FRESHWATER (AQUATIC) DEVIATION ASSESSMENT REPORT

Mahikeng–Pluto 400 kV Transmission Powerline

Tshilimo Consulting Services



DOCUMENT CONTROL

FRESHWATER (AQUATIC) DEVIATION ASSESSMENT REPORT

Mahikeng–Pluto 400 kV Transmission Powerline

Tower Deviation Spans: Towers 110-111 and Towers 491-521

JB Marks Local Municipality (Dr Kenneth Kaunda DM) and Mafikeng Local Municipality (Ngaka Modiri Molema DM), North West Province

Client	Vhubvo Consultancy cc
Project	Mahikeng-Pluto 400 kV Transmission Powerline - Tower Deviation Assessment
Report Title	Freshwater (Aquatic) Deviation Assessment Report - Towers 110-111 and Towers 491-521
Prepared by	Tshilimo Consulting Services (Pty) Ltd
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Independent Reviewer	Takalani Mudau
Date	June 2026
Status	Draft for Review

DECLARATION

I, Khuliso Collen Maphaha, declare that:

- I am an independent specialist and the author of this Freshwater Walkdown Assessment Report;
- I have acted as the independent specialist in this application;
- I have no vested financial, personal, or other interest in the proposed development other than fair remuneration for work performed;
- The work presented in this report is based on my professional knowledge, experience, and available information at the time of compilation;
- The findings, results, and recommendations contained in this report are, to the best of my knowledge, true, correct, and unbiased;
- This report complies with the requirements of the National Environmental Management Act (Act 107 of 1998) and relevant guidelines, including the Aquatic Biodiversity Assessment Protocol (GN 320 of 2020);
- All reasonable care has been taken to ensure that the information provided is accurate and representative of site conditions observed during the assessment;
- I acknowledge that the submission of false or misleading information may result in legal consequences.

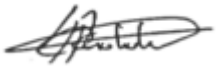
Specialist:

Khuliso Collen Maphaha

Hydrologist

Tshilimo Consulting Services (Pty) Ltd

SACNASP Registration No.: 130272

Signature: 

Date: 24.06.2026

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TABLE OF CONTENT

DOCUMENT CONTROL i

DECLARATION ii

INDEMNITY iii

TABLE OF CONTENT iv

LIST OF FIGURES viii

LIST OF TABLES ix

LIST OF APPINDICES ix

LIST OF ABBREVIATIONS AND ACRONYMS x

LIST OF DEFINITIONS xi

EXECUTIVE SUMMARY xiii

1. INTRODUCTION 1

1.1. Project Background 1

1.2. Purpose and Scope of this Report 1

1.3. Specialist Details and Declaration of Expertise 2

1.4. Structure of this Report 2

2. LEGISLATIVE AND POLICY FRAMEWORK 3

2.1. National Water Act, 1998 (Act No. 36 of 1998) 3

2.2. National Environmental Management Act, 1998 (Act No. 107 of 1998) 3

2.3. National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) ... 3

2.4. Government Notice 320 of 2020: Aquatic Biodiversity Specialist Assessment Protocol 4

2.5. DWS Risk Assessment Matrix and General Authorisation Framework 4

2.6. South African National Water Resource Classification and Resource Quality Objectives 4

2.7. Conservation Planning Instruments 4

2.8. Provincial and Municipal Frameworks 4
3. PHYSICAL ENVIRONMENT 5
3.1. Locality 5
3.1.1. Deviation 1: Towers 110-111 5
3.1.2. Deviation 2: Towers 491-521 5
3.2. Regional Topography and Catchment Context 6
3.3. Geology 8
3.4. Soils 10
3.5. Vegetation, Biome and Bioregion 12
3.5.1. Towers 110-111 12
3.5.2. Towers 491-521 14
3.6. Catchment and Water Management Area 16
4. METHODOLOGY 17
4.1. Desktop Assessment 17
4.2. Field Verification and UAV (Drone) Survey 17
4.3. Aquatic Feature Delineation 17
4.4. Assessment of Significance 18
4.5. DWS Risk Assessment Matrix 18
4.6. Assumptions and Limitations 18
5. RESULTS 19
5.1. National Screening Tool Results: Towers 110-111 19
5.2. National Screening Tool Results: Towers 491–521 19
5.3. Desktop and Field Findings: Towers 491-521 20
5.3.1. Wetland and Watercourse Sensitivity (NWM6 & NFEPA) 20
5.3.2. Terrestrial Biodiversity Context (NWBSP2025) 20

5.3.3. Field (Walkdown) Findings 20
5.3.4. Classification of Identified Features 22
5.3.5. PES, EIS, HIA and REC Assessment 22
5.4. Desktop and Field Findings: Towers 110-111 25
6. IMPACT ASSESSMENT 28
6.1. Impact Assessment: Towers 491-521 28
6.1.1. Construction Phase - Mooi River Crossing (Towers 500-501) 28
6.1.2. Construction Phase - Seasonal Wetland (Tower 493) 29
6.1.3. Construction Phase - General (Towers 491-521) 30
6.1.4. Operational Phase 30
6.2. Impact Assessment: Towers 110-111 31
6.2.1. Construction Phase 31
6.2.2. Operational Phase 31
6.3. Comparative Summary 32
7. DWS RISK MATRIX - SECTION 21(C) AND (I) 33
7.1. Towers 491-521 33
7.2. Towers 110-111 34
8. BUFFER ZONE AND NO-GO AREAS 35
8.1. Towers 491-521 - Mooi River (Towers 500-501) 35
8.2. Towers 491-521 - Seasonal Wetland (Tower 493) 35
8.3. Towers 110-111 36
8.4. General Buffer Conditions 36
9. MITIGATION MEASURES 37
9.1. Design Phase 37
9.2. Construction Phase 37

9.3. Operational Phase 38
9.4. Decommissioning Phase 38
9.5. Mitigation Measures to be Included in the EMPr 38
10. CONCLUSION AND RECOMMENDATIONS 40
10.1. Conclusion 40
10.2. Recommendations 40
11. REFERENCES 42
12. APPENDICES 43

LIST OF FIGURES

Figure 3-1: Locality of the Towers 110-111 deviation span. 5
Figure 3-2: Locality of the Towers 491-521 deviation span. 6
Figure 3-3: Regional digital elevation model (DEM) showing Towers 491 and 521. 7
Figure 3-4: Local digital elevation model and sub-basin delineation for the Towers 110-111 deviation. 8
Figure 3-5: Geology of the Towers 110-111 deviation - Kalahari Group. 9
Figure 3-6: Geology of the Towers 491–521 deviation - Malmani dolomite with Timeball Hill Formation at the northeastern end. 10
Figure 3-7: SOTERSAF soil classification – Towers 110-111 (CLp). 11
Figure 3-8: SOTERSAF soil classification - Towers 491–521 (LPe, with LPq/LXh at the Mooi River crossing). 12
Figure 3-9: Biome (Grassland) - Towers 110-111. 13
Figure 3-10: Vegetation type (Klerksdorp Thornveld) - Towers 110-111. 14
Figure 3-11: Biome map - Towers 491-521. 15
Figure 3-12: Vegetation type transition (Carletonville Dolomite Grassland to Gauteng Shale Mountain Bushveld) - Towers 491-521. 15
Figure 5-1: UAV aerial view of the Mooi River crossing (Towers 500-501), showing the perennial channel within its valley-bottom wetland, bordered by cultivated land. 21
Figure 5-2: Closer UAV view of the Mooi River, showing the defined channel, riparian fringe vegetation, and the adjacent cultivated field boundary. 22
Figure 5-3: Representative open Carletonville Dolomite Grassland away from the confirmed aquatic features, Towers 491-521 span. 23
Figure 5-4: Further representative grassland cover with farmstead visible in the distance, Towers 491-521 span. 24
Figure 5-5: Dolomitic rock outcrop with thicket clumps along the Towers 491-521 corridor. 25
Figure 5-6: UAV aerial view of representative Klerksdorp Thornveld cover, Towers 110-111 deviation area, showing scattered thorn shrub clusters over short grassland with no aquatic feature indicators. 26
Figure 5-7: Close-range UAV view of Kalahari sand substrate with sparse shrub cover, confirming the CLp soil mapping unit and the absence of wetness or hydromorphic indicators. 26

Figure 5-8: UAV view showing thornveld cover adjacent to a road servitude near the Towers 110-111 corridor. 27

LIST OF TABLES

Table 1-1: Specialist details and expertise. 2
Table 5-1: Towers 110-111 screening sensitivities. 19
Table 5-2: Towers 491-521 screening sensitivities. 19
Table 5-3: Biodiversity categories within Towers 491-521. 20
Table 5-4: Confirmed aquatic features - Towers 491-521. 20
Table 5-5: Classification of identified aquatic features. 22
Table 5-6: PES, EIS, HIA and REC assessment results. 23
Table 6-1: Construction impacts - Mooi River crossing. 28
Table 6-2: Construction impacts - seasonal wetland. 29
Table 6-3: General construction impacts - Towers 491-521. 30
Table 6-4: Operational phase impacts - Towers 491-521. 30
Table 6-5: Construction impacts - Towers 110-111. 31
Table 6-6: Operational impacts - Towers 110-111. 31
Table 7-1: DWS RAM assessment - Towers 491-521 33
Table 7-2: DWS RAM assessment – Towers 110-111. 34

LIST OF APPINDICES

Appendix 12-A: National Screening Tool Reports. 43
Appendix 12-B: Quaternary catchment context (D41A, Crocodile West and Marico WMA) - Towers 110-111. 44
Appendix 12-C: Bioregion mapping (Dry Highveld Grassland Bioregion) Towers 110-111. 45
Appendix 12-D: Quaternary catchment context (C23F, Upper Vaal WMA) - Towers 491-521. 46
Appendix 12-E: Bioregion mapping (Dry Highveld / Mesic Highveld Grassland, Central Bushveld) - Towers 491–521. 47
Appendix 12-F: Photographic Record. 48

LIST OF ABBREVIATIONS AND ACRONYMS

Abbreviation / Acronym	Meaning
BA	Basic Assessment
CBA	Critical Biodiversity Area
DEM	Digital Elevation Model
DFFE	Department of Forestry, Fisheries and the Environment
DM	District Municipality
DWS	Department of Water and Sanitation
EIA	Environmental Impact Assessment
EIS	Ecological Importance and Sensitivity
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GN	Government Notice
HGM	Hydrogeomorphic
HIA	Habitat Integrity Assessment
LM	Local Municipality
NEMA	National Environmental Management Act
NEMBA	National Environmental Management: Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Area Expansion Strategy
NWA	National Water Act
NWM6	National Wetland Map Version 6
PES	Present Ecological State
RAM	Risk Assessment Matrix
REC	Recommended Ecological Category
SACNASP	South African Council for Natural Scientific Professions
SANBI	South African National Biodiversity Institute
SOTERSAF	Soil and Terrain Database for Southern Africa
ToPS	Threatened or Protected Species
UAV	Unmanned Aerial Vehicle
WMA	Water Management Area
WULA	Water Use Licence Application

LIST OF DEFINITIONS

Term / Abbreviation	Definition
Aquatic Feature	A water-related environmental feature such as a river, wetland, seep, or drainage line.
Basic Assessment (BA)	An environmental assessment process required in terms of the NEMA EIA Regulations for listed activities with potentially moderate impacts.
Buffer Zone	A protected area surrounding a sensitive feature where development activities are restricted or controlled.
Catchment	An area from which surface water drains into a common river, stream, or wetland system.
CBA	Critical Biodiversity Area identified as important for biodiversity conservation and ecological functioning.
DEM	Digital Elevation Model used to analyse terrain and drainage characteristics.
DFFE	Department of Forestry, Fisheries and the Environment.
Drainage Line	A natural low-lying area where surface water flows during rainfall events.
DWS	Department of Water and Sanitation.
Ecological Support Area (ESA)	An area important for supporting ecological processes and biodiversity functioning.
EIS	Ecological Importance and Sensitivity classification of a water resource.
FEPA	Freshwater Ecosystem Priority Area identified for conservation of freshwater ecosystems.
HGM Unit	Hydrogeomorphic unit used to classify wetland types based on hydrology and geomorphology.
Hydromorphic Soils	Soils showing indicators of prolonged saturation or wetland conditions.
NEMA	National Environmental Management Act, 1998 (Act No. 107 of 1998).
NFEPA	National Freshwater Ecosystem Priority Areas database.
NPAES	National Protected Area Expansion Strategy.
PES	Present Ecological State of a water resource.
RAM	Risk Assessment Matrix prescribed by DWS for Section 21(c) and 21(i) water uses.
REC	Recommended Ecological Category of a water resource.
Riparian Zone	The interface between land and a river or stream, often supporting distinct vegetation.
Section 21(c)	Water use relating to impeding or diverting the flow of water in a watercourse.
Section 21(i)	Water use relating to altering the bed, banks, course, or characteristics of a watercourse.

Term / Abbreviation	Definition
UAV	Unmanned Aerial Vehicle (drone) used for aerial site verification and mapping.
Watercourse	Includes a river, stream, wetland, or drainage feature as defined by the National Water Act.
Wetland	Land saturated with water for sufficient periods to support hydrophilic vegetation and wetland processes.
WULA	Water Use Licence Application submitted in terms of the National Water Act.

EXECUTIVE SUMMARY

Tshilimo Consulting Services (Pty) Ltd was appointed by Vhubvo Consultancy cc to undertake a Freshwater (Aquatic) Deviation Assessment for the proposed Mahikeng-Pluto 400 kV Transmission Powerline deviation spans between Towers 110-111 and Towers 491-521 in the North West Province.

The purpose of the assessment was to identify and assess aquatic features potentially affected by the proposed tower deviations and associated construction activities, and to support the Basic Assessment and Water Use Authorisation processes in terms of the National Water Act, 1998 (Act No. 36 of 1998).

Desktop analysis, field walkdown surveys, and UAV (drone) verification were undertaken to confirm the presence and sensitivity of wetlands, watercourses, and associated aquatic habitats within the deviation footprints. The Towers 491-521 deviation confirmed the presence of a seasonal wetland near Tower 493 and the perennial Mooi River crossing between Towers 500-501, both considered sensitive aquatic systems. In contrast, the Towers 110-111 deviation was confirmed as a dryland footprint with no wetlands or watercourses identified during field verification.

Following the freshwater walkdown assessment and environmental recommendations, the tower positions were revised to avoid direct encroachment into identified aquatic features and associated buffer areas. No tower foundations are proposed within confirmed river channels, wetland areas, or delineated riparian habitat.

Potential impacts associated with vegetation clearance, tower foundation excavation, access movement, sedimentation, and disturbance adjacent to riparian habitat were assessed. However, with the implementation of recommended mitigation measures and exclusion buffers, all identified impacts can be reduced to Low significance.

The assessment concludes that the proposed deviations are environmentally acceptable from a freshwater perspective, provided that the mitigation measures and buffer recommendations contained in this report are implemented during construction and operation.

1. INTRODUCTION

1.1. Project Background

The National Transmission Company South Africa SOC Ltd (NTCSA) proposes the construction of the Mahikeng-Pluto 400 kV Transmission Powerline within North West Province. During the detailed design and route optimisation phase, two localised deviations from the originally authorised alignment were identified as necessary to avoid or reduce impacts on sensitive features, optimise tower placement on suitable terrain, and respond to site-specific constraints identified during the walkdown survey.

This report assesses the freshwater (aquatic) environment associated with two discrete deviation spans on the powerline alignment:

- Deviation 2: Towers 110-111 (approximately 42.8 m lateral deviation), situated within the Mafikeng Local Municipality, Ngaka Modiri Molema District Municipality; and
- Deviation 1: Towers 491-521 (approximately 14 km alignment span), situated within the JB Marks Local Municipality, Dr Kenneth Kaunda District Municipality.

Tshilimo Consulting Services (Pty) Ltd was appointed, through Vhubvo Consultancy cc, as the independent freshwater (aquatic) specialist to assess the potential impacts of both deviations on watercourses, wetlands, and associated riparian habitat, and to inform the Water Use Licence Application (WULA) and Basic Assessment processes associated with the project.

1.2. Purpose and Scope of this Report

The purpose of this report is to:

- Describe the physical and ecological environment of both deviation spans;
- Identify and delineate aquatic features (watercourses, wetlands, riparian zones) within and adjacent to each deviation footprint;
- Assess the potential impacts of construction and operation of the deviated tower positions on identified aquatic features;
- Apply the Department of Water and Sanitation (DWS) Risk Assessment Matrix in terms of the applicable General Authorisation framework under the National Water Act, 1998 (Act No. 36 of 1998), to determine the risk classification of the proposed activities; and

- Recommend appropriate buffer zones, no-go areas, and mitigation measures to inform the final engineering design and environmental authorisation conditions.

This report makes reference to the broader Mahikeng-Pluto 400 kV Transmission Powerline environmental assessment documentation for contextual purposes only. The current assessment specifically addresses the identified deviation sections associated with Towers 491-521 and Towers 110-111.

1.3. Specialist Details and Declaration of Expertise

Table 1-1: Specialist details and expertise.

Specialist	Khuliso Collen Maphaha
Qualification	BSc Earth Science (Hydrology and Water Resources), University of Venda
Professional Registration	Pr.Sci.Nat., South African Council for Natural Scientific Professions (SACNASP), Registration No. 130272
Field of Expertise	Hydrology, Geohydrology, Aquatic Ecology and Freshwater Resource Assessment
Company	Tshilimo Consulting Services (Pty) Ltd (Reg. No. 2021/969303/07)

The specialist confirms the necessary expertise to conduct the freshwater assessment in terms of the requirements of the Aquatic Biodiversity Specialist Assessment Protocol (Government Notice 320 of 2020), and has no vested or financial interest in the outcome of this application other than fair remuneration for work performed.

1.4. Structure of this Report

This report is structured to address each deviation span in parallel, given their distinct geographic, geological, and ecological contexts. Where findings differ materially between the two spans, this is presented in side-by-side or sequential sub-sections. The report structure is as follows: Introduction; Legislative and Policy Framework; Physical Environment; Methodology; Results; Impact Assessment; DWS Risk Assessment Matrix (Section 21(c) and (i)); Buffer Zones and No-Go Areas; Mitigation Measures; Conclusion and Recommendations; References; and Appendices.

2. LEGISLATIVE AND POLICY FRAMEWORK

This assessment has been conducted with reference to the following legislation, regulations, and guideline documents applicable to freshwater resources and linear infrastructure development in South Africa.

2.1. National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) governs the protection, use, development, conservation, management, and control of water resources in South Africa. Section 21 of the NWA defines water uses requiring a licence unless authorised under a General Authorisation or exemption. The following water uses are relevant to construction activities within or near watercourses associated with the deviation spans:

- Section 21(c): Impeding or diverting the flow of water in a watercourse;
- Section 21(i): Altering the bed, banks, course or characteristics of a watercourse.

Where the risk assessment in Section 7 of this report indicates a Low risk rating in terms of the DWS Risk Assessment Matrix, the activity may qualify for the applicable General Authorisation framework under the National Water Act rather than a full Water Use Licence, subject to compliance with the General Authorisation conditions and registration with DWS.

2.2. National Environmental Management Act, 1998 (Act No. 107 of 1998)

NEMA and the associated 2014 EIA Regulations (as amended) require environmental authorisation for listed activities, including the construction of above-ground powerlines exceeding specified voltage and length thresholds. The deviation spans fall within the scope of the existing Basic Assessment process for the Mahikeng–Pluto powerline. Section 24 of NEMA establishes the duty of care principle informing the mitigation hierarchy applied in Section 9 of this report.

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

NEMBA and associated Threatened or Protected Species (ToPS) regulations are relevant where sensitive plant or animal species are confirmed within the deviation footprints, as flagged in the national screening tool results (Section 5).

2.4. Government Notice 320 of 2020: Aquatic Biodiversity Specialist Assessment Protocol

This Protocol, issued under the 2014 EIA Regulations, sets out the minimum requirements for aquatic biodiversity specialist assessments, including delineation methodology, impact assessment requirements, and reporting content. This report has been structured to align with the Protocol's requirements.

2.5. DWS Risk Assessment Matrix and General Authorisation Framework

The Department of Water and Sanitation (DWS) Risk Assessment Matrix (RAM) methodology was applied to assess the potential risk associated with Section 21(c) and 21(i) water uses in relation to the proposed tower deviations. The assessment considered the latest applicable General Authorisation framework and associated risk assessment requirements under the National Water Act, 1998 (Act No. 36 of 1998).

2.6. South African National Water Resource Classification and Resource Quality Objectives

Resource Quality Objectives (RQOs), where gazetted for the relevant Water Management Area, inform the assessment of cumulative impact on water resource quality and the determination of appropriate buffer widths.

2.7. Conservation Planning Instruments

The national Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) mapping, the National Freshwater Ecosystem Priority Areas (NFEPA) database, and the National Protected Area Expansion Strategy (NPAES) have been referenced in the desktop screening (Section 5) to identify areas of very high terrestrial and aquatic biodiversity sensitivity overlapping the deviation footprints.

2.8. Provincial and Municipal Frameworks

Spatial planning instruments of the North West Province, including the Bioregional Plan and applicable Spatial Development Frameworks of the Ngaka Modiri Molema and Dr Kenneth Kaunda District Municipalities, have been considered in the locality and sensitivity assessment of both deviation spans.

3. PHYSICAL ENVIRONMENT

This section describes the physical environment of each deviation span, including locality, topography, geology, soils, vegetation, and surface water context, derived from desktop GIS analysis and verified through site walkdown and drone (UAV) survey where access permitted.

3.1. Locality

3.1.1. Deviation 1: Towers 110-111

The Towers 110-111 deviation is located within the Mafikeng Local Municipality, Ngaka Modiri Molema District Municipality, North West Province. The deviation comprises a short lateral shift of approximately 42.8 m between the two tower positions, situated on Farm Bauwel 128.

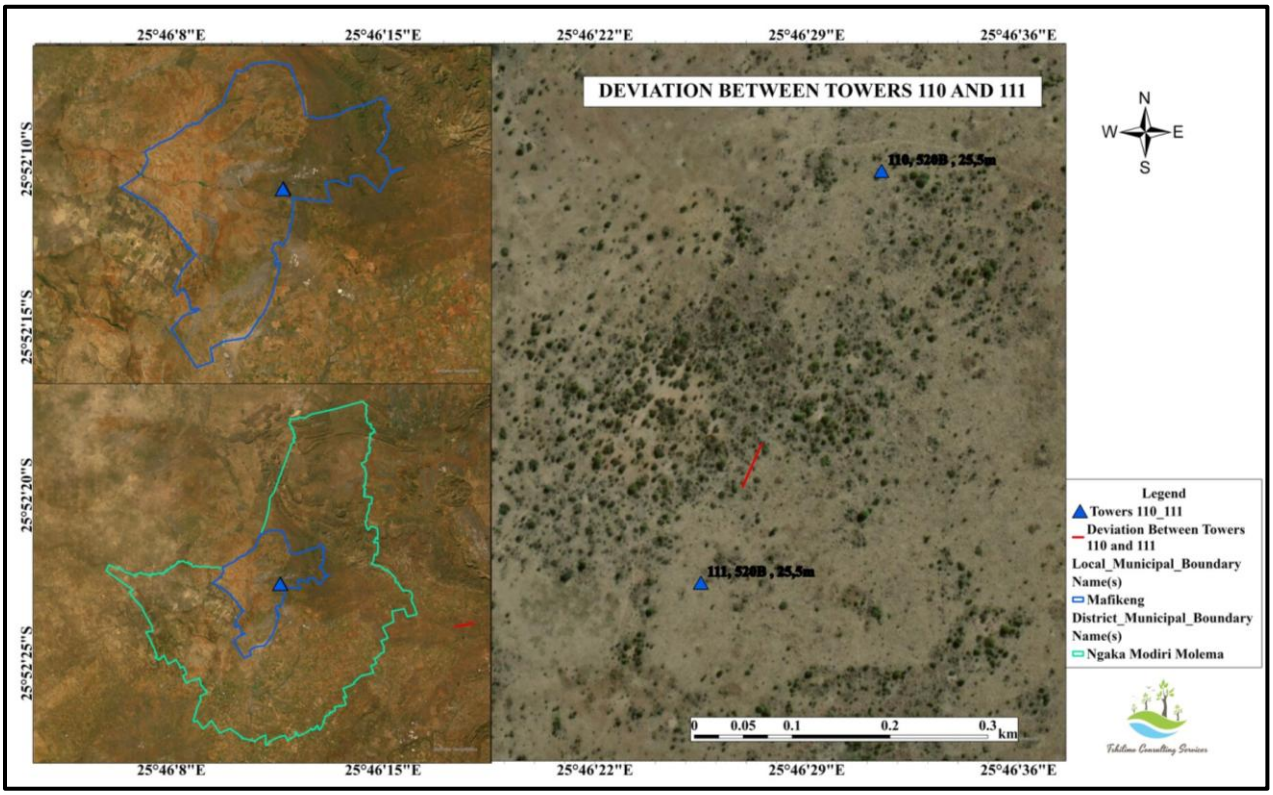


Figure 3-1: Locality of the Towers 110-111 deviation span.

3.1.2. Deviation 2: Towers 491-521

The Towers 491-521 deviation extends approximately 14 km and is located within the JB Marks Local Municipality, Dr Kenneth Kaunda District Municipality, North West Province, on farm portions including Nooitgedacht 69, Klipgat 18, and Goedgedacht 27.

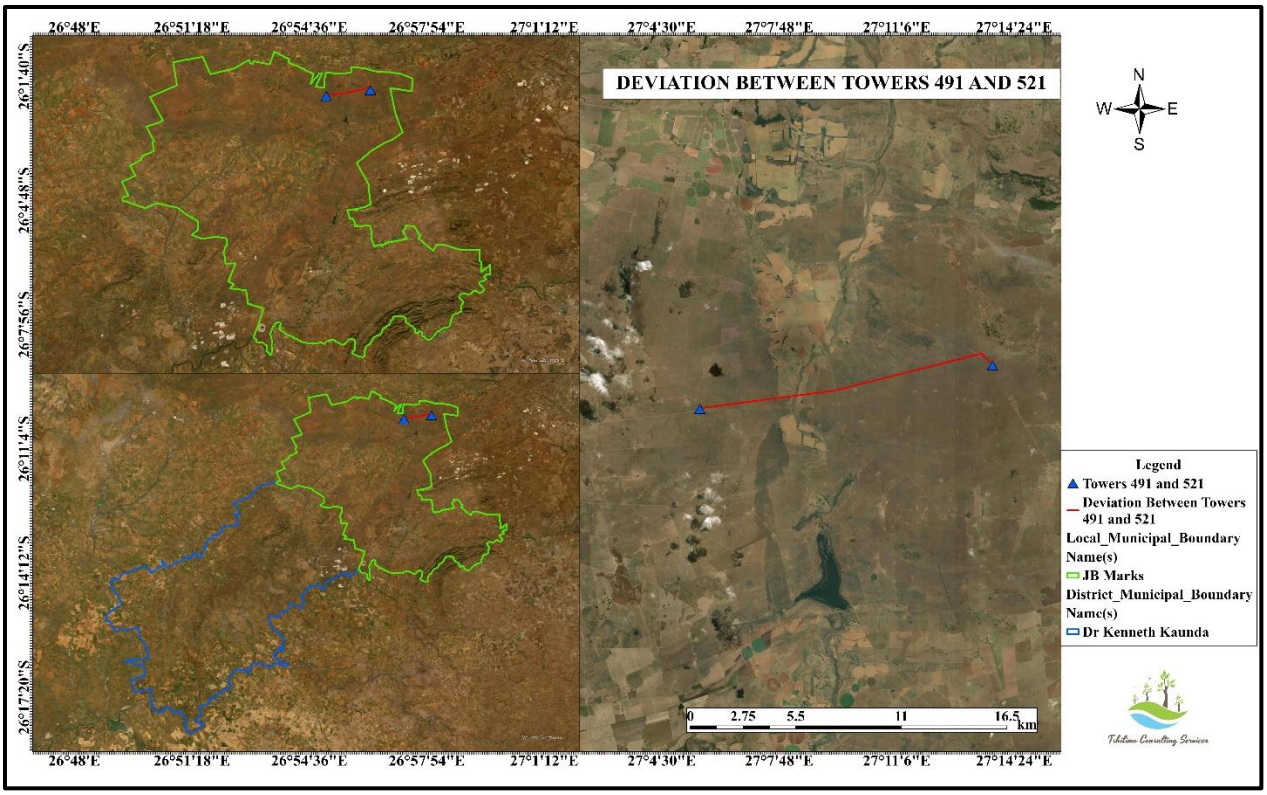


Figure 3-2: Locality of the Towers 491-521 deviation span.

3.2. Regional Topography and Catchment Context

Both deviation spans fall within the broader Mahikeng-Pluto powerline corridor. The regional digital elevation model (DEM) below illustrates the topographic setting of the Towers 491-521 span, situated within a valley corridor flanked by higher ground on both sides, with the lowest elevations (approximately 1,462mamsl) coinciding with the drainage line crossed by the alignment.

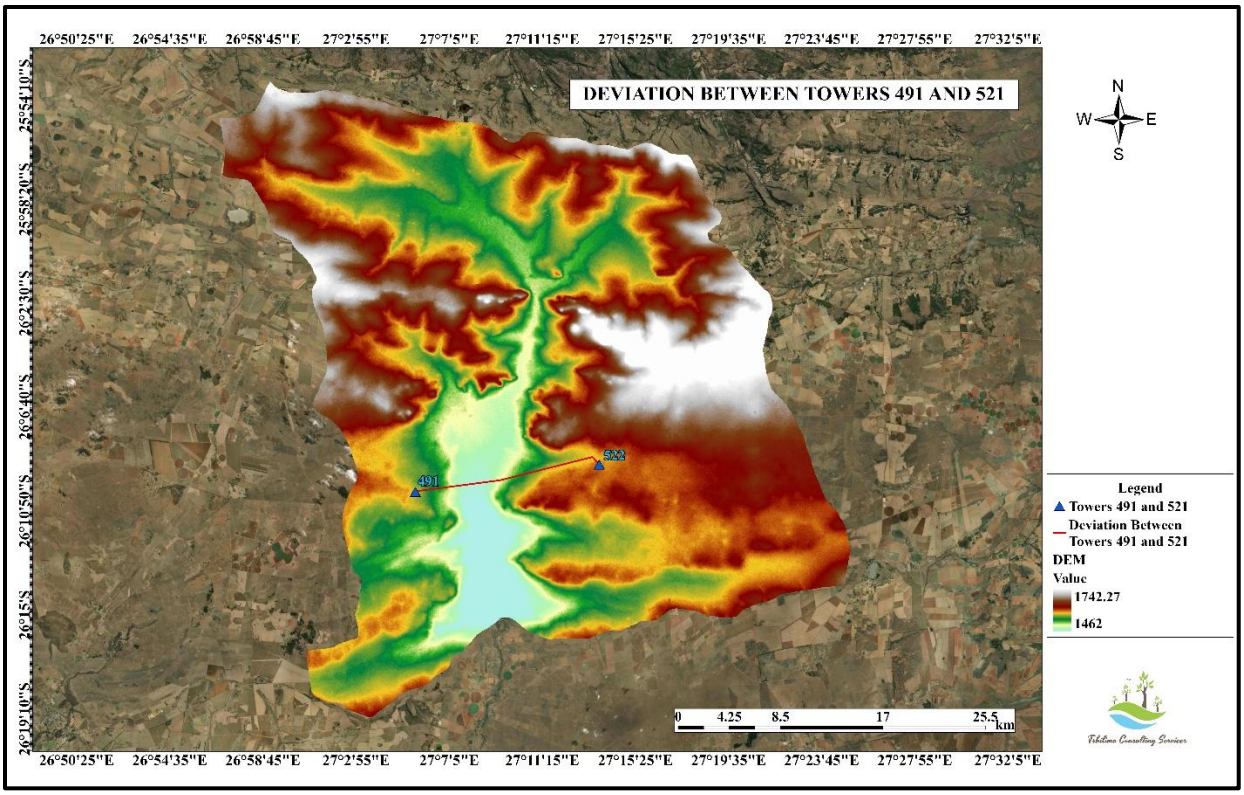


Figure 3-3: Regional digital elevation model (DEM) showing Towers 491 and 521.

The Towers 110-111 deviation lies within a more subdued sub-basin draining toward a lower-lying feature to the southeast. A mapped surface drainage line (Drainage) is shown immediately south of the deviation point in the regional terrain dataset, as shown in Figure 3-4; however, as set out in Section 4.5, field and UAV verification did not confirm a watercourse or wetland feature at this location.

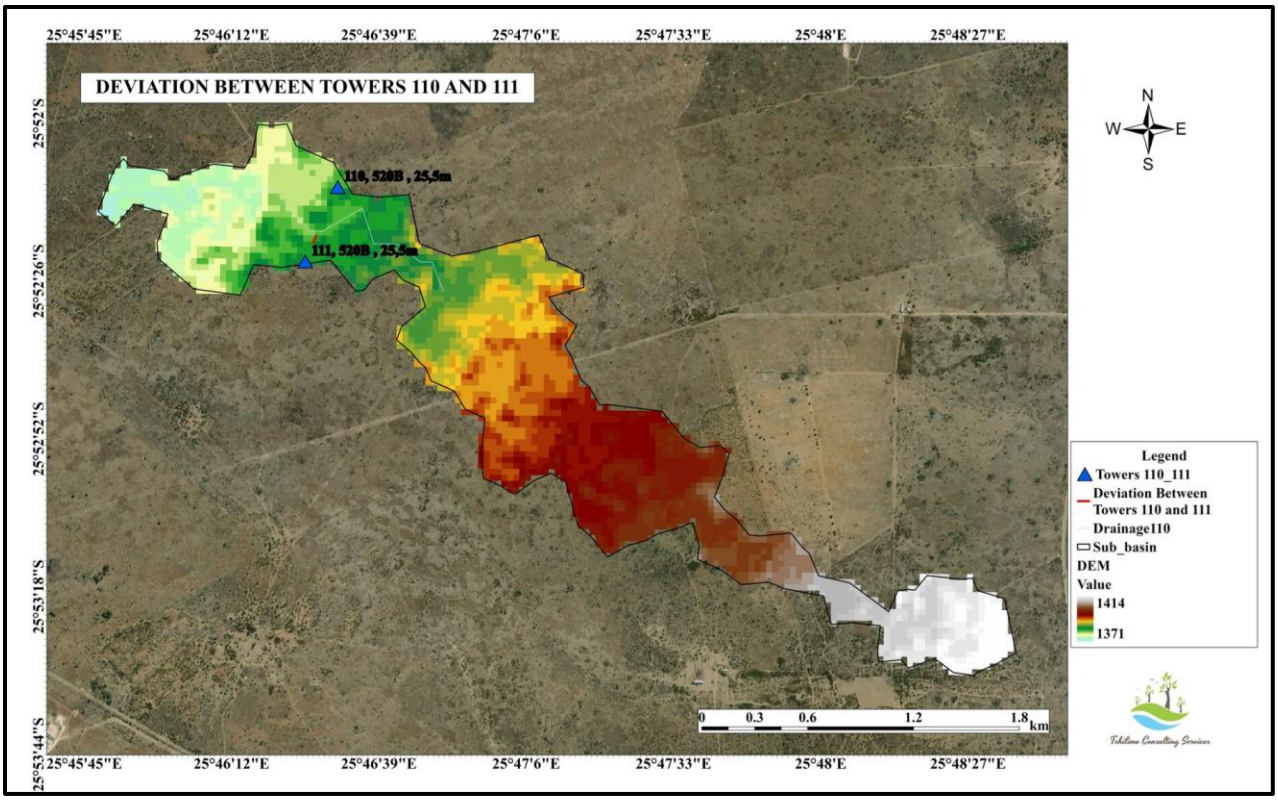


Figure 3-4: Local digital elevation model and sub-basin delineation for the Towers 110-111 deviation.

3.3. Geology

The Towers 110-111 deviation is underlain entirely by Kalahari Group sediments, consistent with the regional Kalahari sand mantle typical of this part of North West Province.

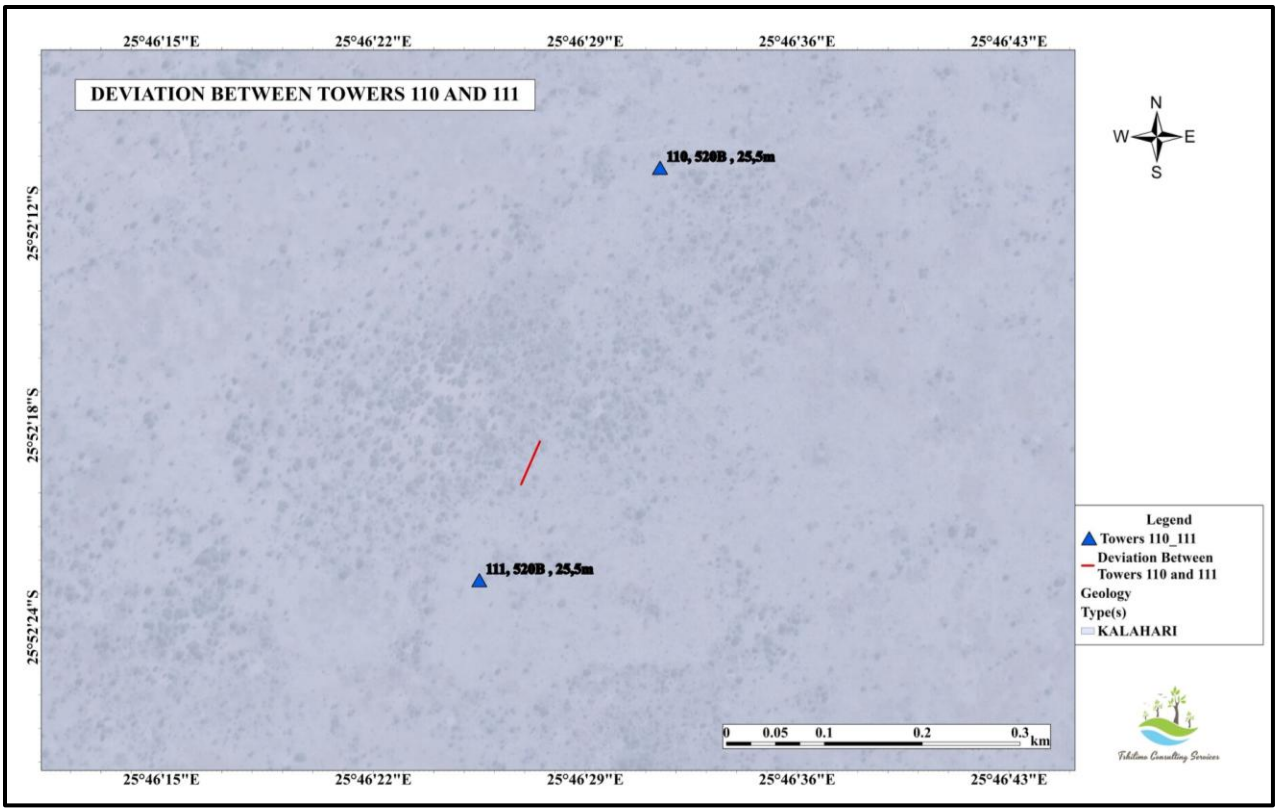


Figure 3-5: Geology of the Towers 110-111 deviation - Kalahari Group.

The Towers 491-521 deviation is underlain predominantly by Malmani Subgroup dolomite, with Timeball Hill Formation shale and quartzite outcropping at the northeastern extent of the span, near Tower 521.

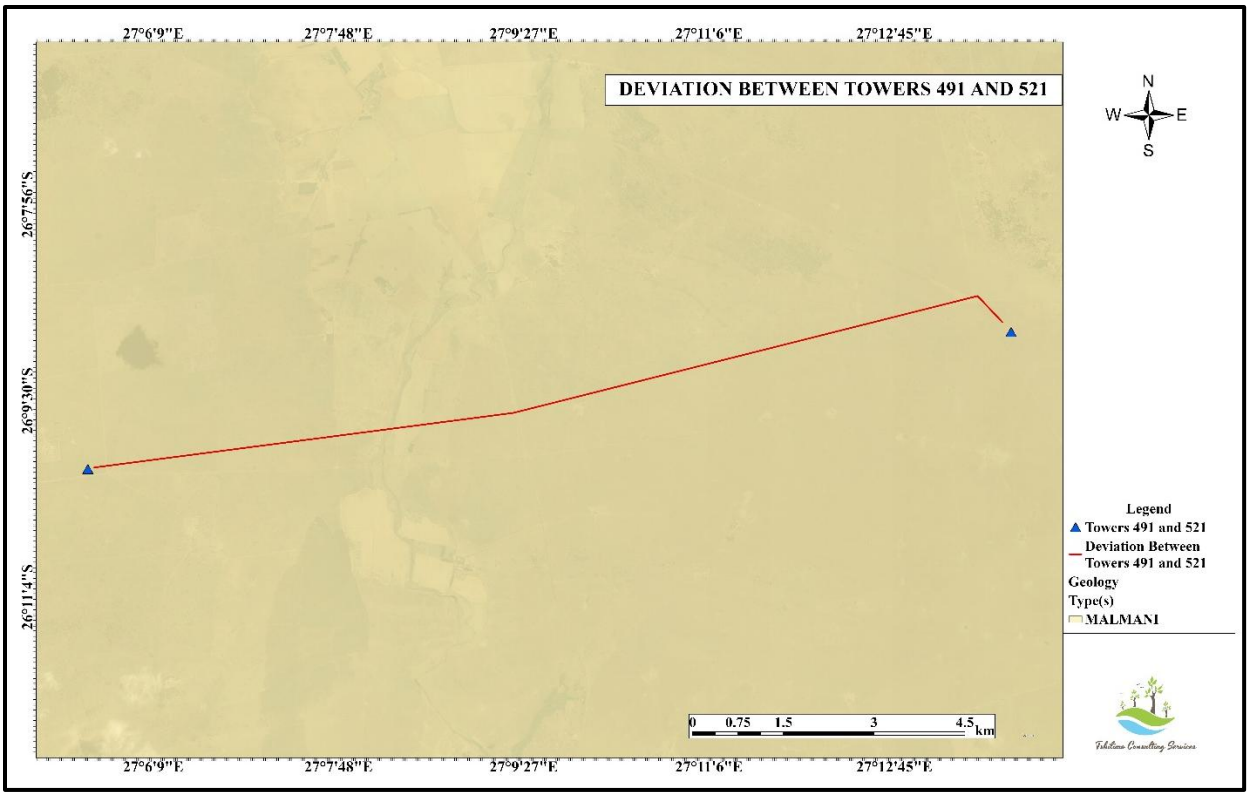


Figure 3-6: Geology of the Towers 491–521 deviation - Malmani dolomite with Timeball Hill Formation at the northeastern end.

The presence of dolomitic geology along the Towers 491-521 span is a material consideration, given the karst sinkhole and subsidence risk typically associated with the Malmani Subgroup, and the close association between dolomite and groundwater-dependent wetland and spring (seep) features observed in this terrain type.

3.4. Soils

Soils within the Towers 110-111 deviation are mapped as CLp under the SOTERSAF classification, consistent with the underlying Kalahari sand geology.

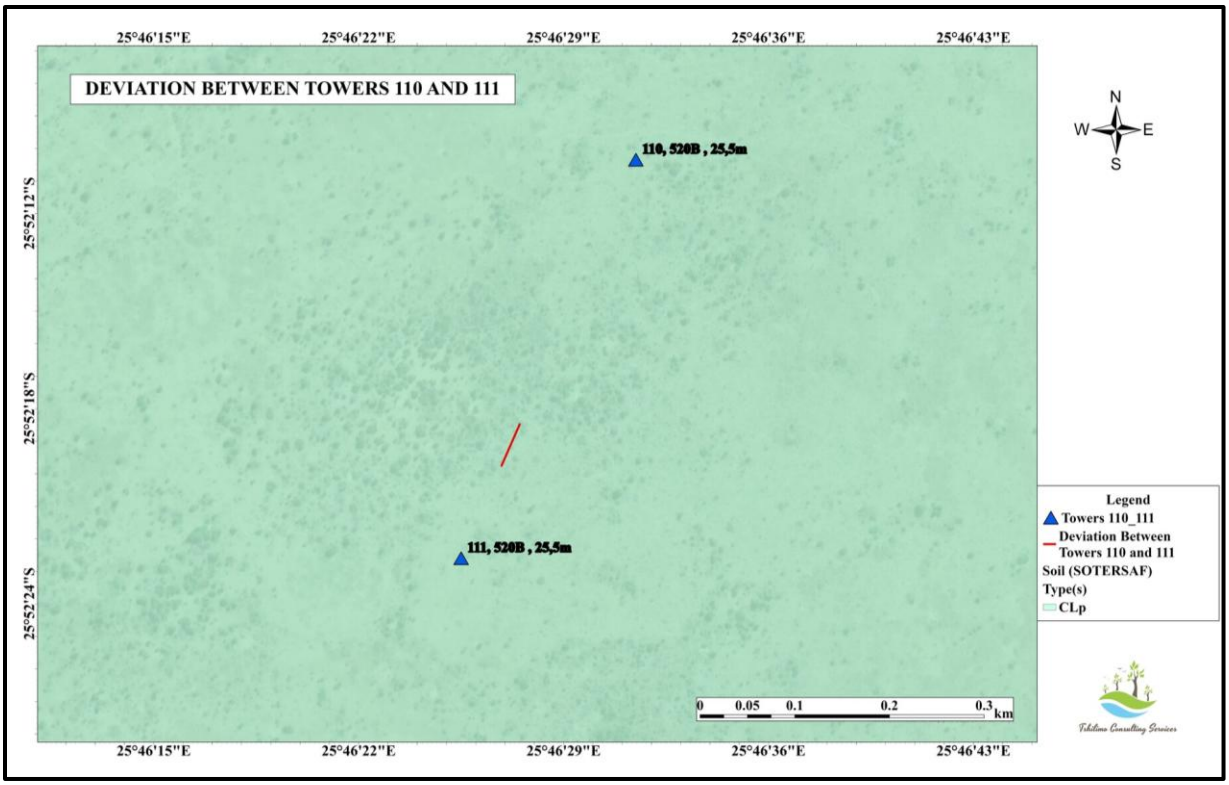


Figure 3-7: SOTERSAF soil classification – Towers 110-111 (CLp).

Soils within the Towers 491-521 deviation are mapped predominantly as LPe, with LPq and LXh associated with the Mooi River crossing near the northeastern end of the span (Towers 500–501).

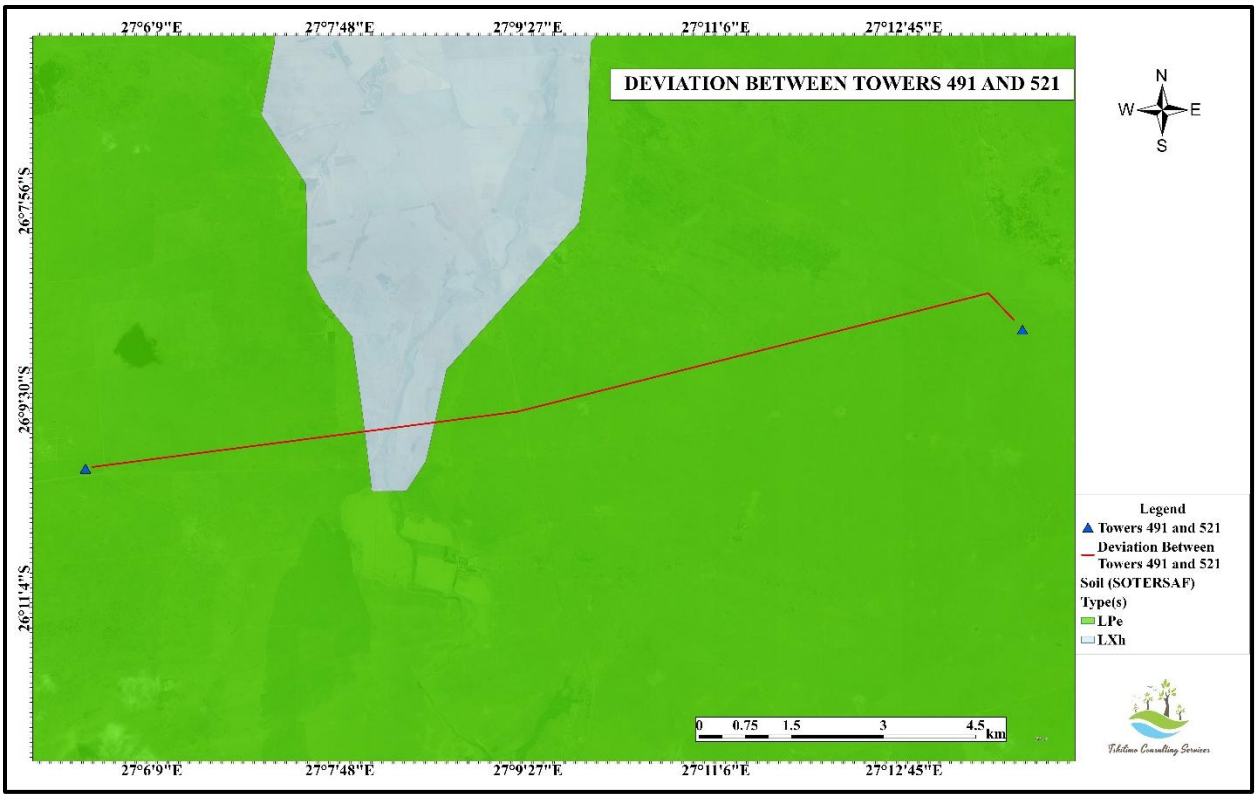


Figure 3-8: SOTERSAF soil classification - Towers 491–521 (LPe, with LPq/LXh at the Mooi River crossing).

3.5. Vegetation, Biome and Bioregion

3.5.1. Towers 110-111

The Towers 110-111 deviation falls within the Grassland Biome, Dry Highveld Grassland Bioregion, and is mapped as Klerksdorp Thornveld vegetation type. Site observation confirms a sparse, open thornveld dominated by scattered low shrubs over short grassland, consistent with the mapped vegetation type.

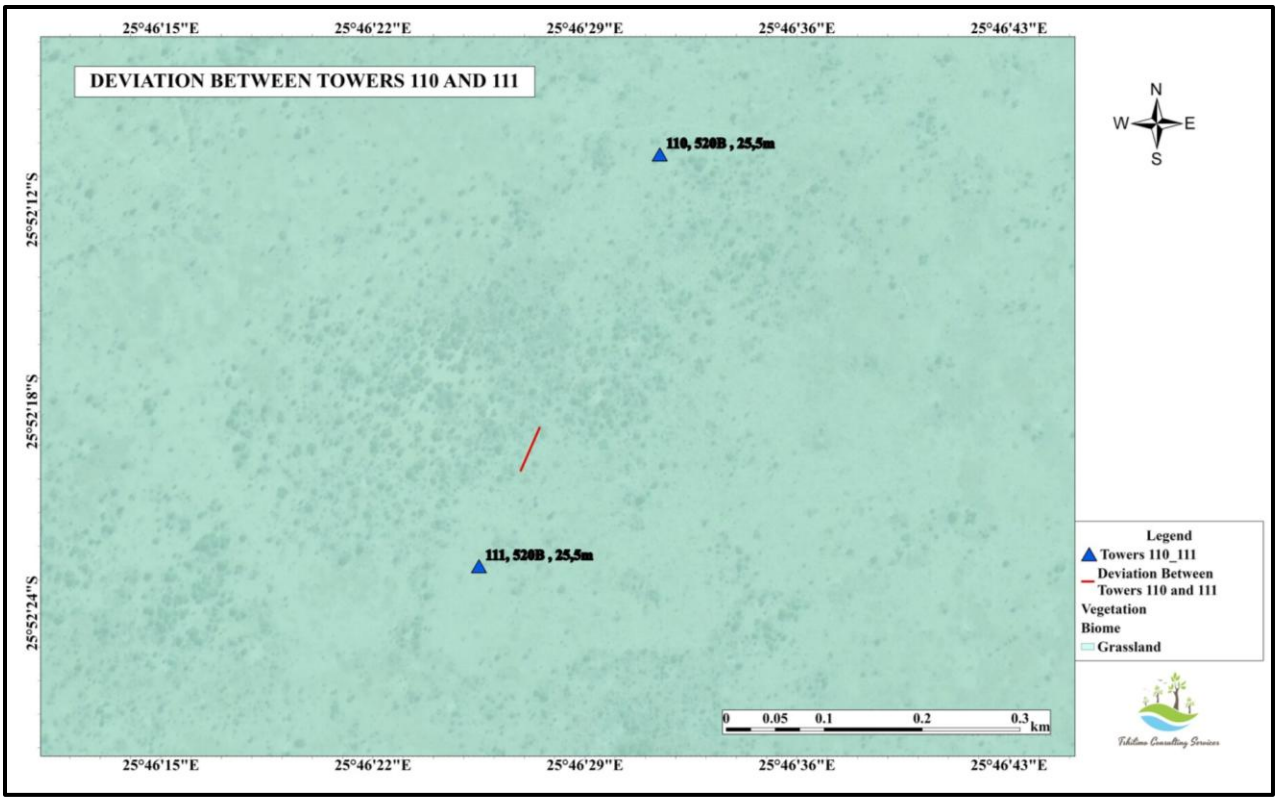


Figure 3-9: Biome (Grassland) - Towers 110-111.

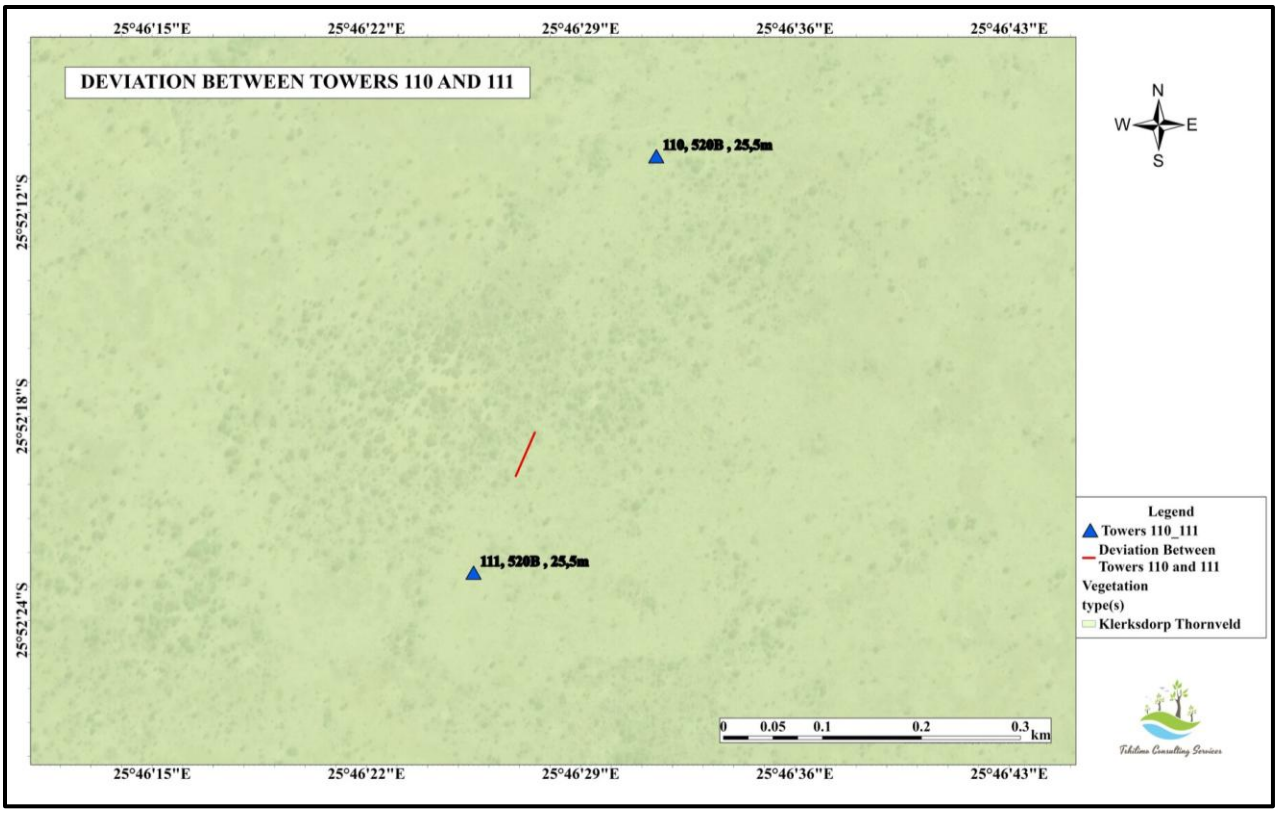


Figure 3-10: Vegetation type (Klerksdorp Thornveld) - Towers 110-111.

3.5.2. Towers 491-521

The Towers 491-521 deviation falls predominantly within the Grassland Biome, Dry Highveld Grassland Bioregion, mapped as Carletonville Dolomite Grassland vegetation type, transitioning to Rand Highveld Grassland and Mesic Highveld Grassland Bioregion at the drainage crossing, and Gauteng Shale Mountain Bushveld / Central Bushveld Bioregion at the northeastern extent near Tower 521.

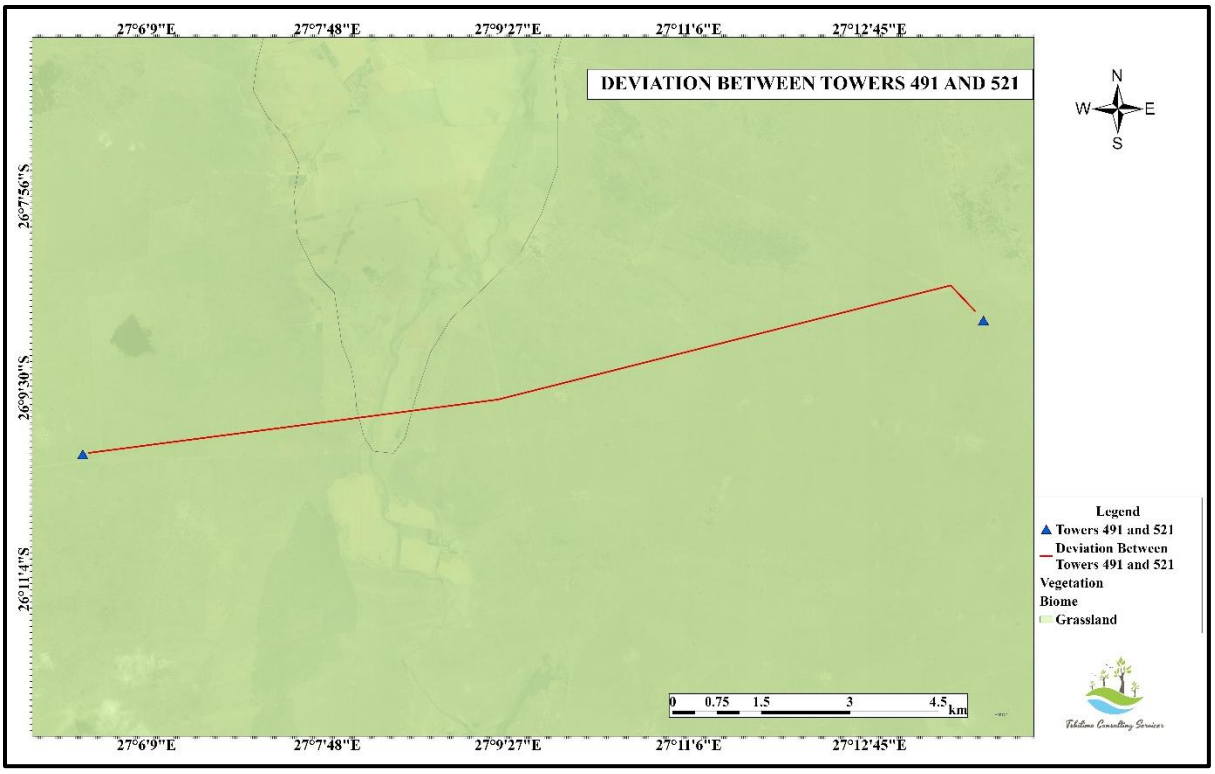


Figure 3-11: Biome map - Towers 491-521.

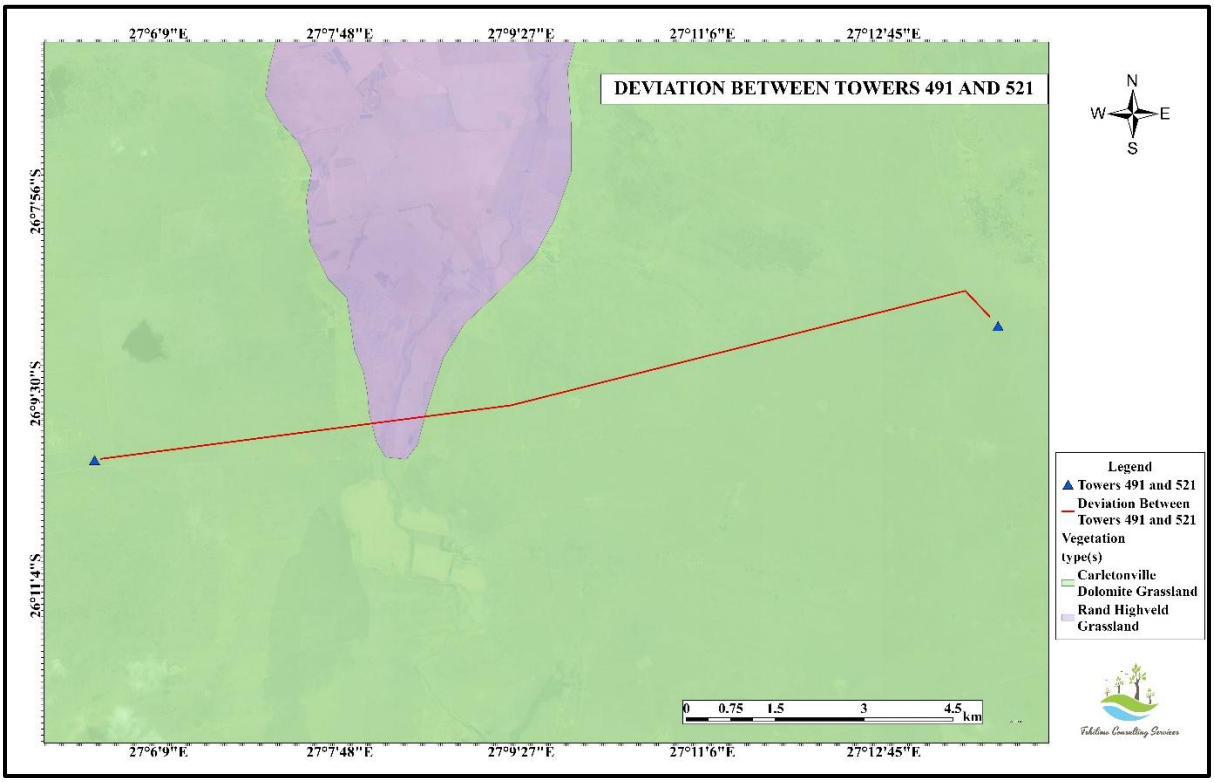


Figure 3-12: Vegetation type transition (Carletonville Dolomite Grassland to Gauteng Shale Mountain Bushveld) - Towers 491-521.

3.6. Catchment and Water Management Area

The Towers 110-111 deviation falls within the D41A quaternary catchment, Vaal Water Management Area.

The Towers 491-521 deviation falls within the C23F quaternary catchment, Upper Vaal Water Management Area.

Both catchments are relevant to determining the cumulative water resource context for the DWS Risk Assessment Matrix applied in Section 7.

4. METHODOLOGY

4.1. Desktop Assessment

A desktop assessment was undertaken for both deviation spans using the following data sources:

- The DFFE National Web-Based Environmental Screening Tool, used to generate site-specific environmental sensitivity screening reports for each deviation footprint;
- 1:50,000 topographical mapping and digital elevation model (DEM) data, used to delineate sub-basins, drainage lines, and topographic context;
- National geology, soils (SOTERSAF), vegetation (SANBI), biome and bioregion datasets;
- National Freshwater Ecosystem Priority Areas (NFEPA) database, Critical Biodiversity Area (CBA) and Ecological Support Area (ESA) mapping, and the National Protected Area Expansion Strategy (NPAES); and
- High-resolution satellite imagery, used to verify desktop-mapped drainage features against visible surface water indicators (vegetation greening, channel morphology).

4.2. Field Verification and UAV (Drone) Survey

Site access for both deviation spans was assessed prior to the walkdown. Where direct ground access was constrained by terrain, land use, or landowner access arrangements, a UAV (drone) aerial survey was used as the primary field verification method, supplemented by ground-based observation at accessible points.

The drone survey was used to confirm the presence, extent, and condition of aquatic features identified during the desktop assessment, including channel morphology, riparian vegetation condition, and the presence or absence of standing or flowing water at the time of survey. Representative photographs from the UAV survey are included in Section 5 and Appendix.

Field survey limitations are noted where relevant, including the dependency of vegetation-based wetland indicators on seasonal timing of the survey.

4.3. Aquatic Feature Delineation

Watercourses and wetlands within and adjacent to each deviation footprint were delineated with reference to the definition of a watercourse under Section 1 of the National Water Act, and the wetland indicators set out in the DWS Guideline for the Delineation of Wetlands and Riparian Areas. Delineation relied on a combination of:

- Terrain (DEM-derived drainage and sub-basin) analysis;
- Soil form and wetness indicators, where field-verifiable;
- Vegetation indicators observed during the UAV survey; and
- Desktop hydrological (NFEPA, river line) datasets.

4.4. Assessment of Significance

Potential impacts identified in Section 6 were assessed in terms of nature, extent, duration, intensity, and probability, from which an overall significance rating was derived using Tshilimo Consulting Services' standard impact assessment methodology, consistent with the requirements of the 2014 EIA Regulations (as amended).

4.5. DWS Risk Assessment Matrix

The risk associated with the proposed Section 21(c) and 21(i) water uses at each deviation span was assessed using the applicable DWS Risk Assessment Matrix (RAM) methodology in accordance with the current General Authorisation requirements under the National Water Act. The RAM scores Likelihood and Consequence for each identified water use against the relevant water resource, the methodology and results of which are presented in Section 7.

4.6. Assumptions and Limitations

- This assessment is based on the tower positions and deviation geometry as supplied at the time of reporting; any subsequent change in tower position or alignment will require re-assessment.
- The UAV survey was conducted during the period stated in Appendix 12-F and reflects surface water conditions at that time only; seasonal variation in flow and wetland extent should be considered when interpreting the findings.
- Species-level sensitivity features flagged by the national screening tool but withheld pending SANBI confirmation (Section 5) have been assessed at the level of sensitivity indicated, without confirmed species identity.

5. RESULTS

This section presents the findings of the desktop screening and field/UAV verification for each deviation span, including the national screening tool sensitivity outcomes and the confirmed aquatic and terrestrial features observed.

5.1. National Screening Tool Results: Towers 110-111

The DFFE National Web-Based Environmental Screening Tool report generated for the Towers 110-111 footprint (Bauwel 128) returned the following theme sensitivity outcomes:

Table 5-1: Towers 110-111 screening sensitivities.

Theme	Very High	High	Medium	Low
Aquatic Biodiversity	X			
Terrestrial Biodiversity	X			

Key sensitivity features driving the Very High ratings: Aquatic Biodiversity - Ecological Support Area 1 (ESA1); Terrestrial Biodiversity - Critical Biodiversity Areas 1 and 2 (CBA1, CBA2) and the National Protected Area Expansion Strategy (NPAES).

5.2. National Screening Tool Results: Towers 491–521

The screening tool report generated for the Towers 491–521 footprint returned the following theme sensitivity outcomes:

Table 5-2: Towers 491-521 screening sensitivities.

Theme	Very High	High	Medium	Low
Aquatic Biodiversity	X			
Terrestrial Biodiversity	X			

Key sensitivity features driving the Very High ratings: Aquatic Biodiversity - CBA1, CBA2, ESA1, ESA2, mapped Wetlands (Seep), and Rivers; Terrestrial Biodiversity - CBA2, ESA1, ESA2, NPAES, and Vulnerable Rand Highveld Grassland; Paleontology - features of Very High paleontological sensitivity.

The Towers 491-521 span therefore presents a materially higher and more extensive aquatic and biodiversity sensitivity profile than the Towers 110-111 span, with multiple Very High triggers across both aquatic and terrestrial themes, compared to a single Very High aquatic trigger (ESA1) at Towers 110-111.

5.3. Desktop and Field Findings: Towers 491-521

5.3.1. Wetland and Watercourse Sensitivity (NWM6 & NFEPA)

The National Wetland Map (NWM6) and NFEPA datasets confirm the presence of seep and depression wetland signatures and a major river (the Mooi River) within the deviation corridor. The Mooi River crossing is associated with a FEPA-related seep feature at Towers 500-501, reflecting its priority status. A precautionary screening buffer was considered around identified aquatic features during the desktop sensitivity assessment process.

5.3.2. Terrestrial Biodiversity Context (NWBSP2025)

The NWBSP2025 Terrestrial CBA/ESA dataset indicates that tower positions within the deviation fall within the following biodiversity categories. Note the overlap of CBA2 with the Mooi River crossing at Towers 500-501.

Table 5-3: Aquatic Biodiversity categories within Towers 491-521.

Biodiversity Category	Towers within Deviation (491–521)	Relative Sensitivity
ESA 1 and 2 (Ecological support – moderate)	All towers	Moderate

5.3.3. Field (Walkdown) Findings

The walkdown confirmed that the majority of the Towers 491-521 deviation traverses dryland with no aquatic features present. Where aquatic features do occur, they comprise a seasonal wetland and a major perennial river crossing, summarised below together with the method by which each was confirmed.

Table 5-4: Confirmed aquatic features - Towers 491-521.

Tower No.	Watercourse / Wetland	100 m	500 m	Verification Method
493	Seasonal wetland	Yes	Yes	Desktop delineation only – no field access (NWM6 / NFEPA / aerial imagery)
500-501	Mooi River (major perennial crossing)	Yes	Yes	Field-verified; drone (UAV) photography – see Appendix D

The Mooi River crossing (Towers 500–501) was accessed and field-verified during the walkdown and is documented by drone (UAV) photography below. The photographs confirm a sinuous,

channelled perennial river set within a broad valley-bottom wetland of reeds and seasonally saturated grassland, bordered by cultivated lands, consistent with a sensitive aquatic system.



Figure 5-1: UAV aerial view of the Mooi River crossing (Towers 500-501), showing the perennial channel within its valley-bottom wetland, bordered by cultivated land.



Figure 5-2: Closer UAV view of the Mooi River, showing the defined channel, riparian fringe vegetation, and the adjacent cultivated field boundary.

The seasonal wetland at Tower 493 could not be accessed during the field survey. It was therefore delineated using desktop methods (NWM6, NFEPA, and high-resolution aerial imagery) rather than ground-truthing. This desktop delineation is considered adequate for screening and impact-assessment purposes at this stage; The revised tower alignment avoids the mapped wetland buffer area associated with Tower 493, and no direct impact on the identified wetland feature is anticipated.

No additional natural watercourses or wetlands were identified at the remaining tower positions within the Towers 491-521 deviation.

5.3.4. Classification of Identified Features

Table 5-5: Classification of identified aquatic features.

Feature	HGM Unit	Hydrological Regime	Sensitivity Class
Seasonal wetland (Tower 493)	Depression / seasonal wetland	Seasonal to semi-permanent	Moderate
Mooi River (Towers 500–501)	Channelled watercourse (river)	Perennial	Very High

5.3.5. PES, EIS, HIA and REC Assessment

Table 5-6: PES, EIS, HIA and REC assessment results.

Feature	PES	EIS	HIA	REC	Justification
Seasonal wetland (Tower 493)	C	Moderate	Moderate	C	Typical seasonal wetland system retaining moderate ecological function.
Mooi River (Towers 500–501)	C	High	High	B/C	Perennial river with strong ecological and hydrological function; moderate modification.

Representative grassland cover away from the two confirmed aquatic features, illustrating the dryland character of the remainder of the Towers 491-521 span, is shown below.



Figure 5-3: Representative open Carletonville Dolomite Grassland away from the confirmed aquatic features, Towers 491-521 span.



Figure 5-4: Further representative grassland cover with farmstead visible in the distance, Towers 491-521 span.

Dolomitic outcrop with associated rock cover and thicket vegetation was also confirmed along the corridor away from the aquatic features, consistent with the mapped Malmani dolomite geology typical of the area.



Figure 5-5: Dolomitic rock outcrop with thicket clumps along the Towers 491-521 corridor.

5.4. Desktop and Field Findings: Towers 110-111

Desktop screening of the Towers 110-111 footprint returned a Very High aquatic biodiversity sensitivity rating (ESA1) and Very High terrestrial biodiversity rating (CBA1, CBA2, NPAES), as set out in Section 5.1. However, no watercourse or wetland feature was identified within or adjacent to the Towers 110-111 deviation footprint during the field (walkdown) and UAV verification survey.

The UAV survey confirmed sparse, open Klerksdorp Thornveld dominated by scattered low thorn shrubs over short grass cover on Kalahari sand substrate, with no standing or flowing surface water, and no hydrophilic vegetation, hydromorphic soil indicators, or defined channel observed within the surveyed area.

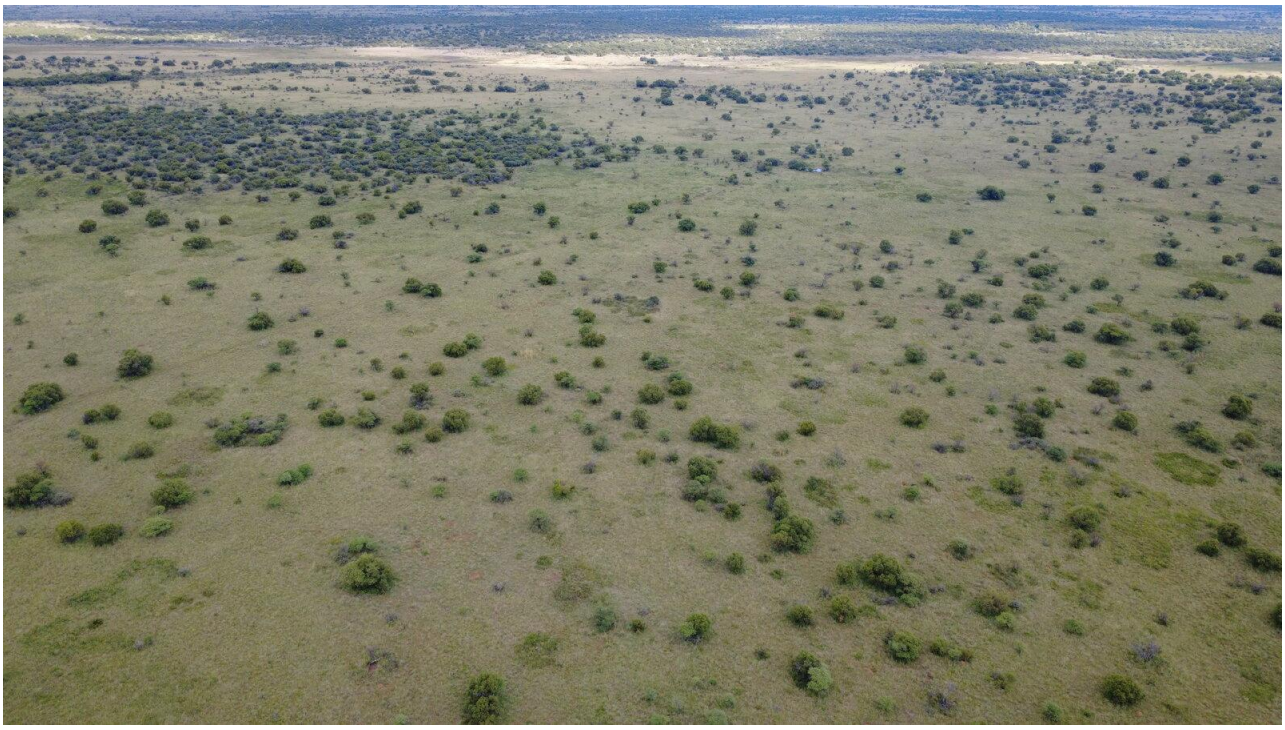


Figure 5-6: UAV aerial view of representative Klerksdorp Thornveld cover, Towers 110-111 deviation area, showing scattered thorn shrub clusters over short grassland with no aquatic feature indicators.



Figure 5-7: Close-range UAV view of Kalahari sand substrate with sparse shrub cover, confirming the CLp soil mapping unit and the absence of wetness or hydromorphic indicators.

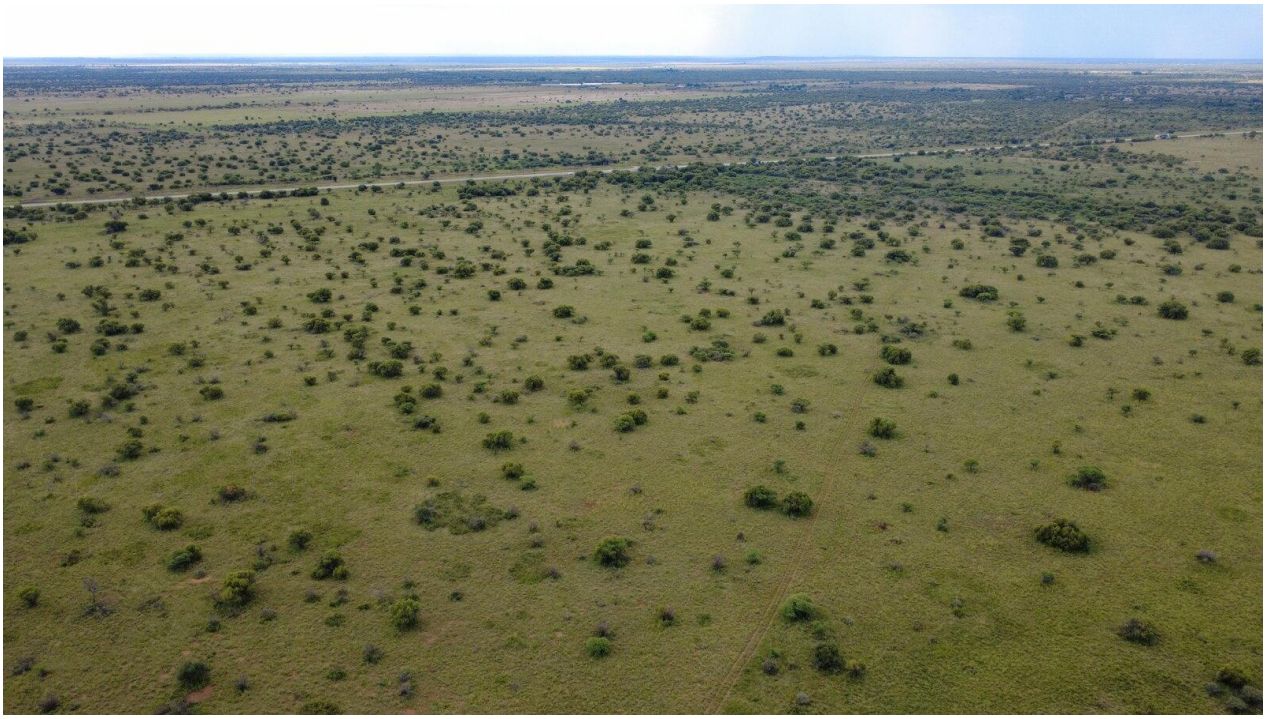


Figure 5-8: UAV view showing thornveld cover adjacent to a road servitude near the Towers 110-111 corridor.

On the basis of the desktop and field findings, the Towers 110-111 deviation is confirmed as a dryland footprint with no watercourse or wetland feature requiring delineation. The Very High aquatic and terrestrial biodiversity sensitivity ratings returned by the national screening tool for this footprint reflect regional CBA/ESA/NPAES mapping rather than a confirmed, site-specific aquatic feature, and are addressed from a terrestrial biodiversity and vegetation perspective rather than as a watercourse-proximity risk in the sections that follow.

6. IMPACT ASSESSMENT

6.1. Impact Assessment: Towers 491-521

The revised tower positions associated with the Towers 491–521 deviation were adjusted following the freshwater walkdown assessment to avoid direct encroachment into identified aquatic features and associated buffer areas. As a result, the anticipated impacts on aquatic resources have been materially reduced and no tower positions are currently located within confirmed wetland or river channel areas.

6.1.1. Construction Phase - Mooi River Crossing (Towers 500-501)

Potential construction-related impacts associated with activities near the Mooi River crossing are summarised in Table 6-1 below.

Table 6-1: Construction impacts - Mooi River crossing.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Localised erosion and sedimentation near the riparian zone due to construction movement and disturbed soil surfaces.	Local	Short-term	Low	Possible	Moderate	Restrict construction activities outside demarcated buffer areas; implement erosion and sediment control measures; rehabilitate disturbed surfaces immediately after construction.	Low
Accidental hydrocarbon contamination from construction vehicles and machinery.	Local	Short-term	Low	Unlikely	Low to Moderate	Implement spill prevention measures; store hazardous substances outside sensitive areas; maintain spill kits onsite.	Low
Disturbance of riparian	Local	Temporary	Low	Possible	Moderate	Clearly demarcate no-	Low

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
vegetation adjacent to access routes.						go areas; restrict unnecessary vegetation clearing and vehicle movement.	

The revised tower positions avoid direct encroachment into the delineated aquatic buffer area associated with the Mooi River crossing. Following implementation of mitigation measures, residual impacts are expected to remain Low.

6.1.2. Construction Phase - Seasonal Wetland (Tower 493)

The revised alignment avoids direct disturbance of the mapped seasonal wetland associated with Tower 493.

Table 6-2: Construction impacts - seasonal wetland.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Temporary disturbance to adjacent dryland vegetation and soils near the mapped wetland buffer area.	Local	Temporary	Low	Possible	Low to Moderate	Restrict activities outside demarcated wetland buffer areas; implement standard construction environmental controls.	Low
Dust generation from construction movement in adjacent dryland areas.	Local	Short-term	Low	Possible	Low	Apply dust suppression where required; limit unnecessary vehicle movement.	Low

No direct infilling, excavation, or alteration of the wetland feature is anticipated due to the revised tower placement outside the wetland buffer area.

6.1.3. Construction Phase - General (Towers 491-521)

The majority of the Towers 491-521 deviation traverses dryland areas with no confirmed aquatic features present.

Table 6-3: General construction impacts - Towers 491-521.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Vegetation clearing within tower footprints and temporary work areas.	Local	Short-term	Low	Definite	Moderate	Minimise vegetation clearing footprint; rehabilitate disturbed areas after construction.	Low
Soil compaction and localised erosion due to vehicle movement.	Local	Temporary	Low	Possible	Moderate	Limit vehicle movement to designated routes; stabilise disturbed areas where required.	Low
Temporary dust and noise generation during construction activities.	Local	Short-term	Low	Definite	Low	Apply standard construction controls and maintain equipment in good condition.	Low

6.1.4. Operational Phase

No permanent impacts on aquatic systems are anticipated during the operational phase as the revised tower positions avoid direct impacts on wetlands and watercourses.

Table 6-4: Operational phase impacts - Towers 491-521.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Occasional disturbance associated with maintenance access.	Local	Temporary	Low	Unlikely	Low	Restrict maintenance access to existing tracks where possible.	Low
Minor vegetation disturbance	Local	Temporary	Low	Possible	Low	Implement controlled vegetation	Low

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
beneath conductors during maintenance activities.						management practices.	

The residual operational impact significance is considered Low.

6.2. Impact Assessment: Towers 110-111

The Towers 110-111 deviation was confirmed during field verification and UAV survey to represent a dryland footprint with no wetlands, drainage lines, riparian habitat, or watercourses identified within the deviation area.

6.2.1. Construction Phase

Table 6-5: Construction impacts - Towers 110-111.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Minor vegetation clearing and soil disturbance associated with tower construction.	Local	Short-term	Low	Definite	Low	Limit disturbance footprint and rehabilitate disturbed areas after construction.	Low
Temporary dust generation from construction movement.	Local	Short-term	Low	Possible	Low	Apply standard dust suppression measures where necessary.	Low

No impacts on aquatic features are anticipated as no watercourses or wetlands occur within or adjacent to the deviation footprint.

6.2.2. Operational Phase

Table 6-6: Operational impacts - Towers 110-111.

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
Minor disturbance associated	Local	Temporary	Negligible	Unlikely	Low	Restrict maintenance activities to	Low

Impact Description	Extent	Duration	Intensity	Probability	Significance Before Mitigation	Mitigation Measures	Residual Significance
with occasional maintenance access.						existing access routes where possible.	

No operational impacts on freshwater resources are anticipated for the Towers 110-111 deviation due to the confirmed absence of aquatic features within the area.

6.3. Comparative Summary

The Towers 491-521 deviation presents a relatively higher aquatic sensitivity due to the presence of the Mooi River and a mapped seasonal wetland within the broader corridor area. However, the revised tower positions avoid direct encroachment into identified aquatic features and associated buffer areas, significantly reducing the anticipated aquatic impacts.

The Towers 110-111 deviation represents a dryland environment with no confirmed aquatic features and therefore presents negligible freshwater risk.

Provided that standard construction environmental controls and aquatic buffer demarcation measures are implemented, both deviations are considered acceptable from an aquatic impact perspective, with anticipated residual impacts remaining Low.

7. DWS RISK MATRIX - SECTION 21(C) AND (I)

The DWS Risk Assessment Matrix (RAM) was applied to assess the potential risks associated with Section 21(c) and 21(i) water uses for the identified deviation sections. The assessment considered the revised tower locations provided following the freshwater walkdown assessment and alignment optimisation process.

The revised tower positions were adjusted to avoid direct encroachment into identified aquatic features and associated buffer areas. As a result, the likelihood and consequence of direct impacts on aquatic resources have been significantly reduced.

7.1. Towers 491-521

The Towers 491-521 deviation includes the broader vicinity of the Mooi River crossing and a mapped seasonal wetland near Tower 493. However, the revised tower positions avoid direct disturbance within the delineated aquatic features and associated buffer areas.

Potential impacts are therefore considered indirect and limited primarily to temporary construction-related disturbance adjacent to regulated areas.

Table 7-1: DWS RAM assessment - Towers 491-521.

Water Use Activity	Aquatic Feature	Likelihood	Consequence	Risk Rating	Risk Class
Construction activities adjacent to the Mooi River crossing (Towers 500-501)	Mooi River (perennial river)	Low	Low	Low	Low Risk
Construction activities adjacent to mapped wetland buffer areas (Tower 493)	Seasonal wetland	Low	Low	Low	Low Risk
General tower construction within dryland areas outside aquatic buffers	No confirmed aquatic feature	Very Low	Very Low	Low	Low Risk

The revised alignment significantly reduces the potential for direct impacts on aquatic systems. No tower foundations are located within confirmed river channels, wetland areas, or delineated riparian habitat.

Provided that standard construction environmental controls are implemented, including erosion control, spill prevention, demarcation of no-go areas, and rehabilitation of disturbed surfaces, the anticipated residual aquatic risk remains Low.

7.2. Towers 110-111

The Towers 110-111 deviation was confirmed during the field walkdown and UAV verification to represent a dryland footprint with no wetlands, drainage lines, riparian habitat, or watercourses identified within or adjacent to the deviation footprint.

No Section 21(c) or 21(i) water uses are therefore anticipated for this deviation section.

Table 7-2: DWS RAM assessment – Towers 110-111.

Water Use Activity	Aquatic Feature	Likelihood	Consequence	Risk Rating	Risk Class
Tower construction and associated activities	No aquatic feature present	Very Low	Very Low	Very Low	Negligible to Low Risk

Based on the findings of the freshwater walkdown assessment and revised tower placement, the Towers 110-111 deviation is not anticipated to result in impacts on freshwater resources.

Overall, both deviation sections are considered acceptable from a freshwater risk perspective, provided that standard environmental management measures and construction controls are implemented throughout the construction phase.

8. BUFFER ZONE AND NO-GO AREAS

The freshwater walkdown assessment identified sensitive aquatic features associated with the Towers 491-521 deviation, namely the Mooi River crossing and a mapped seasonal wetland near Tower 493. Following the walkdown findings and environmental recommendations, the tower positions were revised to avoid direct encroachment into delineated aquatic features and associated buffer areas.

The Towers 110-111 deviation was confirmed to represent a dryland environment with no wetlands, watercourses, or riparian habitat identified within or adjacent to the deviation footprint.

8.1. Towers 491-521 - Mooi River (Towers 500-501)

The Mooi River crossing represents the highest aquatic sensitivity within the deviation corridor due to the presence of a perennial river channel and associated riparian habitat.

The revised tower positions have been adjusted outside the delineated aquatic buffer area associated with the Mooi River crossing. No tower foundations are proposed within the river channel, riparian zone, or wetland area.

The following no-go requirements shall apply during construction:

- No construction activities shall occur within the delineated aquatic feature;
- No stockpiling, batching, refuelling, or servicing of equipment shall occur within or adjacent to the aquatic buffer area;
- Construction access shall be restricted to approved routes only;
- Temporary disturbance outside the demarcated work areas shall be prohibited.

The aquatic buffer area shall be clearly demarcated onsite prior to commencement of construction activities.

8.2. Towers 491-521 - Seasonal Wetland (Tower 493)

A mapped seasonal wetland feature occurs within the broader vicinity of Tower 493. The revised tower alignment avoids direct disturbance within the wetland and associated buffer area.

No tower infrastructure or permanent construction footprint is proposed within the wetland area.

The following controls shall apply:

- The wetland buffer area shall be treated as a no-go area during construction;
- Construction personnel and vehicles shall remain within approved construction areas and access routes;

- No excavation, vegetation clearing, or dumping shall occur within the wetland buffer area.

Given the revised tower positioning outside the regulated area, direct impacts on the wetland are not anticipated.

8.3. Towers 110-111

The Towers 110-111 deviation was confirmed during the field walkdown and UAV verification to contain no wetlands, riparian habitat, drainage lines, or watercourses.

No aquatic buffer zones or freshwater no-go areas are therefore required for this deviation section. Standard construction environmental controls shall nevertheless be implemented to minimise unnecessary vegetation disturbance and soil erosion within the dryland environment.

8.4. General Buffer Conditions

The following general environmental controls shall apply to all deviation sections during construction:

- Clearly demarcated no-go areas shall be maintained throughout the construction period;
- Construction activities shall remain within approved work areas and servitudes;
- Disturbed areas shall be rehabilitated as soon as practicably possible following construction;
- Erosion and sediment control measures shall be implemented where necessary;
- Hydrocarbon spills and contamination shall be prevented through proper storage and handling of hazardous substances;
- Construction waste shall be removed regularly and disposed of at approved facilities.

Provided that the above controls are implemented, the revised tower deviations are not anticipated to result in significant impacts on aquatic systems or associated buffer areas.

9. MITIGATION MEASURES

The following mitigation measures are recommended to minimise potential impacts on freshwater resources, wetlands, riparian habitat, and associated ecological functioning during the design, construction, operational, and decommissioning phases of the proposed deviation sections.

9.1. Design Phase

The following mitigation measures shall apply during the design phase:

- Final tower positions shall avoid direct encroachment into confirmed wetlands, watercourses, riparian habitat, and associated aquatic buffer areas;
- Existing access routes shall be used where practicably possible to minimise disturbance to natural vegetation and soils;
- Tower positions and associated infrastructure shall remain outside delineated no-go areas identified in Section 8 of this report;
- Construction footprints shall be minimised as far as practicably possible.

The above measures shall be incorporated into the final engineering layout and project EMPr.

9.2. Construction Phase

The construction phase presents the highest potential risk to freshwater resources due to vegetation disturbance, soil exposure, construction movement, and accidental contamination.

The following mitigation measures shall be implemented during construction:

- Clearly demarcate all identified aquatic buffer areas and no-go areas prior to commencement of construction activities;
- Restrict construction activities to approved work areas and servitudes only;
- Prohibit stockpiling, batching, refuelling, servicing of equipment, and waste disposal within aquatic features and associated buffer areas;
- Use existing access routes where practicably possible to minimise vegetation disturbance and soil compaction;
- Implement erosion and sediment control measures in all disturbed areas, particularly adjacent to the Mooi River crossing and seasonal wetland areas;
- Prevent hydrocarbon contamination through appropriate handling, storage, and spill response procedures;
- Ensure that spill kits are available onsite during construction activities;

- Limit vegetation clearing to the minimum footprint required for construction activities;
- Remove all construction-related waste from site and dispose of it at approved waste disposal facilities;
- Rehabilitate disturbed areas as soon as practicably possible following construction;
- Prevent unnecessary disturbance to riparian vegetation and adjacent wetland habitat during construction activities.

The above mitigation measures shall form part of the project EMPr and shall be implemented throughout the construction phase.

9.3. Operational Phase

Potential impacts during the operational phase are anticipated to be limited and associated mainly with occasional maintenance access and vegetation management activities.

The following mitigation measures shall apply during the operational phase:

- Restrict maintenance access to existing access tracks where practicably possible;
- Prevent unnecessary vegetation disturbance during maintenance activities;
- Maintain erosion control measures where required;
- Prevent hydrocarbon contamination during maintenance activities involving vehicles or machinery.

These mitigation measures shall be included in the operational EMPr requirements for the powerline.

9.4. Decommissioning Phase

Should decommissioning of the powerline infrastructure occur in future, the following mitigation measures shall apply:

- Remove infrastructure in a manner that minimises disturbance to surrounding vegetation and soils;
- Prevent pollution and hydrocarbon contamination during dismantling activities;
- Rehabilitate all disturbed areas following removal of infrastructure;
- Dispose of all waste materials at approved disposal facilities.

Appropriate environmental controls shall be implemented during decommissioning to minimise potential impacts on freshwater resources and associated aquatic habitat.

9.5. Mitigation Measures to be Included in the EMPr

The following mitigation measures shall specifically be incorporated into the project Environmental Management Programme (EMPr):

- Demarcation of aquatic buffer areas and no-go areas prior to construction;
- Restriction of construction activities to approved footprints and access routes;
- Implementation of erosion and sediment control measures;
- Hydrocarbon spill prevention and spill response procedures;
- Rehabilitation of disturbed areas following construction;
- Proper waste management and disposal procedures;
- Protection of riparian vegetation and adjacent wetland habitat;
- Monitoring of construction activities within environmentally sensitive areas.

Implementation of the above mitigation measures within the EMPr will assist in ensuring that the proposed tower deviations do not result in significant impacts on freshwater resources and associated aquatic ecological functioning.

10. CONCLUSION AND RECOMMENDATIONS

10.1. Conclusion

Tshilimo Consulting Services (Pty) Ltd undertook a Freshwater (Aquatic) Deviation Assessment for the proposed Mahikeng-Pluto 400 kV Transmission Powerline deviation sections associated with Towers 491-521 and Towers 110-111 within the North West Province.

The assessment included a desktop review, freshwater walkdown survey, and UAV verification to identify aquatic features and assess potential impacts associated with the revised tower alignments.

The Towers 491-521 deviation includes the broader vicinity of the Mooi River crossing and a mapped seasonal wetland near Tower 493. These features represent the highest aquatic sensitivities identified within the assessed deviation sections. However, following the freshwater walkdown assessment and environmental recommendations, the tower positions were revised to avoid direct encroachment into identified aquatic features and associated buffer areas.

The Towers 110-111 deviation was confirmed to represent a dryland footprint with no wetlands, watercourses, riparian habitat, or drainage features identified during the field verification process.

Based on the revised tower positions, the proposed deviations are not anticipated to result in direct impacts on freshwater features. Potential impacts are expected to be limited to temporary and localised construction-related disturbance adjacent to regulated areas.

The DWS Risk Assessment Matrix indicates that the anticipated freshwater risks associated with both deviation sections are Low, provided that standard environmental management measures and construction controls are implemented during construction activities.

From a freshwater and aquatic ecological perspective, the revised deviation alignments are therefore considered environmentally acceptable.

10.2. Recommendations

Based on the findings of the freshwater walkdown assessment, the following recommendations apply to the proposed deviation sections:

- Construction activities shall remain within approved work areas and servitudes;
- Identified aquatic buffer areas and no-go areas shall be clearly demarcated prior to construction;
- No construction activities, stockpiling, refuelling, or waste disposal shall occur within delineated aquatic features or associated buffer areas;

- Existing access routes shall be used where practicably possible to minimise vegetation disturbance and soil erosion;
- Erosion and sediment control measures shall be implemented during construction activities;
- Disturbed areas shall be rehabilitated as soon as practicably possible following construction;
- Hydrocarbon spills and contamination shall be prevented through appropriate handling and storage of hazardous substances.

Provided that the above mitigation measures and environmental controls are implemented, the revised tower deviations are not anticipated to result in significant impacts on aquatic systems, wetlands, riparian habitat, or freshwater ecological functioning.

11. REFERENCES

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Mucina, L. and Rutherford, M.C. (eds). 2006. The Vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. South African National Biodiversity Institute, Pretoria.

South African National Biodiversity Institute (SANBI). Critical Biodiversity Areas, Ecological Support Areas, and National Freshwater Ecosystem Priority Areas (NFEPA) spatial datasets.

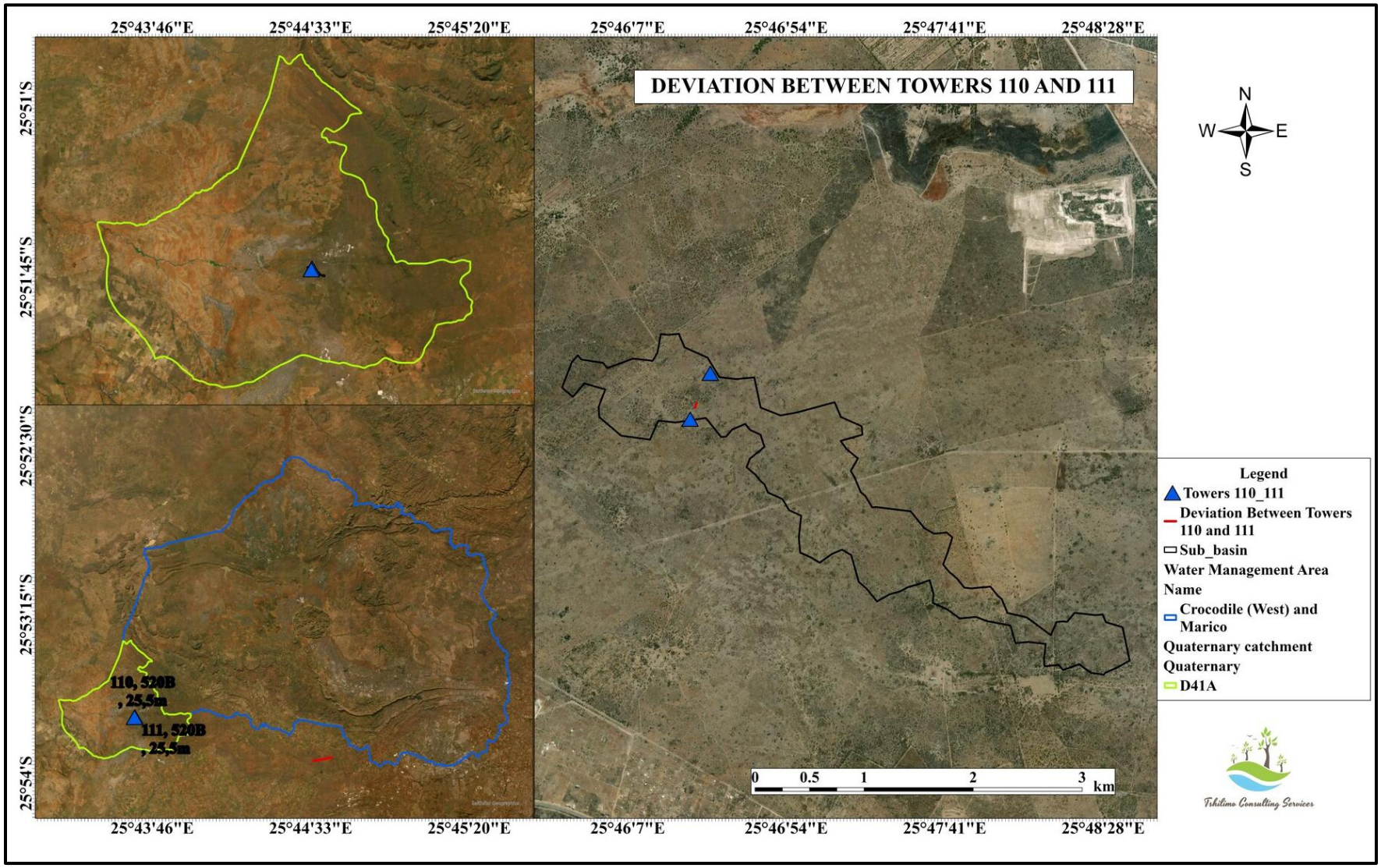
South African National Biodiversity Institute (SANBI) and South African Council for Natural Scientific Professions (SACNASP). Professional registration and specialist assessment guidelines.

12. APPENDICES

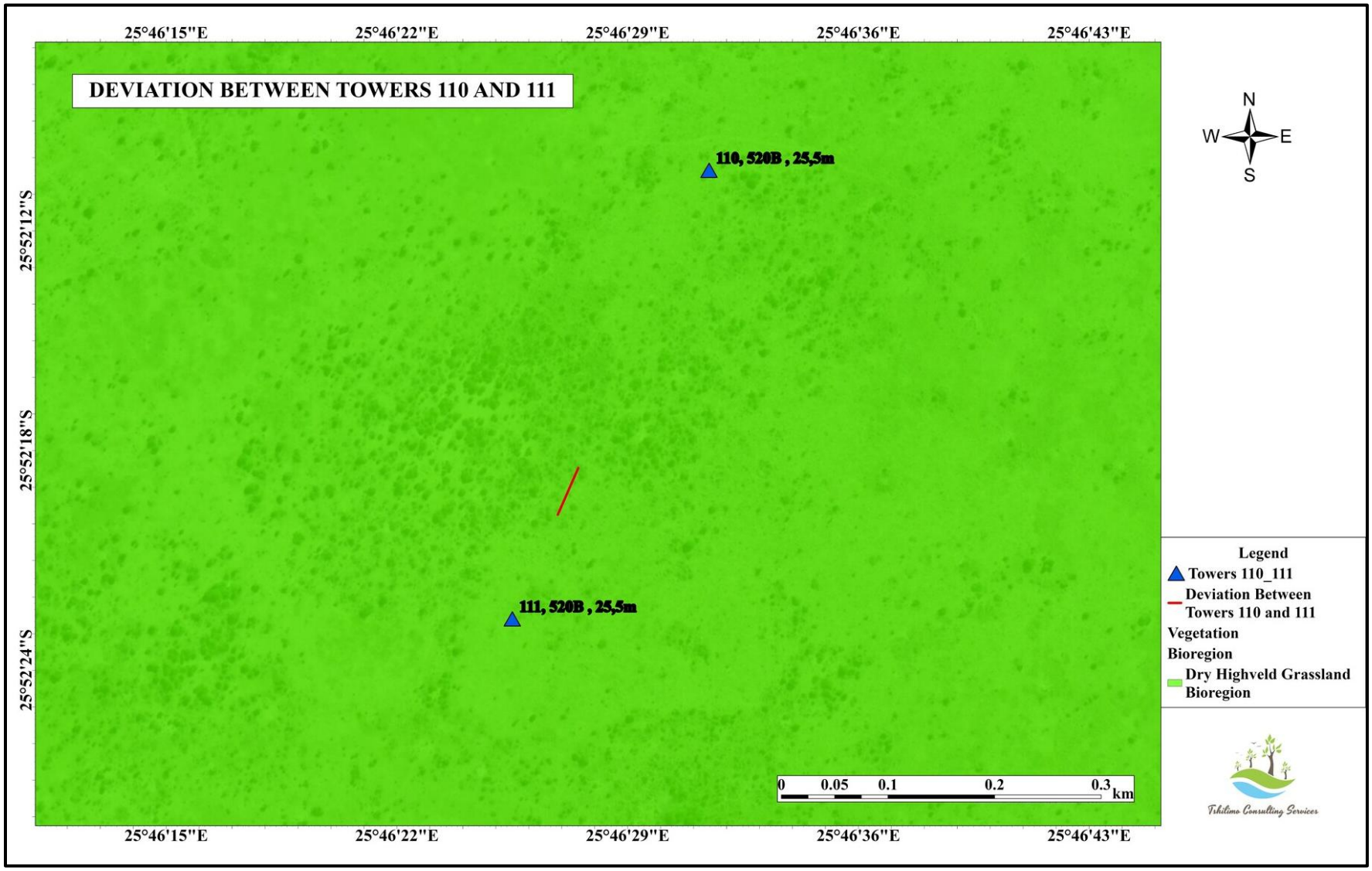
Appendix 12-A: National Screening Tool Reports.

The full National Web-Based Environmental Screening Tool reports generated for the Towers 110-111 and Towers 491-521 footprints, dated 24 June 2026, are appended in full as separate PDF attachments to this report and are summarised in Section 5.

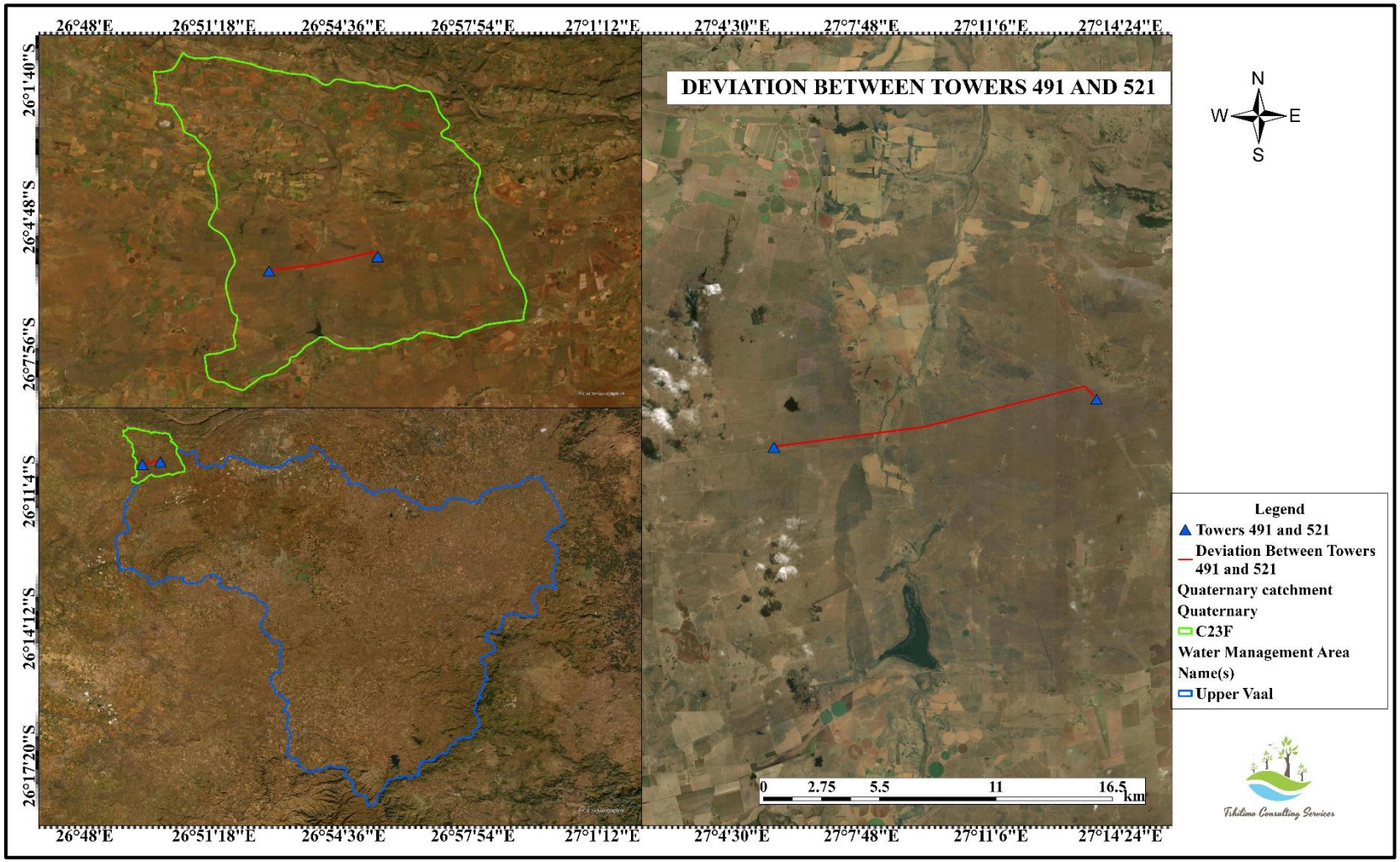
Appendix 12-B: Quaternary catchment context (D41A, Crocodile West and Marico WMA) - Towers 110-111.



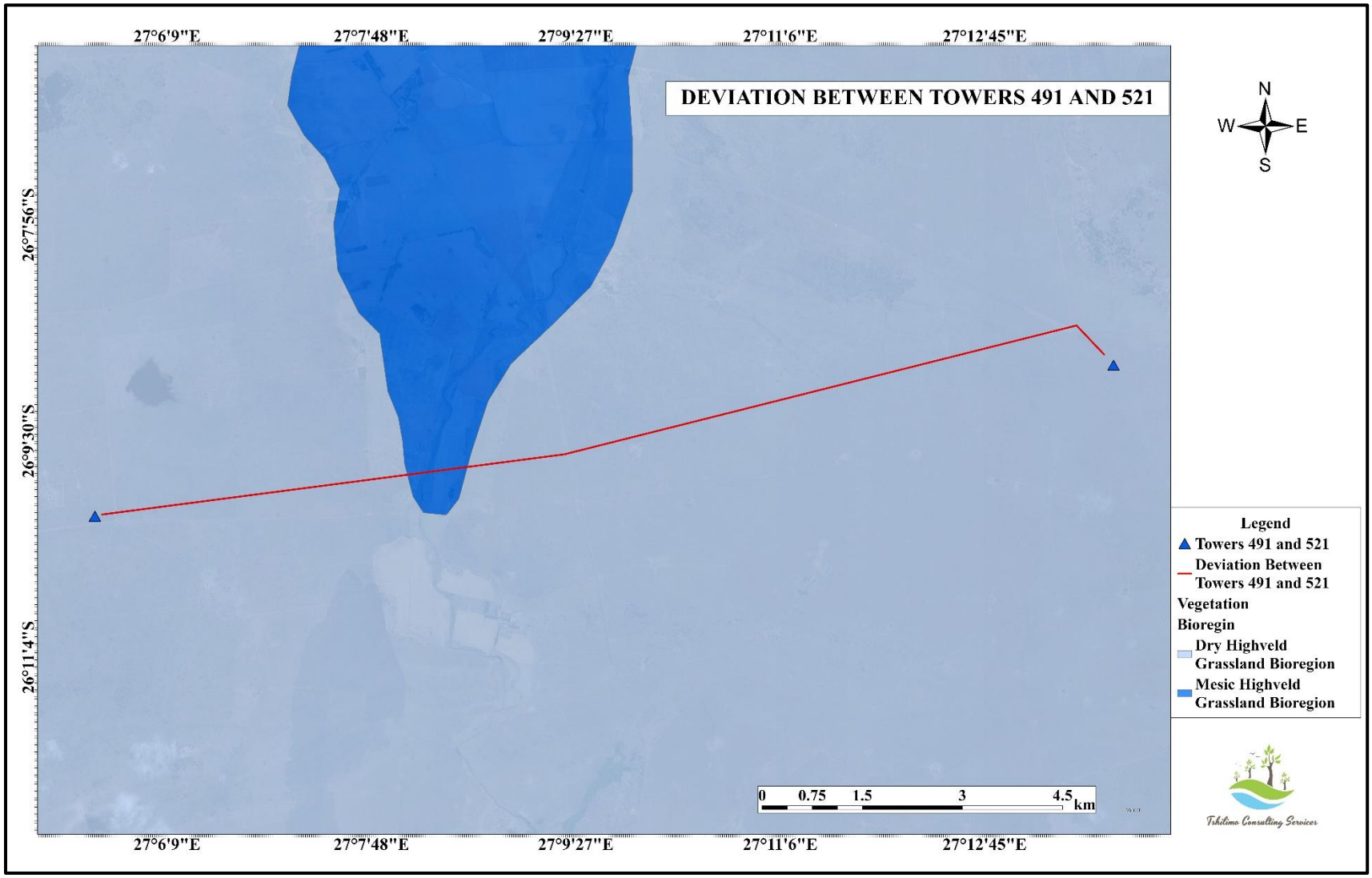
Appendix 12-C: Bioregion mapping (Dry Highveld Grassland Bioregion) Towers 110-111.



Appendix 12-D: Quaternary catchment context (C23F, Upper Vaal WMA) - Towers 491-521.



Appendix 12-E: Bioregion mapping (Dry Highveld / Mesic Highveld Grassland, Central Bushveld) - Towers 491–521.



Appendix 12-F: Photographic Record.



Open Highveld grassland plain with scattered karroid shrubs; existing transmission pylons on the horizon – typical low-sensitivity dryland along the deviation.



Flat grassland with scattered shrubs and an existing powerline corridor in the distance, illustrating the cumulative linear-infrastructure context.



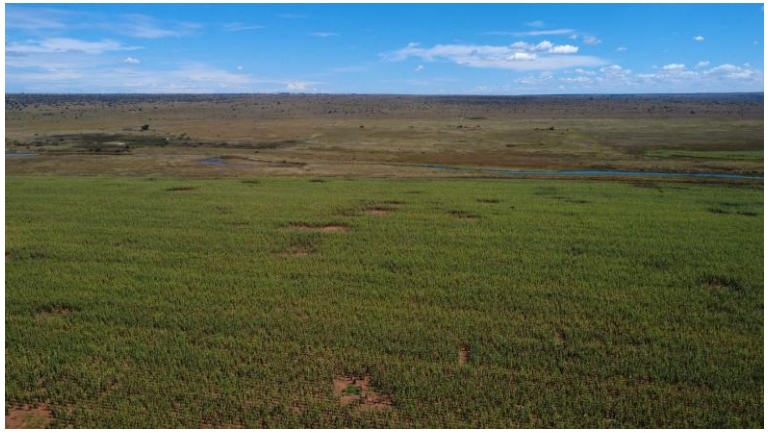
Open grassland plain with a farm track and fence line; gently undulating, low-relief terrain characteristic of the corridor.



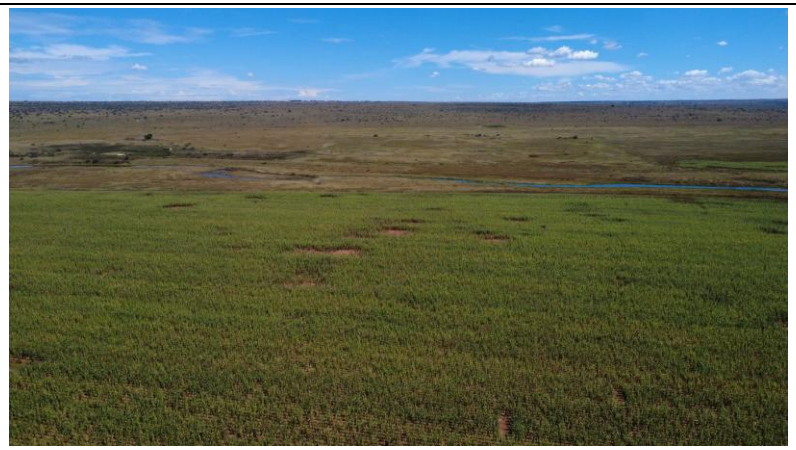
Dwarf-shrub / grassland plain showing grazed veld and scattered shrubs; pylons visible on the horizon.



Cultivated land (young crop) in the foreground transitioning to open grassland – dryland cultivation along the corridor.



Cultivated field in the foreground with the Mooi River channel and valley-bottom wetland visible in the mid-distance; cultivation extends close to the watercourse.



Mooi River valley-bottom wetland and channel viewed across cultivated lands, illustrating the agricultural setting of the crossing.



Tarred road crossing the open grassland plain (existing access / road infrastructure within the corridor).



Farmstead with stock kraal, buildings and water point set within grazed grassland – representative land use along the deviation.



Roadside grassland with exposed dolomitic (Malmani) rock outcrops; vehicle on the adjacent road for scale.



Stony grassland with dolomitic rock and shallow (LPe / Leptosol) soils and scattered woody shrubs – typical upland terrain.



Rocky outcrop area with denser woody shrubs over dolomite, representing the more rocky, higher-lying portions of the corridor.

SPECIALIST CV

CURRICULUM VITAE

MAPHAHA KHULISO COLLEN

Professional Natural Scientist (Pr.Sci.Nat)

SACNASP Registration No.: 130272

Hydrologist | Geohydrologist | Aquatic & Wetland Specialist

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1. PERSONAL DETAILS

Full Name: Maphaha Khuliso Collen

Nationality: South African

Profession: Hydrologist / Environmental Scientist

Current Position: Director & Lead Hydrologist

Company: Tshilimo Consulting Services (Pty) Ltd

Company Registration: 2021/969303/07

Address: 733 Kendall Avenue, Wolmer, Pretoria, 0182

Contact Number: 061 417 7904

Email: khuliso@tshilimoconsulting.co.za

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2. PROFESSIONAL SUMMARY

Maphaha Khuliso Collen is a registered Professional Natural Scientist (Pr.Sci.Nat) with SACNASP and the Director of Tshilimo Consulting Services (Pty) Ltd. He is a highly experienced hydrologist and environmental specialist with extensive practical and professional expertise in hydrology, geohydrology, aquatic biodiversity, wetland delineation, floodline determination, and Water Use Licence Application (WULA)-related studies. He has led and authored numerous specialist assessments for mining, infrastructure, energy, municipal, and industrial developments across South Africa, working in close alignment with NEMA, the National Water Act, and associated DFFE, DWS, and DMRE regulatory frameworks.

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3. PROFESSIONAL REGISTRATIONS

South African Council for Natural Scientific Professions (SACNASP)

Registration: Pr.Sci.Nat: 130272

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4. EDUCATIONAL QUALIFICATIONS

Bachelor of Earth Sciences (Hydrology & Water Resources)

University of Venda (UNIVEN)

Completed: 2018

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5. CORE AREAS OF EXPERTISE

- Surface Water Hydrology
- Geohydrological Impact Assessments (GHIA)
- Groundwater Monitoring & Assessment
- MODFLOW Numerical Groundwater Modelling (ModelMuse)
- Aquatic Biodiversity Assessments (GN 320)
- Wetland Delineation & Functional Assessment (WET-Health, WET-EcoServices)
- Floodline Determination (HEC-RAS)
- Water Use Licence Applications (Section 21(c) & (i))
- Risk Assessment Matrices & Compliance Statements
- Wetland Rehabilitation & Offset Planning
- Environmental Impact Assessments (EIA & BAR)

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6. PROFESSIONAL EXPERIENCE

Director & Lead Hydrologist

Tshilimo Consulting Services (Pty) Ltd | 2021 - Present

- Founder and Director of a Level 1 B-BBEE environmental consulting firm.
- Leads hydrological, geohydrological, aquatic and wetland specialist studies nationwide.
- Acts as independent specialist for EIAs, BARs, WULAs, and Mining Right Applications.

- Oversees technical quality assurance, specialist sign-off, and regulatory alignment.

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7. TECHNICAL SOFTWARE & TOOLS

- ModelMuse (MODFLOW 6 & MODFLOW-2005)
- HEC-RAS & HEC-HMS
- ArcGIS Pro & QGIS
- SWAT & SWMM (working knowledge)
- Microsoft Office Suite

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8. PROFESSIONAL ATTRIBUTES

- Strong regulatory interpretation and compliance skills
- Extensive field-based assessment experience
- Proven report writing and specialist sign-off capability
- High level of professional integrity and independence
- Experienced in multidisciplinary project coordination

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9. AVAILABILITY

Available for hydrological, geohydrological, aquatic and wetland specialist appointments nationwide.

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10. PROJECTS UNDERTAKEN BY

Maphaha Khuliso Collen (Pr.Sci.Nat - SACNASP 130272)

Mining & Prospecting Projects

- Geohydrological Impact Assessment (GHIA) – Heavy Mineral Sands Project from Alexander Bay to Port Nolloth, Northern Cape
  Role: Author & Field Specialist (MODFLOW numerical modelling, baseline assessment)
- Wetland Impact Assessment – Vast Mineral Sands (Pty) Ltd, Richtersveld, Northern Cape
  Role: Independent Specialist Reviewer & Signatory (EA, WML & WULA support)

- Wetland Impact Assessment & Rehabilitation Plan - Bila Chrome Mine, Mooinooi, North West
  Role: Lead Specialist & Field Specialist
- Groundwater Monitoring Programme - Leeuwpoort Landfill Site, Emalahleni, Mpumalanga
  Role: Author & Field Specialist

Powerline & Energy Infrastructure Projects

- Aquatic & Wetland Assessment - Aurora–Juno 400kV Transmission Line, Western Cape
  Role: Author & Field Specialist
- Wetland & Aquatic Impact Assessment - Demeter–Lulamisa 400kV Powerlines, Gauteng
  Role: Author & Field Specialist
- Surface Water Impact Assessment -Tabor-Nzhelele 400kV Powerline, Limpopo
  Role: Author & Field Specialist
- Aquatic & Wetland Assessments - Multiple Eskom / NTCSA powerline and substation projects across Gauteng, Limpopo, Western Cape, Mpumalanga
  Role: Author & Field Specialist

Roads & Transport Infrastructure

- Aquatic Biodiversity Compliance Statement & Section 21(c) and (i) Risk Matrix - SANRAL N14 Section 13 Road Upgrade, North West
  Role: Author & Field Specialist
- Aquatic Biodiversity Theme Compliance Statement -N18 Sections 3, 5 & 6 Road Upgrade, North West
  Role: Author & Field Specialist
- Surface Water Impact Assessment & Walkdown Report - Road & linear infrastructure projects
  Role: Author & Field Specialist

Floodline & Hydrological Studies

- Floodline Assessment (1:50 & 1:100 year) – Barkly West Development (Erf 711 & 4005), Northern Cape
  Role: Lead Hydrologist & Field Specialist
- Floodline Assessment - Winterveld & Soshanguve Water and Sewer Pipeline, City of Tshwane
  Role: Lead Hydrologist & Field Specialist
- Floodline Determination & Hydrological Assessments - Various municipal infrastructure projects
  Role: Lead Hydrologist

Industrial, Port & Urban Developments

- Aquatic & Wetland Assessment - Port of East London Security Fencing & Access Road Upgrade, Eastern Cape
  Role: Lead Specialist & Field Specialist
- Wetland Offset Study - Richards Bay Industrial Development Zone (RBIDZ), KwaZulu-Natal
  Role: Lead Specialist & Field Specialist (SANBI Offset Guidelines)

Water Use Licence & Compliance Support

- Section 21(c) and (i) Risk Assessments - Multiple projects nationwide
- Aquatic Biodiversity Compliance Statements (GN 320)
- Wetland Delineations, PES, EIS & Buffer Determinations
- Groundwater & Surface Water Monitoring Programmes
- Role across all: Independent Specialist, Author, Field Specialist & Signatory

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General Scope Across All Projects

- Wetland delineation and classification

- Aquatic biodiversity assessments (GN 320)
- Hydrological and geohydrological modelling
- MODFLOW numerical groundwater modelling
- Floodline determination (HEC-RAS)
- WULA and DMRE regulatory support
- Specialist reporting and authority-ready documentation
- SWAT & SWMM (working knowledge)

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11. REFERENCES

Available on request.