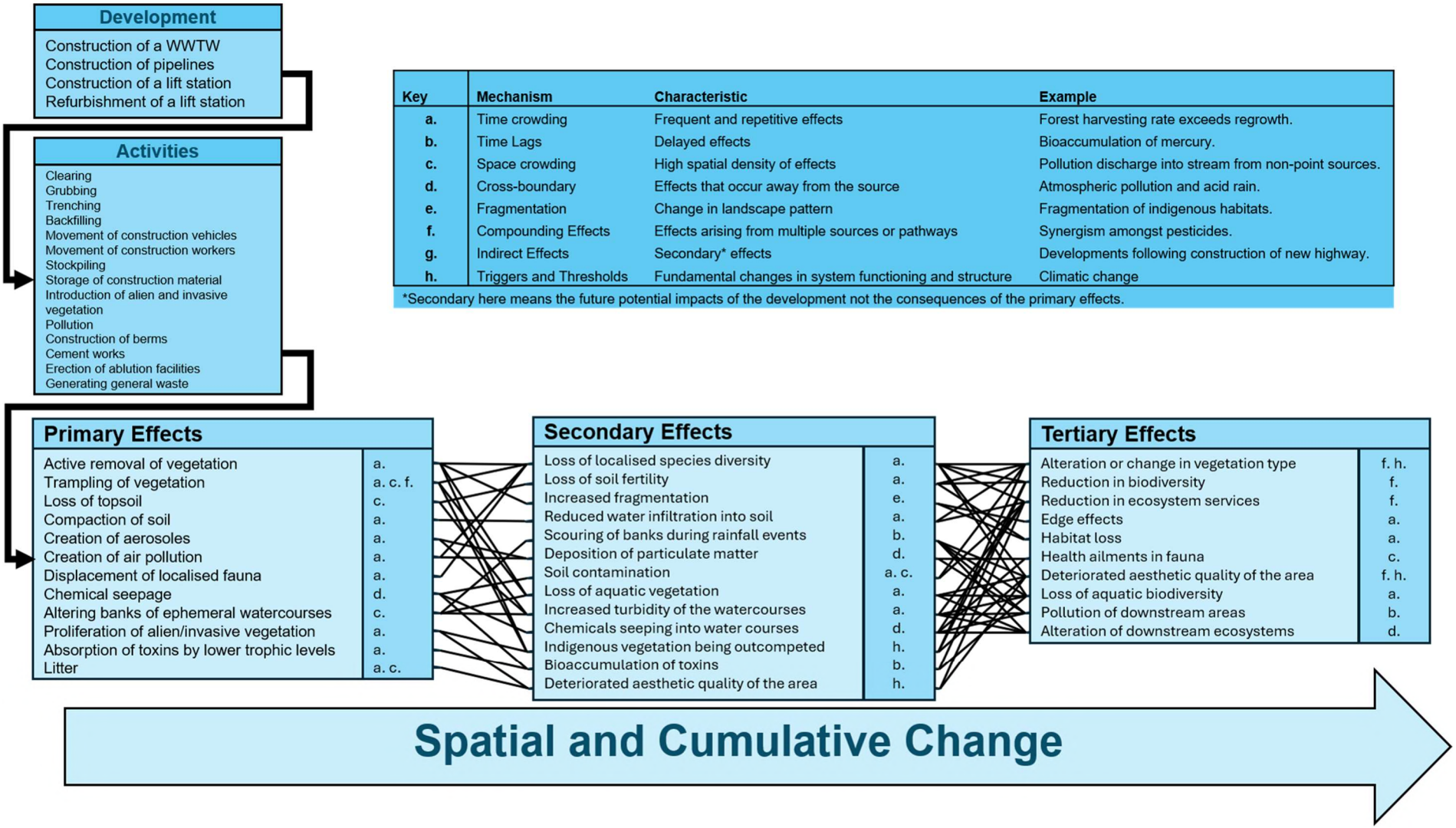


Figure 27: Cumulative impacts associated with the proposed development.

While it is futile to attempt to give an exhaustive account of all potential causal pathways, given the intricacy, multitude of nodes and presence of feedback loops in nature. In considering the most pertinent disturbances it can be shown by the concentration of connections that there are considerable implications in ecosystems when the most foundational components are impacted.

This is evidently, by the number causal pathways implicating watercourses, particularly applicable to construction is conducted in areas approaching riparian habitats and traversing ephemeral drainage lines.

Given the dependence of flora, fauna and human communities on the watercourses for a variety of functions, as well as watercourses' capacity to act as vehicles of any pollutants towards other areas, activities impacting watercourses quickly branch into numerous secondary impacts implicating ecosystems at large. Mitigation measures should therefore, especially in this context, be concentrated on ensuring the no unnecessary deposition of material takes place, protecting surface runoff from contamination and minimising disturbance in watercourses.

17.5 SUMMARY

In the assessment of risks, it became apparent that the risk is primarily concentrated to the themes of water resources, aesthetics, socio-economic, air quality and waste. Furthermore, risks are primarily associated with the operational phase of development in which system and operational failure take place. Thus, most of the impacts can be suitably mitigated through the compilation and implementation of a long-term inspection and maintenance plan. One theme which poses a significant risk during the construction phase is the socio-economic theme, particularly as it relates to landowners. Thus, the socio-economic significance to implicated landowners must be underscored. While this is not anticipated to have significant broader socio-economic or environmental implications, scrupulous public participation involving the property occupants and landowners is going to need to be conducted to ensure that they are kept updated in the public participation process, that they are, if required, fairly compensated and that they are provided with sufficient opportunity and means to relocate with minimal costs to themselves. It is highly recommended that a Community Liaison Officer be integrated into ongoing discussion with landowners to ensure that their interests are represented where construction takes place within communal built-up areas.

Table 14: List of Impacts Assessed with the relative associated risk scores.

Impact Type	Phase	Status	Significance pre-mitigation	Significance post-mitigation
Ecological Impacts				
Habitat Loss	Construction	Negative	2	1
	Operation	N/A	N/A	N/A
Loss of indigenous floral and faunal diversity	Construction	Negative	4	1
	Operation	Negative	4	1
Loss of floral and faunal species of conservation concern	Construction	Negative	2	1
	Operation	N/A	N/A	N/A
Loss of CBAs and ESAs	Construction	Negative	4	1
	Operation	N/A	N/A	N/A
Water Resources				
Surface Water Quality	Construction	Negative	3	1

	Operation	Negative	16	4
Ground Water Quality	Construction	Negative	3	1
	Operation	Negative	16	4
Removal of Riparian Vegetation	Construction	Negative	5	2
	Operation	Negative	2	1
Excavation and Backfilling of Trenches	Construction	Negative	5	2
	Operation	Negative	2	1
Heritage				
Archaeological, palaeontological and Heritage Resources	Construction	Negative	6	N/A
	Operation	N/A	N/A	N/A
Aesthetics				
Construction of Infrastructure	Construction	Negative	6	2
	Operation	Negative	16	1
Socio-economic				
Job creation and the influx of job seekers	Construction	Negative	6	2
	Operation	Negative	2	1
Impacts on affected landowners	Construction	Negative	25	6
	Operation	Negative	12	2
Air Quality				
Generation of exhaust fumes and particulate matter	Construction	Negative	5	2
	Operation	Negative	9	4
Noise and Vibrations	Construction	Negative	6	1
	Operation	Negative	5	3
Waste				
General Solid and Liquid Waste	Construction	Negative	6	2
	Operation	N/A	N/A	N/A
Organic Waste	Construction	Negative	6	2
	Operation	Negative	16	2

The overall negative potential impacts in the incidence of no mitigation measures comprise of four (4) **'Medium'** risk score, two (2) sensitivity themes with a **'Low-Medium'** risk score and one (1) **'Low'** risk score. By implementing the proposed mitigations, however, the risk score can be reduced to an overall **'Low'** risk**,** barring the heritage score which can be completely mitigated such that the associated risk is negligible.

While in some categories even the mitigated scenario still presents an inherent risk. The overall risks associated with the proposed development can still be satisfactorily mitigated with no fatal flaws identified. It remains imperative, however, that maintenance and monitoring of activities during the operational phase continue to ensure that the facilities do not deteriorate and the status quo replicated in the future.

Summary of Negative Impact Assessment findings		
Factors	***Impact Before Mitigation***	***Impact After Mitigation***
Fauna and Flora	2	1
Heritage	6	N/A
Water Resources	14	5
Aesthetics	11	2

Air Quality, Noise and Vibrations	7	3
Waste	14	3
Socio-economic	12	4

17.6 POSITIVE IMPACTS

As noted in consideration of the no-go alternative, the proposed development also entails numerous positive environmental implications. Particularly given that the status quo entails a derelict WWTW in which effluent routinely overflows from the current Warrenton WWTW, pump houses and backed up manholes into surrounding areas. Given the manner in which the proposed development would replace the operation of the current facility, and lead to its eventual decommissioning, the following socio-environmental benefits would be entailed.

17.6.1 TERRESTRIAL ECOLOGICAL IMPACTS:

The continuation of the proposed development would entail that no further spillage from the old facility takes place. This would entail that the termination of the continual disturbance in the form of nutrient loading and inundation of the surrounding soils with water would result in the eventual restoration of the impacted areas to a more natural terrestrial state (provided that there are no other significant impacts which may implicate a change in vegetation unit type). Furthermore, given that it was noted that the effluent from the facility has contaminated a drainage line leading to the Vaal River, it is highly probable, given the duration of disturbance, that the Vaal River and downstream terrestrial habitats are currently being impacted by overflow of effluent. Terminating the operationality and redirecting it to the new operational WWTW would entail that this disturbance is terminated. Given that it is anticipated to at this point be significantly diluted, active rehabilitation measures will not be required.

Holistically, disturbance caused by the current WWTW, can be seen as on a spatial continuum in which the most concentrated impact is in the most immediate proximity of the WWTW diluting, with distance away from the WWTW. Positive impacts brought about by redirecting operation of the current WWTW to the proposed WWTW would thus be most significant to the immediate environment. Given the permanence of the solution, the significant severity of the pollution currently place which would be terminated by the proposed development, as well as the consequence of the medium of pollution entailing that it spreads much further than the immediate area around the WWTW, the positive impact anticipated with the proposed development and termination of operation of the old WWTW is anticipated to be **'medium-high'**. It is important to note that these impacts are anticipated irrespective of whether the old WWTW is demolished. The demolition of the old WWTW and subsequent rehabilitation would only increase the significance of the positive impact.

While the proposed development would first have to be established and operationality entirely diverted from the current WWTW to the new WWTW, before the process of obtaining environmental authorisation for the decommission of the old WWTW can take place (with the rehabilitative measures that would be implicated in that), some rehabilitation is anticipated to take place where the proposed development entails refurbishment i.e. at the Warrenvale Pump Station. Given the small footprint, this is only anticipated to accomplish a **'low-medium'** impact on the terrestrial environment.

Habitat loss							
Impact	Restoration of naturally occurring species in areas impacted by the spillages from the current WWTW system. Improved conditions of terrestrial environments in close proximity to Riparian environments.						
Activities	• Diverting operationality from the current WWTW to the new WWTW. • Rehabilitation of the areas in the immediate environment of the proposed development.						
Constructional Phase							
Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	1	5	3	3	2	6
Operational Phase							
Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	3	4	5	20

17.6.2 WATER RESOURCES:

As noted in the theme of ecological impacts the continuation of the proposed development would entail that no further spillage from the old facility takes place. This would entail that the termination of the continual disturbance in the form of nutrient loading and inundation of the surrounding soils with water would result in the eventual restoration of the impacted areas to a more natural state i.e. the drying up of areas currently artificially inundated with effluent from the WWTW, manholes and pumpstations. This would also result in the subsequent return of drainage lines to their natural states. Furthermore, given that the pollutant is a fluid medium and water soluble it has a tendency of quickly spreading to downstream areas. Termination of the spread would thus also carry a positive impact of **'medium-high'** on downstream habitats. This includes the Vaal River as well as the riparian habitats associated with the Vaal River.

Water Resources							
Impact	Eventual drying up of the artificially inundated areas surrounding the WWTW. Restoration of ephemeral drainage lines to their natural states.						
Activities	• Diverting operationality from the current WWTW to the new WWTW.						
Constructional Phase							
Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Operational Phase							
Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	3	4	5	20

17.6.3 *AESTHETICS:*

While it is not anticipated that the aesthetic quality would be immediately benefited by the construction of the WWTW, the aesthetic quality of areas currently deteriorated on account of the spillage of effluent would be significantly benefited by the termination of pollution. Given the significance of the current offense, mitigated by the aesthetic impact being fairly isolated to the town (compared to the environmental impact which is as noted significantly broader) the anticipated impact of terminating the cause of pollution is anticipated to be **'medium'**.

Construction of Infrastructure							
Impact	The aesthetic improvement of the area brought about by the termination of effluent spillage.						
Activities	Diverting operationality from the current WWTW to the new WWTW.						
Constructional Phase							
Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	N/A						
Operational Phase							

Significance Score	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	4	12

17.6.4 SOCIO-ECONOMIC IMPACT:

The anticipated impact on the socio-economic context of Warrenton is anticipated to be two-fold. Firstly, the recruitment of construction workers and procurement of local services (wherever possible) will entail immediate financial benefits for the local communities. This effect would be immediate albeit temporary thus having **'low-medium'** score ascribed to it.

Secondly, the termination of overflowing effluent from the WWTW, pump stations and manholes would implicate a reduced risk of infecting community members with waterborne pathogens and parasites. Given that this would pose a permanent solution to the current risks implicated by the overflowing effluent a 'medium' impact is anticipated.

Health risk to surrounding communities/ Socio-economic upliftment							
Impact	Reduced health risk associated with water borne pathogens and parasites.						
Activities	• Diverting operationality from the current WWTW to the new WWTW. • Job creation.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	2	2	1	2	5	10
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	4	12

17.6.5 AIR QUALITY:

As in the instance of instance of the theme of terrestrial ecology, while the proposed development would first have to be established and operationality entirely diverted from the current WWTW to the new WWTW, before the process of obtaining environmental authorisation for the decommission of the old WWTW can take place (with the rehabilitative measures that would be implicated in that), some rehabilitation is anticipated to take place where the proposed development entails refurbishment i.e. at the Warrenvale Pump Station. This would entail an immediate improvement in air quality associated with the cleaning of overflowing effluent. Given the small footprint of the areas where rehabilitation can take place before the eventual decommissioning of the current WWTW (this will entail a future environmental impact assessment and environmental authorisation process), this is only anticipated to accomplish a **'low-medium'** impact on the air quality during the construction phase.

The redirection of operationality to the new WWTW and termination of activity at the old WWTW will entail the termination of large volumes of effluent overflowing from the current WWTW, pump stations and manholes. This would implicate the immediate (upon being ready to receive effluent) termination of the source of pollution which is anticipated to carry at least **'medium'** significance. While rehabilitative measures will be required once the source of pollution has been demonstrated to cease (this would be confirmed and demonstrated in a future environmental impact assessment), immediate natural decay would further result in the gradual improvement of air quality as soon as the new WWTW is operational.

*Mitigation	Odours emitted from overflowing effluent and impaired operationality.						
Impact	Improvement of air quality in the areas in close proximity to the overflowing effluent.						
Activities	Diverting operationality from the current WWTW to the new WWTW. Rehabilitating areas where the proposed development entails refurbishment.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	1	5	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	4	12

17.6.6 WASTE:

As in the instance of instance of the theme of terrestrial ecology, while the proposed development would first have to be established and operationality entirely diverted from the current WWTW to the new WWTW, before the process of obtaining environmental authorisation for the decommission of the old WWTW can take place (with the rehabilitative measures that would be implicated in that), some rehabilitation is anticipated to take place where the proposed development entails refurbishment i.e. at the Warrenvale Pump Station. This would entail the removal pf spilt organic waste in some areas during the construction phase of development. Given that this would only be in areas where refurbishment is anticipated to take place this is only anticipated to accomplish a **'low-medium'** impact on removing the organic waste during the construction phase.

The redirection of operationality to the new WWTW and termination of activity at the old WWTW will entail the termination of large volumes of effluent overflowing from the current WWTW, pump stations and manholes. This would implicate the immediate (upon being ready to receive effluent) termination of the source of pollution and thus the immediate termination of organic waste flowing from the WWTW, pump stations and manholes anticipated to carry at least a **'medium significance'**. While rehabilitative measures will be required once the source of pollution has been demonstrated to cease (this would be confirmed and demonstrated in a future environmental impact assessment), immediate natural decay would further result in the integration of the waste into soil effectively neutralising the risk posed.

Mitigation	Organic Waste						
Impact	Prevention and removal of spilt organic waste.						
Activities	Diverting operationality from the current WWTW to the new WWTW. Rehabilitating areas where the proposed development entails refurbishment.						
Constructional Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	1	5	1	2	3	6
Operational Phase							
Before Mitigation	Status	Severity	Duration	Extent	Consequences	Likelihood	Significance
	Positive	3	5	2	3	4	12

PLEASE NOTE: The environmental impact assessment for the decommissioning is only proposed to be initiated once it can be proven that the new WWTW is adequately absorbing and treating all of the effluent from the feeding areas. Thus, it would need to be demonstrated that the current WWTW is not required in any manner. This is to ensure that environmental impacts are not exacerbated by the decommissioning of the current WWTW. Accordingly, rehabilitation of many areas would only be feasible during the decommissioning of the current WWTW.

17.7 NO-GO ALTERNATIVE

The No-Go alternative is the alternative against which the proposed relocation of the Warrenton wastewater treatment works and associated bulk infrastructure is weighed to consider whether the proposed development should constitute an improvement compared to the status-quo. It assumes that the development does not move forth and that no construction takes place.

While it is acknowledged that there would be fewer immediate risks associated with the development not taking place, there would also be immediate and long-term detrimental impacts associated with numerous themes as discussed in 17.6. Positive Impacts, which included:

- Terrestrial ecological impacts
- Water Resources
- Aesthetics
- Socio-economic
- Air Quality
- Waste

The most significant implication is that the no-go option implicates the continuation of the operation of the current WWTW. As noted in the Technical Feasibility Report the current WWTW is in a deteriorated state undermining the reliability and effectiveness of the treatment process. Additionally, a significant amount of effluent is noted to escape the WWTW system in numerous locations (at the WWTW, pumphouses and manholes) resulting in widespread contamination. This is particularly noted in the wetland assessment report in which wide areas are noted to be artificially inundated by overflowing effluent. This is caused by the overloading and ageing infrastructure. Furthermore, it is noted that the increasing volume of effluent being produced by surrounding communities is overtaking the WWTW design capacity. Therefore, refurbishment is not a viable alternative to address the most immediate pressing consequences of the impaired operationality of the WWTW. A larger facility which incorporates newer technologies that require minimal maintenance (to facilitate the budgetary constraints of the local municipality) is required to address not only the most immediate impacts but also to provide a sustainable solution. Given that the current WWTW is already located in close proximity to communities and that alternative developments are currently underway adjacent to the current WWTW, the current location of the WWTW would not prove a feasible location for an expansion of the operation. Furthermore, in attempting to rebuild a new facility in the same footprint of the of the old WWTW while ensuring that the old facility retains maximal functionality poses significant engineering constraints. The preferred solution that would solve the most immediate impacts of overflowing effluent while providing a long-term solution for the absorbing effluent produced by a growing population would entail a new facility located in a different location, utilising newer technologies that require minimal maintenance as far as possible.

Insofar as the proposed development offers such a solution (as is argued in Section 14: Project Motivation), the no-go alternative would entail that such a solution would not be implemented that the current WWTW in its derelict state would continue to be the status-quo as well as all of the detrimental impacts associated therewith. This includes the most immediate impacts namely:

- devastation to the most immediate terrestrial environment (which is already demonstrably altered)
- contamination of both ephemeral and permanent watercourses,
- continued risk to health of fauna and surrounding community,
- continued offence caused by the odours emanating from both the WWTW directly as well as areas which effluent has overflowed from: namely the WWTW, pump stations and manholes,
- reduced aesthetic quality of the area.

Given the fluid and water-soluble medium of the waste, the no-go alternative would further implicate the same impacts (albeit to a diluted extent) in downstream environments.

Socio-economic benefits associated with procurement of products and services and recruitment of workers during both the construction and operational phases would also not come to fruition.

Given the social, health, safety, environmental and economic considerations, the No-Go alternative is thus not the preferred alternative and poses significant social and environmental risks.

18 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS FINDINGS

According to Appendix 3 s3 (1)(o):
"any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation;"

And According to Appendix 3 s3 (1)(q):
"a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation;"

And According to Appendix 3 s3 (1)(r):
"where the proposed activity does not include operational aspects, the period for which the environmental authorisation is required and the date on which the activity will be concluded and the post construction monitoring requirements finalised;"

In summary, while the negative impacts (both direct and cumulative), emergent negative secondary and tertiary impacts associated with the proposed development were assessed, informed by several specialist studies, when weighed against not only the positive impacts of the development, but also the significant ramifications of the no-go alternative, the proposed development should be permitted. No fatal flaws were identified which ought to bar the proposed preferred configurations, layouts, locations and technologies. Concerns raised in the specialist reports are mitigatable.

Two points do, however, need to be emphasised:

1. **Social ramifications of the preferred alternative:**
   As discussed in section 11: Alternatives Considered, two properties have the potential of being implicated in the proposed layout of one of the pipelines in Ikhutseng. While, per the EIA Regulations (GN R982 of 2014 as amended in GN 517 of 2021) in section 39(2)(a) the proponent need not obtain permission from the landowner for the EA process and therefore need not halt the EA application process, all relevant permissions must be obtained before construction **on the impacted properties** is initiated.
2. **Long term operationality:**
   As discussed in section 11: Alternatives considered, options which favoured self-sufficient technologies, low maintenance requirements, and flexibility to rural contexts were employed as far as possible, while ensuring that the projected effluent standards to be used in irrigation adhere to DWS requirements. However, the very nature of WWTW is still inherently risky and a thorough maintenance plan must be implemented by the municipality by close out of construction to ensure that risks inherent to the WWTW are thoroughly mitigated and the current predicament necessitating the relocation of the WWTW, repeated.

18.1 RECOMMENDATIONS TO BE INCLUDED IN EA CONDITIONS

- As it is not yet determined where the location of the construction site office will be nor what the surface areas of the construction site office will be, site office establishment needs to be discussed with a qualified EAP to ensure no additional listing notices or other legislative thresholds are triggered.
- The decommissioning and rehabilitation of the existing Warrenton Wastewater Treatment Works should only commence once the proposed new WWTW has been successfully commissioned and is fully operational. The decommissioning process

should be treated as a separate project and be subject to an independent assessment of the environmental risks, rehabilitation requirements, and regulatory obligations associated with the closure of the existing facility. A detailed decommissioning and rehabilitation plan should be developed and approved prior to the commencement of any decommissioning activities.

- The recommendations and mitigations mentioned in the specialist reports must be adhered to.
- The recommendations and mitigations mentioned in the approved EMPr must be adhered to.

19 THE RECOMMENDATIONS AND MITIGATIONS MENTIONED IN THE SPECIALIST REPORTS MUST BE ADHERED TO. DECLARATION OF INFORMATION ACCURACY

According to Appendix 3 s3 (1)(s):
"an undertaking under oath or affirmation by the EAP in relation to-

(i) the correctness of the information provided in the reports;

(ii) the inclusion of comments and inputs from stakeholders and I&APs;

(iii) the inclusion of inputs and recommendations from the specialist reports where relevant; and

(iv) any information provided by the EAP to interested and affected parties and any responses by the EAP to comments or inputs made by interested or affected parties;"

I, **CW Vermeulen**, in my capacity as the **Lead author** and appointed independent Environmental Assessment Practitioner (EAP) (EAPASA Reg. No.: 2019/1521), hereby undertake and declare under oath that, to the best of my knowledge and belief:

1. The information provided in this Scoping Report is, based on the information furnished by the Applicant and available at this stage, correct.
2. The comments and inputs received from stakeholders and Interested and Affected Parties (I&APs) during the initial notification and registration period have been correctly recorded and considered in this report.
3. Any information provided by me, as the EAP, to I&APs during this scoping phase has been a fair representation of the proposed project and the environmental authorisation process.

Signature	**Date**

20 UNDERTAKING REGARDING LEVEL OF AGREEMENT

I, **CW Vermeulen**, the **Lead EAP** and appointed independent Environmental Assessment Practitioner (EAP), hereby undertake and declare under oath that:

1. The level of agreement reached between myself, as the EAP, and the registered Interested and Affected Parties on the Plan of Study for undertaking the Environmental Impact Assessment (as contained in Section 12 and 14 of this report) has been correctly recorded herein.
2. This Plan of Study reflects the key issues and assessment priorities identified through the initial public participation process and will form the basis for the detailed EIA phase.

Signature	**Date**

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21 APPENDICES