DRAFT BASIC ASSESSMENT REPORT

for

Eskom Mhinga Deviation Powerlines Project.

On behalf of

JUNE 2021

K&T PROJECT REFERENCE:7047I

REVISION A

SECTION A: ACTIVITY INFORMATION

Has a specialist been consulted to assist with the completion of this section?

YES	NO
~~YES~~ X	

Any specialist reports must be contained in Appendix D.

1. ACTIVITY DESCRIPTION

Describe the activity, which is being applied for, in detail[1]:

Eskom proposes to deviate the authorized Kingbird 132kv powerlines in three sections between Phugwane and
Mhinga Substation due to streams/wetlands being located on the authorized route as well as houses being
constructed since the authorization was received on the 19th of November 2010. The deviations total distance in 8km whilst the actual line is 25km in length.

2. FEASIBLE AND REASONABLE ALTERNATIVES

"alternatives", in relation to a proposed activity, means different means of meeting the general purpose and requirements of the activity, which may include alternatives to—

(a) **the property on which or location where it is proposed to undertake the activity;**

(b) the type of activity to be undertaken;

(c) the design or layout of the activity;

(d) the technology to be used in the activity;

(e) the operational aspects of the activity; and

(f) the option of not implementing the activity.

Describe alternatives that are considered in this application. Alternatives should include a consideration of all possible means by which the purpose and need of the proposed activity could be accomplished in the specific instance taking account of the interest of the applicant in the activity. The no-go alternative must in all cases be included in the assessment phase as the baseline against which the impacts of the other alternatives are assessed. The determination of whether site or activity (including different processes etc.) or both is appropriate needs to be informed by the specific circumstances of the activity and its environment. After receipt of this report the Department may also request the applicant to assess additional alternatives that could possibly accomplish the purpose and need of the proposed activity if it is clear that realistic alternatives have not been considered to a reasonable extent.

[1] Please note that this description should not be a verbatim repetition of the listed activity as contained in the relevant Government Notice, but should be a brief description of activities to be undertaken as per the project description.

Paragraphs 3 – 13 below should be completed for each alternative.

3. ACTIVITY POSITION

Indicate the position of the activity using the latitude and longitude of the centre point of the site for each alternative site.

The route considered is a 1000 meter corridor, this area was included in all the specialist studies. Bearing in mind the servitude is only 32 metres, depending on the sensitive features identified by the specialist studies the fact that a 1000 meter corridor was assessed allows for sufficient space to move the powerline route to avoid sensitive features.

*The addendum is attached (**Appendix A-Site Plans)** where the co-ordinates are taken every 250 metres, as the proposed route is over 1000m.*

For route alternatives that are longer than 1000m, please provide an addendum with co-ordinates taken every 250 meters along the route for each alternative alignment.

The addendum is attached where the co-ordinates are taken every 250 metres, as the proposed route is over 1000m.

4. PHYSICAL SIZE OF THE ACTIVITY

Indicate the physical size of the preferred activity/technology as well as alternative activities/technologies (footprints):

Deviation 1:		**Size of the activity:**
Alternative A1[2] (preferred activity alternative)		141 472 m^2
~~Alternative A2 (if any)~~	Engineering Alternative:	m^2
~~Alternative A3 (if any)~~		m^2

or,

for linear activities:

[2] "Alternative A.." refer to activity, process, technology or other alternatives.

Length of the activity:

Deviation 2:

Alternative A1 (preferred activity alternative)	39 168 m^2
~~Alternative A2 (if any)~~	
~~Alternative A3 (if any)~~	

Indicate the size of the alternative sites or servitudes (within which the above footprints will occur):

Size of the site/servitude:

Deviation 3:

Alternative A1 (preferred activity alternative)	58 688 m^2
~~Alternative A2 (if any)~~	m^2
~~Alternative A3 (if any)~~	m^2

5. SITE ACCESS

Does ready access to the site exist?	**YES** (X)	**NO**
If NO, what is the distance over which a new access road will be built	m	

Describe the type of access road planned:

Include the position of the access road on the site plan and required map, as well as an indication of the road in relation to the site.

6. SITE OR ROUTE PLAN

A detailed site or route plan(s) must be prepared for each alternative site or alternative activity. It must be attached as Appendix A to this document.

7. SITE PHOTOGRAPHS

Colour photographs must be attached under Appendix B to this form. It must be supplemented with additional photographs of relevant features on the site, if applicable.

8. FACILITY ILLUSTRATION

A detailed illustration of the activity must be provided in Appendix C for activities that include structures. The illustrations must be to scale and must represent a realistic image of the planned activity. The illustration must give a representative view of the activity.

1. ACTIVITY MOTIVATION

9(a) Socio-economic value of the activity

What is the expected capital value of the activity on completion?	+-R 100 mill	
What is the expected yearly income that will be generated by or as a result of the activity?	+-R 20 mill in terms of business opportunities and benefits to the local communities.	
Will the activity contribute to service infrastructure?	~~YES~~	NO
Is the activity a public amenity?	~~YES~~	NO
How many new employment opportunities will be created in the development phase of the activity?	Approximately 50 people	
What is the expected value of the employment opportunities during the development phase?	+-R 20 mill	
What percentage of this will accrue to previously disadvantaged individuals?	Approximately 85%	
How many permanent new employment opportunities will be created during the operational phase of the activity?	Approximately 25 people	
What is the expected current value of the employment opportunities during the first 10 years?	Approximately 50 people	
What percentage of this will accrue to previously disadvantaged individuals?	Approximately 85%	

9(b) Need and desirability of the activity

Motivate and explain the need and desirability of the activity (including demand for the activity):

NEED:			
i.	Was the relevant municipality involved in the application?	~~YES~~	NO
ii.	Does the proposed land use fall within the municipal Integrated Development Plan?	~~YES~~	NO
iii.	If the answer to questions 1 and / or 2 was NO, please provide further motivation / explanation:		

DESIRABILITY:			
i.	Does the proposed land use / development fit the surrounding area?	YES	NO
ii.	Does the proposed land use / development conform to the relevant structure plans, Spatial development Framework, Land Use Management Scheme, and planning visions for the area?	YES	NO
iii.	Will the benefits of the proposed land use / development outweigh the negative impacts of it?	YES	NO
iv.	If the answer to any of the questions 1-3 was NO, please provide further motivation / explanation:		
	The powerlines don't suite the environment, however the benefit from the project to the local communities is far greater than the visual impacts on the surrounding area.		
v.	Will the proposed land use / development impact on the sense of place?	YES	NO
vi.	Will the proposed land use / development set a precedent?	YES	NO
vii.	Will any person's rights be affected by the proposed land use / development?	YES	NO
viii.	Will the proposed land use / development compromise the "urban edge"?	YES	NO
ix.	If the answer to any of the question 5-8 was YES, please provide further motivation / explanation.		
	It will impact the sense of place, but the benefit of the project to the local community outweighs the impact of the development to the sense of place.		

BENEFITS:			
i.	Will the land use / development have any benefits for society in general?	YES	NO
ii.	Explain: The construction of the powerlines will improve service delivery in the energy sector, and will		
	allow Eskom to provide electricity to the area.		
iii.	Will the land use / development have any benefits for the local communities where it will be located?	YES	NO
iv.	Explain: Yes, staff may be required to assist with the construction of the powerlines, as well as the maintenance of the infrastructure in the future.		

10. APPLICABLE LEGISLATION, POLICIES AND/OR GUIDELINES

List all legislation, policies and/or guidelines of any sphere of government that are applicable to the application as contemplated in the EIA regulations, if applicable:

Title of legislation, policy or guideline:	**Administering authority:**	**Date:**
National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended). Environmental Impact Assessment Regulations 2014 as Amended	The Department of Environment, Forestry and Fisheries as the competent authority (Department)	19/11/2010
Government Notice R983 (Amendments of the 2014 EIA Regulations) of the National Environmental Management Act, 1998 (Act No. 107 of 1998 as amended). Listing Notice 3, GNR. 324		
Constitution of the Republic of South Africa Act (No 108 of 1996).	National & Provincial	1996
National Environmental Management: Waste Act (No. 59 of 2008)	National & Provincial	10 March 2009
National Water Act (No. 36 of 1998)	National & Provincial	26 August 1998
National Heritage Resources Act (No. 25 of 1999)	National & Provincial	
Occupational Health and Safety Act (No. 85 of 1993)	National & Provincial	
Construction Regulations (2014)	National & Provincial	7 February 2014

11. WASTE, EFFLUENT, EMISSION AND NOISE MANAGEMENT

11(a) Solid waste management

Will the activity produce solid construction waste during the construction/initiation phase?	YES	~~NO~~
If yes, what estimated quantity will be produced per month?	5 m^3	

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

Little waste will be produced, waste that cannot be reused will be disposed.

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

The closest licensed waste disposal facility will be identified and disposal will take place

Will the activity produce solid waste during its operational phase?	YES	NO
If yes, what estimated quantity will be produced per month?		m^3

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

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

Not Applicable

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

Can any part of the solid waste be classified as hazardous in terms of the relevant legislation?	YES	NO

If yes, inform the department and request a change to an application for scoping and EIA.

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

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

11(b) Liquid effluent

Will the activity produce effluent, other than normal sewage, that will be disposed of in a municipal sewage system?	YES	NO
If yes, what estimated quantity will be produced per month?		m^3
Will the activity produce any effluent that will be treated and/or disposed of on site?	Yes	NO

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

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

If yes, provide the particulars of the facility:

Facility name:	
Contact person:	
Postal address:	
Postal code:	

Telephone:		Cell:	
E-mail:		Fax:	

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

Any spillages will be collected on the spill slab and then drain into a separator. For the separator the product will be removed and disposed at a registered hazardous landfill site such

11(c) Emissions into the atmosphere

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

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If no, describe the emissions in terms of type and concentration:

11(d) Generation of noise

Will the activity generate noise?	~~YES~~	NO
If yes, is it controlled by any legislation of any sphere of government?	YES	NO

If yes, the applicant should consult with the competent authority to determine whether it is necessary to change to an application for scoping and EIA.
If no, describe the noise in terms of type and level:

Yes however, the construction activities will be confined to working hours and there are no sensitive receptors within a close proximity of the servitude.

12. WATER USE

Please indicate the source(s) of water that will be used for the activity by ticking the appropriate box(es)

~~municipal~~	water board	groundwater	river, stream, dam or lake	other	the activity will not use water

If water is to be extracted from groundwater, river, stream, dam, lake or any other natural feature, please indicate
the volume that will be extracted per month: **None** Litres

Does the activity require a water use permit from the Department of Water Affairs? YES ~~NO~~

If yes, please submit the necessary application to the Department of Water Affairs and attach proof thereof to this application if it has been submitted.

13. ENERGY EFFICIENCY

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

Not Applicable.

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

SECTION B: SITE/AREA/PROPERTY DESCRIPTION

Important notes:

1. **For linear activities (pipelines, etc**) as well as activities that cover very large sites, it may be necessary to complete this section for each part of the site that has a significantly different environment. In such cases please complete copies of Section C and indicate the area, which is covered by each copy No. on the Site Plan.

Section C Copy No. (e.g. A):	

2. Paragraphs 1 - 6 below must be completed for each alternative.

3. Has a specialist been consulted to assist with the completion of this section? | YES | NO |

If YES, please complete the form entitled "Details of specialist and declaration of interest" for each specialist thus appointed:

All specialist reports must be contained in Appendix D.

Property description/physical address:	Remaining Extent of the farm Mhinga's Location 258 MT Remaining Extent of the farm Mhinga's Location Extension 259 MT Remaining Extent of the farm Tshikundu Location's Extension 260 MT Remaining Extent of the farm Tshikundu Location's 262 MT. Remaining Extent of the farm Nthlaveni 2 MU
	(Farm name, portion etc.) Where a large number of properties are involved (e.g. linear activities), please attach a full list to this application.

	In instances where there is more than one town or district involved, please attach a list of towns or districts to this application.
Current land-use zoning:	Undeveloped land, largely impacted by either farming activities or grazing land.
	In instances where there is more than one current land-use zoning, please attach a list of current land use zonings that also indicate which portions each use pertains to, to this application.

Is a change of land-use or a consent use application required? All the landowner consent form are attached in the application form **Appendix 4**,	~~YES~~	NO
Must a building plan be submitted to the local authority?	YES	~~NO~~

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1. GRADIENT OF THE SITE

Indicate the general gradient of the site.

Flat	~~1:50 – 1:20~~	~~1:20 – 1:15~~	1:15 – 1:10	1:10 – 1:7,5	1:7,5 – 1:5	Steeper than 1:5

2. LOCATION IN LANDSCAPE

Indicate the landform(s) that best describes the site:

2.1 Ridgeline		2.6 Plain	X
2.2 Plateau		2.7 Undulating plain / low hills	
2.3 Side slope of hill/mountain		2.8 Dune	
2.4 Closed valley		2.9 Seafront	
2.5 Open valley			

3. GROUNDWATER, SOIL AND GEOLOGICAL STABILITY OF THE SITE

Is the site(s) located on any of the following (tick the appropriate boxes)?

	Alternative S1:		**Alternative S2 (if any):**		**Alternative S3 (if any):**	
Shallow water table (less than 1.5m deep)	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
Dolomite, sinkhole or doline areas	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
Seasonally wet soils (often close to water bodies)	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
Unstable rocky slopes or steep slopes with loose soil	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~

Dispersive soils (soils that dissolve in water)	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
Soils with high clay content (clay fraction more than 40%)	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
Any other unstable soil or geological feature	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~
An area sensitive to erosion	YES	~~NO~~	YES	~~NO~~	YES	~~NO~~

If you are unsure about any of the above or if you are concerned that any of the above aspects may be an issue of concern in the application, an appropriate specialist should be appointed to assist in the completion of this section. (Information in respect of the above will often be available as part of the project information or at the planning sections of local authorities. Where it exists, the 1:50 000 scale Regional Geotechnical Maps prepared by the Council for Geo Science may also be consulted).

4. GROUNDCOVER

Indicate the types of groundcover present on the site:

The location of all identified rare or endangered species or other elements should be accurately indicated on the site plan(s).

Natural veld - good condition^E	Natural veld with scattered aliens^E	Natural veld with heavy alien infestation^E	Veld dominated by alien species^E	Gardens
Sport field	Cultivated land	Paved surface	Building or other structure	Bare soil

If any of the boxes marked with an "^E "is ticked, please consult an appropriate specialist to assist in the completion of this section if the environmental assessment practitioner doesn't have the necessary expertise.

5. LAND USE CHARACTER OF SURROUNDING AREA

Indicate land uses and/or prominent features that does currently occur within a 500m radius of the site and give description of how this influences the application or may be impacted upon by the application:

5.1 Natural area	X	5.22 School	
5.2 Low density residential		5.23 Tertiary education facility	
5.3 Medium density residential		5.24 Church	
5.4 High density residential		5.25 Old age home	
5.5 Medium industrial ^AN		5.26 Museum	
5.6 Office/consulting room		5.27 Historical building	
5.7 Military or police base/station/compound		5.28 Protected Area	

5.8 Spoil heap or slimes dam A		5.29 Sewage treatment plant A	
5.9 Light industrial		5.30 Train station or shunting yard N	
5.10 Heavy industrial AN		5.31 Railway line N	
5.11 Power station		5.32 Major road (4 lanes or more)	
5.12 Sport facilities		5.33 Airport N	
5.13 Golf course		5.34 Harbour	
5.14 Polo fields		5.35 Quarry, sand or borrow pit	
5.15 Filling station H		5.36 Hospital/medical centre	
5.16 Landfill or waste treatment site		5.37 River, stream or wetland	
5.17 Plantation		5.38 Nature conservation area	
5.18 Agriculture		5.39 Mountain, koppie or ridge	
5.19 Archaeological site		5.40 Graveyard	X
5.20 Quarry, sand or borrow pit		5.41 River, stream or wetland	
5.21 Dam or Reservoir		5.42 Other land uses (describe)	

If any of the boxes marked with an "N "are ticked, how will this impact / be impacted upon by the proposed activity?

It will impact the sense of place, but the benefit of the project to the local community outweighs the impact of the development to the environment. There are large nature reserves in the area, including the Kruger National Park to the North, therefore the natural vegetation in and around the project provides corridors for movement and supporting areas for fauna and flora, but none the less the electrification for development and infrastructure projects are important for employment and quality of living standards of the local people of the Collins Chabane Local Municipality.

If any of the boxes marked with an "An" are ticked, how will this impact / be impacted upon by the proposed activity?

If YES, specify and explain: Yes	
If NO, specify:	

If any of the boxes marked with an "H" are ticked, how will this impact / be impacted upon by the proposed activity.

If YES, specify and explain:	N/A
If NO, specify:	

6. CULTURAL/HISTORICAL FEATURES

Are there any signs of culturally or historically significant elements, as defined in section 2 of the National Heritage Resources Act, 1999, (Act No. 25 of 1999), including	YES	No

Archaeological or palaeontological sites, on or close (within 20m) to the site?	~~Yes~~	No

If YES, explain:

The burial heritage sites identified by the heritage specialist are the following: (Exigo-MHI-BP01 - Site Exigo-MHI-BP03).

It is primarily recommended that the burial be conserved in situ and that a conservation buffer of at least 50m, as required by SAHRA Burial Ground and Graves (BGG) Unit.

A fence and access gate should be erected around each burial site. A distance of at least 2m should be maintained between the graves and the fence which should be at least 1,8m high. Clear signboard should be erected indicating the heritage sensitivity of the sites and contact details for visitation of the graves.

For the Probable Iron Age Settlement Area that was identified within deviation 1. (Site Exigo-MHI-IA01) in the Deviation 1 corridor is of medium significance in terms of its regional representation in the Iron Age farmer period landscape of the area.
It is primarily recommended that proposed development components be planned as to avoid impact on the heritage resource, and a heritage conservation buffer of at least 20m around the heritage receptor be implemented.

This was undertaken with the alignment route being amended to avoid the Iron Age Settlement Area.

Eskom Mhinga Route Deviation Project Heritage Sites Locations

Site Code	Coordinate S E	Short Description	Mitigation Action
EXIGO-MHI-BP01	S22.83084° E30.88568°	Burial Site	**Avoidance:** 50m conservation buffers, site fencing and access control, site management plan **Site monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage of the area. **Grave Relocation:** Grave relocation subject to authorizations and permitting if impacted on.
EXIGO-MHI-BP02	S22.82211° E30.87290°	Burial Site	
EXIGO-MHI-BP03	S22.92474° E30.85384°	Burial Site	
EXIGO-MHI-SA01	S22.82134° E30.88045°	Stone Age Occurrence	**Site Monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage occurrences of the site.
EXIGO-MHI-IA01	S22.93148° E30.85236°	Probable Iron Age Settlement Area	**Phase 2 Assessment:** Limited Phase 2investigations (documentation, site sampling) subject to relevant permitting. **Permitting:** Apply for alteration / destruction permits if sites are impacted on. **Site Monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage occurrences of the site.
EXIGO- BOD -FT01	S22.91754° E30.85174°	Unknown Stone Feature	Test provenience of the sites by means of non-intrusive or intrusive methods, should impact on the sites prove inevitable. If the features prove to be human burials, relevant and applicable mitigation and site management measures should apply.
EXIGO- BOD -FT02	S22.92125° E30.85185°	Unknown Stone Feature	

If uncertain, conduct a specialist investigation by a recognised specialist in the field to establish whether there is such a feature(s) present on or close to the site.

Briefly explain the findings of the specialist:	The specialist findings are made available in the above section.

Will any building or structure older than 60 years be affected in any way?	YES	NO
Is it necessary to apply for a permit in terms of the National Heritage Resources Act, 1999 (Act 25 of 1999)?	YES	NO

If yes, please submit or, make sure that the applicant or a specialist submits the necessary application to SAHRA or the relevant provincial heritage agency and attach proof thereof to this application if such application has been made.

SECTION C: PUBLIC PARTICIPATION

1. ADVERTISEMENT

The person conducting a public participation process must take into account any guidelines applicable to public participation as contemplated in section 24J of the Act and must give notice to all potential interested and affected parties of the application which is subjected to public participation by—

(a) fixing a notice board (of a size at least 60cm by 42cm; and must display the required information in lettering and in a format as may be determined by the department) at a place conspicuous to the public at the boundary or on the fence of—

- (i) the site where the activity to which the application relates is or is to be undertaken; and
- (ii) any alternative site mentioned in the application;

(b) giving written notice to—

- (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
- (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
- (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
- (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
- (v) the municipality which has jurisdiction in the area;
- (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
- (vii) any other party as required by the department;

(c) placing an advertisement in—

- (i) one local newspaper; or

(ii) any official *Gazette* that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;

(d) placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the local municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official *Gazette* referred to in subregulation 54(c)(ii); and

(e) using reasonable alternative methods, as agreed to by the department, in those instances where a person is desiring of but unable to participate in the process due to—

(i) illiteracy;

(ii) disability; or

(iii) any other disadvantage.

2. CONTENT OF ADVERTISEMENTS AND NOTICES

A notice board, advertisement or notices must:

(a) indicate the details of the application which is subjected to public participation; and

(b) state—

(i) that the application has been submitted to the department in terms of these Regulations, as the case may be;

(ii) whether basic assessment or scoping procedures are being applied to the application, in the case of an application for environmental authorisation;

(iii) the nature and location of the activity to which the application relates;

(iv) where further information on the application or activity can be obtained; and

(v) the manner in which and the person to whom representations in respect of the application may be made.

3. PLACEMENT OF ADVERTISEMENTS AND NOTICES

Where the proposed activity may have impacts that extend beyond the municipal area where it is located, a notice must be placed in at least one provincial newspaper or national newspaper, indicating that an application will be submitted to the department in terms of these regulations, the nature and location of the activity, where further information on the proposed activity can be obtained and the manner in which representations in respect of the application can be made, unless a notice has been placed in any *Gazette* that is published specifically for the purpose of providing notice to the public of applications made in terms of these Regulations.

Advertisements and notices must make provision for all alternatives.

4. DETERMINATION OF APPROPRIATE MEASURES

The practitioner must ensure that the public participation is adequate and must determine whether a public meeting or any other additional measure is appropriate or not based on the particular nature of each case. Special attention should be given to the involvement of local community structures such as Ward Committees, ratepayers associations and traditional authorities where appropriate. Please note that public concerns that emerge at a later stage that should have been addressed may cause the department to withdraw any authorisation it may have issued if it becomes apparent that the public participation process was inadequate.

5. COMMENTS AND RESPONSE REPORT

The practitioner must record all comments and respond to each comment of the public before the application is submitted. The comments and responses must be captured in a comments and response report as prescribed in these Regulations and be attached to this application. The comments and response report must be attached under Appendix E.

6. AUTHORITY PARTICIPATION

Please note that a complete list of all organs of state and or any other applicable authority with their contact details must be appended to the basic assessment report or scoping report, whichever is applicable.

Authorities are key interested and affected parties in each application and no decision on any application will be made before the relevant local authority is provided with the opportunity to give input.

Name of Authority informed:	Comments received (Yes or No)
Takalani Ngobeni - Collins Chabane Local Municipality:	Yes, *"The municipality won't be able to comment on the above mentioned project until necessary documents are furnished .e.g. Screening report as per regulation 16 (1)v of environmental impact assessment 2014, public participation report , etc...* *Should there be any further queries feel free to contact our offices telephonically to avoid delays*"
Henry Chauke Ward Councilor	No

7. CONSULTATION WITH OTHER STAKEHOLDERS

Note that, for linear activities, or where deviation from the public participation requirements may be appropriate, the person conducting the public participation process may deviate from the requirements of that subregulation to the extent and in the manner as may be agreed to by the department.

Proof of any such agreement must be provided, where applicable.

Has any comment been received from stakeholders?

YES	NO
	X

If "YES", briefly describe the feedback below (also attach copies of any correspondence to and from the stakeholders to this application):

The Basic Assessment is currently on review

The basic assessment has not been put on review, but during the initial engagement meetings dated 09/11/2021 and 09/12/2021 with the relevant tribal authorities where the chiefs of Mhinga and Nklavela Tshkundu were informed of the project shown the deviations on the alignment sheets and considering the benefits to the local communities in terms of electrification and job opportunities signed the landowner consent forms.

SECTION D: IMPACT ASSESSMENT

The assessment of impacts must adhere to the minimum requirements in the EIA Regulations, 2014, and should take applicable official guidelines into account. The issues raised by interested and affected parties should also be addressed in the assessment of impacts.

1. ISSUES RAISED BY INTERESTED AND AFFECTED PARTIES

List the main issues raised by interested and affected parties.

N/A. No comments or issues have been raised by interested and affected parties. All meetings with the tribal authorities of: Mhinga and Nklavela Tshkundu, which have been used to inform the local authorities of the project dated 09/11/2021 and 09/12/2021 with the herdsman have lead to landowner consent being given.

Response from the practitioner to the issues raised by the interested and affected parties (A full response must be given in the Comments and Response Report that must be attached to this report as Annexure E):

N/A. No comments or issues have been raised by interested and affected parties.

2. IMPACTS THAT MAY RESULT FROM THE PLANNING AND DESIGN, CONSTRUCTION, OPERATIONAL, DECOMMISSIONING AND CLOSURE PHASES AS WELL AS PROPOSED MANAGEMENT OF IDENTIFIED IMPACTS AND PROPOSED MITIGATION MEASURES

List the potential direct, indirect and cumulative property/activity/design/technology/operational alternative related impacts (as appropriate) that are likely to occur as a result of the **planning and design phase,** construction phase, operational phase, decommissioning and closure phase, including impacts relating to the choice of site/activity/technology alternatives as well as the mitigation measures that may eliminate or reduce the potential impacts listed.

Table 1: Rating criteria used to assess environmental impacts

Extent	
Site	The impact could affect the whole, or a measurable portion of the site
Local	Extending only as far as the activity, limited to the site and its immediate surroundings
Regional	Impact on the broader region
National	Will have an impact on a national scale or across international borders
Duration	
Short term	0-5 years
Medium term	5-15 years
Long term	Where the impact will cease after the operational life of the activity
Permanent	Where mitigation either by natural process or human intervention will not occur in such a way or in such a time span that the impact can be considered transient
Intensity	
Low	Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected
Medium	Where the affected environment is altered but natural, cultural or social functions and processes continue albeit in a modified way
High	Where natural, cultural or social functions or processes are altered to the extent that it will temporarily cease
Very High	Where natural, cultural or social functions or processes are altered to the extent that it will permanently cease
Probability	
Improbable	Where the possibility of the impact to materialise is very low either because of design or historic experience
Probable	Where there is a distinct possibility that the impact will occur
Highly Probable	Where it is most likely that the impact will occur
Definite	Where the impact will occur regardless of any prevention measures
Significance	
No significance	The impact is not substantial and does not require any mitigation action
Low	The impact is of little importance, but may require limited mitigation
Medium	The impact is of importance and therefore considered to have a negative impact. Mitigation is required to reduce the negative impacts to acceptable levels.
High	The impact is of great importance. Failure to mitigate, with the objective of reducing the impact to acceptable levels, could render the entire development option or entire project proposal unacceptable. Mitigation is therefore essential.

Evaluation Rating System

In order to evaluate and classify the impacts a rating system has been used accordingly. The following scoring criteria were implemented:

Table 2: Scores per rating criteria used

Extent	National 4	Regional 3	Local 2	Site 1
Duration	Permanent 4	Long-term 3	Medium-term 2	Short-term 1
Intensity	Very high 4	High 3	Medium 2	Low 1
Probability of Occurrence	Definite 4	Highly probable 3	Probable 2	Improbable 1

The total points are calculated per impact and the significance of each of the environmental issues are assessed and accorded a rating (low/medium/high) using the rating system below.

a) High impact (13-16 points) – The design of the site may be affected. Mitigation and possible remediation are needed during the construction and/ or operational phases. The effects of the impact may affect the broader environment.

b) Medium impact (9-12 points) – Mitigation is possible with additional design and construction inputs.

c) Low impact (5-8 points) – A low impact has no permanent impact significance. Mitigation measures are feasible and are readily instituted a part of a standing design, construction or operational procedures.

d) No significance (1-4 points) – The impact is not substantial and does not require any mitigation action.

The significance of the impact is assessed without (WOM = without mitigation) and with mitigation (WM = with mitigation) measures in place.

Briefly describe and compare the potential impacts (as appropriate), significance rating of impacts, proposed mitigation and significance rating of impacts after mitigation that are likely to occur as a result of the construction phase for the various alternatives of the proposed development. This must include an assessment of the significance of all impacts.

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
Environmental : **Botanical**	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Low	• A competent Environmental Control Officer (ECO) must oversee the construction and rehabilitation phase of the project, with the protected plant species condition, protection and demarcation as a priority; and • Protected and Threatened Trees: The removal of large trees should be avoided as much as possible. In the event avoidance is not feasible, a permit will be required for the relocation or destruction of trees. • The impact to the *NT Dalbergia melanoxylon (zebra wood)* and protected tree species that occurred throughout the survey corridor are one of the	Moderate	Low

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		major considerations regarding the proposed development. It is thus imperative that all avenues, especially avoidance be considered. If avoidance is not possible, relocation needs to be considered. If avoidance or relation is not possible, a permit for destruction then needs to be applied for at the local authority. • For the Probable Iron Age Settlement Area that was identified within deviation 1. (Site Exigo-MHI-IA01) in the Deviation 1 corridor is of medium significance in terms of its regional representation in the Iron Age farmer period landscape of the area. It is primarily recommended that proposed		

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		development components be planned as to avoid impact on the heritage resource, and a heritage conservation buffer of at least 20m around the heritage receptor be implemented.		
Environmental: Avifauna	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Moderate	• Mitigation measures as described in the specialist study can be implemented to reduce the significance of the risk but there is still a possibility of collision by large non-passerine avifauna species. • Based on the number and status (e.g. CR) of the large SCCs recorded, the area is seen as very highly sensitive. Considering the project was previously approved the impact compared to the benefit was	Moderate	Moderate

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		considered sufficient to warrant the project to be authorized. • This decision should include whether a long term monitoring study should be conducted prior to the approval of this project.		
Environmental: Wetland Assessment	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Low	• The 1:100 year floodline extent along with delineated wetlands are provided and a 30 m buffer was delineated as sensitive areas. These areas should be avoided for habitat protection with no associated infrastructure or building facilities within the delineated areas. • To do this the powerline towers should be designed such that the towers are outside the 1:100 year floodline and 30m	Moderate	Moderate

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		buffer. If this is not possible then.		
Heritage Impacts	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Low	• The burial heritage sites identified by the heritage specialist are the following: (Exigo-MHI-BP01 - Site Exigo-MHI-BP03). • It is primarily recommended that the burial be conserved in situ and that a conservation buffer of at least 50m, as required by SAHRA Burial Ground and Graves (BGG) Unit. • A fence and access gate should be erected around each burial site. A distance of at least 2m should be maintained between the graves and the fence which should be at least 1,8m high. Clear signboard should be erected indicating the	High	Low

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		heritage sensitivity of the sites and contact details for visitation of the graves.		
Fire and explosions	**Extent:** Local **Duration:** Short-term **Intensity:** High **Probability:** Improbable **Significance:** Low	• Hot works are only permitted where it is suitable and in a distal location of any grass. • Fire extinguishers and water should be available should a fire occur. • An emergency fire plan must be available onsite should a fire occur.	**Low**	**Low**
Noise Noise related to construction activities. This may consist of the following: • Construction vehicles • Power tools	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Low	• Limit construction activities to daytime hours which will be between 08H00 to 17H00. • Employees to wear appropriate Personal Protective Equipment (PPE) to limit hearing loss or damage. • Vehicles and equipment/tools are to be well maintained to limit noise levels.	**Low**	**Low**
Waste Generation Waste	**Extent:** Site **Duration:** Short Term	• All waste is to be disposed of at a licensed and correctly designated	**Low**	**Low**

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
generated during construction may consist of the following : • Building rubble. • General waste. • Metal waste.	**Intensity:** Low **Probability:** Highly Probable **Significance:** Low	waste disposal facility. • All waste storage areas onsite must be kept tidy. • Separate bins with closed lids shall be provided for hazardous and general waste and shall be clearly demarcated. • Recyclable waste shall be separated for recycling. • All waste stored onsite must be secured so that it is not blown offsite by wind. • Bins shall be emptied regularly and the contents disposed of at a licensed waste disposal facility.		
Health and Safety Due to construction activities, together with negligence and inadequate staff training, the safety of workers, the public,	**Extent:** Site **Duration:** Short Term **Intensity:** Low **Probability:** Probable **Significance:** Low	• Access to the construction area is to be restricted and only the site personnel are to be permitted access to this area. • The contractor will provide workers with adequate Personal Protective Equipment (PPE). • Ensure that the handling of equipment and	**Low**	**Low**

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
property and/or equipment may be compromised. Injury from moving construction and delivery vehicles.		materials is supervised and adequately instructed. • Ensure adequate training of staff. • Ensure that construction vehicles and equipment are under the control of competent personnel.		
Socio-Economic Socio-economic benefits arising from the project	**Extent:** Local **Duration:** Long Term **Intensity:** Low **Probability:** Probable **Significance:** Low	• No mitigation measures are required as the he impacts are positive in terms of job creation	**Moderate**	**Low**
Visual Impacts	**Extent:** Local **Duration:** Long Term **Intensity:** Moderate **Probability:** Definite **Significance:** Moderate	• With the preparation of the portions of land onto which activities will take place the minimum amount of existing vegetation and topsoil should be removed. • Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site	**Moderate**	**Low**

Proposal - (Preferred Activity)				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
		rehabilitation. • All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. • Adopt responsible construction practices aimed at containing the establishment activities to specifically demarcated areas.		

OPERATIONAL PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
Environmental	**Extent :** Local **Duration :** Short Term **Intensity :** Low **Probability:** Definite **Significance :** Low	• There is not expected to be any further impacts but as suggested by the Avifauna specialist a monitoring plan should be implemented to establish what the impacts on the birds are.	**Low**	**Low**

Fire and explosions	**Extent:** Local **Duration:** Short-term **Intensity:** High **Probability:** Improbable **Significance:** Low	• Hot works are only permitted where it is suitable and in a distal location of any grass. • Fire extinguishers and water should be available should a fire occur. • An emergency fire plan must be available onsite should a fire occur.	**Low**	**Low**
Visual Impacts	**Extent:** Local **Duration:** Long Term **Intensity:** Moderate **Probability:** Definite **Significance:** Moderate	• The existing visual condition of the landscape that may be affected by the proposed project has been described. The study area's scenic quality has been rated moderate, within the context of the sub-region. Sensitive viewing areas and landscape types have been identified and mapped indicating potential minor landscape and receptor sensitivity to the project. • The visual impact of the 132 kV Project will cause moderate changes in the landscape that are noticeable to sensitive viewers looking towards the development from some residential areas (Mhingaville, Maphophe, Saselamani) and the main public road (R524). However,	**Moderate**	**Low**

		these views already contain features associated with power infrastructure, which runs across the northern section of the study area, and the tall savannah vegetation will screen many views.		

No-go option				
CONSTRUCTION PHASE				
Potential impacts	Significance rating of impacts (positive or negative)	Proposed mitigation	Significance rating of impacts after mitigation	Risk of the impact mitigation not being implemented
With the no go option there would not be the benefits of construction activities and the associated infrastructure as well as electrification in the Collins Chabane municipality where there is a growing demand for electricity.				
OPERATIONAL PHASE				
Potential impacts	Significance rating of impacts (positive or negative)	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
The no go option there would not be the benefits of jobs in a severely depressed economy.				

3. ENVIRONMENTAL IMPACT STATEMENT

Taking the assessment of potential impacts into account, please provide an environmental impact statement that summarises the impact that the proposed activity and its alternatives may have on the environment after the management and mitigation of impacts have been taken into account, with specific reference to types of impact, duration of impacts, likelihood of potential impacts actually occurring and the significance of impacts.

SECTION E. RECOMMENDATION OF PRACTITIONER

Is the information contained in this report and the documentation attached hereto sufficient to make a decision in respect of the activity applied for (in the view of the environmental assessment practitioner)?

YES	NO
X	

If "NO", indicate the aspects that should be assessed further as part of a Scoping and EIA process before a decision can be made (list the aspects that require further assessment):

None

If “YES”, please list any recommended conditions, including mitigation measures that should be considered for inclusion in any authorisation that may be granted by the department in respect of the application:

Considering the project was previously approved the impact compared to the benefit was considered sufficient to warrant the project to be authorized. Having stated this, it is important to take into consideration the necessary buffers suggested by the specialists especially the heritage specialist and that the specified buffers are adhered to and therefore both the grave sites and historically senstive areas are protected. The 1:100 year floodline extent along with delineated wetlands are provided in the respective specialist studies. Construction of infrastructure within the floodline and 30 m buffer should be avoided for habitat protection and limit the risk of infrastructure damage during flooding.

Is an EMPr attached?	~~YES~~	NO

The EMPr must be attached as Appendix F.

SECTION F: APPENDIXES

The following appendixes must be attached as appropriate:

Appendix A: Site plan(s)

Appendix B: Photographs

Appendix C: Facility illustration(s)

Appendix D: Specialist reports

Appendix E: Comments and responses report

Appendix F: Environmental Management Programme (EMPr)

Appendix G: Other information

SECTION G: DECLARATION BY THE ENVIRONMENTAL ASSESSMENT PRACTITIONER

I, **Seoras Graham** declare that I –

(a) act as the independent environmental practitioner in this application;

(b) do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2014;

(c) do not have and will not have a vested interest in the proposed activity proceeding;

(d) have no, and will not engage in, conflicting interests in the undertaking of the activity;

(e) undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2006;

(f) will ensure that information containing all relevant facts in respect of the application is distributed or made available to interested and affected parties and the public and that participation by interested and affected parties is facilitated in such a manner that all interested and affected parties will be provided with a reasonable opportunity to participate and to provide comments on documents that are produced to support the application;

(g) will ensure that the comments of all interested and affected parties are considered and recorded in reports that are submitted to the Department in respect of the application, provided that comments that are made by interested and affected parties in respect of a final report that will be submitted to the Department may be attached to the report without further amendment to the report;

(h) will keep a register of all interested and affected parties that participated in a public participation process; and

(i) will provide the Department with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not.

Signature of the Environmental Assessment Practitioner:

Kantey & Templer Consulting Engineers

Name of company:

27 AUGUST 2020

Date:

Appendix A: Site plan(s)

Deviation 1	Point 1	-22.935205°, 30.844224°
	Point 2	-22.933323°, 30.845652°
	Point 3	-22.931868°, 30.847439°
	Point 4	-22.930239°, 30.849063°
	Point 5	-22.928500°, 30.850559°
	Point 6	-22.926862°, 30.852060°
	Point 7	-22.924932°, 30.852577°
	Point 8	-22.922854°, 30.851779°
	Point 9	-22.920840°, 30.850896°
Deviation 2	Point 1	-22.870803°, 30.868584°
	Point 2	-22.868380°, 30.868511°
	Point 3	-22.866333°, 30.869678°
	Point 4	-22.864733°, 30.870887°
Deviation 3	Point 1	-22.830867°, 30.882824°
	Point 2	-22.829174°, 30.881441°
	Point 3	-22.827033°, 30.880311°
	Point 4	-22.825146° 30.879084°
	Point 5	-22.823133°, 30.877699°
	Point 6	-22.821135°, 30.876328°
	Point 7	-22.819139°, 30.875118°
	Point 8	-22.817347°, 30.876575°
	Point 9	-22.815745°, 30.878155°
	Point 10	-22.814143°,

		30.879893°
	Point 11	-22.812399°, 30.881344°
	Point 12	-22.810753°, 30.882976°
	Point 13	-22.809011°, 30.884543°
	Point 14	-22.807382°, 30.886196°
	Point 15	-22.805809°, 30.887962°
	Point 16	-22.804251°, 30.889772°
	Pont 17	-22.802697°, 30.891438°
	Point 18	-22.801000°, 30.893142°

Deviations every 250 metres.

Appendix B: Photographs

Photo 1: Vegetation type along the road at deviation 1 Between Saselamani to Nkavele village

Photo 3: Unidentified rocks likely to be related to ploughing related to farming activities found at Deviation 1**.**

Photo 2: Deviation 2 facing North the typical natural vegetationin the direction of Xikundu village.

Photo 4: Deviation 2, facing north, the stream is the reason for the deviation of the proposed powerline(Deviation 2)

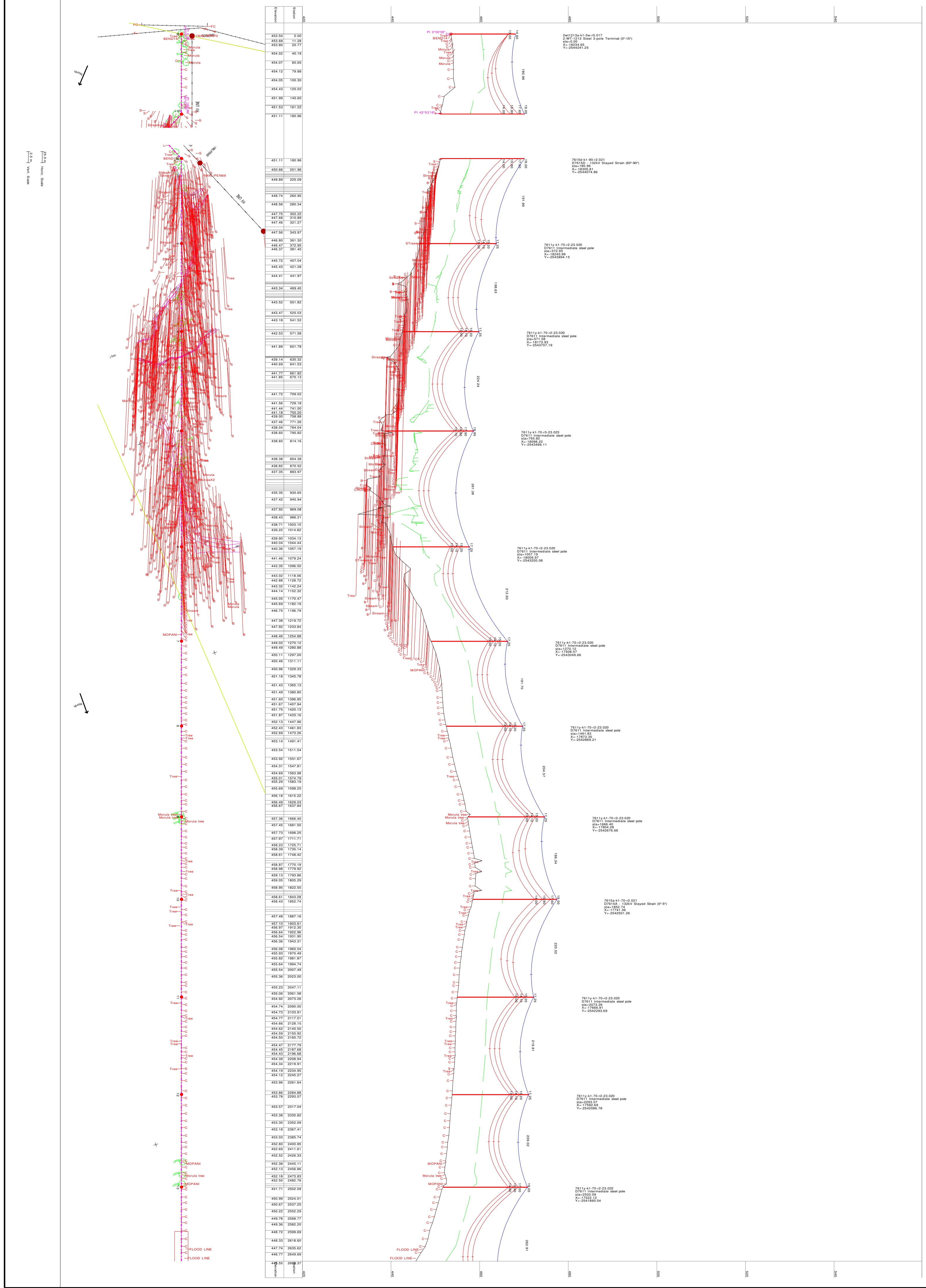
Photo 5: Deviation 3 facing West, the construction vehicles are busy constructing the Pennigotcha and Mhingaville substation located along Punda Maria road R524.

Photo 6: Facing South cattle observed in the vicinity at Xiswati village (Deviation 3), much of the natural vegetation disturbance is because of the cattle grazing.

K&T KANTEY & TEMPLER CONSULTING ENGINEERS		SITE PHOTOGRAPHS	DECEMBER 2020

	Eskom	Mhinga 132kv powerlines	7047I

Appendix C: Facility illustration(s)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7615d-k1-90-r2.021
D7615D - 132kV Stayed Strain (60°-90°)
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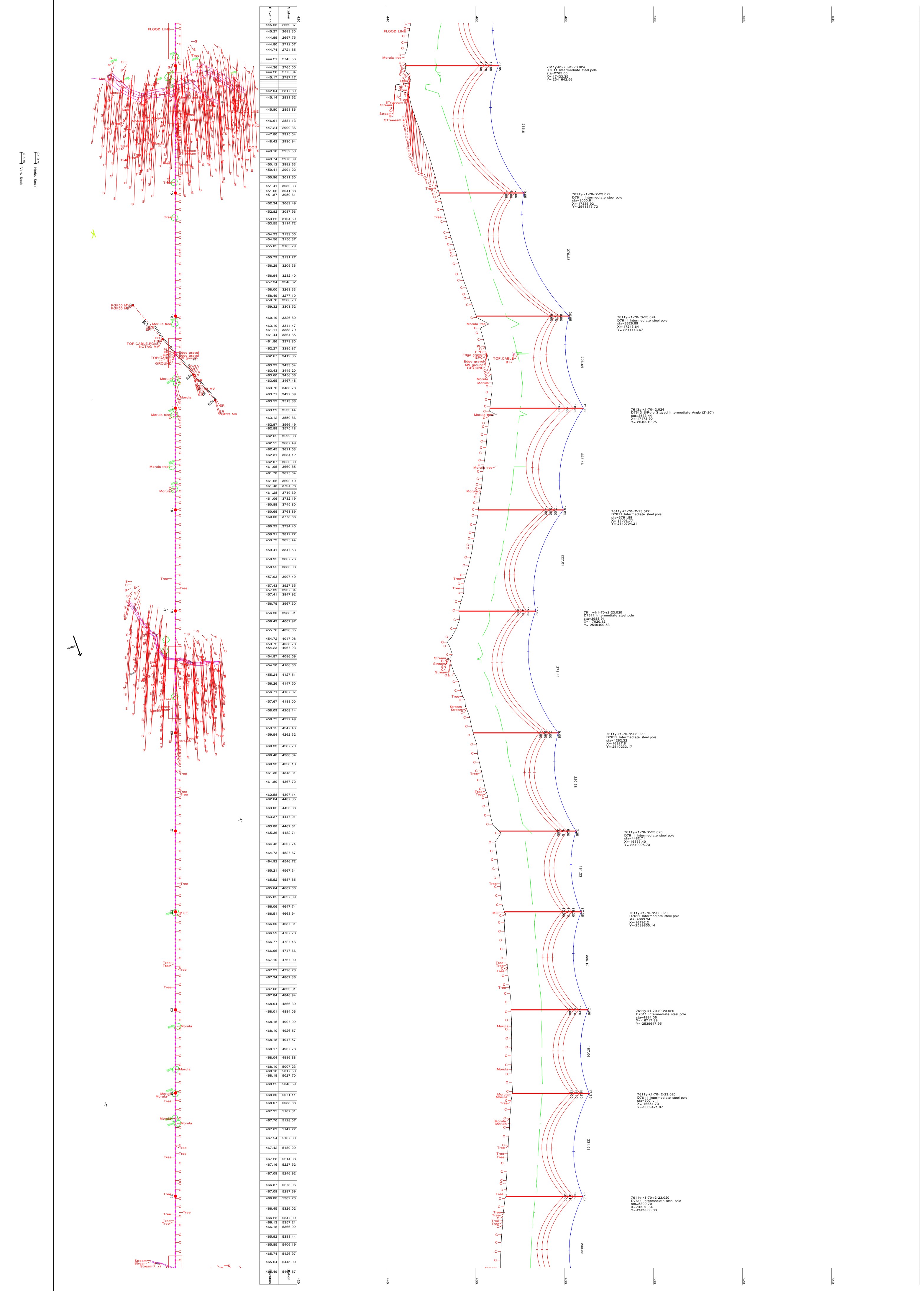
Y=-2544074.86
7611y-k1-70-r2-23.020



FLOOD LINE
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7611y-k1-70-r2-23.022
D7611 Intermediate steel pole
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X=-17336.92
Y=-2541373.73
276.28
7611y-k1-70-r3-23.024
D7611 Intermediate steel pole
sta=3326.89
X=-17243.64
Y=-2541113.67
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7613a-k1-70-r2.024
D7613 S/Pole Stayed Intermediate Angle (2°-20°)
sta=3533.44
X=-17173.90
Y=-2540919.25
228.46
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Y=-2540704.21
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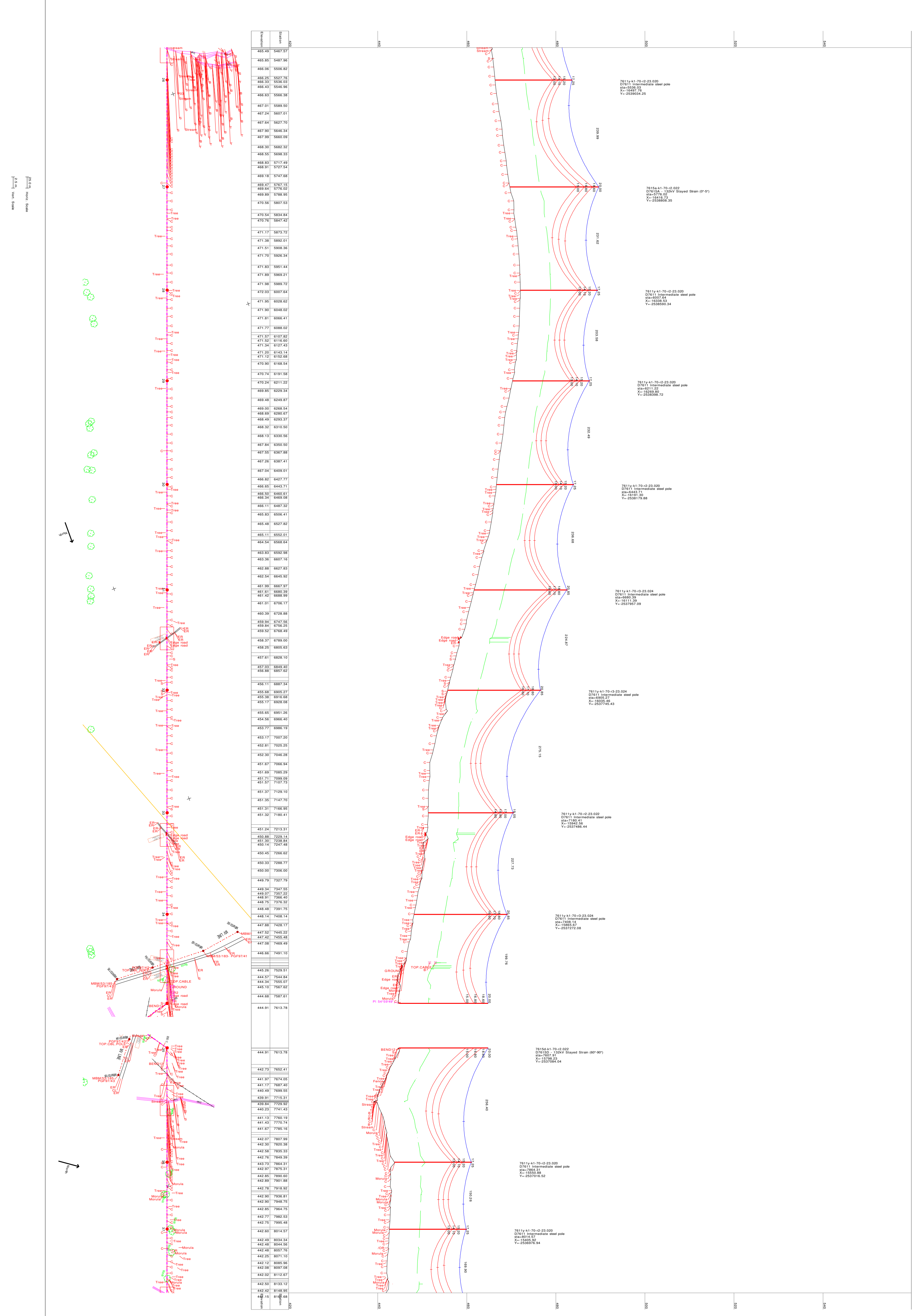

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D7611 Intermediate steel pole
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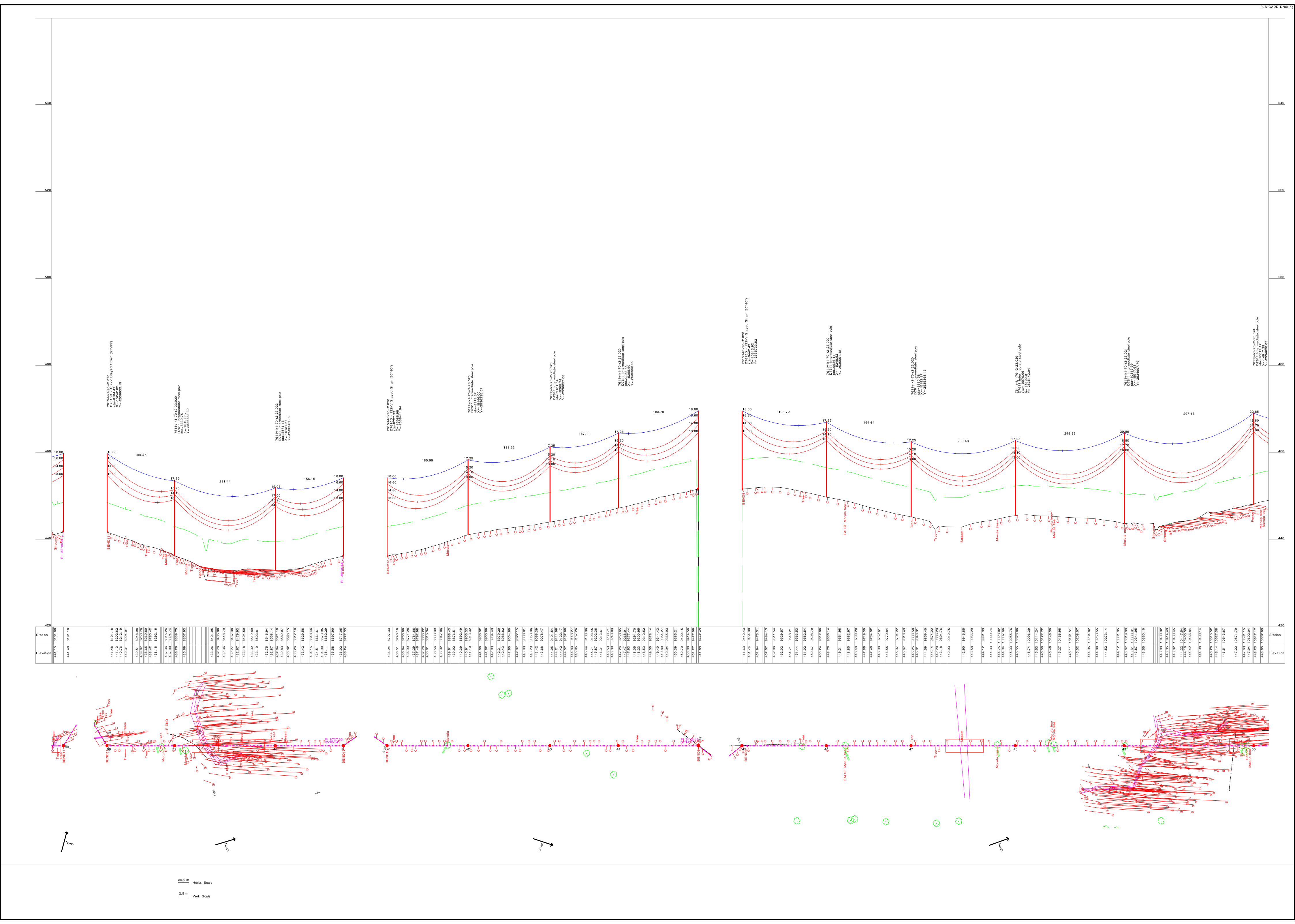
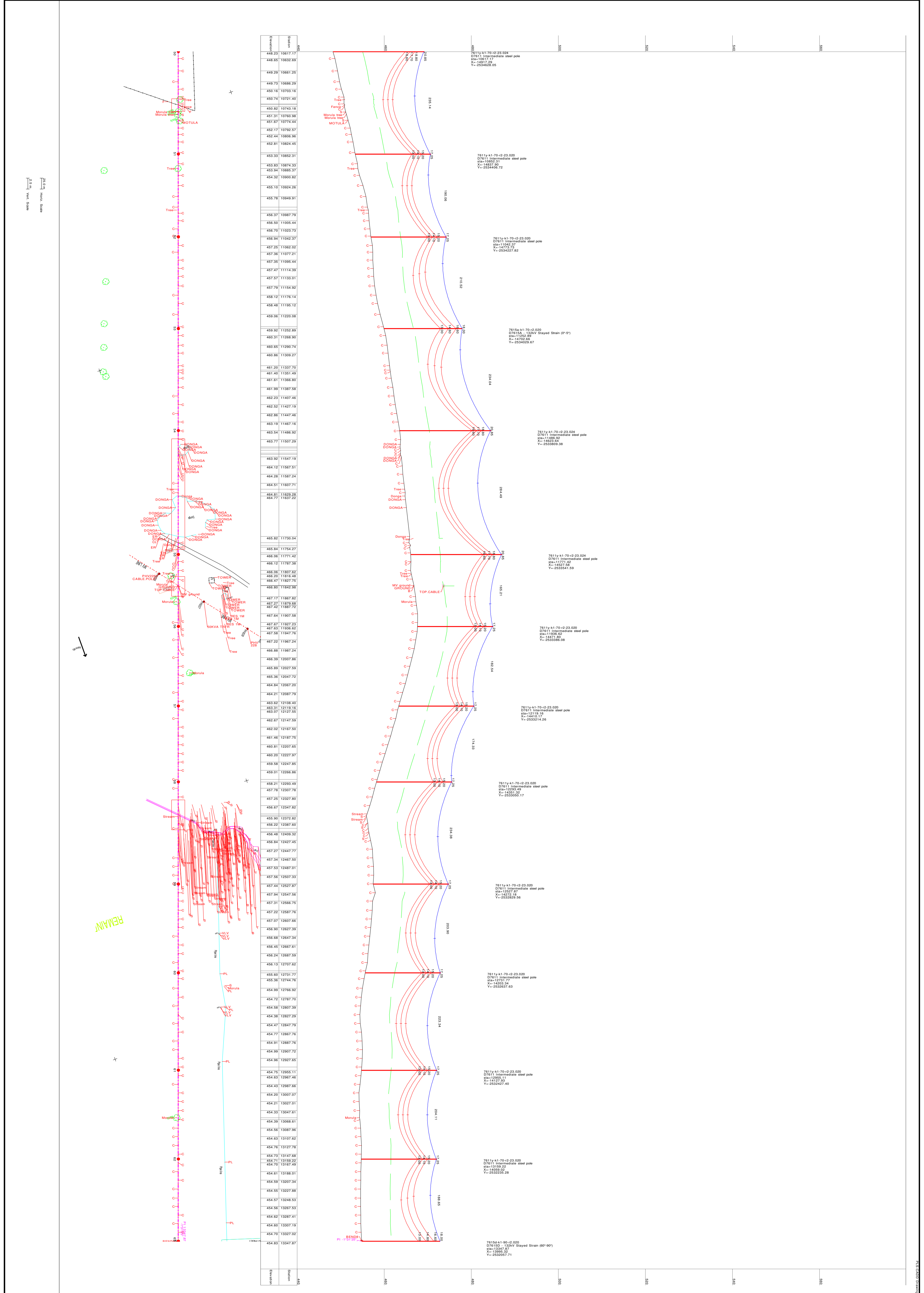
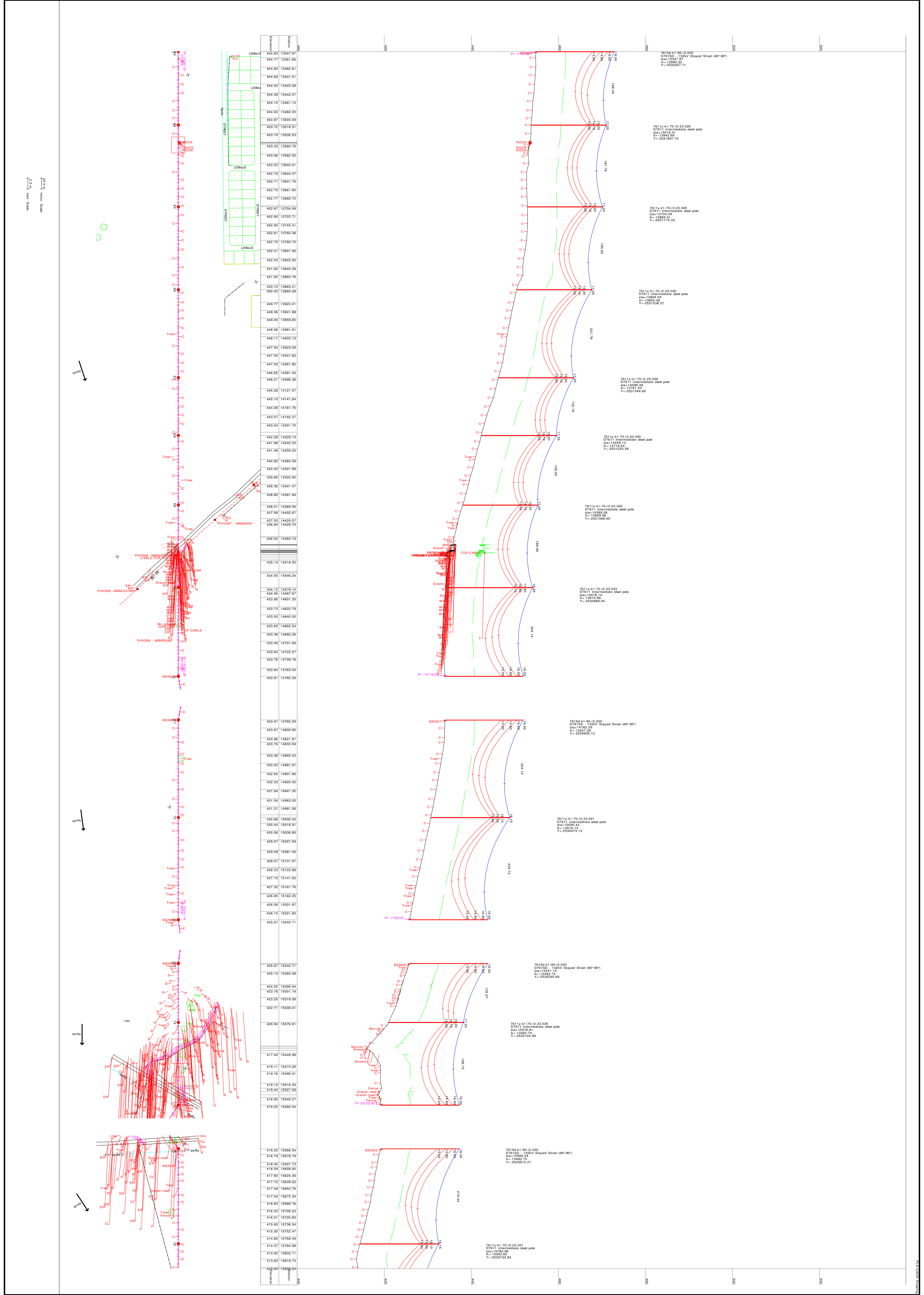
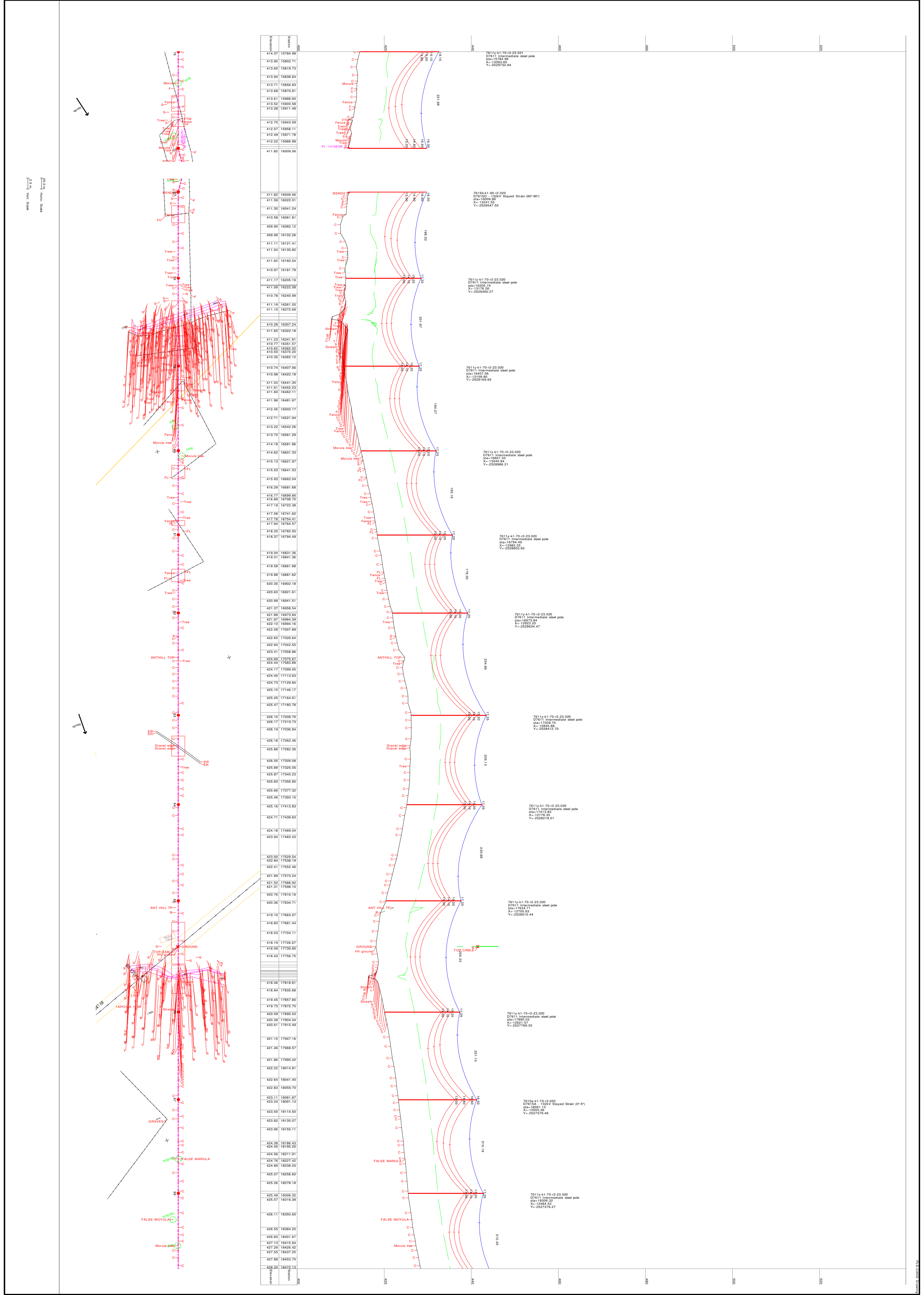


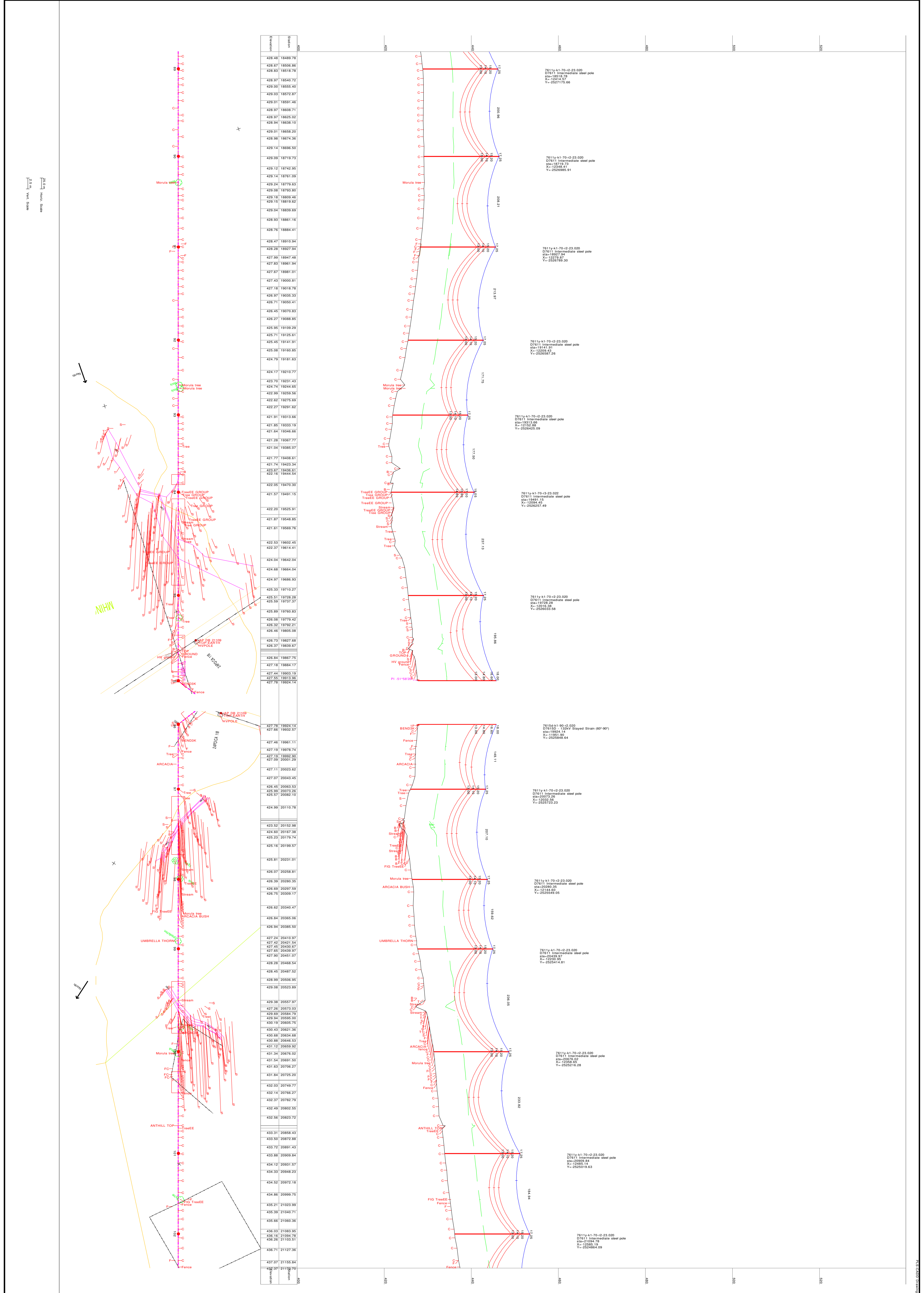
PLS-CADD Drawing
Station
Elevation
Horiz. Scale
Vert. Scale







ANTHILL TOP
Gravel edge
ANT HILL TOP
GROUND
GRAVES
FALSE MARULA
FALSE MOYULA



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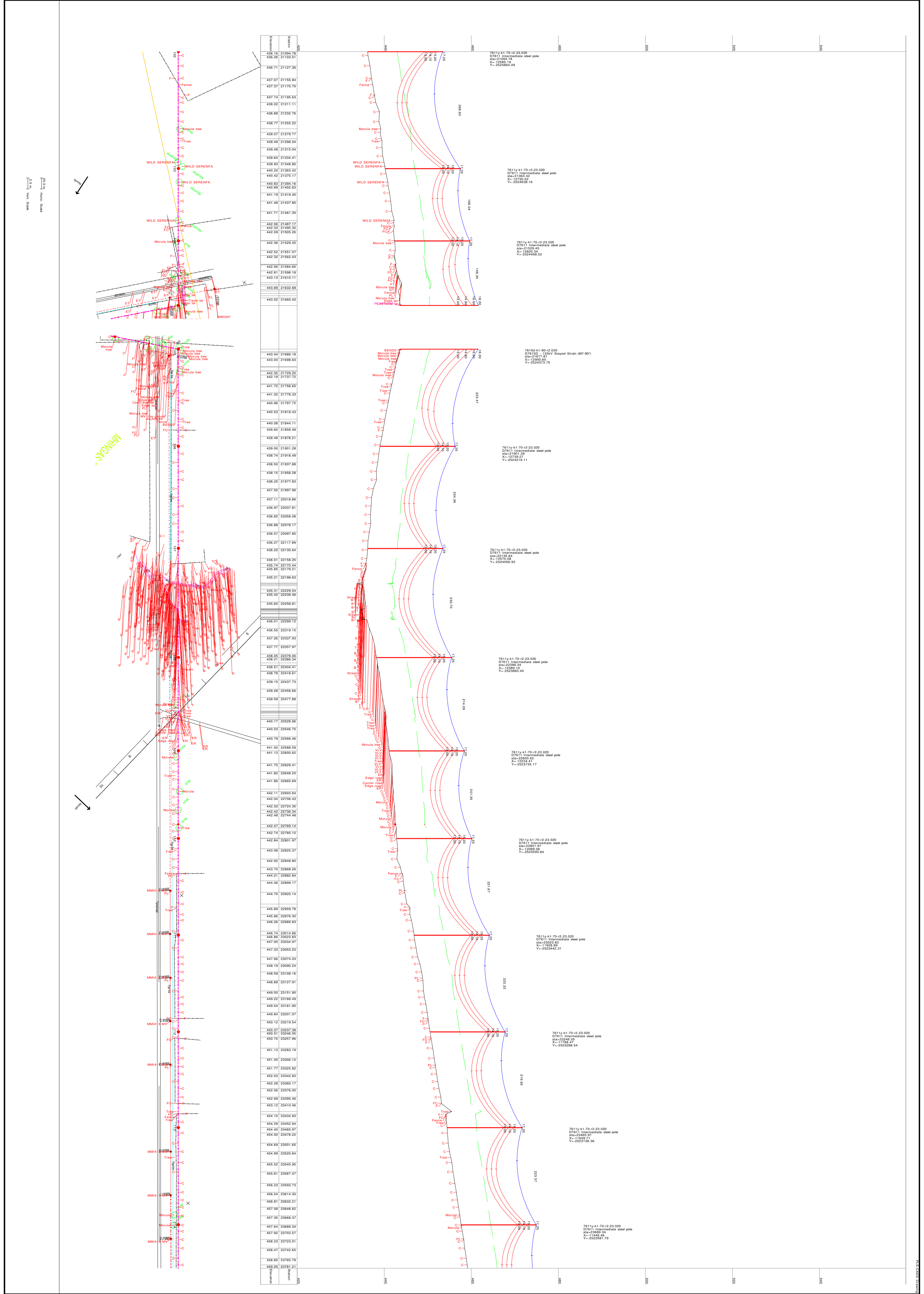

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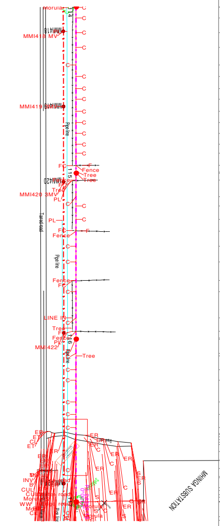
Tree
460
480



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458.85	23765.79
459.05	23781.21
459.24	23797.25
459.44	23811.46
459.64	23827.33
459.84	23842.12
460.01	23856.69
460.21	23871.16
460.36	23882.76
460.55	23899.12
461.20	23909.56
460.66	23918.59
460.60	23940.68
460.78	23953.03
460.95	23970.58
461.09	23986.32
461.09	24006.15
461.20	24027.17
461.28	24051.72
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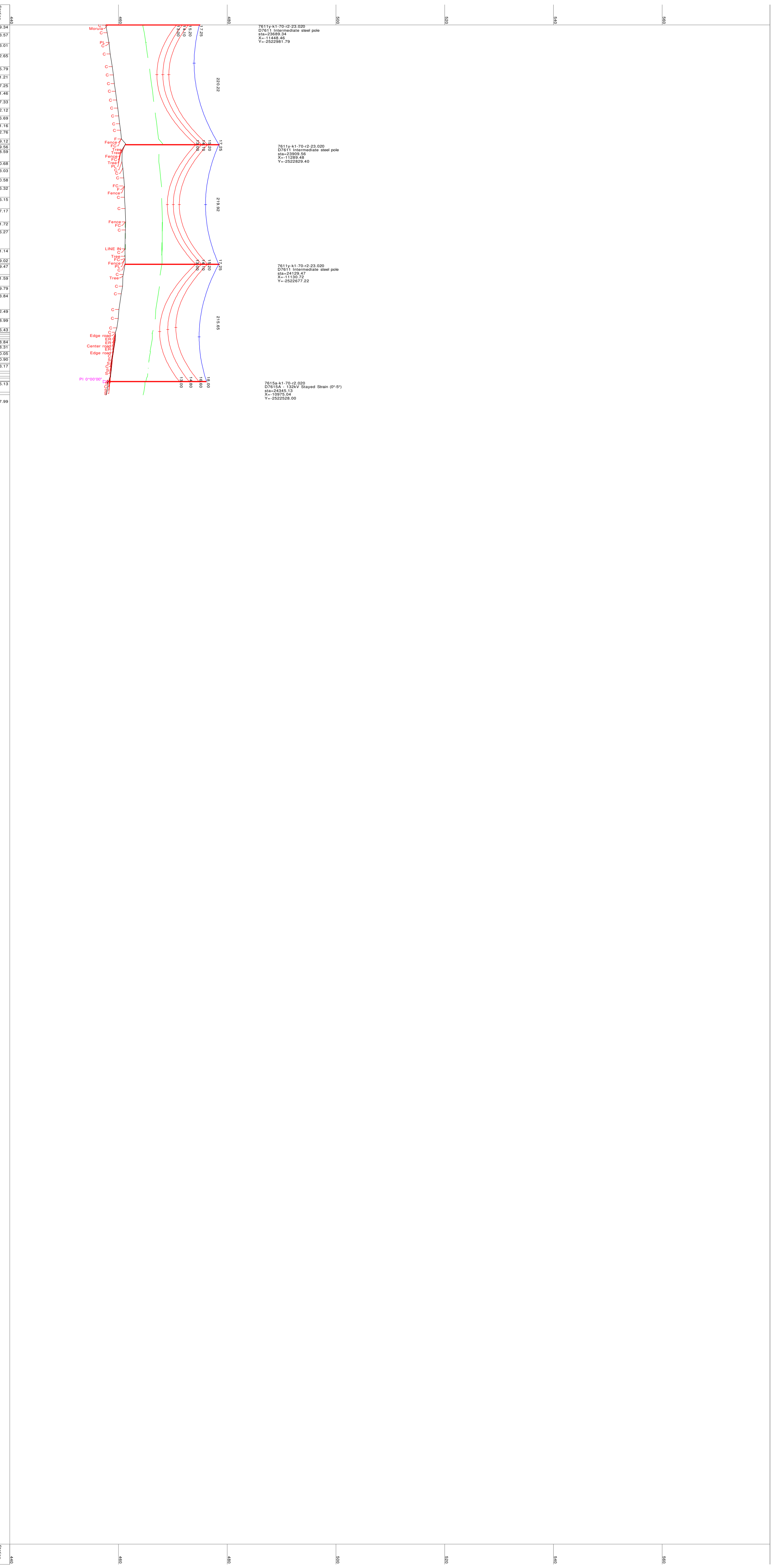

Appendix D: Specialist reports

KANTEY & TEMPLER CONSULTING ENGINEERS: PROPOSED ESKOM MHINGA ROUTE DEVIATION PROJECT, VHEMBE DISTRICT MUNICIPALITY, LIMPOPO PROVINCE

Archaeological Impact Assessment

Innovation in Sustainability

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Innovation in Sustainability

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ARCHAEOLOGICAL IMPACT ASSESSMENT (AIA) ON MAHINGAS 258MT, MAHINGA'S EXTENSION 259MT, TSHIKUNDU 262MT, PAGELEE 274MT AND KLUSTER 293MT FOR THE PROPOSED ESKOM MHINGA ROUTE DEVIATION PROJECT, VHEMBE DISTRICT MUNICIPALITY, LIMPOPO PROVINCE

Conducted for:
Kantey & Templer Consulting Engineers

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Seoras Graham (Kantey & Templer Consulting Engineers)

DOCUMENT DISTRIBUTION LIST

Name	Institution
Seoras Graham	Kantey & Templer Consulting Engineers

DOCUMENT HISTORY

Date	Version	Status
20 January 2021	1.0	Draft

DECLARATION

I, Nelius Le Roux Kruger, declare that –

- I act as the independent specialist;
- I am conducting any work and activity relating to the proposed Eskom Mhinga Route Deviation Project Project in an objective manner, even if this results in views and findings that are not favourable to the client;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have the required expertise in conducting the specialist report and I will comply with legislation, including the relevant Heritage Legislation (National Heritage Resources Act no. 25 of 1999, Human Tissue Act 65 of 1983 as amended, Removal of Graves and Dead Bodies Ordinance no. 7 of 1925, Excavations Ordinance no. 12 of 1980), the Minimum Standards: Archaeological and Palaeontological Components of Impact Assessment (SAHRA, AMAFA and the CRM section of ASAPA), regulations and any guidelines that have relevance to the proposed activity;
- I have not, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this declaration are true and correct.

____
Signature of specialist
Company: Exigo Sustainability
Date: 20 January 2021

EXECUTIVE SUMMARY

This report details the results of an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Eskom Mhinga Route Deviation Project on Mahingas 258MT, Mahinga's Extension 259MT, Tshikundu 262MT, Pagelee 274MT and Kluster 293MT in the Vhembe District Municipality of the Limpopo Province. For the project, 3 areas are proposed as deviations from the original Eskom Mhinga authorized powerline route. These deviations total **8km** with a corridor of **1000m** (500m by 500m on both sides of the route) which forms the focus of this HIA assessment. The report includes background information on the area's archaeology, its representation in Southern Africa, and the history of the larger area under investigation, survey methodology and results as well as heritage legislation and conservation policies. A copy of the report will be supplied to the South African Heritage Resources Agency (SAHRA) and recommendations contained in this document will be reviewed.

Project Title	Eskom Mhinga Route Deviation Project
Project Location	Corridor 1: S22.92539° E30.84762° Corridor 2: S22.86284° E30.86977° Corridor 3: S22.80975° E30.88523°
1:50 000 Map Sheet	2230DD
Farm Portion / Parcel	Mahingas 258MT, Mahinga's Extension 259MT, Tshikundu 262MT, Pagelee 274MT and Kluster 293MT
Magisterial District / Municipal Area	Vhembe District Municipality
Province	Limpopo Province

The history of the eastern Limpopo Province and the Soutpansberg is reflected in an immensely rich archaeological landscape. The interaction between the climate, geology, topography, and the fauna and flora in the Soutpansberg over millions of years has established a milieu in which prehistoric and historic communities thrived. Stone Age habitation occurs in places, mostly in open air locales or in sediments alongside rivers or pans. Bantu-speaking groups moved into this area during the last millennia and these groups, who practiced herding, agriculture, metal working and trading, found a suitable living environment during the Earlier, Middle and Later Iron Age. It was here that their chiefdoms flourished. European farmers, settling in the area since the middle of the 19th century, divided up the landscape into a number of farms. Historical trade routes were well established before the period of Colonial expansion and these routes mainly existed as a direct consequence of mining. During the nineteenth century the Highveld was extensively settled by both Bantu and European groups that migrated into this area and the landscape saw intensive conflicts and war events towards the end of the 19th century. In recent years an urban element developed, expanding at a rapid rate, largely as a result of farming development in the region.

No particular reference to archaeological sites or features of heritage potential were recorded during an examination of literature thematically or geographically related to the project area and an examination of historical aerial imagery and archive maps indicate that the larger landscape had been utilized for intensive agriculture and rural settlement during the last century. As such, large portions of the project area and its surrounds have been altered and transformed in the last century. This inference was confirmed during an archaeological site assessment which was constrained by dense surface vegetation. During the survey, a number of heritage receptors were noted and the following recommendations are made based on general observations in the proposed Eskom Mhinga Route Deviation Project in terms of heritage resources management.

- An isolated Stone Age occurrence in the Deviation 3 corridor (**Site Exigo-MHI-SA01**) is of low heritage significance and it is recommended that site should be monitored by an informed ECO in order to avoid the destruction of previously undetected heritage remains and potential human burials.
- A probable Iron Age occupation at (**Site Exigo-MHI-IA01)** in the Deviation 1 corridor is of medium significance in terms of its regional representation in the Iron Age farmer period landscape of the area. It is primarily recommended that proposed development components be planned as to avoid impact on the heritage resource, and a heritage conservation buffer of at least 20m around the heritage receptor be implemented. If this measure proves unachievable it is recommended that the historical fabric of the sites be conserved by means of a limited Phase 2 Specialist study (mapping, site sampling and possible conservation management and protection) and the necessary permits should be obtained from the relevant Heritage Resources Authorities.
- It is recommended that the provenience of the stone cairns and features **(Site Exigo-MHI-FT01, Site Exigo-MHI-FT2)** in the Deviation 1 corridor be tested by means of non-intrusive (Ground Penetrating Radar) or intrusive (archaeological excavations) methods, should impact on the sites prove inevitable. If the features prove to be human burials, relevant and applicable mitigation and site management measures should apply (see following point).
- Three burial sites or probable burial sites occurring within in the Deviation1 and Deviation 3 corridors (**Site Exigo-MHI-BP01 - Site Exigo-MHI-BP03**) are of high significance and the sites might be impacted on by site development. It is primarily recommended that the burial be conserved *in situ* and that a conservation buffer of at least 50m, as required by SAHRA Burial Ground and Graves (BGG) Unit, be implemented around the heritage receptor. A fence and access gate should be erected around each burial site. A distance of at least 2m should be maintained between the graves and the fence which should be at least 1,8m high. Clear signboard should be erected indicating the heritage sensitivity of the sites and contact details for visitation of the graves. The developer should carefully liaise with the heritage specialist and SAHRA with regards to the management and monitoring of any human grave or cemetery in order to detect and manage negative impact on the sites. In addition, a Site Management Plan should be implemented detailing conservation measures for the graves and responsible parties in this regard. Should impact on the resources prove inevitable, the graves should be relocated by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials (see Addendum 1).
- It should be noted that the site survey for the Eskom Mhinga Route Deviation Project AIA proved to be constrained by dense and often impenetrable vegetation. Dense vegetation not only restricted free movement on the site but obstructed much of the farm in terms of surface visibility. As such, the possibility exists that individual sites could be missed and it recommended that the initial stages of the development be monitored to re-assess the presence of possible heritage resources in the project area.
- As burials have been located on the project property, it is recommended that the EIA public participation and social consultative process address the possibility of further graves occurring in the project area.

- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the Study Area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.

Eskom Mhinga Route Deviation Project Heritage Sites Locations

Site Code	Coordinate S E	Short Description	Mitigation Action
EXIGO-MHI-BP01	S22.83084° E30.88568°	Burial Site	**Avoidance: 50**m conservation buffers, site fencing and access control, site management plan **Site monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage of the area. **Grave Relocation:** Grave relocation subject to authorizations and permitting if impacted on.
EXIGO-MHI-BP02	S22.82211° E30.87290°	Burial Site	
EXIGO-MHI-BP03	S22.92474° E30.85384°	Burial Site	
EXIGO-MHI-SA01	S22.82134° E30.88045°	Stone Age Occurrence	**Site Monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage occurrences of the site.
EXIGO-MHI-IA01	S22.93148° E30.85236°	Probable Iron Age Settlement Area	**Phase 2 Assessment:** Limited Phase 2Investigations (documentation, site sampling) subject to relevant permitting. **Permitting:** Apply for alteration / destruction permits if sites are impacted on. **Site Monitoring:** Site monitoring by the heritage consultant or an ECO familiar with the heritage occurrences of the site.
EXIGO- BOD -FT01	S22.91754° E30.85174°	Unknown Stone Feature	Test provenience of the sites by means of non-intrusive or intrusive methods, should impact on the sites prove inevitable. If the features prove to be human burials, relevant and applicable mitigation and site management measures should apply.
EXIGO- BOD -FT02	S22.92125° E30.85185°	Unknown Stone Feature	

This report details the methodology, limitations and recommendations relevant to these heritage areas, as well as areas of proposed development. It should be noted that recommendations and possible mitigation measures are valid for the duration of the development process, and mitigation measures might have to be implemented on additional features of heritage importance not detected during this Phase 1 assessment (e.g. uncovered during the construction process).

NOTATIONS AND TERMS/TERMINOLOGY

Absolute dating: Absolute dating provides specific dates or range of dates expressed in years.

Archaeological record: The archaeological record minimally includes all the material remains documented by archaeologists. More comprehensive definitions also include the record of culture history and everything written about the past by archaeologists.

Artefact: Entities whose characteristics result or partially result from human activity. The shape and other characteristics of the artefact are not altered by removal of the surroundings in which they are discovered. In the Southern African context examples of artefacts include potsherds, iron objects, stone tools, beads and hut remains.

Assemblage: A group of artefacts recurring together at a particular time and place, and representing the sum of human activities.

Context: An artefact's context usually consists of its immediate *matrix*, its *provenience* and its *association* with other artefacts. When found in *primary context*, the original artefact or structure was undisturbed by natural or human factors until excavation and if in *secondary context,* disturbance or displacement by later ecological action or human activities occurred.

Cultural Heritage Resource: The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

Cultural landscape: A cultural landscape refers to a distinctive geographic area with cultural significance.

Cultural Resource Management (CRM): A system of measures for safeguarding the archaeological heritage of a given area, generally applied within the framework of legislation designed to safeguard the past.

Feature: Non-portable artefacts, in other words artefacts that cannot be removed from their surroundings without destroying or altering their original form. Hearths, roads, and storage pits are examples of archaeological features

Impact: A description of the effect of an aspect of the development on a specified component of the biophysical, social or economic environment within a defined time and space.

Lithic: Stone tools or waste from stone tool manufacturing found on archaeological sites.

Matrix: The material in which an artefact is situated (sediments such as sand, ashy soil, mud, water, etcetera). The matrix may be of natural origin or human-made.

Midden: Refuse that accumulates in a concentrated heap.
Microlith: A small stone tool, typically knapped of flint or chert, usually about three centimetres long or less.
Monolith: A geological feature such as a large rock, consisting of a single massive stone or rock, or a single piece of rock placed as, or within, a monument or site.

Phase 1 CRM Assessment: An Impact Assessment which identifies archaeological and heritage sites, assesses their significance and comments on the impact of a given development on the sites. Recommendations for site mitigation or conservation are also made during this phase.

Phase 2 CRM Study: In-depth studies which could include major archaeological excavations, detailed site surveys and mapping / plans of sites, including historical / architectural structures and features. Alternatively, the sampling of sites by collecting material, small test pit excavations or auger sampling is required. Mitigation / Rescue involves planning the protection of significant sites or sampling through excavation or collection (in terms of a permit) at sites that may be lost as a result of a given development.

Phase 3 CRM Measure: A Heritage Site Management Plan (for heritage conservation), is required in rare cases where the site is so important that development will not be allowed and sometimes developers are encouraged to enhance the value of the sites retained on their properties with appropriate interpretive material or displays.

Provenience: Provenience is the three-dimensional (horizontal and vertical) position in which artefacts are found. Fundamental to ascertaining the provenience of an artefact is *association,* the co-occurrence of an artefact with other archaeological remains; and *superposition,* the principle whereby artefacts in lower levels of a matrix were deposited before the artefacts found in the layers above them, and are therefore older.

Random Sampling: A probabilistic sampling strategy whereby randomly selected sample blocks in an area are surveyed. These are fixed by drawing coordinates of the sample blocks from a table of random numbers.

Scoping Assessment: The process of determining the spatial and temporal boundaries (i.e. extent) and key issues to be addressed in an impact assessment. The main purpose is to focus the impact assessment on a manageable number of important questions on which decision making is expected to focus and to ensure that only key issues and reasonable alternatives are examined. The outcome of the scoping process is a Scoping Report that includes issues raised during the scoping process, appropriate responses and, where required, terms of reference for specialist involvement.

Site (Archaeological): A distinct spatial clustering of artefacts, features, structures, and organic and environmental remains, as the residue of human activity. These include surface sites, caves and rock shelters, larger open-air sites, sealed sites (deposits) and river deposits. Common functions of archaeological sites include living or habitation sites, kill sites, ceremonial sites, burial sites, trading, quarry, and art sites,

Stratigraphy: This principle examines and describes the observable layers of sediments and the arrangement of strata in deposits

Systematic Sampling: A probabilistic sampling strategy whereby a grid of sample blocks is set up over the survey area and each of these blocks is equally spaced and searched.

Trigger: A particular characteristic of either the receiving environment or the proposed project which indicates that there is likely to be an *issue* and/or potentially significant *impact* associated with that proposed development that may require specialist input. Legal requirements of existing and future legislation may also trigger the need for specialist involvement.

LIST OF ABBREVIATIONS

Abbreviation	Description
ASAPA	Association for South African Professional Archaeologists
AIA	Archaeological Impact Assessment
BP	Before Present
BCE	Before Common Era
BGG	Burial Grounds and Graves
CRM	Culture Resources Management
EIA	Early Iron Age (also Early Farmer Period)
EIA	Environmental Impact Assessment
EFP	Early Farmer Period (also Early Iron Age)
ESA	Earlier Stone Age
GIS	Geographic Information Systems
HIA	Heritage Impact Assessment
ICOMOS	International Council on Monuments and Sites
K2/Map	K2/Mapungubwe Period
LFP	Later Farmer Period (also Later Iron Age)
LIA	Later Iron Age (also Later Farmer Period)
LSA	Later Stone Age
MIA	Middle Iron Age (also Early later Farmer Period)
MRA	Mining Right Area
MSA	Middle Stone Age
NHRA	National Heritage Resources Act No.25 of 1999, Section 35
PFS	Pre-Feasibility Study
PHRA	Provincial Heritage Resources Authorities
SAFA	Society for Africanist Archaeologists
SAHRA	South African Heritage Resources Association
YCE	Years before Common Era (Present)

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1 BACKGROUND

1.1 Scope and Motivation

Exigo Sustainability (Pty) Ltd (Exigo) was commissioned by Kantey & Templer Consulting Engineers to conduct an Archaeological Impact Assessment (AIA) study subject to an Environmental Impact Assessment (EIA) process for the proposed Eskom Mhinga Route Deviation Project in the Limpopo Province. The rationale of this AIA is to determine the presence of heritage resources such as archaeological and historical sites and features, graves and places of religious and cultural significance in previously unstudied areas; to consider the impact of the proposed project on such heritage resources, and to submit appropriate recommendations with regard to the cultural resources management measures that may be required at affected sites / features.

1.2 Project Direction

Exigo's expertise ensures that all projects be conducted to the highest international ethical and professional standards. As archaeological specialist for Exigo Sustainability, Mr Neels Kruger acted as field director for the project; responsible for the assimilation of all information, the compilation of the final consolidated AIA report and recommendations in terms of heritage resources on the demarcated project areas. Mr Kruger is an accredited archaeologist and Culture Resources Management (CRM) practitioner with the Association of South African Professional Archaeologists (ASAPA), a member of the Society for Africanist Archaeologists (SAFA) and the Pan African Archaeological Association (PAA) as well as a Master's Degree candidate in archaeology at the University of Pretoria.

1.3 Project Brief

Kantey & Templer Consulting Engineers (Pty) Ltd appointed Exigo Sustainability (Pty) Ltd (Exigo) to undertake a Heritage Impact Assessment process for the proposed construction of 3 power line deviations on Mahingas 258MT, Mahinga's Extension 259MT, Tshikundu 262MT, Pagelee 274MT and Kluster 293MT, Vhembe District Municipality in the Limpopo Province (hereafter referred to as the "Eskom Mhinga Route Deviation Project").

The Eskom Mhinga Powerline has been authorized but three deviations from original authorized route, totaling 8km are proposed. For these deviations, a corridor of 1000m (500m by 500m on both sides of the route) were investigated according to National Environmental Act, 1998 (Act no 107 of 1998) and Regulations on environmental impact assessment, regulation GNR 324, & 327.

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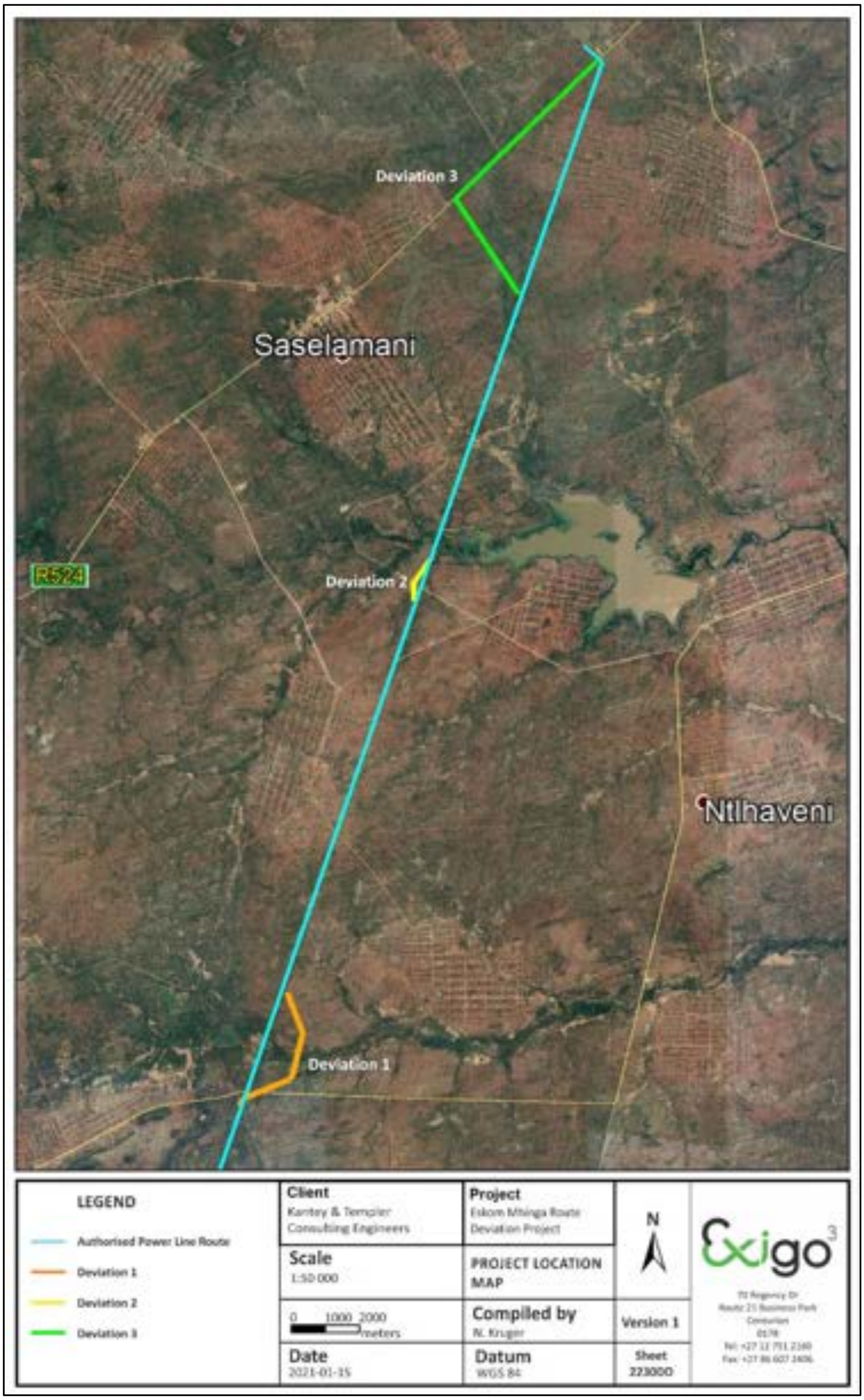

Figure 1-1: Map indicating the respective Deviations subject to the Eskom Mhinga Route Deviation Project.

1.4 Terms of Reference

Heritage specialist input into the Environmental Impact Assessment (EIA) process is essential to ensure that, through the management of change, developments still conserve our heritage resources. It is also a legal requirement for certain development categories which may have an impact on heritage resources. Thus, EIAs should always include an assessment of heritage resources. The heritage component of the EIA is provided for in the **National Environmental Management Act, (Act 107 of 1998)** and endorsed by section 38 of the **National Heritage Resources Act (NHRA - Act 25 of 1999)**. In addition, the NHRA protects all structures and features older than 60 years, archaeological sites and material and graves as well as burial sites. The objective of this legislation is to ensure that developers implement measures to limit the potentially negative effects that the development could have on heritage resources. Based hereon, this project functioned according to the following **terms of reference for** heritage specialist input**:**

- *Provide a detailed description of all archaeological artefacts, structures (including graves) and settlements which may be affected, if any.*
- *Assess the nature and degree of significance of such resources within the area.*
- *Establish heritage informants/constraints to guide the development process through establishing thresholds of impact significance;*
- *Assess and rate any possible impact on the archaeological and historical remains within the area emanating from the proposed development activities.*
- *Propose possible heritage management measures provided that such action is necessitated by the development.*
- *Liaise and consult with the South African Heritage Resources Agency (SAHRA). A Notification of Intent to Develop (NID) will be submitted to SAHRA at the soonest opportunity.*

1.5 CRM: Legislation, Conservation and Heritage Management

The broad generic term *Cultural Heritage Resources* refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

1.5.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and its provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

a. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act No 25 of 1999 (section 35) the following features are protected as cultural heritage resources:

a. Archaeological artefacts, structures and sites older than 100 years

b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography

c. Objects of decorative and visual arts

d. Military objects, structures and sites older than 75 years

e. Historical objects, structures and sites older than 60 years

f. Proclaimed heritage sites

g. Grave yards and graves older than 60 years

h. Meteorites and fossils

i. Objects, structures and sites of scientific or technological value.

In addition, the national estate includes the following:

a. Places, buildings, structures and equipment of cultural significance

b. Places to which oral traditions are attached or which are associated with living heritage

c. Historical settlements and townscapes

d. Landscapes and features of cultural significance

e. Geological sites of scientific or cultural importance

f. Archaeological and paleontological sites

g. Graves and burial grounds

h. Sites of significance relating to the history of slavery

i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.)

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(a) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(b) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(c) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(d) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(a) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(b) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(c) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

b. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves and burial grounds are commonly divided into the following subsets:

a. ancestral graves
b. royal graves and graves of traditional leaders
c. graves of victims of conflict
d. graves designated by the Minister
e. historical graves and cemeteries
f. human remains

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and Ordinance on Excavations (Ordinance no. 12 of 1980) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments.

c. National Heritage Resources Act No 25 of 1999, section 35

This act (Act 107 of 1998) states that a survey and evaluation of cultural resources must be done in areas where development projects, that will change the face of the environment, will be undertaken. The impact of the development on these resources should be determined and proposals for the mitigation thereof are made. Environmental management should also take the cultural and social needs of people into account. Any disturbance of landscapes and sites that constitute the nation's cultural heritage should be avoided as far as possible and where this is not possible the disturbance should be minimized and remedied.

1.5.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

A detailed guideline of statutory terms and requirements is supplied in Addendum 1.

2 REGIONAL CONTEXT

2.1 Area Location

The proposed Eskom Mhinga Route Deviation Project occurs on Mahingas 258MT, Mahinga's Extension 259MT, Tshikundu 262MT, Pagelee 274MT and Kluster 293MT in the Vhembe District Municipality, Limpopo Province. The project area is situated approximately 35km east of the town of Thohoyandou and 10km west of the Punda Maria gate to the Kruger National Park. The project area is located south of the R524 road connecting to Thohoyandou.

The study areas appear on 1:50000 map sheet 2230DD (see Figure 2-1) and a key location point for the project is:

- **Corridor 1: S22.92539° E30.84762°**
- **Corridor 2: S22.86284° E30.86977°**
- **Corridor 3: S22.80975° E30.88523°**

2.2 Area Description: Receiving Environment

The project area occurs along the far-southern slopes and plains of the Soutpansberg. The vegetation according to Mucina and Rutherford (2006) is classified as Tzaneen Sour Bushveld. The annual average rainfall in the area varies between 550 – 850 mm, occurring mostly in the summer months. The study area is located within the quaternary drainage regions A91A and A91B. The regional topography of the study area is classified as undulating plains, with the soils mostly suitable for tree farming. An ecological assessment and wetland delineation will be conducted and included in the EIA Report.

2.3 Site Description

The proposed project is situated in a rural settlement zones along the southern Soutpansberg, around villages such as Maphophe, Saselamani, Xaswita and Gijamandzini. The area has been heavily impacted on by farming practices and human settlement during the last century where large portions of the landscape subject to this assessment has been transformed into cultivated lands in past decades. This has resulted in severe bush densification with alien species occurring in areas but pockets of indigenous vegetation remain in places along drainage lines. An ESKOM power line with a large cleared servitude bisects the project area to the north and a number of regional dirt roads occur throughout the project area.

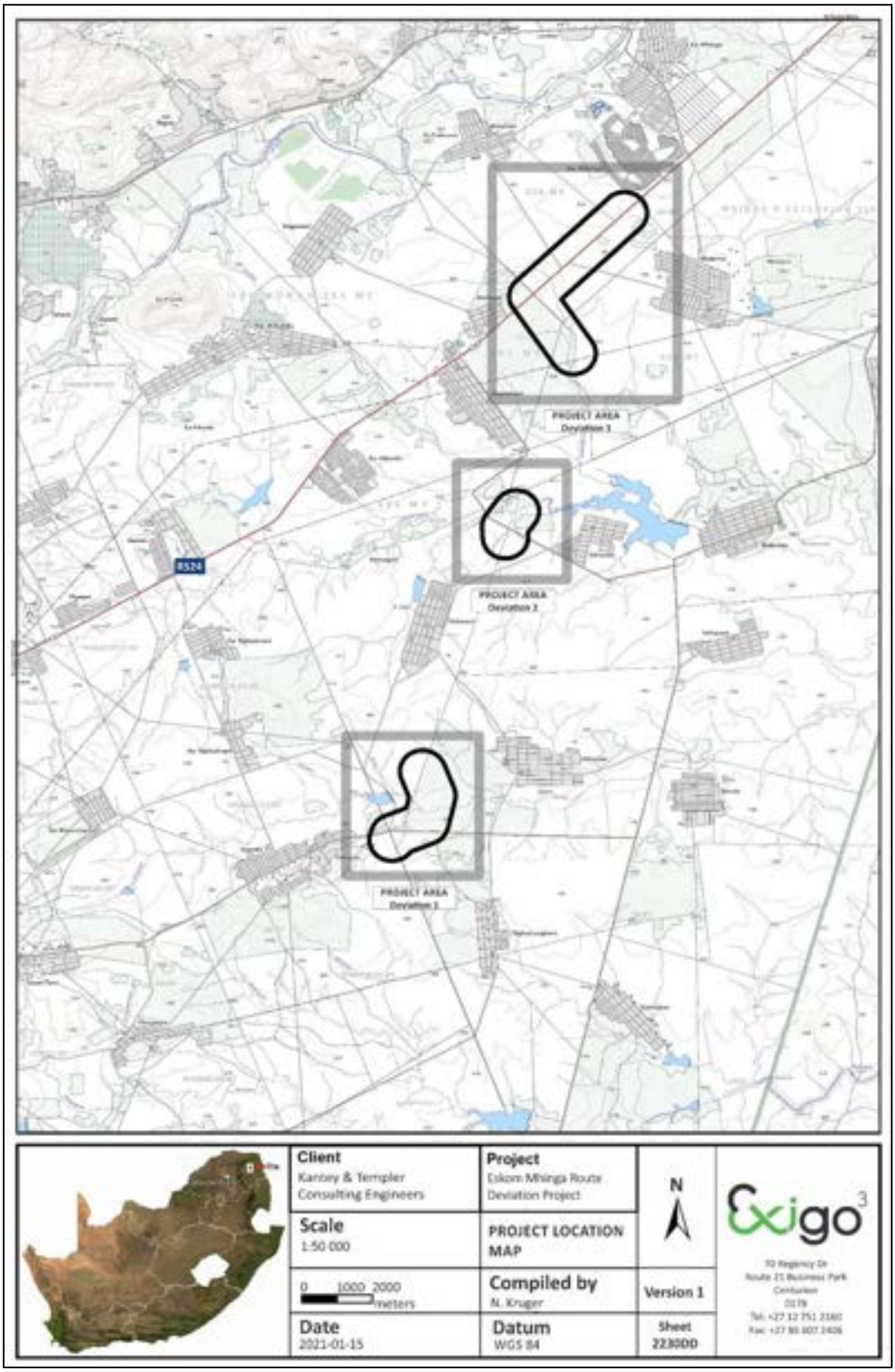

Figure 2-1: 1:50 00 Map representation of the location of the proposed Eskom Mhinga Route Deviation Project (sheet 2230DD).

Figure 2-2: Aerial map providing a regional context for the proposed Eskom Mhinga Route Deviation Project area. Note the 1000m corridors indicated in blue.

3 METHOD OF ENQUIRY

3.1 Sources of Information

Data from detailed desktop, aerial and field studies were employed in order to sample surface areas systematically and to ensure a high probability of heritage site recording.

3.1.1 Desktop Study

The larger landscape around Soutpansberg has been well documented in terms of its archaeology and history. Numerous academic papers and research articles supplied a historical context for the proposed project and archival sources, aerial photographs, historical maps and local histories were used to create a baseline of the landscape's heritage. In addition, the study drew on available unpublished Heritage Assessment reports to give a comprehensive representation of known sites in the study area.

3.1.2 Aerial Survey

Aerial photography is often employed to locate and study archaeological sites, particularly where larger scale area surveys are performed. Site assessment for the project relied heavily on this method to assist the challenging foot and automotive site survey. Here, depressions, variation in vegetation, soil marks and landmarks were examined and specific attention was given to shadow sites (shadows of walls or earthworks which are visible early or late in the day), crop mark sites (crop mark sites are visible because disturbances beneath crops cause variations in their height, vigour and type) and soil marks (e.g. differently coloured or textured soil (soil marks) might indicate ploughed-out burial mounds). Attention was also given to moisture differences, as prolonged dampening of soil as a result of precipitation frequently occurs over walls or embankments. In addition, historical aerial photos obtained during the archival search were scrutinized and features that were regarded as important in terms of heritage value were identified and if they were located within the boundaries of the project area they were physically visited in an effort to determine whether they still exist and in order to assess their current condition and significance. By superimposing high frequency aerial photographs with images generated with Google Earth as well as historical aerial imagery, potential sensitive areas were subsequently identified, geo-referenced and transferred to a handheld GPS device. These areas served as reference points from where further vehicular and pedestrian surveys were carried out.

3.1.3 Mapping of sites

Similar to the aerial survey, the site assessment of the project area relied heavily on archive and more recent map renderings of the landscape to assist the challenging foot and automotive site survey where historical and current maps of the project area were examined. By merging data obtained from the desktop study and the aerial survey, sites and areas of possible heritage potential were plotted on these maps of the larger Soutpansberg area using GIS software. These maps were then superimposed on high-definition aerial representations in order to graphically demonstrate the geographical locations and distribution of potentially sensitive landscapes.

3.1.4 Field Survey

Archaeological survey implies the systematic procedure of the identification of archaeological sites. An archaeological survey of the Eskom Mhinga Route Deviation Project area was conducted in December 2020. The process encompassed a random field survey in accordance with standard archaeological practice by which heritage resources are observed and documented. During the survey, corridors of 500m by 500m on both sides of each of the deviations were investigated. As the project area is densely vegetated, particular focus was placed on GPS reference points identified during the aerial and mapping survey. Where possible, random spot checks were made and potentially sensitive heritage areas were investigated. Using a Garmin GPS, the survey was tracked and general surroundings were photographed with a Samsung Digital camera. Real time aerial orientation, by means of a mobile Google Earth application was also employed to investigate possible disturbed areas during the survey.

3.2 Limitations

3.2.1 Access

The study area is accessed via a network of regional and local roads connecting to the R524 route. Access control is not applied to the respective deviations and no access restrictions onto the site were encountered during the site visit. However, dense vegetation restricted free movement on some portions of the project areas.

3.2.2 Visibility

The surrounding vegetation in the project area mostly comprised out of disused and cultivated farmlands, dense pockets of pioneering species, occasional trees and mixed grasslands. The general visibility at the time of the AIA survey (December 2020) ranged from moderate to low and the archaeological observations on site was restricted by dense vegetation in certain portions of the project area. In single cases during the survey sub-surface inspection was possible. Where applied, this revealed no archaeological deposits.

Figure 3-1: View of general surroundings in the project area along the eastern section of Deviation 1.

Figure 3-2: View of general surroundings in the project area at Deviation 1.

Figure 3-3: View of vegetation in the project area at Deviation 1.

Figure 3-4 View of dense vegetation in the project area Deviation 1.

Figure 3-5: View of a small hill in a southern section of Deviation 1.

Figure 3-6: View of tall vegetation in the project area at Deviation 1.

Figure 3-7: View of dense vegetation in the project area Deviation 1.

Figure 3-8: View of disused agricultural fields and grass cover in the project area at Deviation 2.

Figure 3-9: View of cultivated crop fields at Deviation 2.

Figure 3-10: View of a small informal dwelling at cultivated crop fields at Deviation 2.


Figure 3-11: View of dense vegetation in the project area Deviation 2.


Figure 3-12: View of an informal dwelling at cultivated crop fields at Deviation 2.


Figure 3-13: View of vegetation at Deviation 3.

Figure 3-13: View of a large drainage line in Deviation 3.

Figure 3-13: View of dense pioneering species cover in at Deviation 3.

Figure 3-13: View of a decommissioned old livestock drinking trough at Deviation 3.

Figure 3-13: View of the alignment of Deviation 3 through Maphophe.

Figure 3-13: View of the alignment of Deviation 3 along the R524 road.

3.2.3 Summary: Limitations and Constraints

The site survey for the Eskom Mhinga Route Deviation Project AIA proved to be constrained and the investigation primarily focused around areas tentatively identified as sensitive and of high heritage probability (i.e. those noted during the mapping and aerial survey) as well as areas of potential high human settlement catchment. In summary, the following constraints were encountered during the site survey:

- The surrounding vegetation in the project area mostly comprised out of cultivated and disused farmlands vegetated by dense pockets of pioneering species, occasional trees and mixed grasslands. The general visibility at the time of the site inspection ranged from moderate to low and visibility proved to be a constraint in the project area.
- Dense vegetation restricted free movement on portions of the project landscape and this proved to be a constraint during the site assessment of the project are.

Cognisant of the constraints noted above, it should be stated that the possibility exists that individual sites could be missed due to the localised nature of some heritage remains as well as the possible presence of sub-surface archaeology. Therefore, maintaining due cognisance of the integrity and accuracy of the archaeological survey, it should be stated that the heritage resources identified during the study do not necessarily represent all the heritage resources present in the project area. The subterranean nature of some archaeological sites, dense vegetation cover and visibility constraints sometimes distort heritage representations and any additional heritage resources located during consequent development phases must be reported to the Heritage Resources Authority or an archaeological specialist.

3.3 Impact Assessment

For consistency among specialists, impact assessment ratings by Exigo Specialist are generally done using the Plomp[1] impact assessment matrix scale supplied by Exigo. According to this matrix scale, each heritage receptor in the study area is given an impact assessment.

4 ARCHAEO-HISTORICAL CONTEXT

4.1 The archaeology of Southern Africa

Archaeology in Southern Africa is typically divided into two main fields of study, the **Stone Age** and the **Iron Age** or **Farmer Period**. The following table provides a concise outline of the chronological sequence of periods, events, cultural groups and material expressions in Southern African pre-history and history.

Table 1 Chronological Periods across Southern Africa

Period	Epoch	Associated cultural groups	Typical Material Expressions
Early Stone Age 2.5m – 250 000 YCE	Pleistocene	Early Hominins: *Australopithecines* *Homo habilis* *Homo erectus*	Typically large stone tools such as hand axes, choppers and cleavers.
Middle Stone Age 250 000 – 25 000 YCE	Pleistocene	First *Homo sapiens* species	Typically smaller stone tools such as scrapers, blades and points.
Late Stone Age 20 000 BC – present	Pleistocene / Holocene	*Homo sapiens sapiens* including San people	Typically small to minute stone tools such as arrow heads, points and bladelets.
Early Iron Age / Early Farmer Period 300 – 900 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	First Bantu-speaking groups	Typically distinct ceramics, bead ware, iron objects, grinding stones.
Middle Iron Age (Mapungubwe / K2) / early Later Farmer Period 900 – 1350 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Bantu-speaking groups, ancestors of present-day groups	Typically distinct ceramics, bead ware and iron / gold / copper objects, trade goods and grinding stones.

[1] Plomp, H.,2004

Late Iron Age / Later Farmer Period 1400 AD -1850 AD **(commonly restricted to the interior and north-east coastal areas of Southern Africa)**	Holocene	Various Bantu-speaking groups including Venda, Thonga, Sotho-Tswana and Zulu	Distinct ceramics, grinding stones, iron objects, trade objects, remains of iron smelting activities including iron smelting furnace, iron slag and residue as well as iron ore.
Historical / Colonial Period ±1850 AD – present	Holocene	Various Bantu-speaking groups as well as European farmers, settlers and explorers	Remains of historical structures e.g. homesteads, missionary schools etc. as well as, glass, porcelain, metal and ceramics.

4.2 Discussion: The Soutpansberg Heritage Landscape

The history of the eastern Limpopo Province is reflected in a rich archaeological landscape. The interaction between the climate, geology, topography, and the fauna and flora in the Highveld over millions of years has established a milieu in which prehistoric and historic communities thrived. A number of archaeological and historical studies have been conducted in this section of the Limpopo Province. Many of these studies infer a rich and diverse archaeological landscape - to the extent where it has been suggested that the entire landscape should be considered a cultural landscape based on its extended history of human occupation (Murimbika 2008). Stone Age remains are scattered throughout the area (e.g. Pistorius 2007) including Early- (e.g. Roodt 2002b), Middle- (e.g. Roodt 1997; Pistorius 2008) and numerous Late Stone Age sites or surface collections of stone tools. The Limpopo Valley is known for its rock art and rock engravings with one assessment locating a set of engravings in a shelter to the north of the study area (Stegmann & Roodt 2008). Pistorius (2007) documented a Late Iron Age site north of the study area and referred to the nearby destruction of the Princess Hill site on top of which a landowner constructed a house. Roodt (1997) identified nine sites to the north of the study area with significant archaeological remains spanning 11th Century Eiland to recent Venda habitation including Zwigodini with its Moloko, Khami and Shona traditions. Other sites were also characterised by significant overlapping of traditions and included features such as stone walling, evidence of metal-working in the form of slag, artefacts such as spindle whorls and ironstone outcrops with evidence of early mining (Roodt 1997). A number of graves dating up to recent times were identified by various assessments (e.g. Pistorius 2007; Munyai & Roodt 2007; Pistorius 2008) including a historical graveyard in Makhado some distance to the west of the study area, which included the graves of at least 40 people including one dated to 1903 (Roodt 2003). Nearby this graveyard is a monument erected in 1988 to commemorate João Albasini (Roodt 2003). A number of studies addressed the later history of the region with one describing the history of Lemana School (south of the current study area at Waterval) and the relationship with the Swiss Mission in nearby Elim.

4.2.1 Early History and the Stone Ages

According to archaeological research, the earliest ancestors of modern humans emerged some two to three million years ago. The remains of Australopithecine and *Homo habilis* have been found in dolomite caves and underground dwellings in the Riverton Area at places such as Sterkfontein and Swartkrans near Krugersdorp. Homo habilis, one of the Early Stone Age hominids, is associated with Oldowan artefacts, which include crude implements manufactured from large pebbles. The Acheulian industrial complex replaced the Oldowan industrial complex during the Early Stone Age. This phase of human existence was widely distributed across South Africa and is associated with *Homo erectus*, who manufactured hand axes and cleavers from as early as one and a half million years ago. Middle Stone Age sites dating from as early as two hundred thousand years ago have been found all over South Africa. Middle Stone Age hunter-gatherer bands also lived and hunted in the Orange and Vaal River valleys. These people, who probably looked like modern humans, occupied campsites near water but also used caves as dwellings. They manufactured a wide range of stone tools, including blades and point s that may have had long wooden sticks as hafts and were used as spears. Excavations at Makapansgat near to Mokopane provided evidence of occupation by Australopithecus africanus from approximately 3.3 million years ago. There is evidence of long occupation from the Cave of Hearths with stone tools and associated debris from a date of 400,000 B.P while upper strata are characterised by Middle Stone Age assemblages of 110,000 to 50,000 B.P. and Late Stone Age assemblages dating from 10,000 to 5,000 years B.P. characterised by the Smithfield B industry. The site is one of the few to exhibit Acheulean assemblages in Southern Africa and also contains overlying Middle Stone Age Howiessonspoort industry tools and early evidence of fire use (Bergh, 1999; Mitchell, 2002). Both ESA and MSA sites are known from the Limpopo Valley as well as lithic industries that appear to be transitional between the two ages and with dates estimated at 300,000 years ago (Kuman et al. 2005).The presence of numerous rock art sites with associated stone tool assemblages in the Limpopo River basin, Blouberg, Makgabeng, Waterberg and Soutpansberg attests to the presence of Late Stone Age San/Bushman communities across the region (e.g. Pager, 1973: Eastwood et al., 2002). The Central Limpopo Basin, including the Soutpansberg, Limpopo Valley, the Blouberg-Makgabeng area and the Pafuri area, has over 700 documented rock art sites and is one of the few regions where paintings and engravings occur, sometimes at the same site (Eastwood and Hanisch 2003).

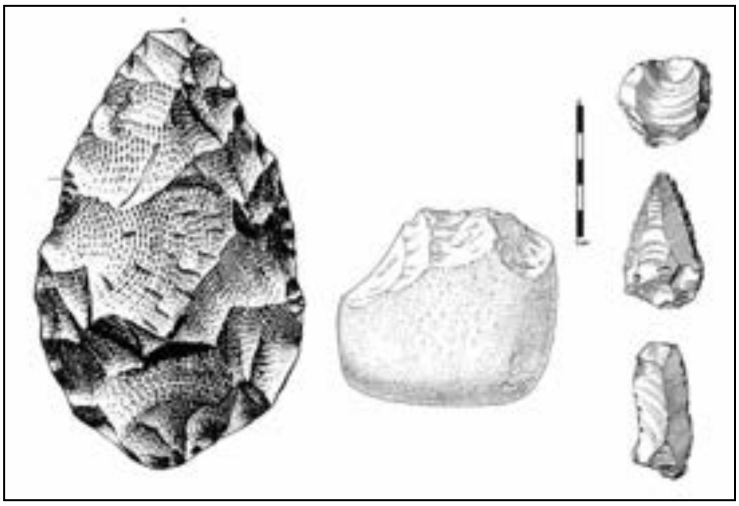

Figure 4-1: Typical ESA handaxe (left) and cleaver (center). To the right is a MSA scraper (right, top), point (right, middle) and blade (right, bottom).

4.2.2 Iron Age / Farmer Period

The beginnings of the Iron Age (Farmer Period) in Southern Africa are associated with the arrival of a new Bantu speaking population group at around the third century AD. These newcomers introduced a new way of life into areas that were occupied by Later Stone Age hunter-gatherers and Khoekhoe herders. Distinctive features of the Iron Age are a settled village life, food production (agriculture and animal husbandry), metallurgy (the mining, smelting and working of iron, copper and gold) and the manufacture of pottery. Iron Age people moved into Southern Africa by c. AD 200, entering the area either by moving down the coastal plains, or by using a more central route. From the coast they followed the various rivers inland. Being cultivators, they preferred rich alluvial soils. The Iron Age can be divided into three phases. The Early Iron Age includes the majority of the first millennium A.D. and is characterised by traditions such as Happy Rest and Silver Leaves. The Middle Iron Age spans the 10th to the 13th Centuries A.D. and includes such well known cultures as those at K2 and Mapungubwe. The Late Iron Age is taken to stretch from the 14th Century up to the colonial period and includes traditions such as Icon and Letaba.

The Vhembe District (the Limpopo and Luvuvhu river valleys in particular) contains some of the earliest and most significant Iron-Age settlements in the region including Schroda, K2 and the Mapungubwe National and World Heritage Site north of the Soutpansberg and Thulamela to the east of the mountain range in the Kruger National Park. The Early Iron Age is represented by a number of sites such as Happy Rest in the Soutpansberg (Hanisch E.O.M, 2003). The Middle Iron Age in the region and the sequence of settlement development and the growing importance of trade networks has been extensively described (e.g. Leslie & Maggs 2000; Bonner & Carruthers 2003) with in depth studies on, amongst others, ethnic stratification, climate change and herding strategies, glass beads and international trade, the ethno-archaeology and archaeology of rainmaking, settlements and landscapes, faunal remains and agricultural production (Huffman 2011). The origin of the local VhaVenda people has been investigated and there is some question as to the degree to which the origins of the people was local or not. The local origins theory falls roughly into the following sequence. Between 1300 and 1450 AD Mapungubwe ceramics related to Shona speakers dominated north of the Soutpansberg while Moloko ceramics, the product of Sotho speakers, were prevalent in the south. From 1450 AD Khami ceramics and associated settlements bore witness to a revived influence from new Shona dynasties in Zimbabwe and by 1550 AD the Letaba facies had arisen from the fusion of Shona and Sotho cultures. The origin of the VhaVenda appears therefore to be local as characterised in the archaeological sequence and it seems likely that a common Venda identity had developed by the 1600s (Loubser 1989). According to Stayt (1968), the “BaVenda” broke away from the Karanga in Zimbabwe and crossed the Limpopo entering the Soutpansberg region in two main streams of migration, the Vhatavhatsinde followed by the Singo, during the latter part of the 17th century. These groups found other tribes already in occupation including the Ngona, Mbedzi, and Twamamba and most researchers are of the opinion that peaceful integration between them took place under the rule of Chief Thohoyandou (Eloff 1968). Another two chiefs and their followers were integrated with the VhaVenda during the rule of Tshikalanga (the son of Thohoyandou). These chiefs were Madzivhandila and Lwamondo who were most probably of Sotho origin and who were appointed as keepers of the chief’s cattle, becoming assimilated into the VhaVenda tribe and culture (Stayt 1968). A number of Iron Age Sites in the region have Provincial Heritage Site status including: Dzata II, Verdun and the Machemma ruins and a number of others have been indicated to be of particular importance including Mutulowe, Tshitaka tsha Makoleni, Mukumbane and the Tshiungani complex (Hanisch 2003).

4.2.3 Later History: Reorganization, Colonial Contact and living heritage.

The beginning of the Historical Period overlaps the demise of the late Stone and Iron Ages and is characterised by the first written accounts of the region from 1600 A.D. A number of early European travellers visited the area from the early 19th Century onwards including Carl Mauch (Burke 1969) and the region saw European settlement and influence from the late 1830’s with the arrival of Louis Trichardt and Hendrik Potgieter and the subsequent establishment of the town of Soutpansbergdorp (later renamed Schoemansdal) in 1848 (Tempelhoff 1999). Given the high summer temperatures, low rainfall and incidence of Malaria the Limpopo Valley was not settled early by European colonists whose earliest settlements, including Soutpansbergdop and Schoemansdal, were located in the cooler, better watered region to the south of the Soutpansberg. It is well known that these early settlements were to a large extent based on the hunting of elephant for ivory, largely herds in the Limpopo Valley to the north. Famous early traders in the region included Coenraad de Buys and João Albasini (Bonner & Carruthers 2003). João Albisini entered the Soutpansberg region in 1848 as a trader and settled on his farm Goedewensch at Piesanghoek from 1857. He later became the local Native Administrator who collected taxes and recorded incidents in the region (Tempelhoff 1999). In 1855 Joaquim de Santa Rita Montanha led a party from Inhambane to the Soutpansberg, following the Limpopo Valley. It was remarked upon that after crossing the River Tave (Save) that “every day they passed and slept in towns or villages of the cultivators, and readily procured the supplies they required” (MacQueen 1862). Further exploration of the course of the Limpopo River was undertaken by Frederick Elton in 1870, who remarked on the “many kraals” and “fertile country” at the junction of the Limpopo and 'Nuanetzi' Rivers (Elton 1871 – 1872). The Berlin Mission Society established a mission station at Ha-Tshivhase in 1872 and another at Tshakuma in 1874. The mission stations, missionaries and gospel played an intricate and important part in the growth and development of the different groups and societies in the Soutpansberg region (Giesekke 2004; Kirkaldy 2005). Two Swiss missionaries, Dr. Henri Berthoud and Reverend Creux, opened a Mission Station at Lwalani, which they called Valdezia, in 1875 to undertake missionary work among the Tsonga-Shangana communities of the area. Elim Mission Station was established in 1879 and the Elim Hospital was established in 1899 (Giesekke 2004; Kirkaldy 2005). During the Anglo-Boer War a brief battle was fought between Rhodesian and Boer forces in the vicinity of Rhodes Drift on the Limpopo some distance to the north west of the study area. The area between then Pietersburg and the Soutpansberg saw guerrilla activity during the war but it is the infamous actions of the Bushveld Carbineers, particularly the murder of civilians by Harry "Breaker" Morant, that the wider area is best known for (Davey 1987). According to Bonner and Carruthers (2003) one overall effect of the war on the area to the north was the total effacing of a 'previously negligible' white presence and the re-occupation of their land by formerly displaced black communities. The first white farmer settled in the Levubu Valley in 1871 and the farm "Grootgeluk" (later known as "Nooitgedacht") was proclaimed in 1879 . After 1900 European farmers were further encouraged by the government to occupy farms in the valley in an effort mainly to compromise for land losses in other parts of the province (Bonner & Carruthers 2003). Many of the farms in the Mhinga area were surveyed towards the end of the 19th century.

5 RESULTS: ARCHAEOLOGICAL SURVEY

5.1 The Off-Site Desktop Survey

In terms of heritage resources, the general landscape around the project area is primarily well known for its Iron Age Farmer and Colonial / Historical Period archaeology related to farming, rural expansion and warfare of the past century. In an HIA Assessment conducted by Murimbika (2012) in the project area[2], a recent historic homestead and three burial sites were recorded in the larger landscape but outside of the project area subject to the Eskom Mhinga Route Deviation Project. No further reference to archaeological sites or features of heritage potential were recorded during an examination of published literature thematically or geographically related to the project area.

An analysis of historical aerial imagery and archive maps reveal the following (see Figure 5-1 to Figure 5-3):

- The Mhinga area is indicated on an early map of the Soutpansberg (Bertoud 1903).
- A number of so-called "huts" and a "voerkraal" (feeding lot) are indicated on a 1967 topographic map of the area and vast cultivated fields across the region appear on a 1980 topographic map of the landscape.
- It is interesting to note that a recent study of on vegetation changes in the Soutpansberg during the past centuries note that southern slopes of the mountain were almost devoid of any tree or shrub growth at the end of the 19th century (Hahn 2018). The study, utilizing an extensive collection of archival photos, show the rapid transformation from high-rainfall grassland to secondary bush encroachment, alien infestation, silviculture and sub-tropical fruit orchards over the last 120 years. The study concluded that a major contributing factor for this radical vegetation change is anthropogenic activities, of which the project landscape seems a clear example.

[2] Murimbika, M. 2012. Archaeological and Heritage Impact Assessment (AIA/HIA) Study for the proposed Mbahe- Mhinga powerline development, Thulamela Local Municipality, Limpopo Provincee. Nzumbululo Heritage Solutions

Figure 5-1: An archive photo of "Pisang Kop", which shows its southern slopes as almost devoid of any tree or shrub growth (Hahn 2018) https://www.zoutnet.co.za/

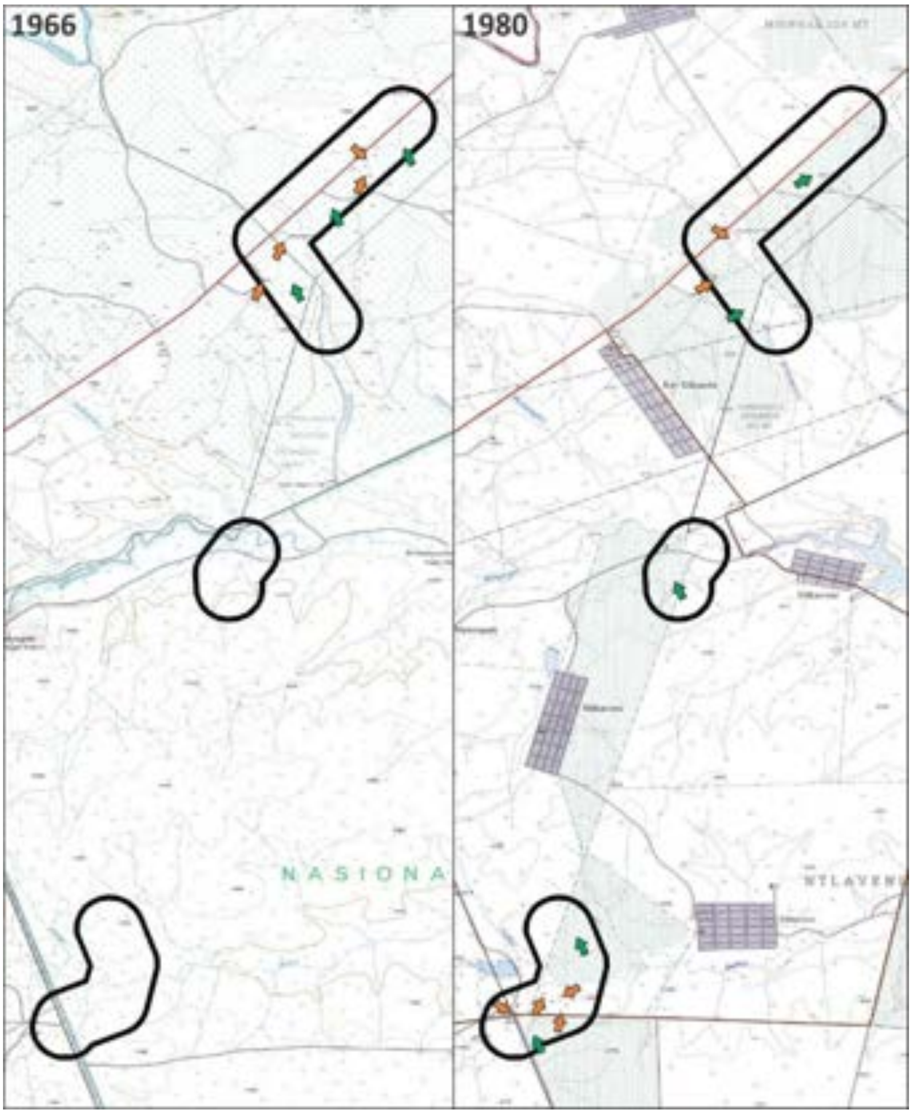

Figure 5-2: Historical topographic maps dating to 1967 (left) and 1980 (right) indicating the location of the project area in the past decades. Man-made features are indicated by orange arrows and green arrows point to cultivated lands.

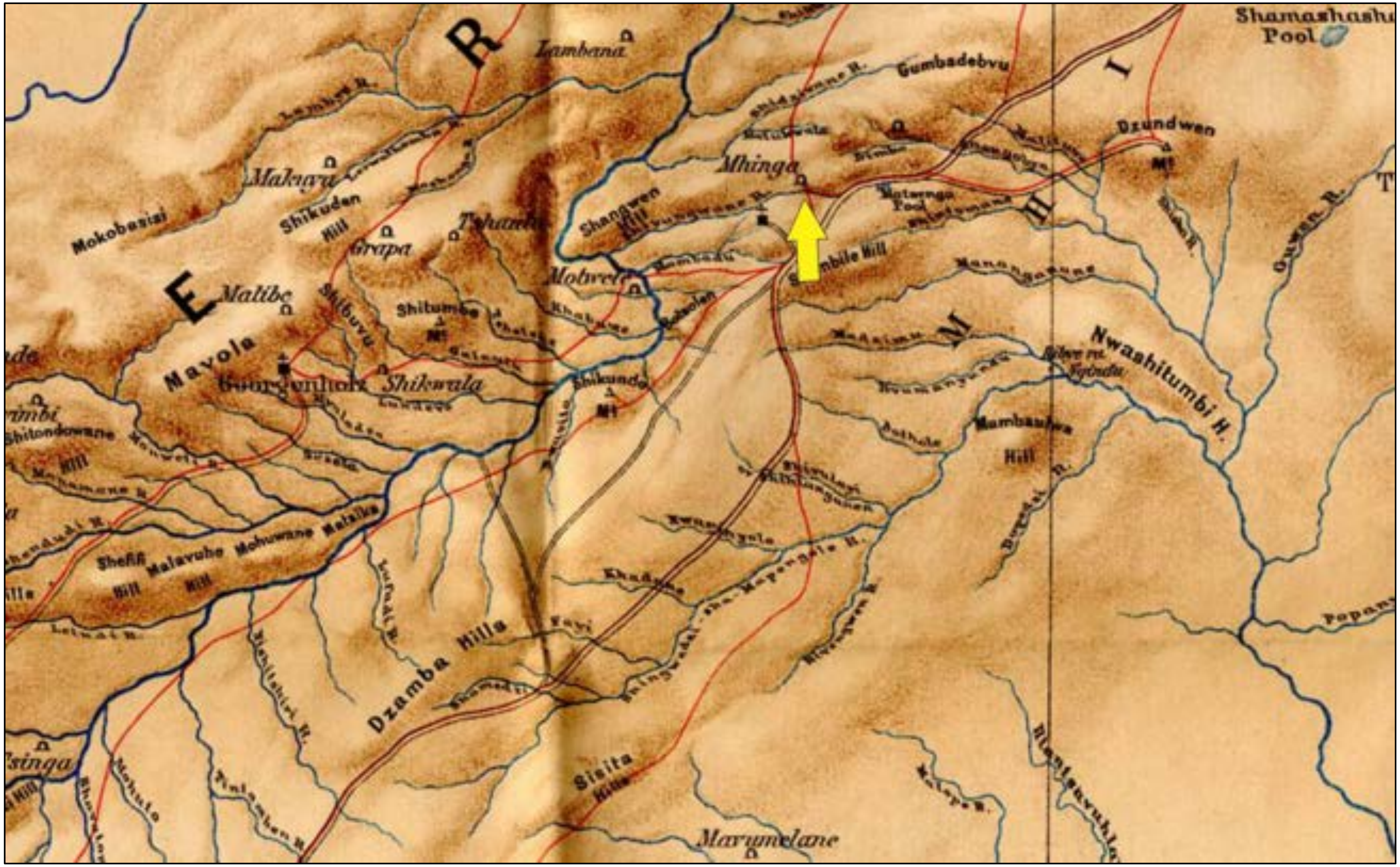

Figure 5-3: Historical map of the southern Soutpansberg dating to 1903 (Berthoud). The general location of Mhinga area is indicated by the yellow arrow.

5.2 The Archaeological Site Survey

An analysis of historical aerial imagery and archive maps of areas subject to this assessment suggests a landscape which has been subjected to historical agricultural activities possibly sterilising the area of heritage remains. This inference was confirmed during an archaeological site assessment but *in situ* heritage remains were nonetheless encountered. The following observations were made during the site survey:

5.2.1 Stone Age Localities

Isolated Stone Age localities were noted in eroded areas of the project footprint. The density of the material scatter was arbitrarily estimated by placing a one-meter drawing frame, sub-divided into quadrants, on a randomly-selected area displaying higher amounts of surface lithics. By plotting the counts of all lithic elements present in the 1x1 metre square relative density per m^2 was established and rated on a scale of low (<10), medium (10-20) and high (>20). This method has been adapted as expedient and non-invasive sampling technique that is particularly useful in value assessment of lithic occurrences during Phase 1 AIA's (see Van Der Ryst 2012).

- **Exigo-MHI-SA01 Stone Age Occurrence (Deviation 3)**
  S22.82134° E30.88045°

Stone Age remains occur abundantly in the larger Soutpansberg landscape where locally available raw material for the manufacture of stone tools is available in the geological landscape. Similarly, a single Middle Stone Age (MSA) tools (a core, a broken point and an adze) were noted near a drainage line within the corridor for Deviation 3. It is not possible to assign an age estimate without an in-depth analysis of a more representative sample and the context of the lithics has been lost. No evidence of any factory or workshop site, or the result of any human settlement was identified. The tools are abraded or weathered suggesting that they have lain on the surface for many years. The small numbers and disturbed context in which they were found means that these archaeological remains have been rated as having low archaeological significance.

Figure 5-4: MSA material from Site Exigo-MHI-SA01.

5.2.2 Iron Age Farmer Period Sites (Deviation 1)

- **Exigo-MHI-IA01 Possible Iron Age Farmer Settlement Area**
  S22.93148° E30.85236°

A possible later Iron Age settlement area were noted along a small, densely overgrown hill and adjoining fields within the corridor for Deviation 1. At the site, a number of small stone terraces and stone features, a possible grain bin stand and undecorated potshards were documented. The poorly preserved stone terraces and structures occur along the small hill and they probably indicate a Later Iron Age Farmer Period occupation / activity area. Preservation of the site is generally poor and associated Iron Age farmer Period material culture and other features are absent from this site. The site might be significant in terms of its regional and local representation in the Iron Age Farmer Period landscape of the area but it is rated as of low significance. The site is located within the Deviation 1 corridor and mitigation of the site is required during early stages of the project.

Figure 5-5: View of poorly preserved stone terracing at Site Exigo-MHI-IA01.

Figure 5-6: View of stone terracing at Site Exigo-MHI-IA01.

Figure 5-7: Single fragments of undecorated pottery from Site Exigo-MHI-IA01.

Figure 5-8: View of a possible grain bin stand at Site Exigo-MHI-IA01.

5.2.3 Burial Sites

- **Exigo-MHI-BP01 Burial Site (Deviation 3)**
  S22.83084° E30.88568°

A small burial site holding at least four graves was noted along the southern portion of the Deviation 3 corridor near an existing power line. The graves are dressed with marked marble headstones and tomb stones positioned in a relative east-west orientation, the site is fenced off and its condition of preservation is good. Material culture such as enamel and glass containers were noted on the surface in association with the graves. The burial site, which is of high heritage significance, is located within the Deviation 3 corridor and impact might occur (see Section 6).

Figure 5-9: View of the burial site at Site Exigo-MHI-BP01.

- **Exigo-MHI-BP02 Burial Site (Deviation 3)**
  S22.82211° E30.87290°

Another burial site holding a large number of graves was noted along the north-western portion of the Deviation 3 corridor. A number of graves are dressed with marked marble headstones and other burials are indicated by elongated stone circle features filled in with earth. Most of the burials area positioned in a relative east-west orientation, the site is not fenced off and its condition of preservation is fair. Material culture such as enamel and glass containers were noted on the surface in association with the graves. The burial site, which is of high heritage significance, is located within the Deviation 3 corridor and impact might occur (see Section 6).

Figure 5-10: View of the burial site at Site Exigo-MHI-BP02.

- **Exigo-MHI-BP03 Burial Site (Deviation 1)**
  S22.92474° E30.85384°

A possible single grave occurs in a disused agricultural field in a central portion of the Deviation 1 corridor. The feature is indicated by elongated stone cairn measuring approximately 1.6m x 1m and a crude stone was placed on one side, assumedly as headstone. The site is not fenced off and its condition of preservation is poor. The apparent burial site, which is of high heritage significance, is located within the Deviation 1 corridor and impact might occur (see Section 6).

Figure 5-11: View of the possible burial site at Site Exigo-MHI-BP03.

5.2.4 Other Sites / Features

- **Exigo-MHI-FT01 Stone Features**
  S22.91754° E30.85174°
- **Exigo-MHI-FT02 Stone Features**
  S22.92125° E30.85185°

A number of circular and irregular stone cairns and stone heaps were located a in a central and northern portion of the Deviation 1 corridor around disused agricultural fields. These features could have originated from agriculture activities where stones are commonly cleared from adjacent crop fields but the stone heaps might also indicate informal human graves. but it is also possible that the. The heritage significance of the sites, located within the Deviation 1 corridor, remains to be established - in particular of the sites are to be impacted on by the development.

Figure 5-12: View of an unidentified stone feature at Site Exigo-MHI-FT01.

Figure 5-13: View of another unidentified stone feature at Site Exigo-MHI-FT01.

Figure 5-14: View of an unidentified stone feature at Site Exigo-MHI-FT02.

Figure 5-15: View of another unidentified stone feature at Site Exigo-MHI-FT02.

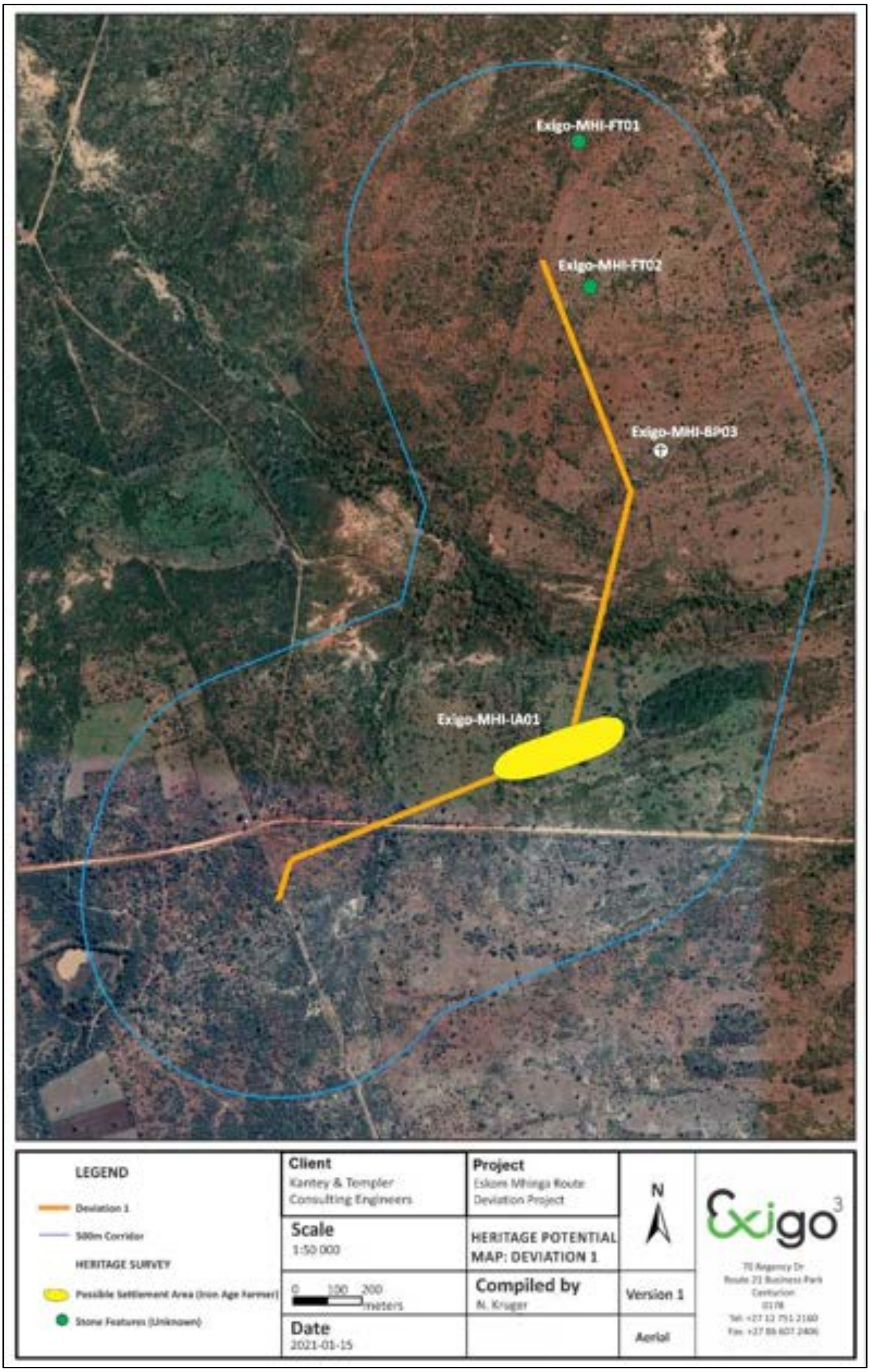

Figure 5-16: Aerial image indicating the location of heritage occurrences along Deviation 1, discussed in the text.

Figure 5-17: Aerial image indicating the location of heritage occurrences along Deviation 3, discussed in the text.

6 RESULTS: STATEMENT OF SIGNIFICANCE AND IMPACT RATING

6.1 Potential Impacts and Significance Ratings[3]

The following section provides a background to the identification and assessment of possible impacts and alternatives, as well as a range of risk situations and scenarios commonly associated with heritage resources management. A guideline for the rating of impacts and recommendation of management actions for areas of heritage potential within the study area is supplied in Section 10.2 of Addendum 3.

6.1.1 General assessment of impacts on resources

Generally, the value and significance of archaeological and other heritage sites might be impacted on by any activity that would result immediately or in the future in the destruction, damage, excavation, alteration, removal or collection from its original position, of any archaeological material or object (as indicated in the National Heritage Resources Act (No 25 of 1999)). Thus, the destructive impacts that are possible in terms of heritage resources would tend to be direct, once-off events occurring during the initial construction period. However, in the long run, the proximity of operations in any given area could result in secondary indirect impacts. The EIA process therefore specifies impact assessment criteria which can be utilised from the perspective of a heritage specialist study which elucidates the overall extent of impacts.

6.1.2 Direct impact rating

Direct or primary effects on heritage resources occur at the same time and in the same space as the activity, e.g. loss of historical fabric through demolition work. **Indirect effects or secondary effects** on heritage resources occur later in time or at a different place from the causal activity, or as a result of a complex pathway, e.g. restriction of access to a heritage resource resulting in the gradual erosion of its significance, which is dependent on ritual patterns of access (refer to Section 10.3 in the Addendum for an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected).

The following table summarizes impacts to the **low** significance Stone Age localities in the proposed Eskom Mhinga Route Deviation Project area **(Site Exigo-MHI-SA01)**:

NATURE OF IMPACT: Impact could involve displacement or destruction of heritage material in the study area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Minor	Minor
PROBABILITY	Definite	Very improbable
SIGNIFICANCE	Low	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Site monitoring.		

[3] Based on: W inter, S. & Baumann, N. 2005. *Guideline for involving heritage specialists in EIA processes: Edition 1.*

CUMULATIVE IMPACTS: Site monitoring by ECO.	
RESIDUAL IMPACTS: n/a	

The following table summarizes impacts to the **medium** significance Iron Age farmer settlement located in the proposed Eskom Mhinga Route Deviation Project area **(Site Exigo-MHI-IA01)**:

NATURE OF IMPACT: Impact could involve displacement or destruction of heritage material in the study area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Minor	Minor
PROBABILITY	Definite	Very improbable
SIGNIFICANCE	Medium	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Site monitoring.		
CUMULATIVE IMPACTS: Site monitoring by ECO, limited Phase 2 Assessment, destruction permitting if and when required.		
RESIDUAL IMPACTS: n/a		

The following table summarizes impacts to the **high** significance burial sites located in the proposed Eskom Mhinga Route Deviation Project area **(Site Exigo-MHI-BP01 - Site Exigo-MHI-BP03)**:

NATURE OF IMPACT: Impact could involve displacement or destruction of heritage material in the study area.		
	Without mitigation	**With mitigation**
EXTENT	Local	Local
DURATION	Permanent	Permanent
MAGINITUDE	Major	Minor
PROBABILITY	Probable	Very improbable
SIGNIFICANCE	High	Low
STATUS	Negative	Neutral
REVERSIBILITY	Non-reversible	Non-reversible
IRREPLACEABLE LOSS OF RESOURCES?	Yes	No
CAN IMPACTS BE MITIGATED?	Yes	
MITIGATION: Avoidance, infrastructure redesign, site management (fencing, access control), strict site monitoring by ECO. Grave Relocation. Public Participation		
CUMULATIVE IMPACTS: No cumulative impact is anticipated.		
RESIDUAL IMPACTS: n/a		

6.2 Evaluation Impacts

A number of archaeological and historical studies have been conducted in the Soutpansberg area which points to a rich and diverse archaeological landscape. The heritage legacy of this area is mostly dominated by Iron Age Farmer and Colonial / Historical Period archaeology primarily related to farming, rural expansion and warfare of the past century.

6.2.1 Archaeology

The study noted the presence of low significance Stone Age localities as well as a probable later Iron Age occupation area. The latter site is of medium significance in terms of its regional representation in the Iron Age farmer period landscape of the area. The site is located in the project zone and might be impacted on by the proposed development activities where in essence, the impact will result the damage / loss of the occurrences. The site will be also sterilized of any future heritage research opportunities. The potential impact on the resource is considered to be HIGH but this impact rating can be limited to a NEGLIBLE impact by the implementation of mitigation measures (avoidance, limited Phase 2 Study and Sampling monitoring, relevant permitting) for the sites, if / when required.

6.2.2 Built Environment

The project area is situated within rural areas of the Soutpansberg where of Historical Period buildings and features, monuments and heritage sites are to be found. In the immediate surroundings of the project area is a number of Colonial Period farmsteads and Contemporary Period buildings, cattle pens and a concrete dam of no heritage value occur within the project area. As such, no impact on the built environment is anticipated.

6.2.3 Cultural Landscape

Generally, the proposed project area and its surrounds are characterised by rural farmlands and dense mountain slope vegetation. Further away from the project area, the landscape displays undulating foothills of the Soutpansberg with flatter plains in-between. This landscape stretches over many kilometres and the proposed project is unlikely to result in a significant impact on the or the landscape sense of place.

6.2.4 Graves / Human Burials Sites

At least 3 human burial sites were located within the project area. The receptors are of high significance in terms of heritage, social and cultural value. The potential impact on the resources is regarded as HIGH but this impact rating can be limited to a NEGLIBLE impact by the implementation of mitigation measures (avoidance, site management, site monitoring / grave relocation) for the sites, if / when required. In the rural areas of the Limpopo Province, graves and cemeteries often occur around farmsteads in family burial grounds but they are also randomly scattered around archaeological and historical settlements. The probability of informal human burials encountered during development should thus not be excluded. In addition, human remains and burials are commonly found close to archaeological sites; they may be found in "lost" graveyards, or occur sporadically anywhere as a result of prehistoric activity, victims of conflict or crime. It is often difficult to detect the presence of archaeological human remains on the landscape as these burials, in most cases, are not marked at the surface. Human remains are usually observed when they are exposed through erosion. In some instances packed stones or rocks may indicate the presence of informal pre-colonial burials. If any human bones are found during the course of construction work then they should be reported to an archaeologist and work in the immediate vicinity should cease until the appropriate actions have been carried out by the archaeologist. Where human remains are part of a burial they would need to be exhumed under a permit from either SAHRA (for pre-colonial burials as well as burials later than about AD 1500). Should any unmarked human burials/remains be found during the course of construction, work in the immediate vicinity should cease and the find must immediately be reported to the archaeologist, or the South African Heritage Resources Agency (SAHRA). Under no circumstances may burials be disturbed or removed until such time as necessary statutory procedures required for grave relocation have been met

6.3 Management actions

Recommendations for relevant heritage resource management actions are vital to the conservation of heritage resources. A general guideline for recommended management actions is included in Section 10.4 of Addendum 3.

OBJECTIVE: ensure conservation of heritage resources of significance, prevent unnecessary disturbance and/or destruction of previously undetected heritage receptors.

*It is recommended that the provenience of the stone cairns and features **(Site Exigo-MHI-FT01, Site Exigo-MHI-FT2)** in the project area be tested by means of non-intrusive (Ground Penetrating Radar) or intrusive (archaeological excavations) methods, should impact on the sites prove inevitable. If the features prove to be human burials, relevant and applicable mitigation and site management measures should apply.*

*For the Stone Age features of low significance **(Site Exigo-MHI-SA01)** within the project area the following are required in terms of heritage management and mitigation:*

PROJECT COMPONENT/S	All phases of construction and operation.	
POTENTIAL IMPACT	Damage/destruction of sites.	
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.	
MITIGATION: TARGET/OBJECTIVE	To locate previously undetected heritage remains / graves as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.	
MITIGATION: ACTION/CONTROL	**RESPONSIBILITY**	**TIMEFRAME**
Fixed Mitigation Procedure (**required**)		
Site Monitoring: Regular examination of trenches and excavations in order to detect and preserve previously undocumented heritage receptors.	ECO, HERITAGE ASSESSMENT PRACTITIONER	Monitor as frequently as practically possible. Prior to the commencement of construction and earth-moving.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.	
MONITORING	Successful location of sites by person/s monitoring.	

*For the Iron Age Site (**Site Exigo-MHI-IA01**) occurring in the project area the following are required in terms of heritage management and mitigation:*

PROJECT COMPONENT/S	All phases of construction and operation.	
POTENTIAL IMPACT	Damage/disturbance to sites and subsurface features and deposits.	
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.	
MITIGATION: TARGET/OBJECTIVE	To conserve the historical fabric of the sites and to locate undetected heritage remains as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.	
MITIGATION: ACTION/CONTROL	**RESPONSIBILITY**	**TIMEFRAME**
Preferred Mitigation Procedure		
Avoidance: Implement a heritage conservation buffer of at least 20m around the heritage receptor, where possible redesign infrastructure to avoid the heritage resource and the proposed conservation buffer. Fence all burial places and apply access control.	DEVELOPER QUALIFIED HERITAGE SPECIALIST	Prior to the commencement of construction and earth-moving.
Alterative Mitigation Procedure (**if preferred mitigation procedure is not feasible**)		

Phase 2 Study and Sampling: Limited Phase 2 Specialist Assessment of sites including mapping, site sampling and possible conservation management and protection measures. Subject to authorizations and relevant permitting from heritage authorities and affected parties.	QUALIFIED HERITAGE SPECIALIST	Prior to the commencement of construction and earth-moving.
Fixed Mitigation Procedure (**required**)		
Site Monitoring: Regular examination of trenches and excavations.	ECO	Monitor as frequently as practically possible.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.	
MONITORING	Successful location of sites by person/s monitoring.	

*For the highly significant single burial sites (**Site Exigo-MHI-BP01 - Site Exigo-MHI-BP03**) occurring within the proposed Eskom Mhinga Route Deviation Project the following are required in terms of heritage management and mitigation:*

PROJECT COMPONENT/S	All phases of construction and operation.	
POTENTIAL IMPACT	Damage/disturbance to subsurface burials and surface burial features.	
ACTIVITY RISK/SOURCE	Digging foundations and trenches into sensitive deposits that are not visible at the surface.	
MITIGATION: TARGET/OBJECTIVE	To locate human burials as soon as possible after disturbance so as to maximize the chances of successful rescue/mitigation work.	
MITIGATION: ACTION/CONTROL	**RESPONSIBILITY**	**TIMEFRAME**
Preferred Mitigation Procedure		
Avoidance: Implement a heritage conservation buffer of at least 50m around the burial sites, redesign project infostructure to avoid the heritage resource and the proposed conservation buffer. Erect fences around the burial sites and apply access control with signage to indicate visitation contacts. Strict and continuous monitoring of the burial sites during development, implementation of a site management plan detailing site management conservation measures.	DEVELOPER QUALIFIED HERITAGE SPECIALIST	Prior to the commencement of construction and earth-moving.
Alterative Mitigation Procedure (**if preferred mitigation procedure is not feasible**)		
Grave relocation: relocation of the burial to the nearby cemetery, documentation of site, full social consultation with affected parties, possible conservation management and protection measures. subject to authorisations and relevant permitting from heritage authorities and affected parties	QUALIFIED HERITAGE SPECIALIST	Prior to the commencement of construction and earth-moving.
Fixed Mitigation Procedure (**required**)		
Site Monitoring: Regular examination of trenches and excavations in this area in order to avoid the destruction of previously undetected burials or heritage remains.	ECO	Monitor as frequently as practically possible.
PERFORMANCE INDICATOR	Archaeological sites are discovered and mitigated with the minimum amount of unnecessary disturbance.	
MONITORING	Successful location of sites by person/s monitoring.	

7 RECOMMENDATIONS

The larger landscape around the project area indicate a rich heritage horizon encompassing Iron Age Farmer and Colonial / Historical Period archaeology primarily related to farming, rural expansion and warfare of the past century. Locally, the project area has seen vast transformation by agriculture activities potentially sterilising surface and subsurface of heritage remains, especially those dating to pre-colonial and prehistorical times. Cognisance should nonetheless be taken of archaeological material that might be present in surface and sub-surface deposits along drainage lines and in pristine areas. The following recommendations are made based on general observations in the proposed Eskom Mhinga Route Deviation Project area:

- An isolated Stone Age occurrence in the Deviation 3 corridor (**Site Exigo-MHI-SA01**) is of low heritage significance and it is recommended that site should be monitored by an informed ECO in order to avoid the destruction of previously undetected heritage remains and potential human burials.
- A probable Iron Age occupation at (**Site Exigo-MHI-IA01)** in the Deviation 1 corridor is of medium significance in terms of its regional representation in the Iron Age farmer period landscape of the area. It is primarily recommended that proposed development components be planned as to avoid impact on the heritage resource, and a heritage conservation buffer of at least 20m around the heritage receptor be implemented. If this measure proves unachievable it is recommended that the historical fabric of the sites be conserved by means of a limited Phase 2 Specialist study (mapping, site sampling and possible conservation management and protection) and the necessary permits should be obtained from the relevant Heritage Resources Authorities.
- It is recommended that the provenience of the stone cairns and features **(Site Exigo-MHI-FT01, Site Exigo-MHI-FT2)** in the Deviation 1 corridor be tested by means of non-intrusive (Ground Penetrating Radar) or intrusive (archaeological excavations) methods, should impact on the sites prove inevitable. If the features prove to be human burials, relevant and applicable mitigation and site management measures should apply (see following point).
- Three burial sites or probable burial sites occurring within in the Deviation1 and Deviation 3 corridors (**Site Exigo-MHI-BP01 - Site Exigo-MHI-BP03**) are of high significance and the sites might be impacted on by site development. It is primarily recommended that the burial be conserved *in situ* and that a conservation buffer of at least 50m, as required by SAHRA Burial Ground and Graves (BGG) Unit, be implemented around the heritage receptor. A fence and access gate should be erected around each burial site. A distance of at least 2m should be maintained between the graves and the fence which should be at least 1,8m high. Clear signboard should be erected indicating the heritage sensitivity of the sites and contact details for visitation of the graves. The developer should carefully liaise with the heritage specialist and SAHRA with regards to the management and monitoring of any human grave or cemetery in order to detect and manage negative impact on the sites. In addition, a Site Management Plan should be implemented detailing conservation measures for the graves and responsible parties in this regard. Should impact on the resources prove inevitable, the graves should be relocated by a qualified archaeologist, and in accordance with relevant legislation, permitting, statutory permissions and subject to any local and regional provisions and laws and by-laws pertaining to human remains. A full social consultation process should occur in conjunction with the mitigation of cemeteries and burials (see Addendum 1).
- It should be noted that the site survey for the Eskom Mhinga Route Deviation Project AIA proved to be constrained by dense and often impenetrable vegetation. Dense vegetation not only restricted free movement on the site but obstructed much of the farm in terms of surface

visibility. As such, the possibility exists that individual sites could be missed and it recommended that the initial stages of the development be monitored to re-assess the presence of possible heritage resources in the project area.

- As burials have been located on the project property, it is recommended that the EIA public participation and social consultative process address the possibility of further graves occurring in the project area.
- Considering the localised nature of heritage remains, the general monitoring of the development progress by an ECO or by the heritage specialist is recommended for all stages of the project. Should any subsurface palaeontological, archaeological or historical material, or burials be exposed during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately.
- It should be stated that it is likely that further undetected archaeological remains might occur elsewhere in the Study Area along water sources and drainage lines, fountains and pans would often have attracted human activity in the past. Also, since Stone Age material seems to originate from below present soil surfaces in eroded areas, the larger landscape should be regarded as potentially sensitive in terms of possible subsurface deposits. Burials and historically significant structures dating to the Colonial Period occur on farms in the area and these resources should be avoided during all phases of construction and development, including the operational phases of the development.

In addition to these site-specific recommendations, careful cognizance should be taken of the following:

- As Palaeontological remains occur where bedrock has been exposed, all geological features should be regarded as sensitive.
- Water sources such as drainage lines, fountains and pans would often have attracted human activity in the past. As Stone Age material occur in the larger landscape, such resources should be regarded as potentially sensitive in terms of possible subsurface deposits.

8 GENERAL COMMENTS AND CONDITIONS

This AIA report serves to confirm the extent and significance of the heritage landscape of the proposed Eskom Mhinga Route Deviation Project area. The larger heritage horizon encompasses rich and diverse archaeological landscapes and cognisance should be taken of heritage resources and archaeological material that might be present in surface and sub-surface deposits. If, during construction, any possible archaeological material culture discoveries are made, the operations must be stopped and a qualified archaeologist be contacted for an assessment of the find. Such material culture might include:

- Formal Earlier Stone Age stone tools.
- Formal MSA stone tools.
- Formal LSA stone tools.
- Potsherds
- Iron objects.
- Beads made from ostrich eggshell and glass.
- Ash middens and cattle dung deposits and accumulations.
- Faunal remains.
- Human remains/graves.
- Stone walling or any sub-surface structures.
- Historical glass, tin or ceramics.
- Fossils.

If such sites were to be encountered or impacted by any proposed developments, recommendations contained in this report, as well as endorsement of mitigation measures as set out by AMAFA, SAHRA, the National Resources Act and the CRM section of ASAPA will be required. It must be emphasised that the conclusions and recommendations expressed in this archaeological heritage sensitivity investigation are based on the visibility of archaeological sites/features and may not therefore, represent the area's complete archaeological legacy. Many sites/features may be covered by soil and vegetation and might only be located during sub-surface investigations. If subsurface archaeological deposits, artefacts or skeletal material were to be recovered in the area during construction activities, all activities should be suspended and the archaeological specialist should be notified immediately **(*cf*. NHRA (Act No. 25 of 1999)**, Section 36 (6)). It must also be clear that Archaeological Specialist Reports will be assessed by the relevant heritage resources authority (SAHRA).

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10 ADDENDUM 1: HERITAGE LEGISLATION BACKGROUND

10.1 CRM: Legislation, Conservation and Heritage Management

The broad generic term Cultural Heritage Resources refers to any physical and spiritual property associated with past and present human use or occupation of the environment, cultural activities and history. The term includes sites, structures, places, natural features and material of palaeontological, archaeological, historical, aesthetic, scientific, architectural, religious, symbolic or traditional importance to specific individuals or groups, traditional systems of cultural practice, belief or social interaction.

10.1.1 Legislation regarding archaeology and heritage sites

The South African Heritage Resources Agency (SAHRA) and their provincial offices aim to conserve and control the management, research, alteration and destruction of cultural resources of South Africa. It is therefore vitally important to adhere to heritage resource legislation at all times.

d. National Heritage Resources Act No 25 of 1999, section 35

According to the National Heritage Resources Act of 1999 a historical site is any identifiable building or part thereof, marker, milestone, gravestone, landmark or tell older than 60 years. This clause is commonly known as the "60-years clause". Buildings are amongst the most enduring features of human occupation, and this definition therefore includes all buildings older than 60 years, modern architecture as well as ruins, fortifications and Iron Age settlements. "Tell" refers to the evidence of human existence which is no longer above ground level, such as building foundations and buried remains of settlements (including artefacts).

The Act identifies heritage objects as:

- objects recovered from the soil or waters of South Africa including archaeological and palaeontological objects, meteorites and rare geological specimens
- visual art objects
- military objects
- numismatic objects
- objects of cultural and historical significance
- objects to which oral traditions are attached and which are associated with living heritage
- objects of scientific or technological interest
- any other prescribed category

With regards to activities and work on archaeological and heritage sites this Act states that:

"No person may alter or demolish any structure or part of a structure which is older than 60 years without a permit by the relevant provincial heritage resources authority." (34. [1] 1999:58)

and

"No person may, without a permit issued by the responsible heritage resources authority-

(d) destroy, damage, excavate, alter, deface or otherwise disturb any archaeological or palaeontological site or any meteorite;

(e) destroy, damage, excavate, remove from its original position, collect or own any archaeological or palaeontological material or object or any meteorite;

(f) trade in, sell for private gain, export or attempt to export from the Republic any category of archaeological or palaeontological material or object, or any meteorite; or

(g) bring onto or use at an archaeological or palaeontological site any excavation equipment or any equipment which assist in the detection or recovery of metals or archaeological and palaeontological material or objects, or use such equipment for the recovery of meteorites. (35. [4] 1999:58)."

and

"No person may, without a permit issued by SAHRA or a provincial heritage resources agency-

(h) destroy, damage, alter, exhume or remove from its original position or otherwise disturb the grave of a victim of conflict, or any burial ground or part thereof which contains such graves;

(i) destroy, damage, alter, exhume, remove from its original position or otherwise disturb any grave or burial ground older than 60 years which is situated outside a formal cemetery administered by a local authority;

(j) bring onto or use at a burial ground or grave referred to in paragraph (a) or (b) and excavation equipment, or any equipment which assists in the detection or recovery of metals (36. [3] 1999:60)."

e. Human Tissue Act of 1983 and Ordinance on the Removal of Graves and Dead Bodies of 1925

Graves 60 years or older are heritage resources and fall under the jurisdiction of both the National Heritage Resources Act and the Human Tissues Act of 1983. However, graves younger than 60 years are specifically protected by the Human Tissues Act (Act 65 of 1983) and the Ordinance on the Removal of Graves and Dead Bodies (Ordinance 7 of 1925) as well as any local and regional provisions, laws and by-laws. Such burial places also fall under the jurisdiction of the National Department of Health and the Provincial Health Departments. Approval for the exhumation and re-burial must be obtained from the relevant Provincial MEC as well as the relevant Local Authorities.

10.1.2 Background to HIA and AIA Studies

South Africa's unique and non-renewable archaeological and palaeontological heritage sites are 'generally' protected in terms of the National Heritage Resources Act (Act No 25 of 1999, section 35) and may not be disturbed at all without a permit from the relevant heritage resources authority. Heritage sites are frequently threatened by development projects and both the environmental and heritage legislation require impact assessments (HIAs & AIAs) that identify all heritage resources in areas to be developed. Particularly, these assessments are required to make recommendations for protection or mitigation of the impact of the sites. HIAs and AIAs should be done by qualified professionals with adequate knowledge to (a) identify all heritage resources including archaeological and palaeontological sites that might occur in areas of developed and (b) make recommendations for protection or mitigation of the impact on the sites.

The National Heritage Resources Act (Act No. 25 of 1999, section 38) provides guidelines for Cultural Resources Management and prospective developments:

***"38.** (1) Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a* *development categorised as:*

(a) the construction of a road, wall, powerline, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

(b) the construction of a bridge or similar structure exceeding 50m in length;

(c) any development or other activity which will change the character of a site:

(i) exceeding 5 000 m^2 in extent; or

(ii) involving three or more existing 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 heritage resources authority;

(d) the re-zoning of a site exceeding 10 000 m^2 in extent; or

(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."

And:

"The responsible heritage resources authority must specify the information to be provided in a report required in terms of subsection (2)(a): Provided that the following must be included:

(k) The identification and mapping of all heritage resources in the area affected;

(l) an assessment of the significance of such resources in terms of the heritage assessment criteria set out in section 6(2) or prescribed under section 7;

(m) an assessment of the impact of the development on such heritage resources;

(n) an evaluation of the impact of the development on heritage resources relative to the sustainable social and economic benefits to be derived from the development;

(o) the results of consultation with communities affected by the proposed development and other interested parties regarding the impact of the development on heritage resources;

(p) if heritage resources will be adversely affected by the proposed development, the consideration of alternatives; and

(q) plans for mitigation of any adverse effects during and after the completion of the proposed development (38. [3] 1999:64)."

Consequently, section 35 of the Act requires Heritage Impact Assessments (HIAs) or Archaeological Impact Assessments (AIAs) to be done for such developments in order for all heritage resources, that is, all places or objects of aesthetics, architectural, historic, scientific, social, spiritual, linguistic or technological value or significance to be protected. Thus any assessment should make provision for the protection of all these heritage components, including archaeology, shipwrecks, battlefields, graves, and structures older than 60 years, living heritage, historical settlements, landscapes, geological sites, palaeontological sites and objects. Heritage resources management and conservation.

10.2 Assessing the Significance of Heritage Resources

Archaeological sites, as previously defined in the National Heritage Resources Act (Act 25 of 1999) are places in the landscape where people have lived in the past – generally more than 60 years ago – and have left traces of their presence behind. In South Africa, archaeological sites include hominid fossil sites, places where people of the Earlier, Middle and Later Stone Age lived in open sites, river gravels, rock shelters and caves, Iron Age sites, graves, and a variety of historical sites and structures in rural areas, towns and cities. Palaeontological sites are those with fossil remains of plants and animals where people were not involved in the accumulation of the deposits. The basic principle of cultural heritage conservation is that archaeological and other heritage sites are valuable, scarce and *non-renewable.* Many such sites are unfortunately lost on a daily basis through development for housing, roads and infrastructure and once archaeological sites are damaged, they cannot be re-created as site integrity and authenticity is permanently lost. Archaeological sites have the potential to contribute to our understanding of the history of the region and of our country and continent. By preserving links with our past, we may not be able to revive lost cultural traditions, but it enables us to appreciate the role they have played in the history of our country.

- Categories of significance

Rating the significance of archaeological sites, and consequently grading the potential impact on the resources is linked to the significance of the site itself. The significance of an archaeological site is based on the amount of deposit, the integrity of the context, the kind of deposit and the potential to help answer present research questions. Historical structures are defined by Section 34 of the National Heritage Resources Act, 1999, while other historical and cultural significant sites, places and features, are generally determined by community preferences. The guidelines as provided by the NHRA (Act No. 25 of 1999) in Section 3, with special reference to subsection 3 are used when determining the cultural significance or other special value of archaeological or historical sites. In addition, ICOMOS (the Australian Committee of the International Council on Monuments and Sites) highlights four cultural attributes, which are valuable to any given culture:

- *Aesthetic value:*

Aesthetic value includes aspects of sensory perception for which criteria can and should be stated. Such criteria include consideration of the form, scale, colour, texture and material of the fabric, the general atmosphere associated with the place and its uses and also the aesthetic values commonly assessed in the analysis of landscapes and townscape.

- *Historic value:*

Historic value encompasses the history of aesthetics, science and society and therefore to a large extent underlies all of the attributes discussed here. Usually a place has historical value because of some kind of influence by an event, person, phase or activity.

- *Scientific value:*

The scientific or research value of a place will depend upon the importance of the data involved, on its rarity, quality and on the degree to which the place may contribute further substantial information.

- *Social value:*

Social value includes the qualities for which a place has become a focus of spiritual, political, national or other cultural sentiment to a certain group.

It is important for heritage specialist input in the EIA process to take into account the heritage management structure set up by the NHR Act. It makes provision for a 3-tier system of management including the South Africa Heritage Resources Agency (SAHRA) at a national level, Provincial Heritage Resources Authorities (PHRAs) at a provincial and the local authority. The Act makes provision for two types or forms of protection of heritage resources; i.e. formally protected and generally protected sites:

Formally protected sites:

- Grade 1 or national heritage sites, which are managed by SAHRA
- Grade 2 or provincial heritage sites, which are managed by the provincial HRA (MP-PHRA).
- Grade 3 or local heritage sites.

Generally protected sites:

- Human burials older than 60 years.
- Archaeological and palaeontological sites.
- Shipwrecks and associated remains older than 60 years.
- Structures older than 60 years.

With reference to the evaluation of sites, the certainty of prediction is definite, unless stated otherwise and if the significance of the site is rated high, the significance of the impact will also result in a high rating. The same rule applies if the significance rating of the site is low. The significance of archaeological sites is generally
ranked into the following categories.

Significance	Rating Action
No significance: sites that do not require mitigation.	None
Low significance: sites, which may require mitigation.	2a. Recording and documentation (Phase 1) of site; no further action required 2b. Controlled sampling (shovel test pits, auguring), mapping and documentation (Phase 2 investigation); permit required for sampling and destruction
Medium significance: sites, which require mitigation.	3. Excavation of representative sample, C14 dating, mapping and documentation (Phase 2 investigation); permit required for sampling and destruction [including 2a & 2b]
High significance: sites, where disturbance should be avoided.	4a. Nomination for listing on Heritage Register (National, Provincial or Local) (Phase 2 & 3 investigation); site management plan; permit required if utilised for education or tourism
High significance: Graves and burial places	4b. Locate demonstrable descendants through social consulting; obtain permits from applicable legislation, ordinances and regional by-laws; exhumation and reinternment [including 2a, 2b & 3]

Furthermore, the significance of archaeological sites was based on six main criteria:

- Site integrity (i.e. primary vs. secondary context),
- Amount of deposit, range of features (e.g., stonewalling, stone tools and enclosures),
- Density of scatter (dispersed scatter),
- Social value,
- Uniqueness, and
- Potential to answer current and future research questions.

11 ADDENDUM 2: CONVENTIONS USED TO ASSESS THE SIGNIFICANCE OF HERITAGE

11.1 Site Significance Matrix

According to the NHRA, Section 2(vi) the **significance** of heritage sites and artefacts is determined by it aesthetic, architectural, historical, scientific, social, spiritual, linguistic or technical value in relation to the uniqueness, condition of preservation and research potential. It must be kept in mind that the various aspects are not mutually exclusive, and that the evaluation of any site is done with reference to any number of these. The following matrix is used for assessing the significance of each identified site/feature.

2. SITE EVALUATION			
2.1 Heritage Value (NHRA, section 2 [3])	High	Medium	Low
It has importance to the community or pattern of South Africa's history or pre-colonial history.			
It possesses unique, uncommon, rare or endangered aspects of South Africa's natural or cultural heritage.			
It has potential to yield information that will contribute to an understanding of South Africa's natural and cultural heritage.			
It is of importance in demonstrating the principle characteristics of a particular class of South Africa's natural or cultural places or objects.			
It has importance in exhibiting particular aesthetic characteristics valued by a particular community or cultural group.			
It has importance in demonstrating a high degree of creative or technical achievement at a particular period.			
It has marked or special association with a particular community or cultural group for social, cultural or spiritual reasons (sense of place).			
It has strong or special association with the life or work of a person, group or organisation of importance in the history of South Africa.			
It has significance through contributing towards the promotion of a local sociocultural identity and can be developed as a tourist destination.			
It has significance relating to the history of slavery in South Africa.			
It has importance to the wider understanding of temporal changes within cultural landscapes, settlement patterns and human occupation.			
2.2 Field Register Rating			
National/Grade 1 [should be registered, retained]			
Provincial/Grade 2 [should be registered, retained]			
Local/Grade 3A [should be registered, mitigation not advised]			
Local/Grade 3B [High significance; mitigation, partly retained]			
Generally Protected A [High/Medium significance, mitigation]			
Generally protected B [Medium significance, to be recorded]			
Generally Protected C [Low significance, no further action]			
2.3 Sphere of Significance	High	Medium	Low
International			
National			
Provincial			
Local			
Specific community			

11.2 Impact Assessment Criteria

The following table provides a guideline for the rating of impacts and recommendation of management actions for sites of heritage potential.

Significance of the heritage resource
This is a statement of the nature and degree of significance of the heritage resource being affected by the activity. From a heritage management perspective, it is useful to distinguish between whether the significance is embedded in the physical fabric or in associations with events or persons or in the experience of a place; i.e. its visual and non-visual qualities. This statement is a primary informant to the nature and degree of significance of an impact and thus needs to be thoroughly considered. Consideration needs to be given to the significance of a heritage resource at different scales (i.e. site-specific, local, regional, national or international) and the relationship between the heritage resource, its setting and its associations.

Nature of the impact
This is an assessment of the nature of the impact of the activity on a heritage resource, with some indication of its positive and/or negative effect/s. It is strongly informed by the statement of resource significance. In other words, the nature of the impact may be historical, aesthetic, social, scientific, linguistic or architectural, intrinsic, associational or contextual (visual or non-visual). In many cases, the nature of the impact will include more than one value.

Extent
Here it should be indicated whether the impact will be experienced:

- On a site scale, i.e. extend only as far as the activity;
- Within the immediate context of a heritage resource;
- On a local scale, e.g. town or suburb
- On a metropolitan or regional scale; or
- On a national/international scale.

Duration
Here it should be indicated whether the lifespan of the impact will be:

- Short term, (needs to be defined in context)
- Medium term, (needs to be defined in context)
- Long term where the impact will persist indefinitely, possibly beyond the operational life of the activity, either because of natural processes or
by human intervention; or
- Permanent where mitigation either by natural process or by human intervention will not occur in such a way or in such a time span that the
impact can be considered transient.

Of relevance to the duration of an impact are the following considerations:

- Reversibility of the impact; and
- Renewability of the heritage resource.

Intensity
Here it should be established whether the impact should be indicated as:

- Low, where the impact affects the resource in such a way that its heritage value is not affected;
- Medium, where the affected resource is altered but its heritage value continues to exist albeit in a modified way; and
- High, where heritage value is altered to the extent that it will temporarily or permanently be damaged or destroyed.

Probability
This should describe the likelihood of the impact actually occurring indicated as:

- Improbable, where the possibility of the impact to materialize is very low either because of design or historic experience;
- Probable, where there is a distinct possibility that the impact will occur;
- Highly probable, where it is most likely that the impact will occur; or
- Definite, where the impact will definitely occur regardless of any mitigation measures

Confidence

This should relate to the level of confidence that the specialist has in establishing the nature and degree of impacts. It relates to the level and reliability of information, the nature and degree of consultation with I&AP's and the dynamic of the broader socio-political context.

- High, where the information is comprehensive and accurate, where there has been a high degree of consultation and the socio-political context is relatively stable.
- Medium, where the information is sufficient but is based mainly on secondary sources, where there has been a limited targeted consultation and socio-political context is fluid.
- Low, where the information is poor, a high degree of contestation is evident and there is a state of socio-political flux.

Impact Significance

The significance of impacts can be determined through a synthesis of the aspects produced in terms of the nature and degree of heritage significance and the nature, duration, intensity, extent, probability and confidence of impacts and can be described as:

- Low; where it would have a negligible effect on heritage and on the decision
- Medium, where it would have a moderate effect on heritage and should influence the decision.
- High, where it would have, or there would be a high risk of, a big effect on heritage. Impacts of high significance should have a major influence on the decision;
- Very high, where it would have, or there would be high risk of, an irreversible and possibly irreplaceable negative impact on heritage. Impacts of very high significance should be a central factor in decision-making.

11.3 Direct Impact Assessment Criteria

The following table provides an outline of the relationship between the significance of a heritage context, the intensity of development and the significance of heritage impacts to be expected

	TYPE OF DEVELOPMENT			
HERITAGE CONTEXT	**CATEGORY A**	**CATEGORY B**	**CATEGORY C**	**CATEGORY D**
CONTEXT 1 High heritage Value	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected	Very high heritage impact expected
CONTEXT 2 Medium to high heritage value	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected	Very high heritage impact expected
CONTEXT 3 Medium to low heritage value	Little or no heritage impact expected	Minimal heritage impact expected	Moderate heritage impact expected	High heritage impact expected
CONTEXT 4 Low to no heritage value	Little or no heritage impact expected	Little or no heritage impact expected	Minimal heritage value expected	Moderate heritage impact expected

NOTE: A DEFAULT "LITTLE OR NO HERITAGE IMPACT EXPECTED" VALUE APPLIES WHERE A HERITAGE RESOURCE OCCURS OUTSIDE THE IMPACT ZONE OF THE DEVELOPMENT.

HERITAGE CONTEXTS	CATEGORIES OF DEVELOPMENT
Context 1: Of high intrinsic, associational and contextual heritage value within a national, provincial and local context, i.e. formally declared or potential Grade 1, 2 or 3A heritage resources **Context 2:** Of moderate to high intrinsic, associational and contextual value within a local context, i.e. potential Grade 3B heritage resources. **Context 3:**	**Category A: Minimal intensity development** - No rezoning involved; within existing use rights. - No subdivision involved. - Upgrading of existing infrastructure within existing envelopes - Minor internal changes to existing structures - New building footprints limited to less than 1000m2. **Category B: Low-key intensity development** - Spot rezoning with no change to overall zoning of a site. - Linear development less than 100m

Of medium to low intrinsic, associational or contextual heritage value within a national, provincial and local context, i.e. potential Grade 3C heritage resources **Context 4:** Of little or no intrinsic, associational or contextual heritage value due to disturbed, degraded conditions or extent of irreversible damage.	- Building footprints between 1000m2-2000m2 - Minor changes to external envelop of existing structures (less than 25%) - Minor changes in relation to bulk and height of immediately adjacent structures (less than 25%). **Category C: Moderate intensity development** - Rezoning of a site between 5000m2-10 000m2. - Linear development between 100m and 300m. - Building footprints between 2000m2 and 5000m2 - Substantial changes to external envelop of existing structures (more than 50%) - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 50%) **Category D: High intensity development** - Rezoning of a site in excess of 10 000m2 - Linear development in excess of 300m. - Any development changing the character of a site exceeding 5000m2 or involving the subdivision of a site into three or more erven. - Substantial increase in bulk and height in relation to immediately adjacent buildings (more than 100%)

11.4 Management and Mitigation Actions

The following table provides a guideline of relevant heritage resources management actions is vital to the conservation of heritage resources.

No further action / Monitoring
Where no heritage resources have been documented, heritage resources occur well outside the impact zone of any development or the primary context of the surroundings at a development footprint has been largely destroyed or altered, no further immediate action is required. Site monitoring during development, by an ECO or the heritage specialist are often added to this recommendation in order to ensure that no undetected heritage\ remains are destroyed.
Avoidance
This is appropriate where any type of development occurs within a formally protected or significant or sensitive heritage context and is likely to have a high negative impact. Mitigation is not acceptable or not possible. This measure often includes the change / alteration of development planning and therefore impact zones in order not to impact on resources.
Mitigation
This is appropriate where development occurs in a context of heritage significance and where the impact is such that it can be mitigated to a degree of medium to low significance, e.g. the high to medium impact of a development on an archaeological site could be mitigated through sampling/excavation of the remains. Not all negative impacts can be mitigated.
Compensation
Compensation is generally not an appropriate heritage management action. The main function of management actions should be to conserve the resource for the benefit of future generations. Once lost it cannot be renewed. The circumstances around the potential public or heritage benefits would need to be exceptional to warrant this type of action, especially in the case of where the impact was high.
Rehabilitation
Rehabilitation is considered in heritage management terms as a intervention typically involving the adding of a new heritage layer to enable a new sustainable use. It is not appropriate when the process necessitates the removal of previous historical layers, i.e. restoration of a building or place to the previous state/period. It is an appropriate heritage management action in the following cases: - The heritage resource is degraded or in the process of degradation and would benefit from rehabilitation. - Where rehabilitation implies appropriate conservation interventions, i.e. adaptive reuse, repair and maintenance, consolidation and minimal loss of historical fabric. - Where the rehabilitation process will not result in a negative impact on the intrinsic value of the resource.
Enhancement

MHINGA PENNINGGOTSHA ROUTE

ESKOM 132 kV POWERLINE

Visual Impact Assessment Report

04 June 2021

GYLA

VISUAL IMPACT ASSESSMENT REPORT

MHINGA PENNINGGOTSHA ROUTE 132 kV POWERLINE ESKOM PROJECT

Submitted to:

KANTEY & TEMPLER
Consulting Engineers
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Craighall, 2024
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Report Revision No:	*DRAFT*
Date Issued:	07 June 2021
Prepared By:	Graham Young PrLArch, FILASA
Reviewed By:	Graham Young PrLArch, FILASA
Signed:	

Reference:	075_2021: Mhinga Penninggotsha Route – Eskom 132 kV Powerline

EXPERTISE OF SPECIALIST

Name:	Graham A Young
Qualification:	BL (Toronto); ML (Pretoria)
Professional Registration:	South African Council for the Landscape Architectural Profession (SACLAP) Fellow Institute of Landscape Architects of South Africa (FILASA)
Experience in Years:	Over 40 years
Experience	Graham is a landscape architect with over forty years' experience. He has worked in Southern Africa and Canada and has valuable expertise in the practice of landscape architecture, urban design, and environmental planning. He is also a senior lecturer, teaching urban design and landscape architecture at post and undergraduate levels at the University of Pretoria. A specialty of his is Visual Impact Assessment for which he was cited with an ILASA Merit Award in 1999. He has completed over 300 specialist reports for projects in South Africa, Canada and other African countries. He was on the panel that developed the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee (they manage a World Heritage Site) along with the *Visual Impact Assessment Training Module Guideline Document.*

DECLARATION OF INDEPENDENCE

I, Graham Young, declare that –

- I am contracted as the Visual Impact Assessment Report for the ***Mhinga Penninggotsha 132 kV Eskom Power line*** project.
- I will perform the work relating to the application objectively, even if this results in views and findings that are not favourable to the applicant.
- I declare that there are no circumstances that may compromise my objectivity in performing such work.
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the National Environmental Management Act (Act 107 of 1998), 2014 Environmental Impact Assessment Regulations (as amended on 7 April 2017), and any guidelines that have relevance to the proposed activity.
- I will comply with the Act, regulations, and all other applicable legislation.
- I will consider, to the extent possible, the matters listed in Regulation 13.
- I have no, and will not engage in, conflicting interests in the undertaking of the activity.
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing – any decision to be taken concerning the application by the competent authority; and – the objectivity of any report, plan, or document to be prepared by myself for submission to the competent authority.
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 16 (1)(b)(iii).

Graham A. Young FILASA PrLArch Reg. No. 87001
BL (Toronto), ML (Pretoria)

07 June 2021

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SPECIALIST REPORTING REQUIREMENTS

Specialist Reporting Requirements According to Appendix 6 of the National Environmental Management Act (Act 107 of 1998), Environmental Impact Assessment Regulation 2014 (as amended on 7 April 2017)	
Requirement	**Relevant section in report**
Details of the specialist who prepared the report;	Page iii, Appendix E
The expertise of that person to compile a specialist report including a curriculum vitae;	Page iii, Appendix E
A declaration that the person is independent in a form as may be specified by the competent authority;	Page iv
An indication of the scope of, and the purpose for which, the report was prepared;	Section 1.3 – 1.4
An indication of the quality and age of base data used for the specialist report;	Section 3.2 and 7
A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 12 and 13
The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 1.4
A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 3
Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure;	Section 9 and 10
An identification of any areas to be avoided, including buffers;	N/A
A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figures 5
A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 1.5
A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	Section 10
Any mitigation measures for inclusion in the EMPR;	Section 11
Any conditions for inclusion in the environmental authorisation;	N/A
Any monitoring requirements for inclusion in the EMPR or environmental authorisation;	N/A

A reasoned opinion whether the proposed activity, activities or portions thereof should be authorised regarding the acceptability of the proposed activity or activities;	Section 14
If the opinion is that the proposed activity, or activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPR, and where applicable, the closure plan;	Section 11
A description of any consultation process that was undertaken during the course of carrying out the study;	N/A K&T carried out this process
A summary and copies if any of comments that were received during any consultation process;	N/A
Any other information requested by the competent authority.	N/A

ACRONYMS, ABBREVIATIONS & GLOSSARY

Acronyms & Abbreviations	
EIA	Environmental Impact Assessment
EMPR	Environmental Management Programme Report
EAP	Environmental Assessment Practitioner
GYLA	Graham A Young Landscape Architect
NEMA	National Environmental Management Act
SACLAP	South African Council for the Landscape Architectural Profession
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment

Glossary	
Aesthetic Value	Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace the sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay, 1993). Thus, aesthetic value encompasses more than the seen view, visual quality, or scenery, and includes atmosphere, landscape character, and sense of place (Schapper, 1993).
Aesthetically significant place	A formally designated place visited by recreationists and others for the express purpose of enjoying its beauty. For example, tens of thousands of people visit Table Mountain on an annual basis. They come from around the country and even from around the world. By these measurements, one can make the case that Table Mountain (a designated National Park) is an aesthetic resource of national significance. Similarly, a resource that is visited by large numbers who come from across the region probably has regional significance. A place visited primarily by people whose place of origin is local is generally of local significance. Unvisited places either have no significance or are "no trespass" places. (New York, Department of Environment 2000).
Aesthetic impact	Aesthetic impact occurs when there is a detrimental effect on the perceived beauty of a place or structure. Mere visibility, even startling visibility of a project proposal, should not be a threshold for decision making. Instead, a project, by its visibility, must interfere with or reduce (i.e. visual impact) the public's enjoyment and/or appreciation of the appearance of a valued

	resource e.g. cooling tower blocks a view from a National Park overlook (after New York, Department of Environment 2000).
Cumulative Effects	The summation of effects that result from changes caused by development in conjunction with the other past, present, or reasonably foreseeable actions.
Landscape Character	The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, woods, trees, water bodies, buildings, and roads. They are generally quantifiable and can be easily described.
Landscape Impact	Landscape effects derive from changes in the physical landscape, which may give rise to changes in its character and how this is experienced (Institute of Environmental Assessment & The Landscape Institute 1996).
Study area	For this report, the Project Study area refers to the proposed project footprint/project site as well as the 'zone of potential influence' (the area defined as the radius about the centre point of the project site beyond which the visual impact of the most visible features will be reduced to low to insignificant), which is a 5,0km radius from the approximate centre of the proposed project site footprint.
Project Footprint / Site	For this report, the Project *site*/*footprint* refers to the actual layout of the project as described.
Sense of Place (*genius locus*)	Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. *A genius locus* means 'spirit of the place'.
Sensitive Receptors	Sensitivity of visual receptors (viewers) to a proposed development.
Viewshed analysis	The two-dimensional spatial pattern created by an analysis defines areas, which contain all possible observation sites from which an object would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1,8m above ground level.
Visibility	The area from which project components would potentially be visible. Visibility depends upon general topography, aspect, tree cover, or other visual obstruction, elevation, and distance.
Visual Exposure	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion and visual acuity, which is also influenced by weather and light conditions.
Visual Impact	Visual effects relate to the changes that arise in the composition of available views because of changes to the landscape, to people's responses to the changes, and the overall effects concerning visual amenity.
Visual Intrusion	The nature of intrusion of an object on the visual quality of the environment

	resulting in its compatibility (absorbed into the landscape elements) or discord (contrasts with the landscape elements) with the landscape and surrounding land uses.
Visual absorption capacity	Visual absorption capacity is defined as the landscape's ability to absorb physical changes without transformation in its visual character and quality. The landscape's ability to absorb change ranges from low capacity areas, in which the location of the activity is likely to cause visual change in the character of the area, to high capacity areas, in which the visual impact of the development will be minimal (Amir & Gidalizon 1990).
Worst-case Scenario	The principle applied where the environmental effects may vary, for example, seasonally to ensure the most severe potential effect is assessed.
Zone of Potential Visual Influence	By determining the zone of potential visual influence, it is possible to identify the extent of potential visibility and views which could be affected by the proposed development. Its maximum extent is the radius around an object beyond which the visual impact of its most visible features will be insignificant primarily due to distance.

EXECUTIVE SUMMARY

Graham A Young Landscape Architect (GYLA) was commissioned by Kantey and Templer Consulting Engineers (K&T) to carry out a visual impact assessment (VIA) of the proposed deviation of an Eskom 132kV power line near Thohoyandou, Limpopo ("the Project"). Refer to the regional context in Figure 1. The VIA focuses on the potentially intrusive nature of physical aspects of the proposed Project (form, scale, and bulk), within its local context.

Project Site and Study area

The Project site comprises three separate areas along the alignment from Penninggotsha sub-station (in the south) to a location immediately adjacent to the R524 and west of Mhingaville village. The three sites are where the original alignment is proposed to be altered due to other environmental issues and the visual consequences of these are assessed in this report. Figure 1 indicates the location of the three proposed deviation locations within the study area. The study area comprises a visual envelope of 1,5km to either side of the power line route[1]. The original servitude buffer was established as 500m on either side of the centre line. These zones are also indicated in Figure 1.

Objective of the Study

The study aims to ensure that the visual/aesthetic consequences of the proposed Project are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014 (as amended).

Terms of Reference

A specialist study is required to establish the visual baseline and to identify and assess the visual impacts arising from the Project based on the general requirements for a VIA. The following terms of reference were established based on the directive received from K&T i.e. "Proposed [visual] study on proposed deviations of 8km (3 areas proposed for deviations from [the] original authorised route) with a corridor of 1km (500m by 500m on both sides of the route) according to National environmental Act, 1998 (Act no. 107 of 1998) and Regulations on environmental impact assessment, regulation GNR 324 and 327.

- Data collected during the site visit (05 and 06 May 2021) will allow for a description and characterization of the receiving environment.
- Identify issues that must be addressed in the impact assessment phase.
- Describe the landscape character, quality and assess the visual resource of the study area.
- Describe the visual characteristics of the components of the project; and
- Rate the significance of the impact of the project.
- Proposed mitigation measures to reduce the potential impact of the project.

Assumptions and Limitations

The following assumptions limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a 1,5km zone around the centre line of the proposed power line.
- The description of project components is limited to what has been supplied to the author before the date of completion of this report.
- Site photos were taken in May and do not reflect the complete landscape character of the area as experienced through all seasons. The weather was sunny with moderate haze conditions.

Findings

The existing visual condition of the landscape that may be affected by the proposed Project has been described. The study area's scenic quality has been rated *moderate*, within the context of the sub-region. Sensitive viewing areas and landscape types have been identified and mapped indicating potential minor landscape and receptor sensitivity to the project.

Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. The visual impact of the 132 kV Project will cause moderate changes in the landscape that are noticeable to sensitive viewers looking towards the development from some residential areas (Mhingaville, Maphophe, Saselamani) and the main public road (R524). However, these views already contain features associated with power infrastructure, which runs across the northern section of the study area, and the tall savannah vegetation will screen many views. The potential for visual impact will be substantially reduced and is rated as *moderate*, during the operational phase without mitigation and *low* with mitigation.

Mitigation measures are possible in all phases of the project and can reduce the anticipated impact.

At closure, after removal of the infrastructure and the rehabilitation of disturbed areas, the impact will reduce to *negligible.* This, however, assumes that all mitigation measures are effectively implemented and managed.

The proposed Project will be developed in an area where power infrastructure (sub-stations, distribution, and transmission lines) exists. The intervisibility of these existing and the proposed 132 kV project will cause a cumulative negative effect on the aesthetics and views in the study area. The separate effects of the Project may not be of major significance, but together with the existing power infrastructure, they would create additional adverse effects on visual receptors within their combined visual envelopes if management practices are not rigorously applied.

Author's Opinion

It is the opinion of the author that all aspects of the Project, from a potential visual impact perspective, should be approved, provided that the mitigation/management measures are effectively implemented, managed, and monitored in the long term.

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1. INTRODUCTION

1.1 Project Overview and Background

Graham A Young Landscape Architect (GYLA) was commissioned by Kantey and Templer Consulting Engineers (K&T) to carry out a visual impact assessment (VIA) of the proposed deviation of an Eskom 132kV power line near Thohoyandou, Limpopo ("the Project"). Refer to the regional context in Figure 1. The VIA focuses on the potentially intrusive nature of physical aspects of the proposed Project (form, scale, and bulk), within its local context.

1.2 Project Site and Proposed Study area

The Project site comprises three separate areas along the alignment from Penninggotsha sub-station (in the south) to a location immediately adjacent to the R524 and west of Mhingaville village. The three sites are where the original alignment is proposed to be altered due to other environmental issues and the visual consequences of these are assessed in this report. Figure 1 indicates the location of the three proposed deviation locations within the study area. The study area comprises a visual envelope of 1,5km to either side of the power line route[2]. The original servitude buffer was established as 500m on either side of the centre line. These zones are also indicated in Figure 1.

1.3 The objective of the Specialist Study

The study aims to ensure that the visual/aesthetic consequences of the proposed Project are understood and adequately considered in the Environmental Impact Assessment (EIA) process in terms of Appendix 6 of the EIA Regulations 2014 (as amended).

1.4 Terms of Reference

A specialist study is required to establish the visual baseline and to identify and assess the visual impacts arising from the Project based on the general requirements for a VIA. The following terms of reference were established based on the directive received from K&T i.e. "Proposed [visual] study on proposed deviations of 8km (3 areas proposed for deviations from [the] original authorised route) with a corridor of 1km (500m by 500m on both sides of the route) according to National environmental Act, 1998 (Act no. 107 of 1998) and Regulations on environmental impact assessment, regulation GNR 324 and 327":

- Data collected during the site visit (05 and 06 May 2021) will allow for a description and characterization of the receiving environment.
- Identify issues that must be addressed in the impact assessment phase.
- Describe the landscape character, quality and assess the visual resource of the study area.
- Describe the visual characteristics of the components of the project; and
- Rate the significance of the impact of the project.
- Proposed mitigation measures to reduce the potential impact of the project.

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[2] Distance Zones set of pre-determined distances from a viewpoint and help in delineating the extent of a study area. In the Bureau of Land Management's visual resource management system, landscapes are subdivided into three distanced zones based on relative visibility from travel routes or observation points (US Department of the Interior. 2013). The three zones are foreground, middleground, and background. The foreground - middleground zone include areas seen from public roads, residential areas, conservation areas and other viewing locations that are less than 5 - 8km away depending on the terrain. Areas beyond the foreground-middleground zone but usually greater than 8 km away are in the background zone. Areas not seen as foreground-middleground or background (i.e., hidden from view) are in the seldom-seen zone. Beyond 1,5km the effect of a 132kV power line along with its poles, will dimmish dramatically. (EirGrid 2016 and Hull and Bishop 1988).

1.5 Assumption, Uncertainties, and Limitations

The following assumptions limitations have been made in the study:

- The extent of the study area is determined by the zone of potential influence, which in this study relates to a 1,5km zone around the centre line of the proposed power line.
- The description of project components is limited to what has been supplied to the author before the date of completion of this report.
- Site photos were taken in May and do not reflect the complete landscape character of the area as experienced through all seasons. The weather was sunny with moderate haze conditions.

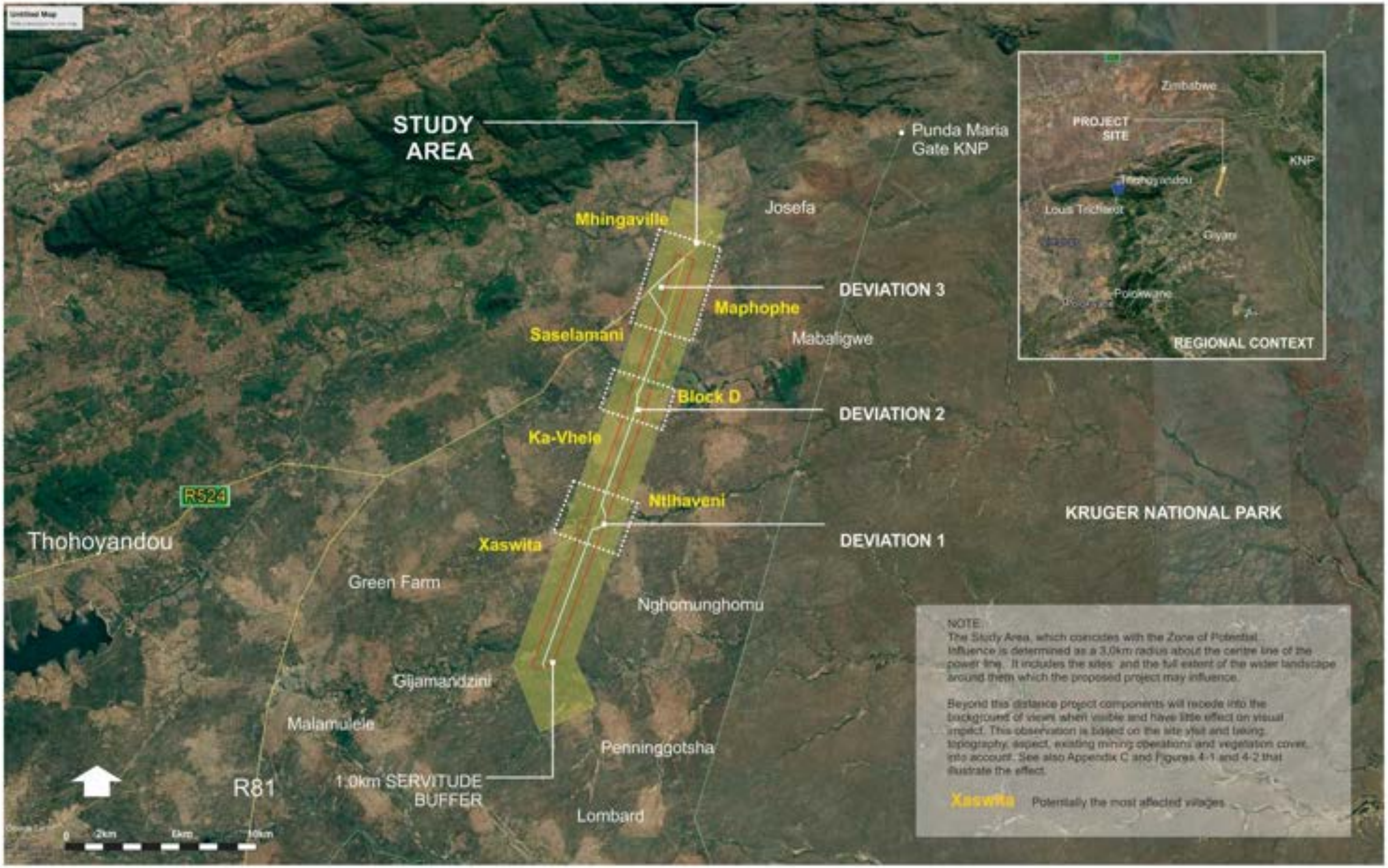

Figure 1: LOCALITY AND STUDY AREA - Eskom Mhinga Penninggotsha 132kV

GYLA
Graham A Young
Landscape Architect

2. LEGAL REQUIREMENTS AND GUIDELINES

This report adheres to the following legal requirements and guideline documents.

National Legislation and Guidelines

National Environmental Management Act (Act 107 of 1998), EIA Regulations

The specialist report is per the specification on conducting specialist studies as per Government Gazette (GN) R 982 (as amended) of the National Environmental Management Act (NEMA) Act 107 of 1998. The mitigation measures as stipulated in the specialist report can be used as part of the Environmental Management Programme Report (EMPR) and will be in support of the Environmental Impact Assessment (EIA) and Appendix 6 of the EIA Regulations 2014 (as amended).

Western Cape Department of Environmental Affairs & Development Planning: Guideline for Involving Visual and Aesthetic Specialists in EIA Processes Edition 1 (CSIR, 2005)

Although the guidelines were specifically compiled for the Province of the Western Cape, they provide guidance that is appropriate for any EIA process. The Guideline document also seeks to clarify instances when a visual specialist should get involved in the EIA process.[3]

[3] The Western Cape Guidelines are the only official guidelines for visual impact assessment reports in South Africa and can be regarded as best practice throughout the country.

3. APPROACH AND METHODOLOGY

3.1 Approach

The assessment of likely effects on a landscape resource and visual amenity is complex since it is determined through a combination of quantitative and qualitative evaluations. When assessing visual impact, the worst-case scenario is considered. Landscape and visual assessments are separate, although linked, procedures.

The landscape, its analysis, and the assessment of impacts on the landscape all contribute to the baseline for visual impact assessment studies. The assessment of the potential impact on the landscape is carried out as an impact on an environmental resource, i.e. the physical landscape. Visual impacts, on the other hand, are assessed as one of the interrelated effects on people (i.e. the viewers and the impact of an introduced object into a view or scene).

3.1.1 The Visual Resource

Landscape character, landscape quality (Warnock & Brown 1998), and “sense of place” (Lynch 1992) are used to evaluate the visual resource i.e. the receiving environment. A qualitative evaluation of the landscape is essentially a subjective matter. In this study, the aesthetic evaluation of the study area is determined by the professional opinion of the author based on on-site observations and the results of contemporary research in perceptual psychology.

Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response is usually to both visual and non-visual elements and can embrace the sound, smell, and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay 1993). Thus, aesthetic value is more than the combined factors of the seen view, visual quality, or scenery. It includes atmosphere, landscape character, and sense of place (Schapper 1993).

Studies for perceptual psychology have shown a human preference for landscapes with higher visual complexity, for instance, scenes with water or topographic interest. Based on contemporary research, landscape quality increases where:

- Topographic ruggedness and relative relief increase.
- Water forms are present.
- Diverse patterns of grassland and trees occur.
- Natural landscape increases and man-made landscape decreases.
- Where land use compatibility increases (Crawford 1994).

Aesthetic appeal (value) is therefore considered high when the following are present (Ramsay 1993):

- Abstract qualities: such as the presence of vivid, distinguished, uncommon, or rare features or abstract attributes.
- Evocative responses: the ability of the landscape to evoke particularly strong responses in community members or visitors.
- Meanings: the existence of a long-standing special meaning to a group of people or the ability of the landscape to convey special meanings to viewers in general.

- Landmark quality: a feature that stands out and is recognized by the broader community.

And conversely, it would be low where:

- Limited patterns of grasslands and trees occur.
- Natural landscape decreases and man-made landscape increases.
- And where land use compatibility decreases (Crawford 1994).

In determining the quality of the visual resource for the Project site, both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a keen sense of place, regardless of whether they are scenically beautiful. However, where landscape quality, aesthetic value, and a strong sense of place coincide, the visual resource or perceived value of the landscape is high.

3.1.2 Sensitivity of Visual Resource

The sensitivity of a landscape or visual resource is the degree to which a landscape type or area can accommodate change arising from development, without detrimental effects on its character. Its determination is based upon an evaluation of each key element or characteristic of the landscape likely to be affected. The evaluation will reflect such factors as its “quality, value, contribution to landscape character, and the degree to which the particular element or characteristic can be replaced or substituted” (LI-IEMA 2013).

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3.1.3 Sense of Place

Central to the concept of sense of place is that the landscape requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape taken together with the cultural transformations and traditions associated with the historic use and habitation of the area. According to Lynch (1992), sense of place is the extent to which a person can recognize or recall a place as being distinct from other places – as having a vivid, unique, or at least particular, character of its own. Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, the values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, keen sense of place.

The study area’s sense of place is derived from the emotional, aesthetic, and visual response to the environment, and therefore it cannot be experienced in isolation. The landscape context must be considered. The combination of the natural landscape together with the manmade structures (urban areas, roads, and utilities, etc) contribute to the sense of place for the study area. It is this combination that defines the study area and establishes its visual and aesthetic identity.

3.1.4 Sensitive Viewer Locations

The sensitivity of visual receptors and views are dependent on the location and context of the viewpoint, the expectations and occupation or activity of the receptor or the importance of the view, which may be determined concerning its popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art. Typically, sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.
- Communities where development results in negative changes in the landscape setting or valued views enjoyed by the community.
- Occupiers of residential properties with views negatively affected by the development.

Views from residences and tourist facilities/routes are typically the most sensitive since they are frequent and of long duration.

Other, less sensitive, receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).
- People traveling through or past the affected landscape in cars or other transport modes.
- People at their place of work.

For a detailed description of the methodology to determine the value of a visual resource, refer to Appendix A. Image 1 below, graphically illustrates the visual impact process used to determine the significance of the visual impact of the Project.

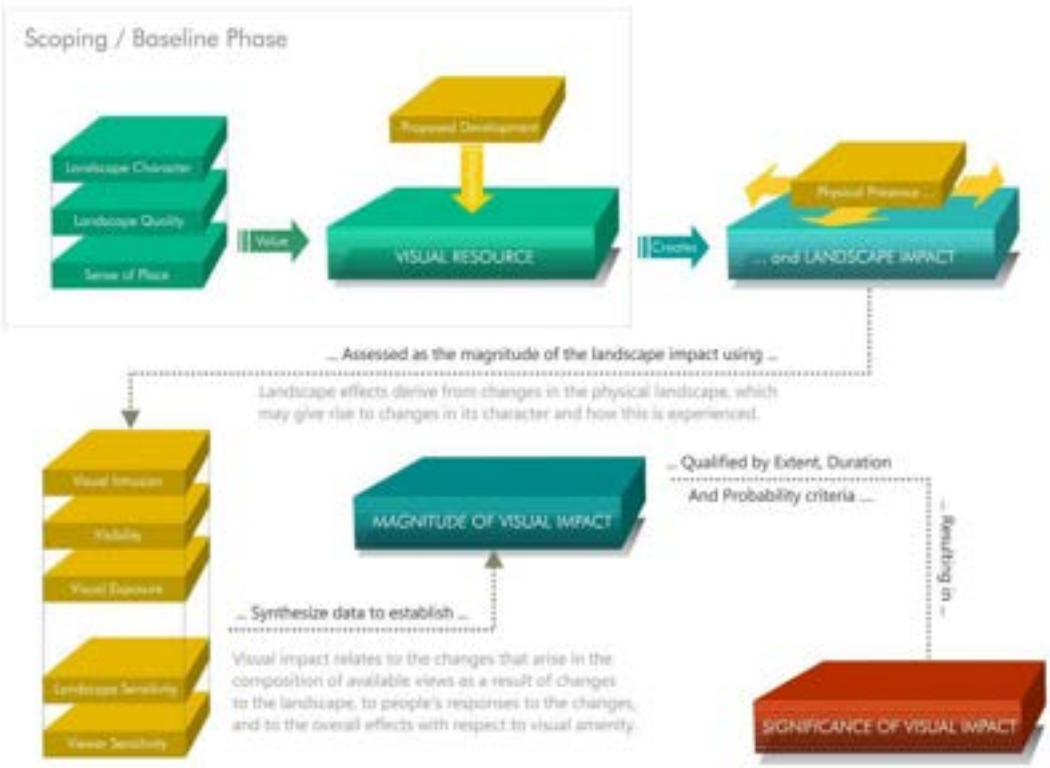

Image 1: Visual Impact Process

3.2 Methodology

The following method was used:

- Site visit: A field survey was undertaken on 05 and 06 May 2021 when the study area was scrutinized to the extent that the receiving environment could be documented and adequately described.
- Project components: The physical characteristics of the project components were described and illustrated based on information supplied by K&T.
- The landscape character of the study area was described. The description of the landscape focused on the nature and character of the landscape rather than the response of a viewer.
- The quality of the landscape was described using recognized contemporary research in perceptual psychology as the basis.
- The sense of place of the study area was described as to the uniqueness and distinctiveness of the landscape.
- The impact of the proposed Project was rated using significance rating criteria.

4. DESCRIPTION OF THE PROJECT

The project is a 132kV powerline as illustrated in Figure 2. The poles are steel and range in installed height from 17,4 to 20m above ground level. Three separate deviations from the original authorised alignment are proposed as illustrated in Figure 3-1 (Deviation 1), Figure 3-2 (Deviation 2), and Figure 3-3 (Deviation 3).

Deviation 1 differs from the original alignment and is proposed over a 1,4km distance to the east of the centre line of the route but within the 1km servitude buffer. The deviation comprises (Figure 3-1):

- Pole numbers 35 to 45
- 3 x D7615 stayed strain poles
- 7 X D7611 intermediate steel poles
- The poles range in height from 17,4m to 20m above natural ground level.

Deviation 2 differs from the original alignment and is proposed over a 1,1km distance to the west of the centre line of the route, but within the 1km servitude buffer. The deviation comprises (Figure 3-2):

- Pole numbers 71 to 77
- 4 x D7615 stayed strain poles
- 7 X D7611 intermediate steel poles
- The poles range in height from 17,4m to 18,3m above natural ground level.

Deviation 3 differs from the original alignment and is proposed over a 3,5km distance to the west of the centre line of the route, and the western most aspect of the route is outside the original 1km servitude buffer. The deviation comprises (Figure 3-3):

- Pole numbers 96 to 117
- 3 x D7615 stayed strain poles
- 20 X D7611 intermediate steel poles
- The poles range in height from 17,4m to 18m above natural ground level.

Refer also to the Staking Table spreadsheet in Appendix F.

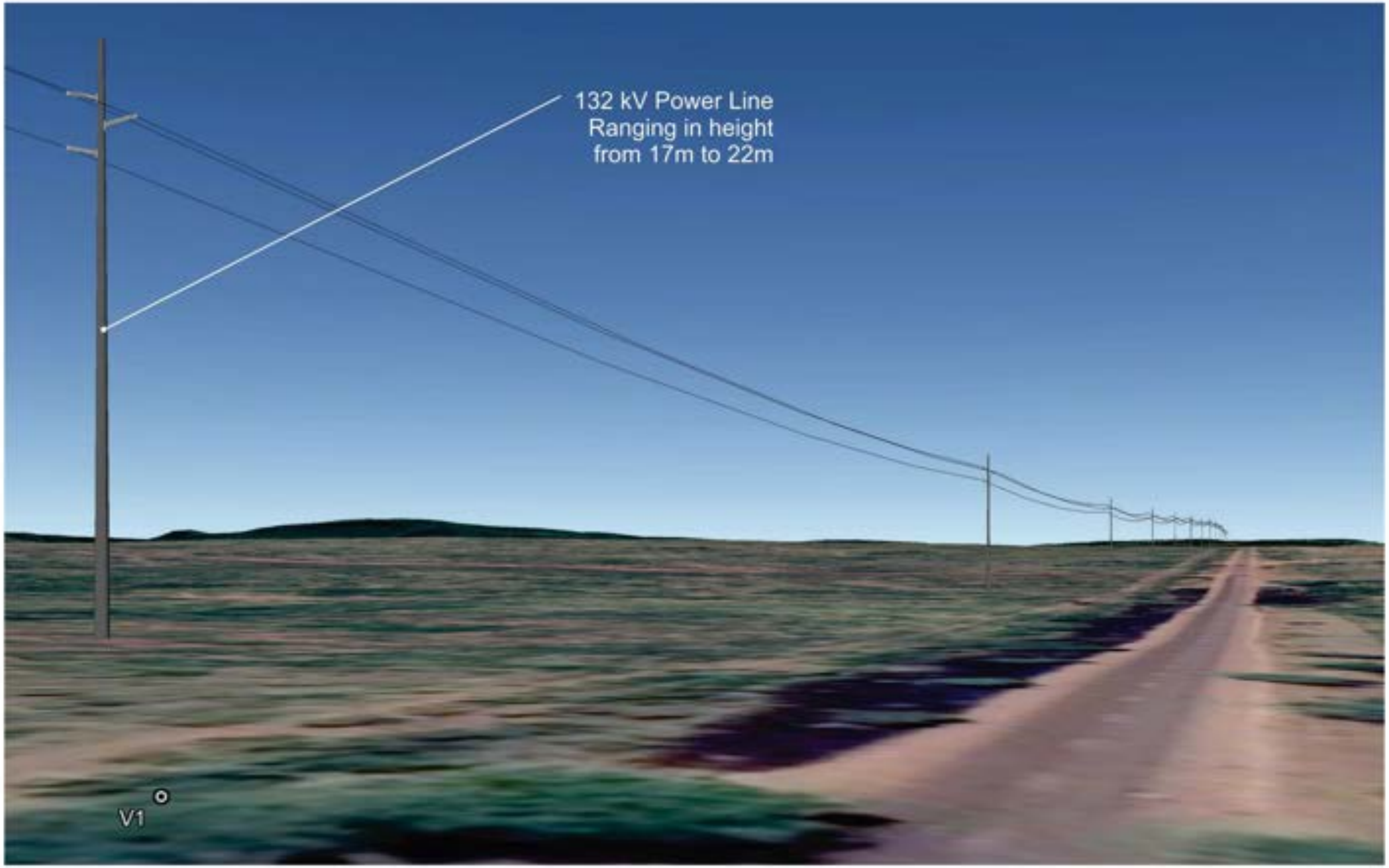

Figure 2: 132kV POWER LINE COMPONENTS - Eskom Mhinga Penninggostha 132kV

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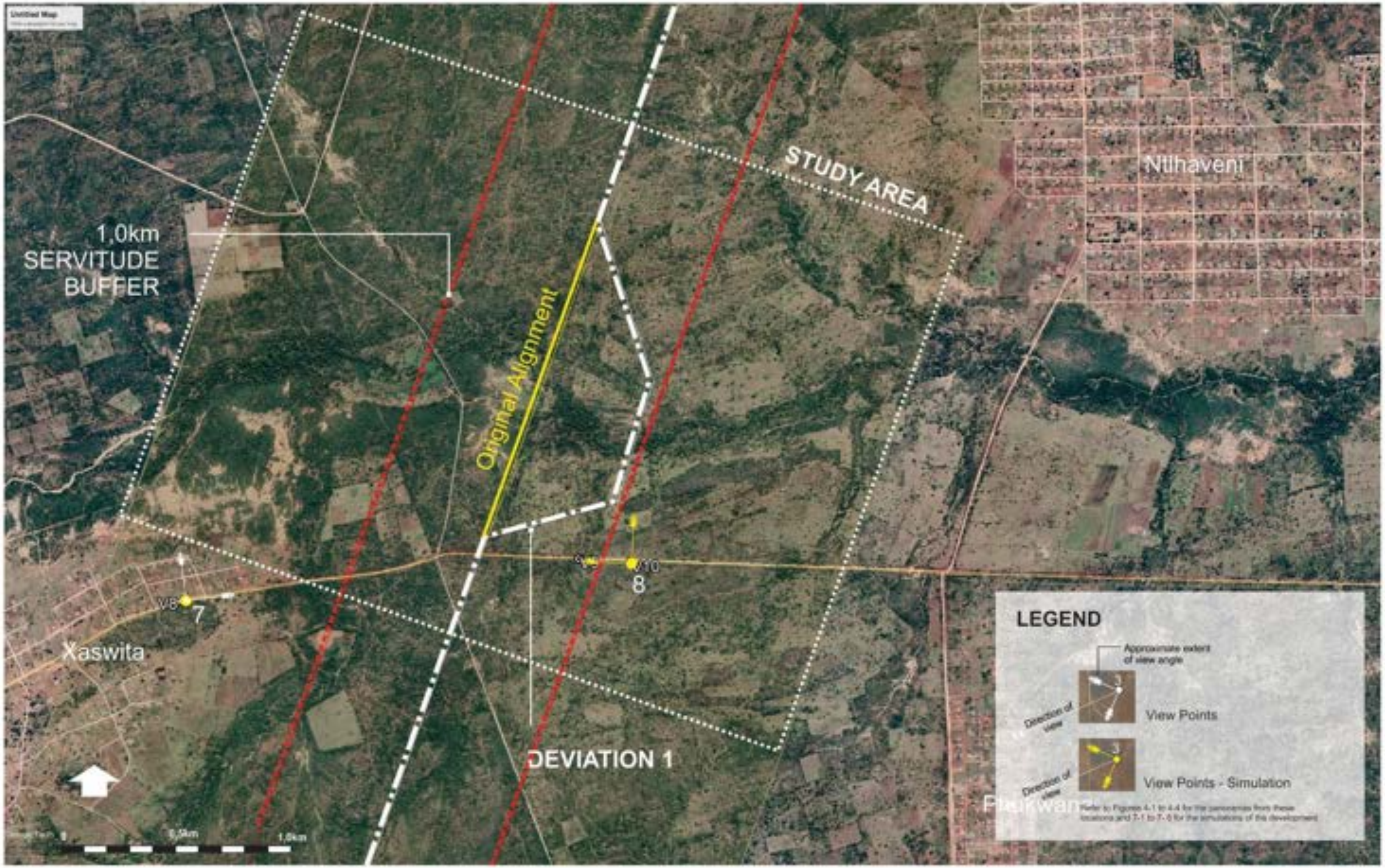

Figure 2-1: LAYOUT DEVIATION 1 - Eskom Mhinga Penninggostha 132kV

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Figure 2-2: LAYOUT DEVIATION 2 - Eskom Mhinga Penninggostha 132kV

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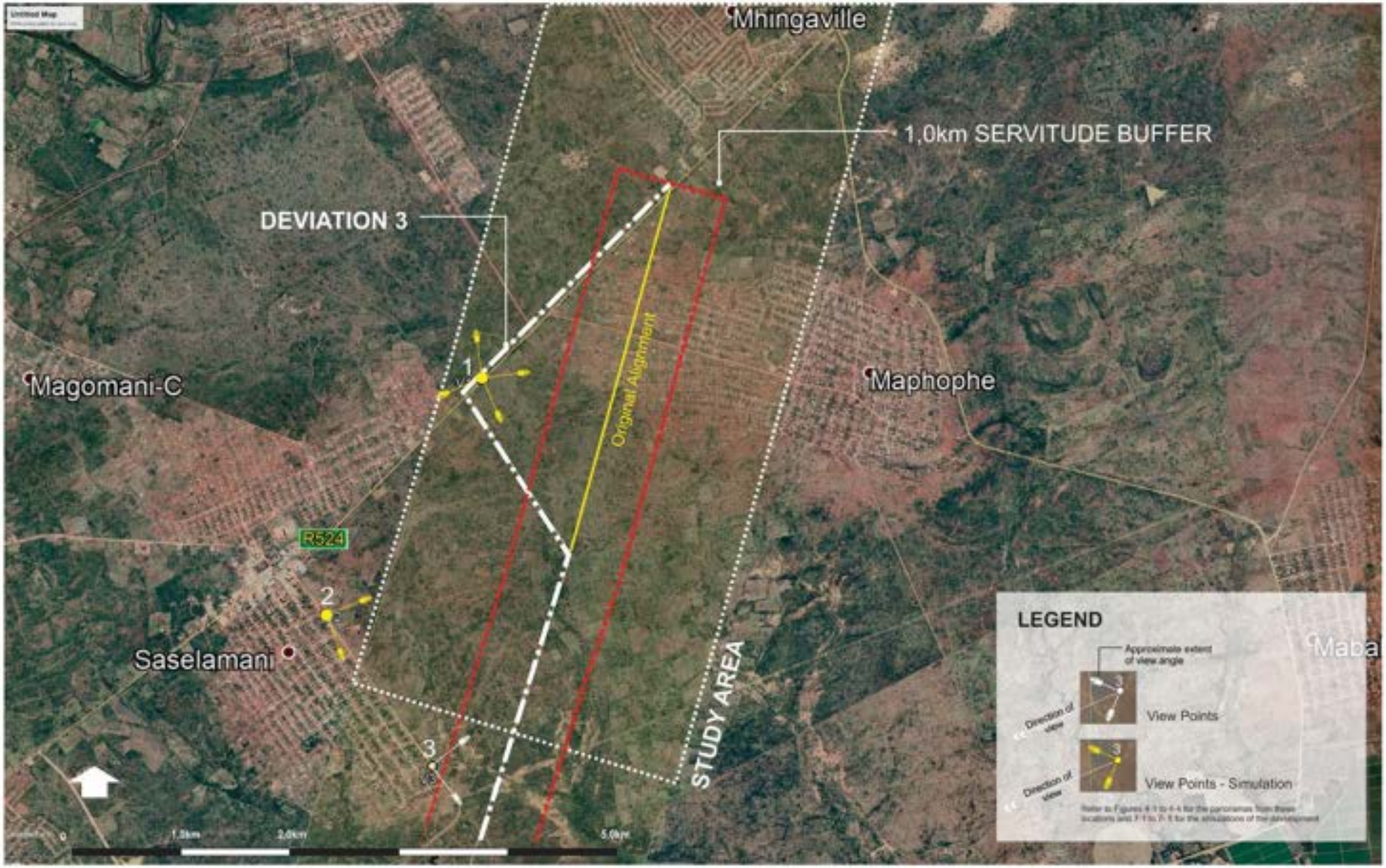

Figure 2-3: LAYOUT DEVIATION 3 - Eskom Mhinga Penninggostha 132kV

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5. PROJECT ALTERNATIVES

No alternative routes have been proposed.

6. VISUAL ISSUES

Typical issues associated with power line projects are:

- Who will be able to see the new development?
- What will it look like, and will it contrast with the receiving environment?
- Will the development affect sensitive views in the area and if so, how?
- What will be the impact of the development during the day and at night?
- What will the cumulative impact be?

The public participation process is being conducted by K&T and to date, no visual concerns have been raised. Seoras is this correct?

7. THE ENVIRONMENTAL SETTING

7.1 Land Use and Landscape Character

The study area is characterized by one basic landscape and vegetation type, which is slowly being compromised through rural development and associated harvesting activities. The project sites occur within the Makuleke Sandy Bushveld vegetation unit (Mucina and Rutherford (ed) 2006:489) on irregular sandy plains. Two river systems pass through the area at Deviation 1 site (a southern tributary of the Mphongolo River) and Deviation 2 site (immediately south of the Mphongolo River). Photographic panoramas (refer to Figure 3 for their locations) of the area are presented in Figures 4-1 to 4-4 and illustrate the nature and character of the sub-region, which comprises mostly tree savanna and tall shrubs interspersed with rural development. Species such as *Terminalia sericea*, *Burkea africana,* and *Peltophorum africana* tend to dominate the natural tree cover. These species can be come tall and create a relatively dense 'filter' to visibility in the area, especially when the viewpoint is at ground level, as is evident in the panoramas.

The dominant land use is subsistence farming along with grazing lands and the preponderance of rural/urban development. Several villages occur in and around the three study sites. They are:

- Nghomunghomu and Xaswita in the south at Deviation 1
- Ka-Vhele and Block D at Deviation 2 and
- Saselamani, Maphophe, and Mhingaville at Deviation 3.

The panoramas also illustrate that power infrastructure (distribution lines and transmission lines) is prevalent in the study area, specifically evident in View 2 immediately east of Saselamani.

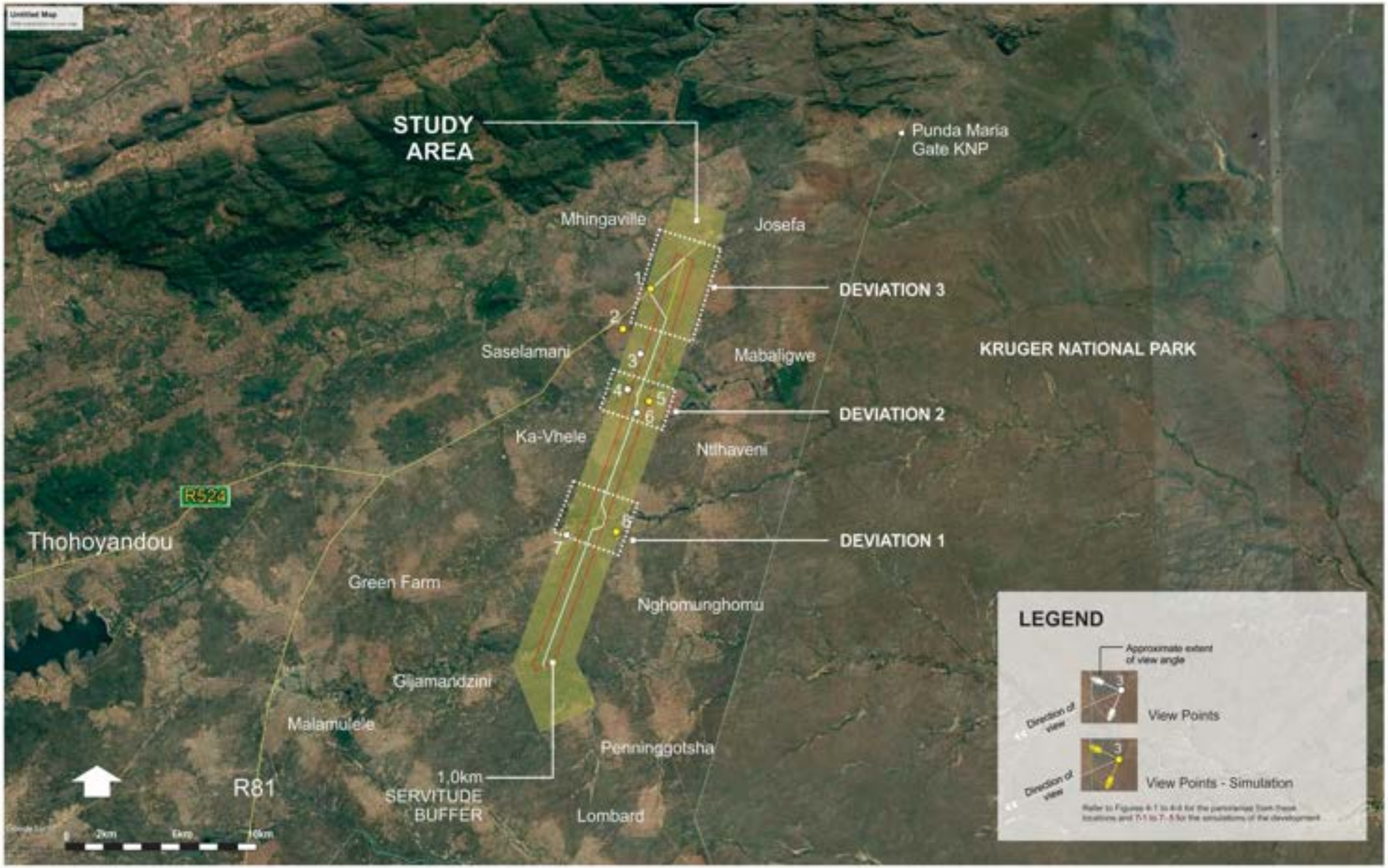

Figure 3: VIEWING POINTS - Eskom Mhinga Penninggostha 132kV

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Figure 04-1: LANDSCAPE CHARACTER - Views 1, 2 and 3
Refer to Figure 3 for location of viewing points and homesteads

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Figure 04-2: LANDSCAPE CHARACTER - Views 4 and 5

Refer to Figure 3 for location of viewing points and homesteads

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View 6: looking southwest from a local road to Ka-Vhele

View 7: looking east from the eastern edge of Xaswita

View 8: looking west from east of Xaswita

Figure 04-3: LANDSCAPE CHARACTER - Views 6, 7 and 8

Refer to Figure 3 for location of viewing points and homesteads

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8. VISUAL RESOURCE

8.1 Visual Resource Value / Scenic Quality

The scenic quality (using the scenic quality rating criteria described in Appendix A) of the study area is primarily derived from the landscape type described above and as illustrated in Figures 4-1 to 4-3. When the criteria listed in Appendix A are taken together, an overall rating of *moderate* within the context of the sub-region is allocated to the study area and each of the three deviation sites. All comprise some natural landscape, subsistence farming, and the encroachment of rural villages and power infrastructure. A summary of the study area's visual resource value, per landscape type, is tabulated in Table 1 below.

Table 1: Value of the Visual Resource

(After The Landscape Institute with the Institute of Environmental Management and Assessment, 2002)

High	**Moderate** *The study area inclusive of the three project deviation sites*	**Low**
This landscape type is considered to have a *high* value because it is a: A distinct landscape that exhibits a positive character with valued features that combine to give the experience of unity, richness, and harmony. It is a landscape that may be of importance to conserve, and which has a strong sense of place. Sensitivity: It is sensitive to change in general and will be detrimentally affected if the change is inappropriately dealt with.	This landscape type is considered to have a *moderate* value because it is a: A common landscape that exhibits some positive character, but which has evidence of alteration/degradation/ erosion of features resulting in areas of more mixed character. Sensitivity: It is potentially sensitive to change in general and change may be detrimental if inappropriately dealt with.	This landscape type is considered to have a *low* value because it is a: Minimal landscape generally negative in character with few, if any, valued features. Sensitivity: It is not sensitive to change in general and change

8.2 Sense of Place

According to Lynch (1992) sense of place is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own. The sense of place for the study area derives from the combination of landscape and cultural interventions over time, and their impact on the senses. The study area's sense of place will change depending on the viewers' location and the extent of human activities included in and given the viewing envelope. The northern deviation site (Deviation 3) has a greater 'encroachment' of 'urban' and power infrastructure and thus its scenic resource value is compromised to a degree when compared with the other two sites. The sense of place for the study area is not that distinct within the context of the sub-region. It does, however, convey a rural/natural combination that leaves a moderately positive sense of place.

9. LANDSCAPE IMPACT

The *landscape impact* (i.e. the change to the fabric and character of the landscape caused by the physical presence of the intervention) of the Project is ***moderate*** to ***low,*** with the greatest impact occurring during the construction phase due to the clearing of vegetation and exposure of the red-coloured soil that will contrast with the existing green and brown hues of the sites and their immediate surroundings. These activities will moderately change the landscape characteristics of the study area. During the operational phase, the landscape impact will reduce to low, as the vegetation and rehabilitated areas recover.

As stated in the approach section, the physical change to the landscape at the Project sites must be understood in terms of the power line's visibility and potential impact on views from sensitive viewing areas, along with its effect on the visual aesthetics of the area (impact on the baseline visual resource). The following sections discuss the effect the Project may have on the visual and aesthetic environment.

10. VISUAL IMPACT

Visual impacts will be caused by activities and infrastructure in all Project phases i.e. establishment, operational and closure, and decommissioning. Activities associated with the Project will be visible to varying degrees from varying distances around the project sites. During the establishment and operational phases, the Project's visibility will be influenced by the activities described above through the physical introduction of the powerline poles and the cables. During the closure phases, the visibility and visual intrusion of the Project will reduce as the infrastructure is removed and the area rehabilitated.

The *magnitude* of visual impact is determined using visibility, visual intrusion, visual exposure, and viewer sensitivity criteria (assumed to be low for the project[§]). When the *magnitude* of impact is qualified with spatial, duration, and probability criteria the significance of the impact can be predicted (refer to Appendix C).

10.1 Sensitive Receptors

Sensitive visual receptors include people living in or visiting homesteads in the villages located adjacent to the study area and the three deviation sites as indicated in Figures 1 and 5, i.e. from north to south – Mhingaville, Maphophe, Saselamani, Block D, Ka-Vhele, Ntlhaveni, and Xaswita. Other receptors, but less sensitive, include people traveling along the R524 and the local roads that traverse the study area. Table 2 below, summarizes sensitive receptors and locations using a worst-case scenario.

Figure 5 locates these sensitive viewing areas and routes, relative to the project sites. Visual sensitivities would arise from these areas and the R524 by people observing and being affected by the change to the aesthetic baseline as described above and illustrated in Figures 4-1 to 4-3.

Table 2: Potential Sensitivity of Visual Receptors

High	Moderate	Low
People visiting or living in villages adjacent to the three deviation sites. These include Mhingaville, Maphophe, Saselamani, Block D, Ka-Vhele, Ntlhaveni, and Xaswita.	Locals and visitors traveling through the study area on the R524 and along local roads that connect the various villages in and around the study area.	People working within the study area and traveling along local roads whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

[§] At the time of writing, the outcome of the I&AP process was not known. A low sensitivity is anticipated as it is assumed that the locals would be please to have the supply of additional electricity to the area.

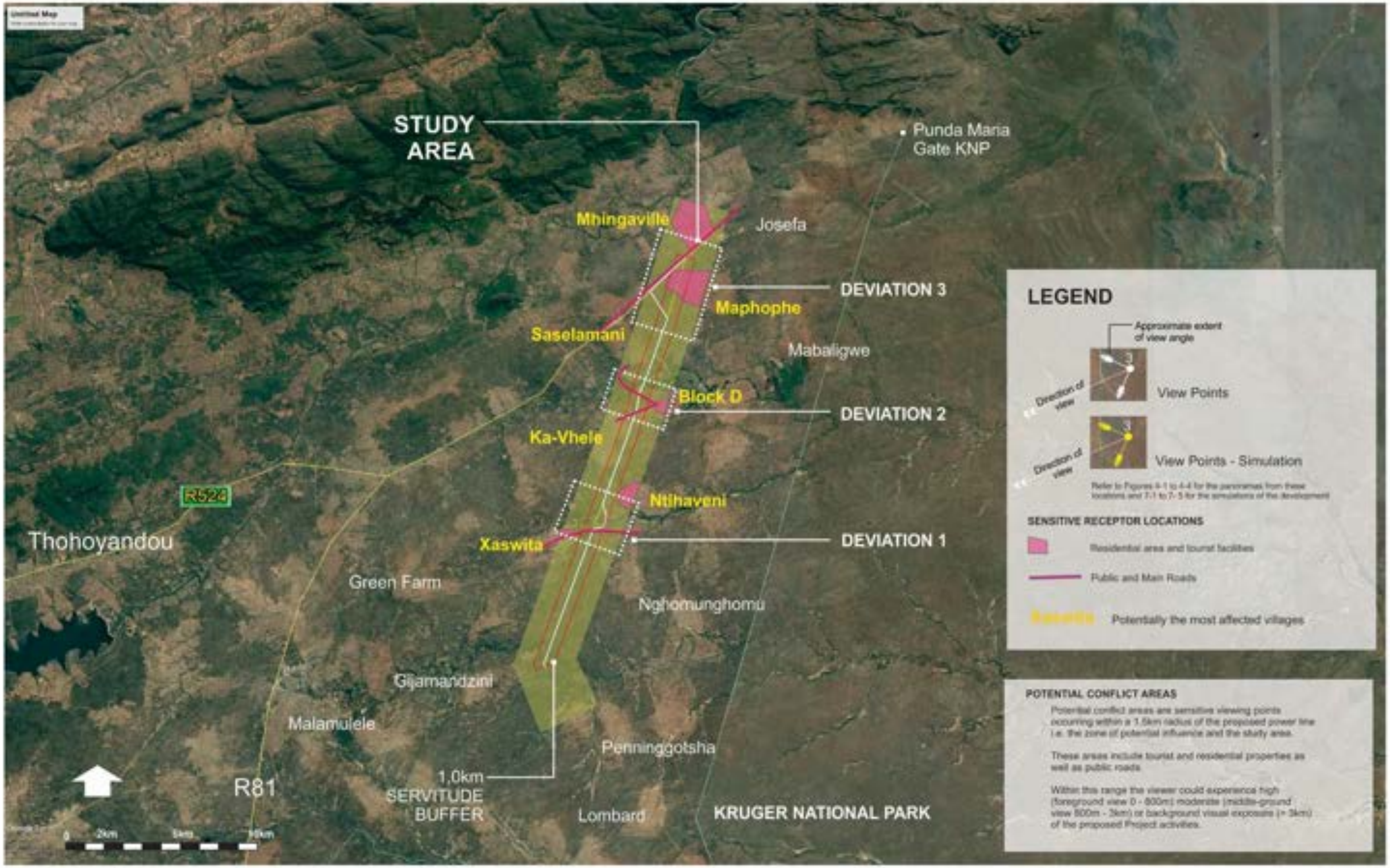

Figure 5: RECEPTOR SENSITIVITY - Eskom Mhinga Penninggostha 132kV

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10.2 Visibility and Visual Absorption Capacity

The ‘zone of potential influence’ for the Project was established at 1,5km to either side of the centre line of the proposed route. Beyond this distance the impact of the powerline would have diminished considerably, as it will recede into the background and/or visibility would be reduced due to atmospheric conditions (haze on days when certain climatic conditions prevail, specifically inversions) and/or topography and vegetative cover. Refer also to Appendix B for an illustration of the effect of distance on visual exposure.

The landscape has a moderate to high visual absorption capacity (VAC), i.e. the landscape's ability to absorb physical changes without transformation in its visual character and quality is limited. This is due to the flatness of the landscape and the medium to tall savanna trees and large shrubs that would block or screen views from sensitive viewing areas to the three deviation sites. The simulations in Figures 6-1, to 6-6 indicate that the Project components would be visible from surrounding areas and the R524, however, the powerline and its infrastructure would mostly be screened by existing vegetation and structures.

10.3 Visual Intrusion

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit with or disrupt/enhance the ecological and cultural aesthetic of the landscape as a whole? And ties in with the concept of visual absorption capacity (VAC) described above.

The simulations also illustrate that Project activities will have a minimal effect on sensitive views and the baseline landscape when seen from a variety of viewing locations around the project sites. These scenarios represent the worst-case scenario during the operational phase of the Project. The 132kV power line infrastructure would appear in the foreground and the middle ground of some sensitive views, resulting, generally, in a *moderate* to *low* visual intrusion for all three of the deviation sites. Receptors experiencing the highest intrusion rating (*moderate*) are people traveling along the R524 between Saselamani and Mhingaville (deviation site 3), although, the 132kV powerline would be aligned alongside an existing distribution line and therefore it would not appear to be ‘out of place’. L*ow* intrusion is predicted for all other residential areas and local roads located near deviation sites 1 and 2.

It should be noted that the proposed deviation routes at sites 1 and 2 are contained within the original 1,0km buffer zone. The deviation at site number 3, extends beyond the western edges of the buffer zone but is routed through a savanna landscape away from the eastern edge of Saselamani, thereby reducing its intrusion considerably as illustrated in View 2, Figure 6-3. It should be noted that the re-routing in this deviation, results in the powerline not passing through a residential area (the western edge of Maphophe).

Table 4 summarizes the visual intrusion ratings of the powerline.

Table 4: Visual Intrusion

High	**Moderate**	**Low**
None	Along the R524 between Saselamani and Mhingaville, the north-western edge of Maphophe.	For all other sensitive viewing areas.
The Project would have a substantial negative effect on the visual quality (sense of place) of the landscape relative to the baseline landscape because it would: • Contrast dramatically with the patterns or elements that define the structure of the landscape.	The Project would have a moderate negative effect on the visual quality (sense of place) of the landscape: • Contrast with the current patterns or elements that define the structure of the landscape. • Be partially compatible with land use (industrial), settlement, or enclosure patterns of the general area;	The Project would have a minimal effect on the visual quality (sense of place) of the landscape: • Contrasts minimally with the patterns or cultural elements that define the structure of the landscape. • Is mostly compatible with land use, settlement, or enclosure patterns;
RESULT: A notable change in landscape characteristics over an extensive area and an intensive change over a localized area resulting in major changes in key views.	*RESULT:* A moderate change in landscape characteristics over localized areas resulting in a moderate change to key views.	*RESULT:* Minimal change resulting in a minor change to key views sensitive viewing areas.

At closure, the infrastructure will be removed, and the disturbed areas rehabilitated. Post-closure, when rehabilitation becomes effective, the intrusive value of the Project will be negligible when rated against the current baseline.

Figure 06-1: SIMULATION VIEW 1 - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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Figure 06-2: SIMULATION VIEW 1b - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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Figure 06-3: SIMULATION VIEW 2 - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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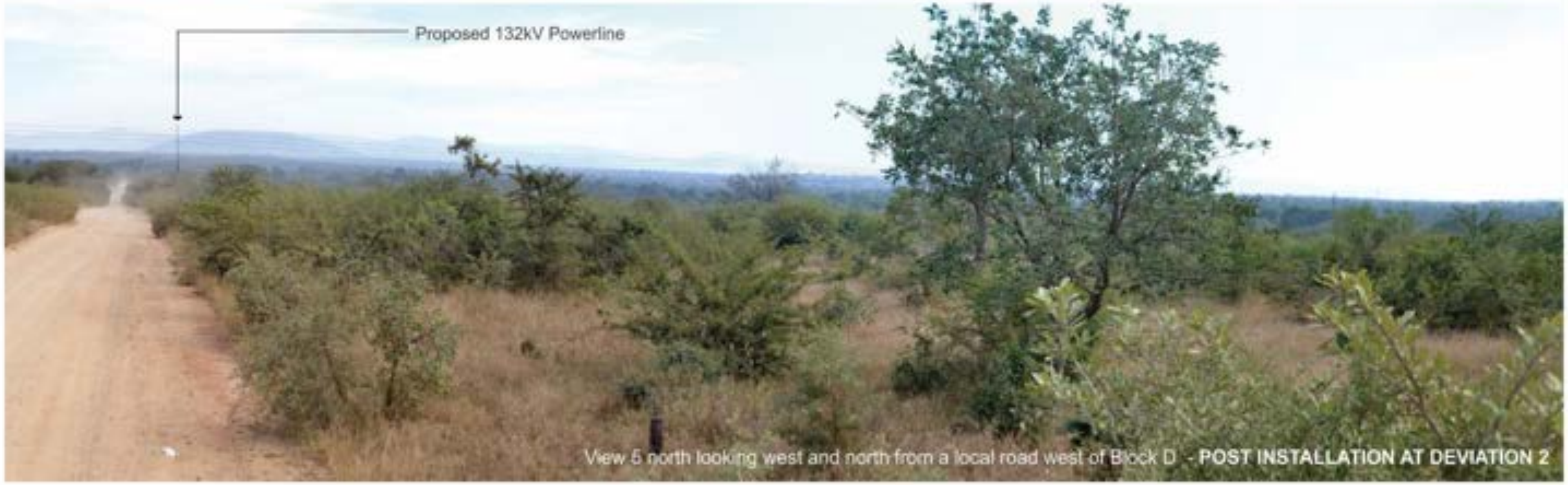

Figure 06-4: SIMULATION VIEW 5 north - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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Figure 06-5: SIMULATION VIEW 5 south - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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Figure 06-6: SIMULATION VIEW 8 - Eskom Mhinga Penninggotsha 132kV

Refer to Figure for the location of the view points

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10.4 Magnitude of Visual Impact

Referring to discussions above and using the criteria listed in Appendix B, the *magnitude* of the visual impact of the Project is rated in Table 5 below for all phases of the project. To assess the *magnitude* of impact four main factors are considered.

- *Visual Intrusion:* The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use, within the context of the landscape's VAC.
- *Visibility:* The area/points from which project components will be visible.
- *Visual exposure:* Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
- *Sensitivity:* Sensitivity of visual receptors to the proposed development.

In synthesizing the criteria a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgment (LI-IEMA 2013). According to the results tabulated below the *magnitude* of visual impact (based on the worst-case scenario) will *moderate* along the R524 road immediately homesteads south of the road in the north-western corner of Maphophe. A moderate For the remaining sections of the study area there will either be *moderate* or a *low* magnitude of impact. The northern, eastern, and southern extremities of the study area will have no visual impact as is indicated in the viewshed in Figure 7-5.

Table 5: *Magnitude* of the impact of the proposed Project operational phase (without mitigation)

High None	**Moderate** Users of the R524 between Saselamani and Mhingaville and some residents in the northwest sector of Maphophe	**Low** Sensitive receptors located near the deviation sties (i.e. Saselamani, Mhingaville, the remained of Maphophe, Block D, Ka-Vhele, Ntlhaveni, and Xaswita.	**Negligible to none** The remainder of the study area
Major loss of or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and/or introduction of elements considered to be uncharacteristic when set within the attributes of the receiving landscape. **High scenic quality impacts would result.**	Partial loss of or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape. **Moderate scenic quality impacts would result**	Minor loss of or alteration to key elements/features / characteristics of the baseline. i.e. Pre-development landscape or view and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape. **Low scenic quality impacts would result.**	Very minor loss or alteration to key elements/features/characteristics of the baseline. i.e. Pre-development landscape or view and/or introduction of elements that is not uncharacteristic with the surrounding landscape – approximating the 'no change' situation. **Negligible scenic quality impacts would result.**

11. MANAGEMENT MEASURES

In considering mitigating measures three rules are considered - the measures should be feasible (economically), effective (how long will it take to implement and what provision is made for management/maintenance), and acceptable (within the framework of the existing landscape and land use policies for the area). To address these, the following principles have been established:

- Mitigation measures should be designed to suit the existing landscape character and needs of the locality. They should respect and build upon landscape distinctiveness.
- It should be recognized that many mitigation measures, especially the establishment of planted screens and rehabilitation, are not immediately effective.

There are three main areas where management efforts should be focussed and are essential during the operation phase of the mine:

- Good housekeeping to reduce dust from construction activities, and in all working areas and access roads required during the construction process, and
- The rehabilitation of disturbed areas with an indigenous grass mix.

The following mitigation measures are recommended for the Project and should be included as part of the Environmental Management Programme Report (EMPR). The following general actions are recommended:

11.1 Planning and site development

- With the preparation of the portions of land onto which activities will take place the minimum amount of existing vegetation and topsoil should be removed.
- Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation.
- All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use.
- Adopt responsible construction practices aimed at containing the establishment activities to specifically demarcated areas.
- Specifications with regards to the placement of construction camps (if required), as well as a site plan of the construction camp, indicating waste areas, storage areas, and placement of ablution facilities should be included in the EMPr. These areas should either be screened or positioned in areas where they would be less visible from nearby residential areas and main roads.
- Construction activities should be limited to between 08:00 and 17:00 or in conjunction with the ECO.
- Building or waste material discarded should be undertaken at an authorised location, which should not be within any sensitive areas.

11.2 Landscaping and ecological approach to rehabilitation

- Where new vegetation is proposed to be introduced to the site, an ecological approach to rehabilitation, as opposed to a horticultural approach should be adopted. For example, communities of indigenous plants enhance biodiversity, a desirable outcome for the area. This approach can significantly reduce long-term costs as less maintenance would be required over conventional landscaping methods as well as the introduced landscape being more sustainable.

11.3 Good housekeeping

- During operation, all construction roads will require an effective dust suppression management programme, such as regular wetting and/or the use of non-polluting chemicals that will retain moisture in the road surface.
- Dust suppression techniques must also be applied to all areas prone to produce dust other than working areas.

12. SIGNIFICANCE OF VISUAL IMPACT

The *Magnitude* of impact, rated in Table 5, is further qualified with *scale (extent)*, *duration* and *probability* criteria to determine the *significance* of the visual impact. Table 6 below summarises in detail, the *significance* of the visual impact during all phases of the project, collectively for the three deviation sites. These results are based on the worst-case scenario when the impacts of all aspects of the project are taken together using the impact criteria in Appendix D. According to these criteria *significance* of the impact is a function of (Magnitude + Duration + Extent) x Probability**.

Table 6: Significance of Visual Impact

POTENTIAL VISUAL IMPACT	Magnitude	Duration	Extent	Probability	Significance	Status
ESTABLISHMENT PHASE (without mitigation) Moderate alteration to the visual quality of aspects of the study area and the site due to the removal of vegetation, to create the working corridor for the powerline. The erection of pole structures and movement of materials on and off-site will moderately contrast with the baseline. The result is a moderate impact on the visual aesthetics and sense of place of the study area from a sensitive viewing area. Activities will be visible from the adjacent roads (R534 and local roads) for short periods.	6	1	2	3	**27 (L)**	Negative
ESTABLISHMENT PHASE (with mitigation) *Mitigation measures are feasible during this phase and relate mostly to good housekeeping. Management measures as proposed in Section 11.0 must be effectively implemented.*	4	1	2	2	**14 (L)**	Negative

**

Points	Significance Weighting	Description
< 30 points	**Low**	Where this impact would not have a direct influence on the decision to develop in the area
31-60 points	**Medium**	Where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	**High**	Where the impact must have an influence on the decision process to develop in the area

OPERATIONAL PHASE (without mitigation) Alteration to the visual quality of aspects of the study area due to the presence of the powerline and its associated infrastructure. The result is a minor impact on the visual aesthetics and sense of place of localised sections of the study area. Activities will be visible from the main road (R524) and local roads with high visual exposure i.e. activities would occur in the foreground of views but would be partially screened by existing vegetation.	6	4	2	3	**36 (M)**	Negative
OPERATIONAL PHASE (with mitigation) *Mitigation measures are feasible during the operational phase. Due to the nature of the activities, the impact could be reduced when the measures proposed in Section 11 are implemented and effectively managed.*	4	4	2	3	**30 (L)**	Negative
DECOMMISSIONING (REHABILITATION) At closure, all structures will be removed. Rehabilitation measures to prevent erosion and achieve rapid plant growth and colonization are implemented and effectively managed in disturbed areas.	4	1	2	2	**14 (L)**	Insignificant

13. CUMULATIVE EFFECT

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect how the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

The proposed Project will be developed in an area where power infrastructure (sub-stations, distribution, and transmission lines) exists. The intervisibility of these existing and the proposed 132 kV project will cause a cumulative negative effect on the aesthetics and views in the study area. The separate effects of the Project may not be of major significance, but together with the existing power infrastructure, they would create additional adverse effects on visual receptors within their combined visual envelopes if management practices are not rigorously applied.

14. CONCLUSION

The existing visual condition of the landscape that may be affected by the proposed Project has been described. The study area's scenic quality has been rated *moderate*, within the context of the sub-region. Sensitive viewing areas and landscape types have been identified and mapped indicating potential minor landscape and receptor sensitivity to the project.

Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. The visual impact of the 132 kV Project will cause moderate changes in the landscape that are noticeable to sensitive viewers looking towards the development from some residential areas (Mhingaville, Maphophe, Saselamani) and the main public road (R524). However, these views already contain features associated with power infrastructure, which runs across the northern section of the study area, and the tall savannah vegetation will screen many views. The potential for visual impact will be substantially reduced and is rated as *moderate*, during the operational phase without mitigation and *low* with mitigation.

Mitigation measures are possible in all phases of the project and can reduce the anticipated impact.

At closure, after removal of the infrastructure and the rehabilitation of disturbed areas, the impact will reduce to *negligible.* This, however, assumes that all mitigation measures are effectively implemented and managed.

Author's Opinion

It is the opinion of the author that all aspects of the Project, from a potential visual impact perspective, should be approved provided that the mitigation/management measures are effectively implemented, managed, and monitored in the long term.

*** GYLA ***

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To reach an understanding of the effect of development on a landscape resource, it is necessary to consider the different aspects of the landscape as follows:

Landscape Elements and Character

The individual elements that make up the landscape, including prominent or eye-catching features such as hills, valleys, savannah, trees, water bodies, buildings and roads are generally quantifiable and can be easily described.

Landscape character is therefore the description of the pattern, resulting from combinations of natural (physical and biological) and cultural (land use) factors and how people perceive these. The visual dimension of the landscape reflects how these factors create repetitive groupings and interact to create areas that have a specific visual identity. The process of landscape character assessment can increase appreciation of what makes the landscape distinctive and what is important about an area. The description of landscape character thus focuses on the *nature of the land*, rather than the response of a viewer.

Landscape Value – all-encompassing (Aesthetic Value)

Aesthetic value is the emotional response derived from the experience of the environment with its natural and cultural attributes. The response can be either to visual or non-visual elements and can embrace the sound, smell and any other factor having a strong impact on human thoughts, feelings, and attitudes (Ramsay 1993). Thus, aesthetic value encompasses more than the seen view, visual quality, or scenery, and includes atmosphere, landscape character, and sense of place (Schapper 1993).

Aesthetic appeal (value) is considered high when the following are present (Ramsay 1993):

- *Abstract qualities*: such as the presence of vivid, distinguished, uncommon or rare features or abstract attributes.
- *Evocative responses*: the ability of the landscape to evoke particularly strong responses in community members or visitors.
- *Meanings*: the existence of a long-standing special meaning to a group of people or the ability of the landscape to convey special meanings to viewers in general.
- *Landmark quality*: a feature that stands out and is recognised by the broader community.

Sense of Place

Central to the concept of a sense of place is that the place requires uniqueness and distinctiveness. The primary informant of these qualities is the spatial form and character of the natural landscape together with the cultural transformations and traditions associated with historic use and habitation. According to Lynch (1992) sense of place "is the extent to which a person can recognize or recall a place as being distinct from other places - as having a vivid, or unique, or at least particular, character of its own". Sense of place is the unique value that is allocated to a specific place or area through the cognitive experience of the user or viewer. In some cases, these values allocated to the place are similar for a wide spectrum of users or viewers, giving the place a universally recognized and therefore, strong sense of place.

Scenic Quality

Assigning values to visual resources is a subjective process. The phrase, “beauty is in the eye of the beholder,” is often quoted to emphasize the subjectivity in determining scenic values. Yet, researchers have found consistent levels of agreement among individuals asked to evaluate visual quality.

Studies for perceptual psychology have shown a human preference for landscapes with a higher visual complexity particularly in scenes with water, over homogeneous areas. Based on contemporary research landscape quality increases when:

- Topographic ruggedness and relative relief increase.
- Where water forms are present.
- Where diverse patterns of grasslands and trees occur.
- Where natural landscape increases and man-made landscape decreases.
- And where land use compatibility increases and land use edge diversity decreases (Crawford 1994).

Scenic Quality - Explanation of Rating Criteria:

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Landform: Topography becomes more interesting as it gets steeper or more massive, or more severely or universally sculptured. Outstanding landforms may be monumental, as the Fish River or Blyde River Canyon, the Drakensberg or other mountain ranges, or they may be exceedingly artistic and subtle as certain pinnacles, arches, and other extraordinary formations.

Vegetation: (Plant communities) Give primary consideration to the variety of patterns, forms, and textures created by plant life. Consider short-lived displays when they are known to be recurring or spectacular (wildflower displays in the Karoo regions). Consider also smaller scale vegetational features, which add striking and intriguing detail elements to the landscape (e.g., gnarled or wind-beaten trees, and baobab trees).

Water: That ingredient that adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration in selecting the rating score.

Colour: Consider the overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) as they appear during seasons or periods of high use. Key factors to use when rating "colour" are variety, contrast, and harmony.

Adjacent Scenery: The degree to which scenery outside the scenery unit being rated enhances the overall impression of the scenery within the rating unit. The distance which adjacent scenery will influence scenery within the rating unit will normally range from 0-8 kilometres, depending upon the characteristics of the topography, the vegetative cover, and other such factors. This factor is generally applied to units that would normally rate very low in a score, but the influence of the adjacent unit would enhance the visual quality and raise the score.

Scarcity: This factor provides an opportunity to give added importance to one or all the scenic features that appear to be relatively unique or rare within one physiographic region. There may also be cases where a separate evaluation of each of the key factors does not give a true picture of the overall scenic quality of an area. Often it is several not so spectacular elements in the proper combination that produces the most pleasing and memorable scenery - the scarcity factor can be used to recognize this type of area and give it the added emphasis it needs.

Cultural Modifications: Cultural modifications in the landform/water, vegetation, and addition of structures should be considered and may detract from the scenery in the form of a negative intrusion or complement or improve the scenic quality of a unit.

Scenic Quality Inventory and Evaluation Chart

(After The Visual Resource Management System, Department of the Interior of the USA Government, Bureau of Land Management)

Key factors	Rating Criteria and Score		
Landform	High vertical relief as expressed in prominent cliffs, spires, or massive rock outcrops, or severe surface variation or highly eroded formations including major Badlands or dune systems; or detail features dominant and exceptionally striking and intriguing such as glaciers. **5**	Steep canyons, mesas, buttes, cinder cones, and drumlins; or interesting erosional patterns or variations in size and shape of landforms; or detail features which are interesting though not dominant or exceptional. **3**	Low rolling hills, foothills, or flat valley bottoms; or few or no interesting landscape features. **1**
Vegetation and landcover	A variety of vegetative types as expressed in interesting forms, textures, and patterns. **5**	Some variety of vegetation, but only one or two major types. **3**	Little or no variety or contrast in vegetation. **1**
Water	Clear and clean appearing, still, or cascading white water, any of which are a dominant factor in the landscape. **5**	Flowing, or still, but not dominant in the landscape. **3**	Absent, or present, but not noticeable. **0**
Colour	Rich colour combinations, variety or vivid colour; or pleasing contrasts in the soil, rock, vegetation, water or snow fields. **5**	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element. **3**	Subtle colour variations, contrast, or interest; generally mute tones. **1**
Influence of adjacent scenery	Adjacent scenery greatly enhances visual quality. **5**	Adjacent scenery moderately enhances overall visual quality. **3**	Adjacent scenery has little or no influence on overall visual quality. **0**
Scarcity	One of a kind; or unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing, etc. National and provincial parks and conservation areas *** 5+**	Distinctive, though somewhat like others within the region. **3**	Interesting within its setting, but common within the region. **1**
Cultural modifications	Modifications add favourably to visual variety while promoting visual harmony. **2**	Modifications add little or no visual variety to the area and introduce no discordant elements. **0**	Modifications add variety but are very discordant and promote strong disharmony. **4**

Scenic Quality (i.e. value of the visual resource)

In determining the quality of the visual resource both the objective and the subjective or aesthetic factors associated with the landscape are considered. Many landscapes can be said to have a strong sense of place, regardless of whether they are scenically beautiful but where landscape quality, aesthetic value and a strong sense of place coincide - the visual resource or perceived value of the landscape is considered to be very high.

When considering both objective and subjective factors associated with the landscape there is a balance between landscape character and individual landscape features and elements, which would result in the values as follows:

Value of Visual Resource – expressed as Scenic Quality
(After The Landscape Institute with the Institute of Environmental Management and Assessment (2013))

High	**Moderate**	**Low**
Areas that exhibit a very positive character with valued features that combine to give the experience of unity, richness and harmony. These are landscapes that may be of particular importance to conserve and which may be sensitive change in general and which may be detrimental if change is inappropriately dealt with.	Areas that exhibit positive character, but which may have evidence of alteration to /degradation/erosion of features resulting in areas of more mixed character. Potentially sensitive to change in general; again, change may be detrimental if inappropriately dealt with but it may not require special or particular attention to detail.	Areas generally negative in character with few, if any, valued features. Scope for positive enhancement frequently occurs.

A visual impact study analysis addresses the importance of the inherent aesthetics of the landscape, the public value of viewing the natural landscape, and the contrast or change in the landscape from the project.

For some topics, such as water or air quality, it is possible to use measurable, technical international or national guidelines or legislative standards, against which potential effects can be assessed. The assessment of likely effects on a landscape resource and on visual amenity is more complex, since it is determined through a combination of quantitative and qualitative evaluations. (The Landscape Institute with the Institute of Environmental Management and Assessment (2002).

Landscape impact assessment includes a combination of objective and subjective judgements, and it is therefore important that a structured and consistent approach is used. It is necessary to differentiate between judgements that involve a degree of subjective opinion (as in the assessment of landscape value) from those that are normally more objective and quantifiable (as in the determination of magnitude of change). Judgement should always be based on training and experience and be supported by clear evidence and reasoned argument. Accordingly, suitably qualified and experienced landscape professionals carry out landscape and visual impact assessments (The Landscape Institute with the Institute of Environmental Management and Assessment (2002),

Landscape and visual assessments are separate, although linked, procedures. The landscape baseline, its analysis and the assessment of landscape effects all contribute to the baseline for visual assessment studies. The assessment of the potential effect on the landscape is carried our as an effect on an environmental resource, i.e. the landscape. Visual effects are assessed as one of the interrelated effects on population.

Landscape Impact

Landscape impacts derive from changes in the physical landscape, which may give rise to changes in its character and from effects to the scenic values of the landscape. This may in turn affect the perceived value ascribed to the landscape. The description and analysis of effects on a landscape resource relies on the adoption of certain basic principles about the positive (or beneficial) and negative (or adverse) effects of change in the landscape. Due to the inherently dynamic nature of the landscape, change arising from a development may not necessarily be significant (Institute of Environmental Assessment & The Landscape Institute (2002)).

Visual Impact

Visual impacts relate to the changes that arise in the composition of available views as a result of changes to the landscape, to people's responses to the changes, and to the overall effects with respect to visual amenity. Visual impact is therefore measured as the change to the existing visual environment (caused by the physical presence of a new development) and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the area.

To assess the magnitude of visual impact four main factors are considered.

Visual Intrusion:	The nature of intrusion or contrast (physical characteristics) of a project component on the visual quality of the surrounding environment and its compatibility/discord with the landscape and surrounding land use.
Visibility:	The area/points from which project components will be visible.
Visual exposure:	Visibility and visual intrusion qualified with a distance rating to indicate the degree of intrusion.
Sensitivity:	Sensitivity of visual receptors to the proposed development

Visual Intrusion / contrast

Visual intrusion deals with the notion of contextualism i.e. how well does a project component fit into the ecological and cultural aesthetic of the landscape as a whole? Or conversely what is its contrast with the receiving environment. Combining landform / vegetation contrast with structure contrast derives overall visual intrusion/contrast levels of high, moderate, and low.

Landform / vegetation contrast is the change in vegetation cover and patterns that would result from construction activities. Landform contrast is the change in landforms, exposure of soils, potential for erosion scars, slumping, and other physical disturbances that would be noticed as uncharacteristic in the natural landscape. Structure contrast examines the compatibility of the proposed development with other structures in the landscape and the existing natural landscape. Structure contrast is typically strongest where there are no other structures (e.g., buildings, existing utilities) in the landscape setting.

Photographic panoramas from key viewpoints before and after development are presented to illustrate the nature and change (contrast) to the landscape created by the proposed development. A computer simulation technique is employed to superimpose a graphic of the development onto the panorama. The extent to which the component fits or contrasts with the landscape setting can then be assessed using the following criteria.

- Does the physical development concept have a negative, positive or neutral effect on the quality of the landscape?
- Does the development enhance or contrast with the patterns or elements that define the structure of the landscape?
- Does the design of the project enhance and promote cultural continuity or does it disrupt it?

The consequence of the intrusion / contrast can then be measured in terms of the sensitivity of the affected landscape and visual resource given the criteria listed below. For instance, within an industrial area, a new sewage treatment works may have an insignificant landscape and visual impact; whereas in a *valued* landscape it might be considered to be an intrusive element. (Institute of Environmental Assessment & The landscape Institute (1996)).

Visual Intrusion

High	Moderate	Low	Positive
If the project: - Has a substantial negative effect on the visual quality of the landscape; - Contrasts dramatically with the patterns or elements that define the structure of the landscape; - Contrasts dramatically with land use, settlement or enclosure patterns; - Is unable to be 'absorbed' into the landscape.	If the project: - Has a moderate negative effect on the visual quality of the landscape; - Contrasts moderately with the patterns or elements that define the structure of the landscape; - Is partially compatible with land use, settlement or enclosure patterns. - Is partially 'absorbed' into the landscape.	If the project: - Has a minimal effect on the visual quality of the landscape; - Contrasts minimally with the patterns or elements that define the structure of the landscape; - Is mostly compatible with land use, settlement or enclosure patterns. - Is 'absorbed' into the landscape.	If the project: - Has a beneficial effect on the visual quality of the landscape; - Enhances the patterns or elements that define the structure of the landscape; - Is compatible with land use, settlement or enclosure patterns.

Result	Result	Result	Result
Notable change in landscape characteristics over an extensive area and/or intensive change over a localized area resulting in major changes in key views.	Moderate change in landscape characteristics over localized area resulting in a moderate change to key views.	Imperceptible change resulting in a minor change to key views.	Positive change in key views.

Visual intrusion also diminishes with scenes of higher complexity, as distance increases, the object becomes less of a focal point (more visual distraction), and the observer's attention is diverted by the complexity of the scene (Hull and Bishop (1988)).

Visibility

A viewshed analysis was carried out to define areas, which contain all possible observation sites from which the development would be visible. The basic assumption for preparing a viewshed analysis is that the observer eye height is 1.8m above ground level. Topographic data was captured for the site and its environs at 10 m contour intervals to create the Digital Terrain Model (DTM). The DTM includes features such as vegetation, rivers, roads and nearby urban areas. These features were 'draped' over the topographic data to complete the model used to generate the viewshed analysis. It should be noted that viewshed analyses are not absolute indicators of the level of significance (magnitude) of the impact in the view, but merely a statement of the fact of potential visibility. The visibility of a development and its contribution to visual impact is predicted using the criteria listed below:

Visibility

High	**Moderate**	**Low**
Visual Receptors If the development is visible from over half the zone of potential influence, and/or views are mostly unobstructed and/or the majority of viewers are affected.	*Visual Receptors* If the development is visible from less than half the zone of potential influence, and/or views are partially obstructed and or many viewers are affected	*Visual Receptors* If the development is visible from less than a quarter of the zone of potential influence, and/or views are mostly obstructed and/or few viewers are affected.

Visual Exposure

Visual exposure relates directly to the distance of the view. It is a criterion used to account for the limiting effect of increased distance on visual impact. The impact of an object in the foreground (0 – 800m) is greater than the impact of that same object in the middle ground (800m – 5.0 km) which, in turn is greater than the impact of the object in the background (greater than 5.0 km) of a particular scene.

Distance from a viewer to a viewed object or area of the landscape influences how visual changes are perceived in the landscape. Generally, changes in form, line, colour, and texture in the landscape become less perceptible with increasing distance.

Areas seen from 0 to 800m are considered foreground; foliage and fine textural details of vegetation are normally perceptible within this zone.

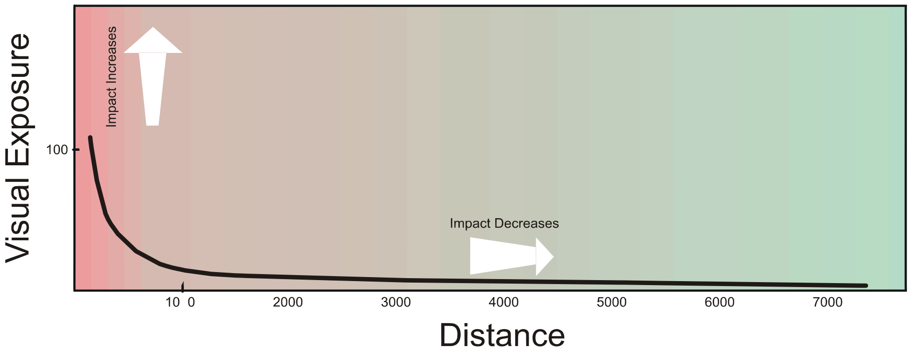
Areas seen from 800m to 5.0km are considered middle ground; vegetation appears as outlines or patterns. Depending on topography and vegetation, middle ground is sometimes considered to be up to 8.0km.

Areas seen from 5.0km to 8.0km and sometimes up to 16km and beyond are considered background. Landforms become the most dominant element at these distances.

Seldom seen areas are those portions of the landscape that, due to topographic relief or vegetation, are screened from the viewpoint or are beyond 16km from the viewpoint. Landforms become the most dominant element at these distances.

The impact of an object diminishes at an exponential rate as the distance between the observer and the object increases. Thus, the visual impact at 1000 m would be 25% of the impact as viewed from 500 m. At 2000 m it would be 10% of the impact at 500 m. The inverse relationship of distance and visual impact is well recognised in visual analysis literature (e.g.: Hull and Bishop (1988)) and is used as an important criteria for the study. This principle is illustrated in the Figures below.

Effect of Distance on Visual Exposure



View from 10 000 metres

View from 5 000 metres

View from 3 000 metres

View from 1 000 metres

Sensitivity of Visual Receptors

When visual intrusion, visibility and visual exposure are incorporated, and qualified by sensitivity criteria (visual receptors) the magnitude of the impact of the development can be determined.

The sensitivity of visual receptors and views will be depended on:

- The location and context of the viewpoint.
- The expectations and occupation or activity of the receptor.
- The importance of the view (which may be determined with respect to is popularity or numbers of people affected, its appearance in guidebooks, on tourist maps, and in the facilities provided for its enjoyment and references to it in literature or art).

The most sensitive receptors may include:

- Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape.
- Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.
- Occupiers of residential properties with views affected by the development.
- These would all be high.

Other receptors include:

- People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value).
- People travelling through or past the affected landscape in cars, on trains or other transport routes.
- People at their place of work.

The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view.

In this process more weight is usually given to changes in the view or visual amenity which are greater in scale, and visible over a wide area. In assessing the effect on views, consideration should be given to the effectiveness of mitigation measures, particularly where planting is proposed for screening purposes (Institute of Environmental Assessment & The Landscape Institute (1996).

Sensitivity of Visual Receptors

High	Moderate	Low
Users of all outdoor recreational facilities including public rights of way, whose intention or interest may be focused on the landscape. Communities where the development results in changes in the landscape setting or valued views enjoyed by the community.	People engaged in outdoor sport or recreation (other than appreciation of the landscape, as in landscapes of acknowledged importance or value). People travelling through or past the affected landscape in cars, on trains or other transport routes.	The least sensitive receptors are likely to be people at their place of work, or engaged in similar activities, whose attention may be focused on their work or activity and who therefore may be potentially less susceptible to changes in the view (i.e. office and industrial areas). Roads going through urban and industrial areas

Occupiers of residential properties with views affected by the development.		

Intensity of the Visual Impact

Potential visual impacts are determined by analysing how the physical change in the landscape, resulting from the introduction of a project, are viewed and perceived from sensitive viewpoints. Impacts to views are the highest when viewers are identified as being sensitive to change in the landscape, and their views are focused on and dominated by the change. Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks, and conservation areas, highways and travel routes, and important cultural features and historic sites, especially in foreground views.

The magnitude of impact is assessed through a synthesis of visual intrusion, visibility, visual exposure and viewer sensitivity criteria. Once the magnitude of impact has been established this value is further qualified with spatial, duration and probability criteria to determine the *significance* of the visual impact.

For instance, the fact that visual intrusion and exposure diminishes significantly with distance does not necessarily imply that the relatively small impact that exists at greater distances is unimportant. The level of impact that people consider acceptable may be dependent upon the purpose they have in viewing the landscape. A particular development may be unacceptable to a hiker seeking a natural experience, or a household whose view is impaired, but may be barely noticed by a golfer concentrating on his game or a commuter trying to get to work on time (Ittleson *et al.,* 1974).

In synthesising these criteria a numerical or weighting system is avoided. Attempting to attach a precise numerical value to qualitative resources is rarely successful, and should not be used as a substitute for reasoned professional judgement. (Institute of Environmental Assessment and The landscape Institute (1996)).

Intensity (Intensity) of Visual Impact

High	**Moderate**	**Low**	**Negligible**
Total loss of or major alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements considered to be totally uncharacteristic when set within the attributes of the receiving landscape.	Partial loss of or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements that may be prominent but may not necessarily be substantially uncharacteristic when set within the attributes of the receiving landscape.	Minor loss of or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view an/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape.	Very minor loss or alteration to key elements/features/characteristics of the baseline. I.e. Pre-development landscape or view and/or introduction of elements that are not uncharacteristic with the surrounding landscape – approximating the 'no change' situation.

High scenic quality impacts would result.	Moderate scenic quality impacts would result	Low scenic quality impacts would result.	Negligible scenic quality impacts would result.

Cumulative effects

Cumulative landscape and visual effects (impacts) result from additional changes to the landscape or visual amenity caused by the proposed development in conjunction with other developments (associated with or separate to it), or actions that occurred in the past, present or are likely to occur in the foreseeable future. They may also affect the way in which the landscape is experienced. Cumulative effects may be positive or negative. Where they comprise a range of benefits, they may be considered to form part of the mitigation measures.

Cumulative effects can also arise from the intervisibility (visibility) of a range of developments and /or the combined effects of individual components of the proposed development occurring in different locations or over a period of time. The separate effects of such individual components or developments may not be significant, but together they may create an unacceptable degree of adverse effect on visual receptors within their combined visual envelopes. Intervisibility depends upon general topography, aspect, tree cover or other visual obstruction, elevation and distance, as this affects visual acuity, which is also influenced by weather and light conditions. (Institute of Environmental Assessment and The landscape Institute (1996)).

The methods and formulae are largely based on DEAT's Guideline Document: Integrated Environmental Management Information Series: Series 5 – Impact Significance (2002). Environmental issues and potential impacts will be assessed using recognised qualitative impact assessment methodology. The objective of the assessment of impacts is to identify and assess all the significant impacts that may arise because of the proposed project. The process of assessing the impacts of the project encompasses the following four activities:

1. Identification and assessment of potential impacts

2. Prediction of the nature, magnitude, extent, and duration of potentially significant impacts

3. Identification of mitigation measures that could be implemented to reduce the severity or significance of the impacts of the activity

4. Evaluation of the significance of the impact after the mitigation measures have been implemented i.e. the significance of the residual impact.

Impacts are assessed in terms of the following criteria:

<table>
<tr><th>Criteria</th><th>Indicator</th></tr>
<tr><td>The nature</td><td>A description of what causes the effect, what will be affected and how it will be affected</td></tr>
<tr><td>The physical extent</td><td>Wherein it is indicated whether:
<table><tr><td>1.</td><td>The impact will be limited to the site</td></tr><tr><td>2.</td><td>The impact will be limited to the local area</td></tr><tr><td>3.</td><td>The impact will be limited to the region</td></tr><tr><td>4.</td><td>The impact will be national</td></tr><tr><td>5.</td><td>The impact will be international</td></tr></table></td></tr>
<tr><td>The duration</td><td>Wherein it is indicated whether the lifetime of the impact will be of:
<table><tr><td>1</td><td>A very short duration (0–1 years)</td></tr><tr><td>2</td><td>A short duration (2-5 years)</td></tr><tr><td>3</td><td>Medium-term (5–15 years)</td></tr><tr><td>4</td><td>Long term (> 15 years)</td></tr><tr><td>5</td><td>Permanent</td></tr></table></td></tr>
<tr><td>The magnitude of impact on ecological processes</td><td>Impacts quantified on a scale from 0-10, where a score is assigned:
<table><tr><td>0</td><td>Small and will have no effect on the environment</td></tr><tr><td>2</td><td>Minor and will not result in an impact on processes</td></tr><tr><td>4</td><td>Low and will cause a slight impact on processes</td></tr><tr><td>6</td><td>Moderate and will result in processes continuing but in a modified way</td></tr><tr><td>8</td><td>High (processes are altered to the extent that they temporarily cease)</td></tr><tr><td>10</td><td>Very high and results in complete destruction of patterns and permanent cessation of processes</td></tr></table></td></tr>
</table>

The *probability* of occurrence/ likelihood of the impact actually occurring	Probability is estimated on a scale where: 1 — Very improbable (probably will not happen) 2 — Improbable (some possibility, but low likelihood) 3 — Probable (distinct possibility) 4 — Highly probable (most likely a 50:50 chance of occurrence) 5 — Definite (impact will occur regardless of any prevention measures)

Significance is assessed in terms of:

- The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high
- The status, which is described as either positive, negative or neutral
- The degree to which the impact can be reversed
- The degree to which the impact may cause irreplaceable loss of resources
- The degree to which the impact can be mitigated

The significance is determined by combining the criteria in the following formula:

Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points.

The significance weightings for each potential impact are outlined in the table below

Points	Significance Weighting	Description
< 30 points	**Low**	Impact is of a low order and therefore likely to have little real effect. In the case of adverse impacts, mitigation is either easily achieved or little will be required, or both. Social, cultural and economic activities of communities can continue unchanged. In the case of beneficial impacts, alternative means of achieving this benefit are likely to be easier, cheaper, more effective and less time-consuming. **Where this impact would not have a direct influence on the decision to develop in the area**
31-60 points	**Medium**	Impact is real, but not substantial in relation to other impacts that might take effect within the bounds of those that could occur. In the case of adverse impacts, mitigation is both feasible and fairly easily possible. Social, cultural and economic activities of communities are changed, but can be continued (albeit in a different form). Modification of the project design or alternative action may be required. In the case of beneficial impacts, other means of achieving this benefit are about equal in time, cost

		and effort. **Where the impact could influence the decision to develop in the area unless it is effectively mitigated**
> 60 points	**High**	Of the highest order possible within the bounds of impacts that could occur. In the case of adverse impacts, there is no possible mitigation that could offset the impact, or mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. In the case of beneficial impacts, the impact is of a substantial order within the bounds of impacts that could occur. **Where the impact must have an influence on the decision process to develop in the area.**

To characterize the nature and magnitude of visual intrusion of the proposed project, a photographic simulation technique was used. This method was used according to Sheppard (in Lange 1994), where a visual simulation is good quality when the following five criteria are met.

Representativeness:	A simulation should represent important and typical views of a project.
Accuracy:	The similarity between a simulation and the reality after the project has been realized.
Visual clarity:	Detail, parts and overall contents have to be clearly recognizable.
Interest:	A simulation should hold the attention of the viewer.
Legitimacy:	A simulation is defensible if it can be shown how it was produced and to what degree it is accurate.

To comply with this standard it was decided to produce a stationary or static simulation (Van Dortmont in Lange, 1994), which shows the proposed development from a typical static observation points (Critical View Points).

Photographs are taken on site during a site visit with a manual focus, 50mm focal depth digital camera. All camera settings are recorded and the position of each panoramic view is recorded by means of a GPS. These positions, coordinates are then placed on the virtual landscape (see below).

A scale model of the proposal is built in virtual space, scale 1:1, based on CAD (vector) information as supplied by the architect / designers. This model is then placed on a virtual landscape, scale 1:1, as produced by means of GIS software. The accuracy of this depends on the contour intervals.

The camera views are placed on the points as recorded on the virtual landscape. The respective photographs are overlaid onto the camera views, and the orientation of the cameras adjusted accordingly. The light source is adjusted to suit the view. Each view is then rendered as per the process above.

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Visual Impact Assessments

Graham is a registered landscape architect with interest and experience in landscape architecture, urban design and environmental planning. He holds a degree in landscape architecture from the University of Toronto and has practiced in Canada and Africa, where he has spent most of his working life. He has served as President of the Institute of Landscape Architects of South Africa (ILASA) and as Vice President of the Board of Control for Landscape Architects. He is a Fellow of ILASA.

During his 40 years plus career he has received numerous ILASA and other industry awards. He has published widely on landscape architectural issues and has had projects published both locally and internationally in, scientific and design journals and books. He was a being a founding member of Newtown Landscape Architects and is also a senior lecturer, teaching landscape architecture and urban design at post and undergraduate levels, at the University of Pretoria. He has been a visiting studio critic at the University of Witwatersrand and University of Cape Town and in 2011 was invited to the University of Rhode Island, USA as their Distinguished International Scholar for that year. He currently practices as a Sole Proprietor.

A niche specialty of his is Visual Impact Assessment for which he was cited with an ILASA Merit Award in 1999. He has completed over 250 specialist reports for projects in South Africa, Canada and other African countries. He was on the panel that developed the *Guideline for Involving Visual and Aesthetic Specialists in EIA Processes* (2005) and produced a research document for Eskom, *The Visual Impacts of Power Lines* (2009). In 2011, he produced '*Guidelines for involving visual and aesthetic specialists'* for the Aapravasi Ghat Trust Fund Technical Committee (they manage a World Heritage Site) along with the *Visual Impact Assessment Training Module Guideline Document.*

Pole No.	Station	Height Adjust.	Orientation Angle	X easting	Y Northing	Centerline Z Elevation	Ahead Span	Line angle	Str Description	Str Height	Embedded Length	Pole LENGTH
1	0		180	-18294,7	-2544241,2	453,498	180,962		2-WT-1213 Steel 3-pole Terminal (0°-15°)	14,6	2	16,6
2	180,962			-18305,8	-2544074,9	451,111	191,985	42,8884	D7615D - 132kV Stayed Strain (60°-90°)	19	2	21
3	372,948			-18243	-2543898,2	446,469	198,629		D7611 Intermediate steel pole	17,4	2,6	20
4	571,576			-18173,9	-2543707,2	442,13	224,241		D7611 Intermediate steel pole	17,4	2,6	20
5	795,817			-18098,2	-2543496,1	438,599	261,378		D7611 Intermediate steel pole	20,1	2,9	23
6	1057,195			-18010	-2543250,1	440,304	212,928		D7611 Intermediate steel pole	17,4	2,6	20
7	1270,123			-17938,3	-2543049,7	449,017	191,702		D7611 Intermediate steel pole	17,4	2,6	20
8	1461,825			-17871,4	-2542869,2	452,476	204,571		D7611 Intermediate steel pole	17,4	2,6	20
9	1666,396			-17804,3	-2542676,7	457,356	186,343		D7611 Intermediate steel pole	17,4	2,6	20
10	1852,739			-17741,4	-2542501,6	458,43	220,518		D7615A - 132kV Stayed Strain (0°-5°)	19	2	21
11	2073,256			-17666,9	-2542293,7	454,917	219,812		D7611 Intermediate steel pole	17,4	2,6	20
12	2293,068			-17592,7	-2542086,8	453,775	209,022		D7611 Intermediate steel pole	17,4	2,6	20
13	2502,09			-17522,1	-2541890	451,71	262,912		D7611 Intermediate steel pole	19,2	2,8	22
14	2765,002			-17433,4	-2541642,6	444,356	285,607		D7611 Intermediate steel pole	21	3	24
15	3050,609			-17336,9	-2541373,7	453,809	276,282		D7611 Intermediate steel pole	19,2	2,8	22
16	3326,891			-17243,6	-2541113,7	460,189	206,545		D7611 Intermediate steel pole	21	3	24
17	3533,436			-17173,9	-2540919,3	461,288	228,458		D7611 Intermediate steel pole	21	3	24
18	3761,894			-17096,8	-2540704,2	460,094	227,013		D7611 Intermediate steel pole	19,2	2,8	22
19	3988,907			-17020,1	-2540490,5	456,298	273,415		D7611 Intermediate steel pole	17,4	2,6	20
20	4262,322			-16927,8	-2540233,2	459,542	220,384		D7611 Intermediate steel pole	19,2	2,8	22
21	4482,706			-16853,4	-2540025,7	465,364	181,229		D7611 Intermediate steel pole	17,4	2,6	20
22	4663,935			-16792,2	-2539855,1	466,51	220,121		D7611 Intermediate steel pole	17,4	2,6	20
23	4884,056			-16717,9	-2539647,9	468,007	187,056		D7611 Intermediate steel pole	17,4	2,6	20
24	5071,113			-16654,7	-2539471,9	468,798	231,593		D7611 Intermediate steel pole	17,4	2,6	20
25	5302,705			-16576,5	-2539253,9	466,879	233,327		D7611 Intermediate steel pole	17,4	2,6	20
26	5536,032			-16497,8	-2539034,3	466,13	239,992		D7611 Intermediate steel pole	17,4	2,6	20
27	5776,025			-16416,7	-2538808,4	469,845	231,617		D7615A - 132kV Stayed Strain (0°-5°)	20	2	22
28	6007,642			-16338,5	-2538590,3	472,031	203,578		D7611 Intermediate steel pole	17,4	2,6	20
29	6211,22			-16269,8	-2538398,7	470,241	232,488		D7611 Intermediate steel pole	17,4	2,6	20
30	6443,708			-16191,3	-2538179,9	466,654	236,683		D7611 Intermediate steel pole	17,4	2,6	20
31	6680,391			-16111,4	-2537957,1	461,614	224,874		D7611 Intermediate steel pole	21	3	24
32	6905,266			-16035,5	-2537745,4	455,678	275,147		D7611 Intermediate steel pole	21	3	24
33	7180,413			-15942,6	-2537486,4	451,318	227,731		D7611 Intermediate steel pole	19,2	2,8	22
34	7408,143			-15865,7	-2537272,1	448,139	199,764		D7611 Intermediate steel pole	21	3	24
35	7607,907			-15798,2	-2537084	444,771	256,402	54,9968	D7615D - 132kV Stayed Strain (60°-90°)	20	2	22
36	7864,309			-15550,9	-2537016,5	441,734	150,26		D7611 Intermediate steel pole	17,4	2,6	20
37	8014,569			-15405,9	-2536976,9	442,596	169,903		D7611 Intermediate steel pole	17,4	2,6	20
38	8184,472		180	-15242	-2536932,2	441,809	155,273	-58,1349	D7615D - 132kV Stayed Strain (60°-90°)	18	2	20
39	8339,745			-15197,7	-2536783,4	436,29	231,438		D7611 Intermediate steel pole	17,4	2,6	20
40	8571,183			-15131,6	-2536561,6	432,845	156,147		D7611 Intermediate steel pole	19,2	2,8	22
41	8727,33		180	-15087	-2536411,9	436,244	185,987	-35,0983	D7615D - 132kV Stayed Strain (60°-90°)	18	2	20
42	8913,317			-15546	-2536235,6	441,098	188,221		D7611 Intermediate steel pole	17,4	2,6	20

43	9601,518			-15225,7	-2536657,1	444,05	157,131		D7611 Intermediate steel pole	17,4	2,6	30
44	9758,649			-15155,6	-2535908,1	447,258	183,777		D7611 Intermediate steel pole	17,4	2,6	30
45	9842,426			-15113,9	-2535733,8	451,617	193,716	38,7362	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
46	9636,142			-15148,5	-2535557,5	449,777	194,444		D7611 Intermediate steel pole	17,4	2,6	30
47	9830,585			-15181,9	-2535368,5	446,251	239,478		D7611 Intermediate steel pole	17,4	2,6	30
48	10070,06			-15000	-2535143	445,552	249,925		D7611 Intermediate steel pole	17,4	2,6	30
49	10319,99			-15037,6	-2534907,8	441,673	297,185		D7611 Intermediate steel pole	21	3	24
50	10617,17			-14957,3	-2534628,1	448,226	235,137		D7611 Intermediate steel pole	21	3	24
51	10852,31			-14857,5	-2534406,7	453,331	190,06		D7611 Intermediate steel pole	17,4	2,6	30
52	11042,37			-14771,7	-2534127,8	456,94	210,517		D7611 Intermediate steel pole	17,4	2,6	30
53	11252,89			-14703,7	-2534029,7	459,916	234,036		D7615A - 132kV Stayed Strain (0°-5°)	18	2	30
54	11486,93			-14621,6	-2533809,4	463,541	284,494		D7611 Intermediate steel pole	21	3	24
55	11771,42			-14527,6	-2533541,6	466,356	165,266		D7611 Intermediate steel pole	21	3	24
56	11936,67			-14471,6	-2533386,1	467,675	182,541		D7611 Intermediate steel pole	17,4	2,6	30
57	12119,16			-14400,2	-2533214,3	463,312	174,327		D7611 Intermediate steel pole	17,4	2,6	30
58	12293,49			-14351,3	-2533050,2	458,211	234,379		D7611 Intermediate steel pole	17,4	2,6	30
59	12527,87			-14272,2	-2532829,6	457,444	203,898		D7611 Intermediate steel pole	17,4	2,6	30
60	12731,77			-14201,3	-2532637,6	453,605	223,34		D7611 Intermediate steel pole	17,4	2,6	30
61	12955,11			-14127,5	-2532427,4	454,749	204,166		D7611 Intermediate steel pole	17,4	2,6	30
62	13159,22			-14050	-2532235,3	454,714	188,651		D7611 Intermediate steel pole	17,4	2,6	30
63	13347,87		180	-13995,3	-2532057,7	454,827	168,444	-1,5235	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
64	13516,31			-13962,7	-2531897,7	451,715	187,779		D7611 Intermediate steel pole	17,4	2,6	30
65	13704,09			-13884	-2531719,6	452,866	190,499		D7611 Intermediate steel pole	17,4	2,6	30
66	13894,59			-13824,5	-2531538,4	450,405	201,786		D7611 Intermediate steel pole	17,4	2,6	30
67	14096,38			-13761,4	-2531346,7	446,209	132,757		D7611 Intermediate steel pole	17,4	2,6	30
68	14229,13			-13719,9	-2531220,6	442,277	159,932		D7611 Intermediate steel pole	17,4	2,6	30
69	14389,06			-13670	-2531068,7	438,014	189,08		D7611 Intermediate steel pole	17,4	2,6	30
70	14578,14			-13616,9	-2530889	434,17	204,143		D7611 Intermediate steel pole	20,1	2,9	21
71	14782,29		180	-13547,1	-2530695,1	431,914	224,134	-10,7736	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
72	15006,42			-13515,1	-2530473,1	430,583	234,719		D7611 Intermediate steel pole	18,1	2,7	21
73	15241,14		180	-13481,7	-2530240,7	425,796	135,671	7,94	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
74	15376,81			-13481,7	-2530105	420,56	189,727		D7611 Intermediate steel pole	17,4	2,6	30
75	15566,54			-13461,8	-2529915,3	419,205	218,441	33,1751	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
76	15784,98			-13361,6	-2529732,8	414,371	221,877		D7611 Intermediate steel pole	18,1	2,7	21
77	16006,86		180	-13241,6	-2529547,1	411,785	198,331	-14,1498	D7615D - 132kV Stayed Strain (60°-90°)	18	2	30
78	16205,19			-13176,3	-2529360,3	411,168	201,872		D7611 Intermediate steel pole	17,4	2,6	30
79	16407,06			-13129,8	-2529169,7	410,74	194,27		D7611 Intermediate steel pole	17,4	2,6	30
80	16601,33			-13045,8	-2528986,2	414,631	193,16		D7611 Intermediate steel pole	17,4	2,6	30
81	16794,49			-12982,2	-2528803,8	418,371	179,352		D7611 Intermediate steel pole	17,4	2,6	30
82	16973,84			-12923,2	-2528634,3	421,877	234,859		D7611 Intermediate steel pole	17,4	2,6	30
83	17208,7			-12865,9	-2528412,7	426,148	205,126		D7611 Intermediate steel pole	17,4	2,6	30
84	17413,83			-12778,9	-2528219	425,157	220,88		D7611 Intermediate steel pole	17,4	2,6	30
85	17634,71			-12705,6	-2528013,4	420,357	255,317		D7611 Intermediate steel pole	17,4	2,6	30
86	17890,03			-12621,6	-2527769,4	420,389	301,168		D7611 Intermediate steel pole	17,4	2,6	30
87	18091,14			-12555,4	-2527579,5	423,239	215,189		D7615A - 132kV Stayed Strain (0°-5°)	18	2	30

88	18306,32			-12484,5	-2527376,3	425,495	212,45		D7611 Intermediate steel pole	17,4	2,6	20
89	18518,79			-12414,6	-2527175,7	428,826	200,958		D7611 Intermediate steel pole	17,4	2,6	20
90	18719,73			-12348,4	-2526985,9	429,087	208,21		D7611 Intermediate steel pole	17,4	2,6	20
91	18927,94			-12279,9	-2526789,3	428,275	213,967		D7611 Intermediate steel pole	17,4	2,6	20
92	19141,91			-12209,4	-2526587,8	425,453	171,749		D7611 Intermediate steel pole	17,4	2,6	20
93	19313,66			-12152,9	-2526425,1	421,906	177,496		D7611 Intermediate steel pole	17,4	2,6	20
94	19491,15			-12094,4	-2526257,5	421,571	237,13		D7611 Intermediate steel pole	19,2	2,8	22
95	19728,28			-12016,4	-2526033,6	423,505	195,86		D7611 Intermediate steel pole	17,4	2,6	20
96	19924,14		180	-11951,9	-2525848,6	427,75	149,111	-51,9721	D7615D - 132kV Stayed Strain (60°-90°)	18	2	20
97	20073,26			-12032,6	-2525723,2	425,992	207,098		D7611 Intermediate steel pole	17,4	2,6	20
98	20280,35			-12144,6	-2525549,1	426,385	159,621		D7611 Intermediate steel pole	17,4	2,6	20
99	20439,97			-12231	-2525414,8	427,653	238,047		D7611 Intermediate steel pole	17,4	2,6	20
100	20678,02			-12358,7	-2525213,3	431,336	231,82		D7611 Intermediate steel pole	17,4	2,6	20
101	20909,84			-12485,1	-2525019,6	433,877	184,94		D7611 Intermediate steel pole	17,4	2,6	20
102	21094,78			-12585,2	-2524864,1	438,157	268,634		D7611 Intermediate steel pole	17,4	2,6	20
103	21363,42			-12730,5	-2524638,2	440,351	166,038		D7611 Intermediate steel pole	17,4	2,6	20
104	21529,45			-12820,3	-2524498,5	442,357	148,353		D7611 Intermediate steel pole	17,4	2,6	20
105	21677,81			-12900,6	-2524373,7	443,609	223,47	78,963	D7615D - 132kV Stayed Strain (60°-90°)	18	2	20
106	21901,28			-12739,8	-2524219,1	439,005	234,364		D7611 Intermediate steel pole	17,4	2,6	20
107	22135,64			-12570,1	-2524056,8	438,399	250,7		D7611 Intermediate steel pole	17,4	2,6	20
108	22386,34			-12389,1	-2523883,5	438,21	214,278		D7611 Intermediate steel pole	17,4	2,6	20
109	22600,62			-12234,4	-2523735,2	441,126	201,349		D7611 Intermediate steel pole	17,4	2,6	20
110	22801,97			-12089,1	-2523595,8	442,837	221,866		D7611 Intermediate steel pole	17,4	2,6	20
111	23023,83			-11928,9	-2523442,3	446,856	222,218		D7611 Intermediate steel pole	17,4	2,6	20
112	23246,05			-11768,5	-2523288,5	450,51	219,916		D7611 Intermediate steel pole	17,4	2,6	20
113	23465,97			-11609,7	-2523136,4	454,4	223,37		D7611 Intermediate steel pole	17,4	2,6	20
114	23689,34			-11448,5	-2522981,8	457,643	220,225		D7611 Intermediate steel pole	17,4	2,6	20
115	23909,56			-11289,5	-2522829,4	461,333	219,916		D7611 Intermediate steel pole	17,4	2,6	20
116	24129,48			-11130,7	-2522677,2	463,17	215,65		D7611 Intermediate steel pole	17,4	2,6	20
117	24345,13			-10975	-2522528	458,186			D7615A - 132kV Stayed Strain (0°-5°)	18	2	20

AVIFAUNA ASSESSMENT FOR THE MHINGA POWERLINE DEVIATIONS

Mhinga, Limpopo

February 2021

CLIENT

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1 Introduction

The Biodiversity Company was commissioned to conduct an avifauna assessment for the proposed deviations of 8 km (3 areas proposed for deviations from original authorised route) of the132 kV powerlines stretching between Phugwane and Mhinga Substation within the Limpopo Province. The original line was approved under authorisation number 12/12/20/1667. Eskom proposes to deviate the authorised Kingbird 132kV powerlines in three sections due to streams being located on the authorised route as well as houses being constructed since the authorisation was received in 2010. The deviations total distance is approximately 8 km whilst the actual line is 25 kms in length (Kantey and Templer, 2021). Deviation 1 is said to be 4.421 km long, following the R524 and stretching into a portion of Nkavele Village. Deviation 2 is 1.224 km long and deviates just after the Nkavele road just after the town of Saselemane. Deviation 3 is 1.834 km moving east from the Xaswita village (Figure 1-1).

The centre points of the deviations are:

- Deviation 1, center point: 22° 55’ 43.01”S and 30° 51’ 08.41” E;
- Deviation 2, center point: 22° 51’ 58.73”S and 30° 52’ 10.13” E; and
- Deviation 3, center point: 22° 49’ 11.77”S and 30° 52’ 46.61”E.

The deviations fall on the following properties:

Deviation 1:

- Remaining Extent of the farm Mhinga's Location 258 MT;
- Remaining Extent of the farm Mhinga's Location Extension 259 MT;
- Remaining Extent of the farm Tshikundu Location Extension 260 MT; and
- Remaining Extent of the farm Tshikundu Location 262 MT.

Deviation 2 and Deviation 3:

- Remaining Extent of the farm Nthlaveni 2 MU (Kantey and Templer, 2021).

The approach adopted for the assessments has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the relative animal species theme sensitivity for the project areas as “high sensitivity” and that an avifauna assessment must be undertaken prior to authorization.

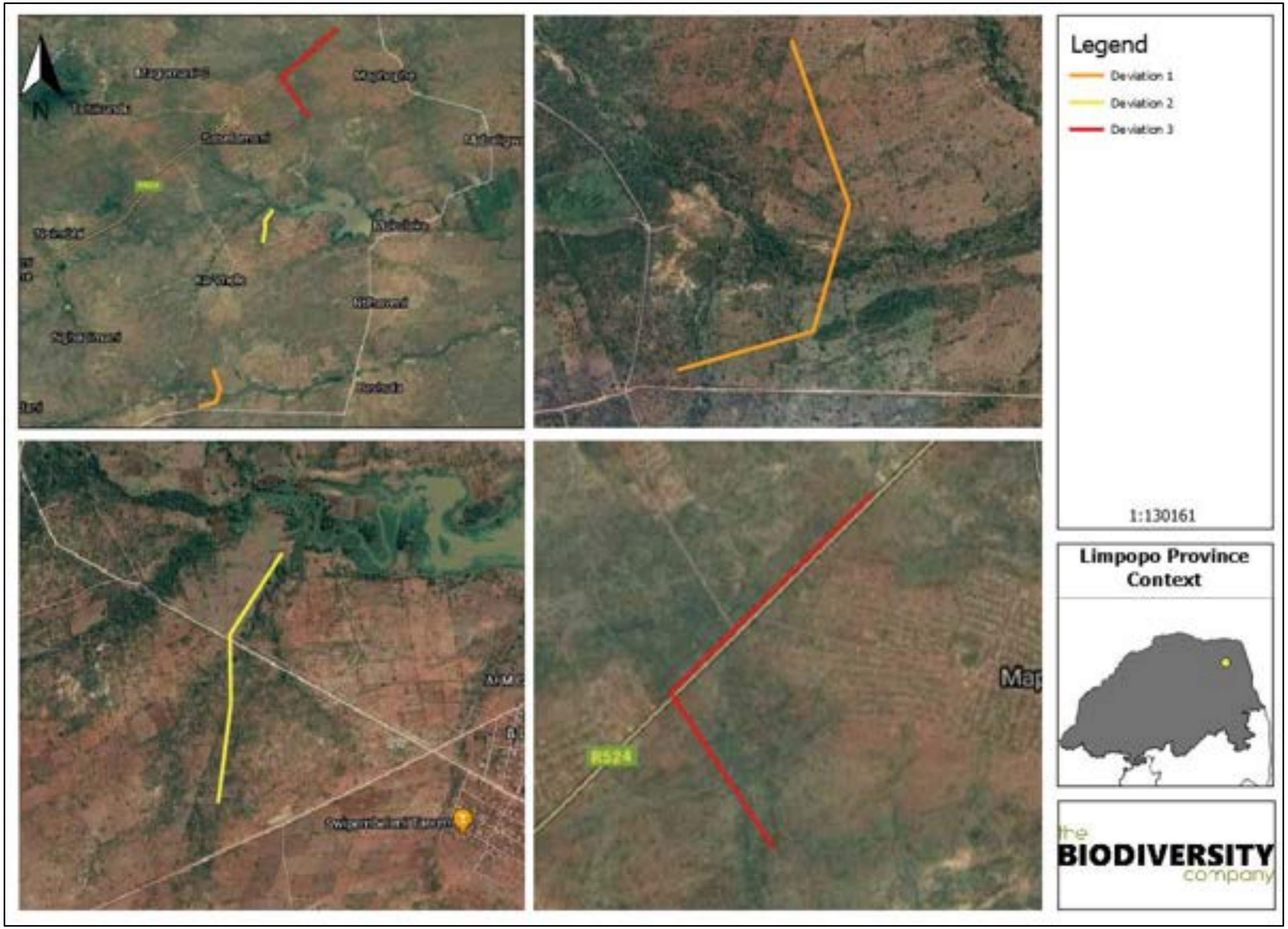

Figure 1-1 The deviations for the Mhinga Powerline

1.1 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- A single season survey was conducted for the study, which would constitute a summer season survey;
- This assessment has not assessed any temporal trends for the project;
- No night surveys were conducted due to safety concerns; and
- It was assumed the information provided for the deviations and previous report is accurate.

2 Specialist details

Report Name	**AVIFAUNA ASSESSMENT FOR THE MHINGA POWERLINE DEVIATIONS**	
Reference	**Mhinga Avifauna**	
Submitted to	K&T	
Report Writer	**Lindi Steyn**	
	Dr Lindi Steyn has completed her PhD in Biodiversity and Conservation from the University of Johannesburg. Lindi is a terrestrial ecologist with a special interest in ornithology. She has completed numerous studies ranging from basic Assessments to Environmental Impact Assessments following IFC standards.	
Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

3 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the avifauna community of the associated ecosystems within the project areas. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the proposed development area and surrounding landscape;

- Desktop assessment to compile an expected species list and possible threatened avifauna species that occur within the proposed landscape;
- Field survey to ascertain the species and guild structure of the present avifauna community and their habitat associations within the proposed development area;
- Identify the manner that the proposed development impacts the avifauna community and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

4 Project Area

The Mhinga Powerline project area is situated between the Phugwane and Mhinga Substation within the Limpopo Province. The predominant land uses surrounding the project area includes formal and informal housing, open spaces and protected areas (Figure 4-1). A locality map of the project area is shown in Figure 4-1.

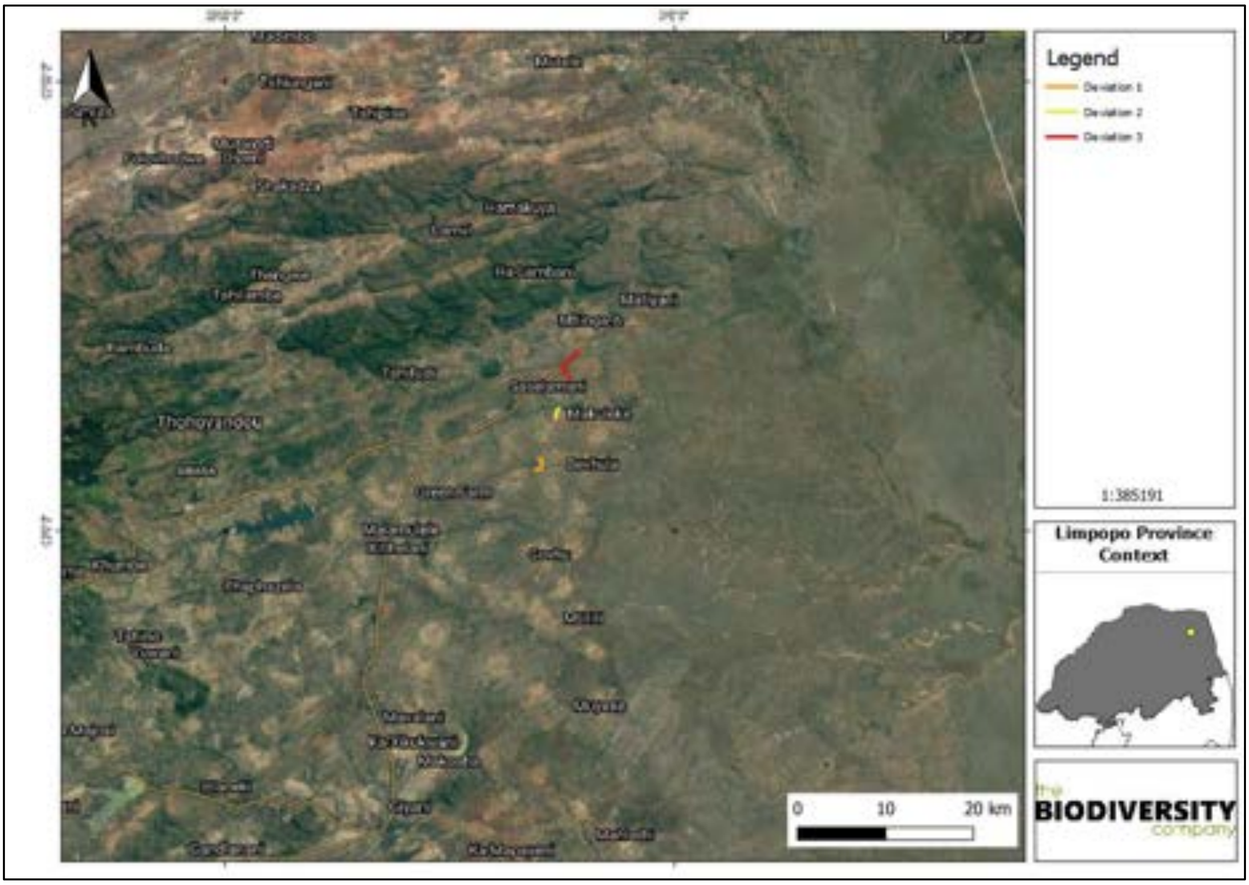

Figure 4-1 Map illustrating the location of the proposed Mhinga project area

5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 5-1 are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 5-1 A list of key legislative requirements relevant to biodiversity and conservation in Limpopo Province

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
	National Water Act (NWA, 1998)
Provincial	Limpopo Conservation Plan (2018)
	Limpopo Environmental Management Act (2003)
	Vhembe District Bioregional Plan (LEDET, 2017)

6 Methodology

6.1 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets in order to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

6.1.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

Protected areas:

South Africa Protected Areas Database (SAPAD) (DEA, 2020) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003; and

National Protected Areas Expansion Strategy (NPAES) (SANBI, 2010) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.

Critical Biodiversity Areas (Limpopo Conservation Plan, Version 2 (LCPv2), (Desmet *et al.,* 2018) – Critical Biodiversity Areas (CBAs) are natural or near-natural features, habitats or landscapes that include terrestrial, aquatic and marine areas that are considered critical for:

- meeting national and provincial biodiversity targets and thresholds;
- safeguarding areas required to ensure the persistence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
- conserving important locations for biodiversity features or rare species.

The key output of a systematic biodiversity plan is a map of biodiversity priority areas. The CBA map delineates Critical Biodiversity Areas 1 and 2 (CBAs), Ecological Support Areas 1 and 2 (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state (Desmet *et al.,* 2018).

Important Bird and Biodiversity Areas (BirdLife South Africa, 2015) – Important Bird and Biodiversity Areas (IBAs) constitute a global network of over 13 500 sites, of which 112 sites are found in South Africa. IBAs are sites of global significance for bird conservation, identified through multi-stakeholder processes using globally standardised, quantitative and scientifically agreed criteria; and

South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer *et al.,* 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the

National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

6.1.2 Avifauna Assessment

The desktop component of the avifauna assessment comprised of:

- Literature review of avifauna species that are likely to be impacted by the development of developments;
- Compiling an expected avifauna list using the South African Bird Atlas Project 2 (SABAP2) using the 2245_3050, 2250_3050, 2255_3050, 2300_3050 and 2255_3045 pentads (2020);
- Determine if the project area overlap or come in close proximity to a Co-ordinated Avifaunal Road Count (CAR) route(Taylor *et. al.* 1999) or a Coordinated Waterbird Count Site (CWAC); and
- Review of the previous avifaunal assessments (Section 8.1.4).

6.2 Field Assessment

A single field survey was undertaken during the 7th to the 10th of December 2020 (wet season) to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types within the limits of time and access.

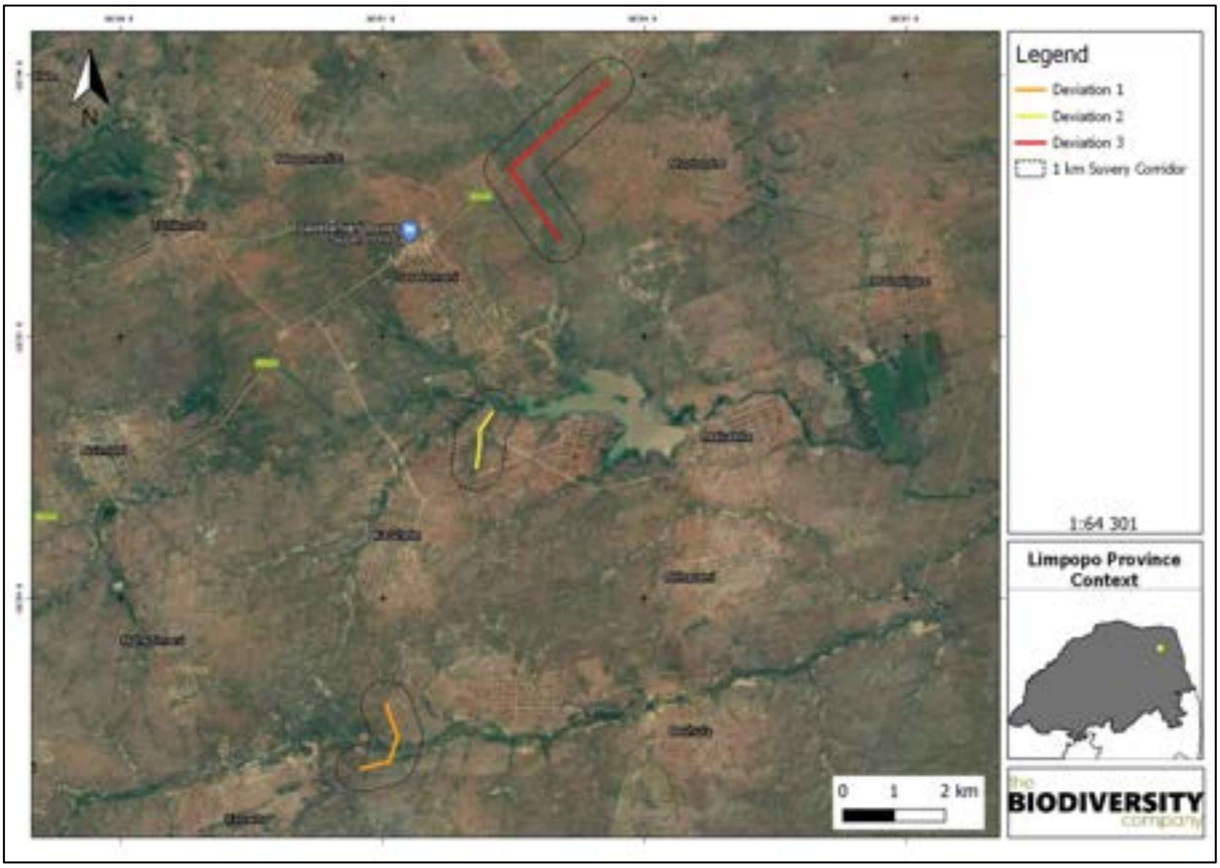

Figure 6-1 Map illustrating the field survey area

Sampling consisted of standardized point counts as well as random diurnal incidental surveys and vantage point surveys. Standardized point counts (following Buckland *et al.* 1993) were conducted to gather data on the species composition and relative abundance of species within the broad habitat types identified. Each point count was run over a 5 min period. The horizontal detection limit was set at 50 m. At each point the observer would document the date, start time and end time, habitat, numbers of each species, detection method (seen or heard), behaviour (perched or flying) and general notes on habitat and nesting suitability for conservation important species. To supplement the species inventory with cryptic and illusive species that may not be detected during the rigid point count protocol, diurnal incidental searches were conducted. This involved the opportunistic sampling of species between point count periods, river scanning and road cruising. To ensure raptors are accounted for, a vantage point survey was conducted at two locations.

6.2.1 Data analysis

Point count data was arranged into a matrix with point count samples in rows and species in columns. The table formed the basis of the various subsequent statistical analyses. This data was first used to distinguish similarities / differences in the species composition between the four identified avifaunal habitats, the matrix was converted into a Bray-Curtis dissimilarity matrix and used to generate a two-axis Principal component analysis (PCA) ordination. The data was subject to fourth root transformation to downscale the contribution of very abundant species while upscaling the influence of less abundant species. However, the effect was negligible and ultimately the raw data proved more informative. Thirdly, raw count data was converted to relative abundance values and used to establish dominant species and calculate the diversity of each habitat. Shannons Diversity Index (H) was the metric used to estimate diversity. Lastly, present and potentially occurring species were assigned to 13 major trophic guilds loosely based on the classification system developed by González-Salazar *et al.* (2014). Species were first classified by their dominant diet (carnivore, herbivore, granivore, frugivore, nectarivore, omnivore, then by the medium upon / within which they most frequently forage (ground, water, foliage, air) and lastly by their activity period (nocturnal or diurnal). All statistical analyses were performed using SPSS.

6.2.2 Buffer Requirements

Buffers were determined between the proposed activity and the impact receptor (e.g. breeding site, roost or other key habitat). The aim of the buffer is to provide an area that must be avoided.

6.3 Site Ecological Importance (SEI)

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 6-1 and Table 6-2, respectively.

Table 6-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 6-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area.

	Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 6-3

Table 6-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	High	Medium	Low	Very low
Functional Integrity (FI)	Very high	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 6-4.

Table 6-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 6-5.

Table 6-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance (SEI)		Biodiversity Importance (BI)				
		Very high	High	Medium	Low	Very low
Receptor Resilience (RR)	Very Low	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 6-6.

Table 6-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

7 Results & Discussion

7.1 Desktop Assessment

7.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 7-1.

Table 7-1 Summary of relevance of the proposed Mhinga to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Critical Biodiversity Area	All the deviations intersects with either an ESA1 or an ESA2 or both of these classified areas	7.1.1.1
Protected Areas	The project area falls in the Vhembe Biosphere Reserve transitional zone, is 8.11 km from the Kruger National Park and also located 3.47 km from the Mphaphuli Protected Environment.	7.1.1.2
Important Bird and Biodiversity Areas	9 km from the Kruger National Park IBA and 21 km from the Soutpansberg IBA	7.1.1.3

Vegetation Type	Falls across either the Granite Lowveld or Makuleke Sandy Bushveld or both vegetation types	7.1.1.4
South African Inventory of Inland Aquatic Ecosystems	Deviation 1 and 2 falls across an LC river and deviation 2 crosses a poorly protected wetland	7.1.1.5
Coordinated Avifaunal Count	Does not intersect a CAR route	7.1.3
Coordinated Waterbird Count	The project area cannot be found in close proximity to a CWAC site	-

7.1.1.1 Limpopo Biodiversity Conservation Plan

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2018).

Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Desmet *et al.,* 2018).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Desmet *et al.,* 2018).

Figure 7-1 shows the project area superimposed on the Terrestrial CBA map. The project area overlaps with ESA1 and ESA2 areas.

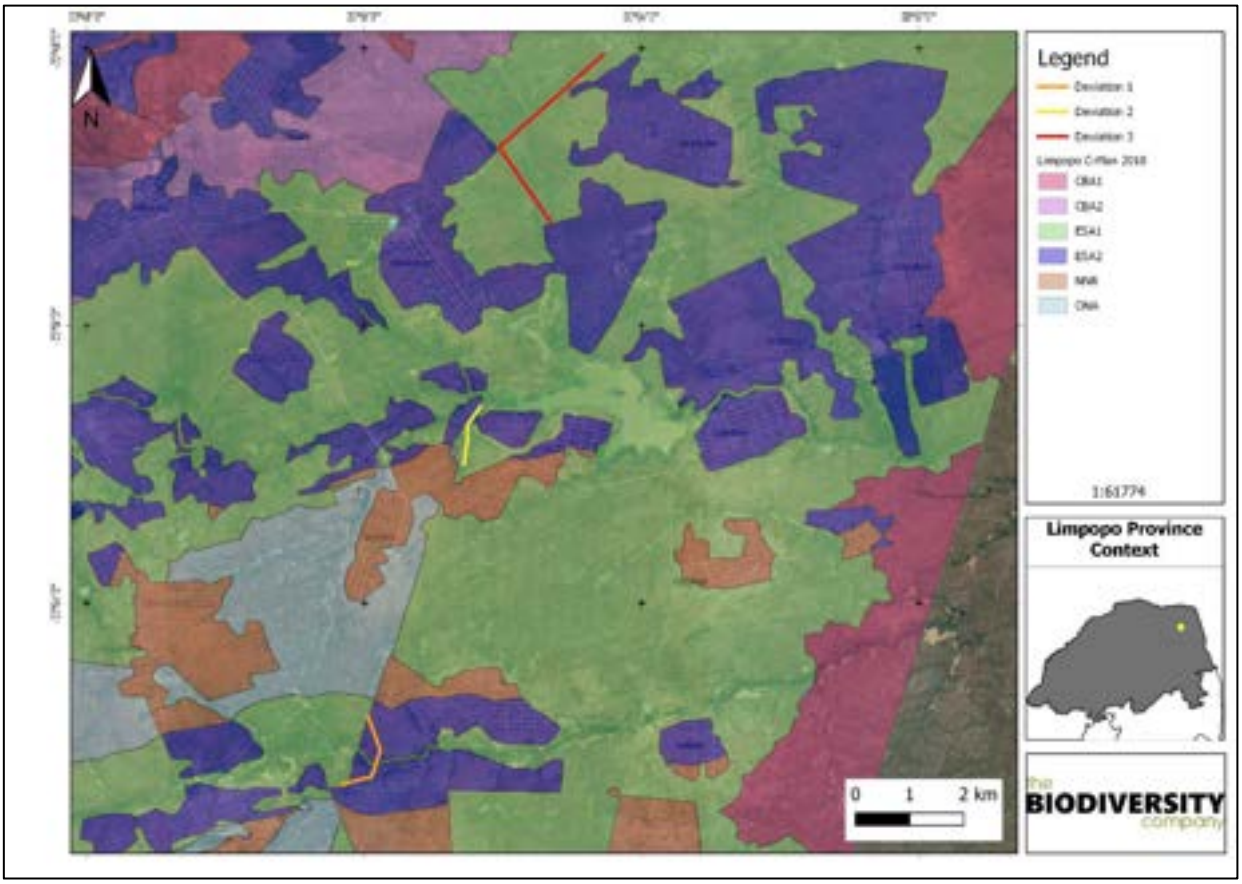

Figure 7-1 ***Map illustrating the locations of Critical Biodiversity Areas proximal to the proposed Mhinga project area***

7.1.1.2 Protected Areas

The Department of Environmental Affairs maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas:

- Special nature reserves;
- National parks;
- Nature reserves;
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;

- Marine protected areas declared in terms of the Marine Living Resources Act;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

The types of conservation areas that are currently included in the database are the following:

- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Transfrontier conservation areas;
- Transfrontier parks;
- Military conservation areas and
- Conservancies

Figure 7-2 shows that the project area falls in the Vhembe Biosphere Reserve transitional zone. It does also fall within 8.11 km of the Kruger National Park which means it falls in the 10 km protected area buffer. The project area is also located 3.47 km from the Mphaphuli Protected Environment and thus within its 5 km buffer zone.

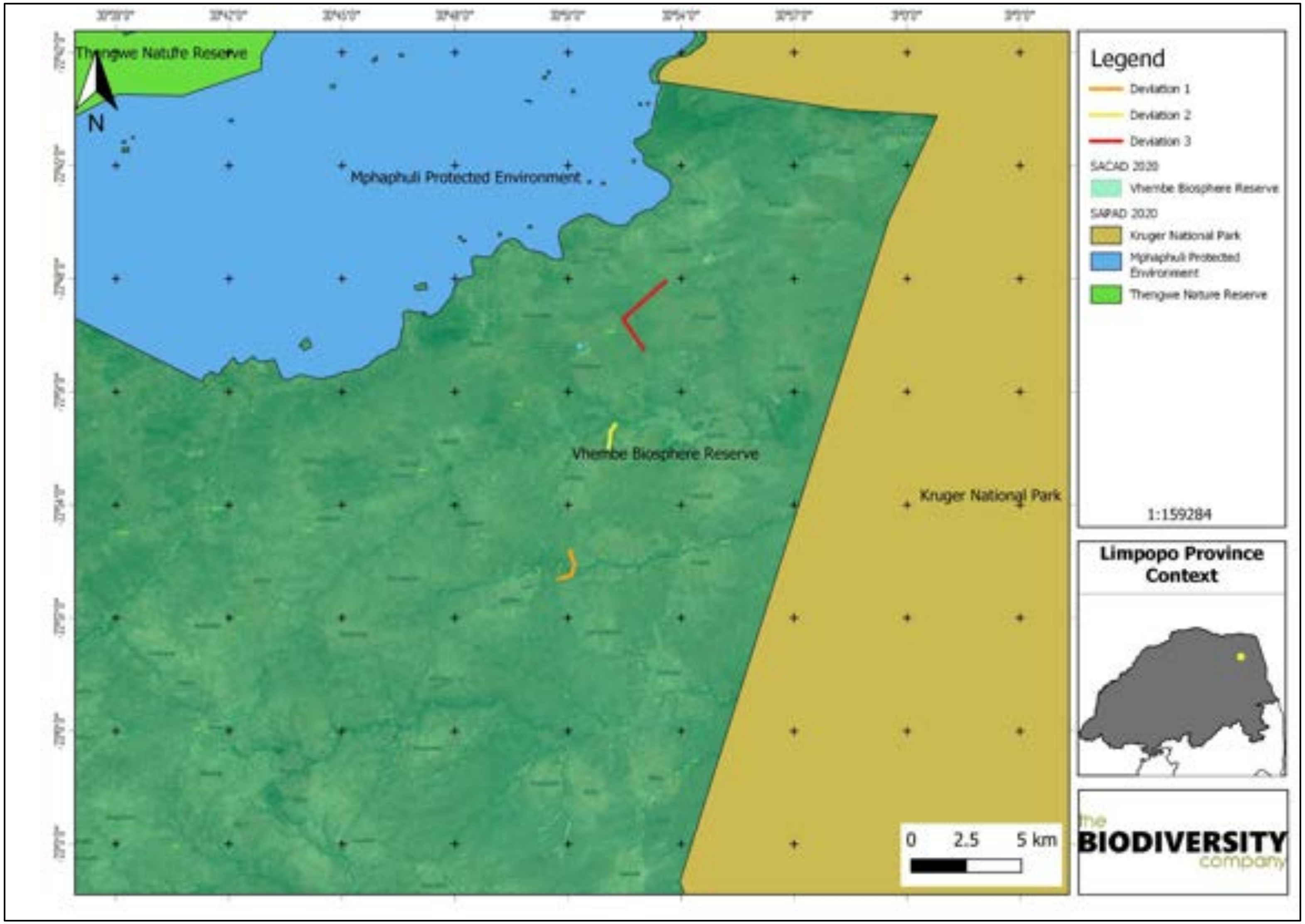

Figure 7-2 Map illustrating the location of protected areas proximal to the proposed Mhinga project area

7.1.1.3 Important Bird & Biodiversity Areas

Important Bird & Biodiversity Areas (IBAs) are the sites of international significance for the conservation of the world's birds and other conservation significant species as identified by BirdLife International. These sites are also all Key Biodiversity Areas; sites that contribute significantly to the global persistence of biodiversity (Birdlife, 2017).

According to Birdlife International (2017), the selection of IBAs is achieved through the application of quantitative ornithological criteria, grounded in up-to-date knowledge of the sizes and trends of bird populations. The criteria ensure that the sites selected as IBAs have true significance for the international conservation of bird populations and provide a common currency that all IBAs adhere to, thus creating consistency among, and enabling comparability between, sites at national, continental and global levels.

The project area is 9 km from the Kruger National Park (KNP) IBA and 21 km from the Southpansberg IBA (Figure 7-3).

The KNP IBA is situated in the lowveld of Limpopo and Mpumalanga. This IBA is known to support 490 bird species, 57% of the total South African species count. This diversity is attributed to the variety of habitats found here. Globally threatened species found in the IBA include: Cape Vulture, Southern Ground-Hornbill, Hooded Vulture, White-backed Vulture, Lappet-faced Vulture, White-headed Vulture, Kori Bustard, Crowned Eagle *Stephanoaetus coronatus*, Bateleur, Secretarybird *Sagittarius serpentarius* and Martial Eagle. Regionally threatened species are White-backed Night Heron, Saddle-billed Stork, Tawny Eagle, African Finfoot, African Grass Owl, Pel's Fishing Owl, Black Stork, Marabou Stork, African Pygmy Goose *Nettapus auritus*, Bat Hawk *Macheiramphus alcinus*, Lanner Falcon *Falco biarmicus*, Greater Painted-snipe *Rostratula benghalensis*, Half-collared Kingfisher *Alcedo semitorquata* and Lemon-breasted Canary.

Restricted-range and biome-restricted species include Arnot's Chat *Pentholaea arnotti* (restricted to the north of the park) and the uncommon Stierling's Wren-Warbler *Calamonastes stierlingi*, Gorgeous Bush-Shrike, Meves's Starling *Lamprotornis mevesii* and Lemon-breasted Canary. White-throated Robin-Chat *Cossypha humeralis*, Burchell's Starling *L. australis*, Kurrichane Thrush *Turdus libonyanus*, White-bellied Sunbird *Cinnyris talatala* and Brown-headed Parrot.

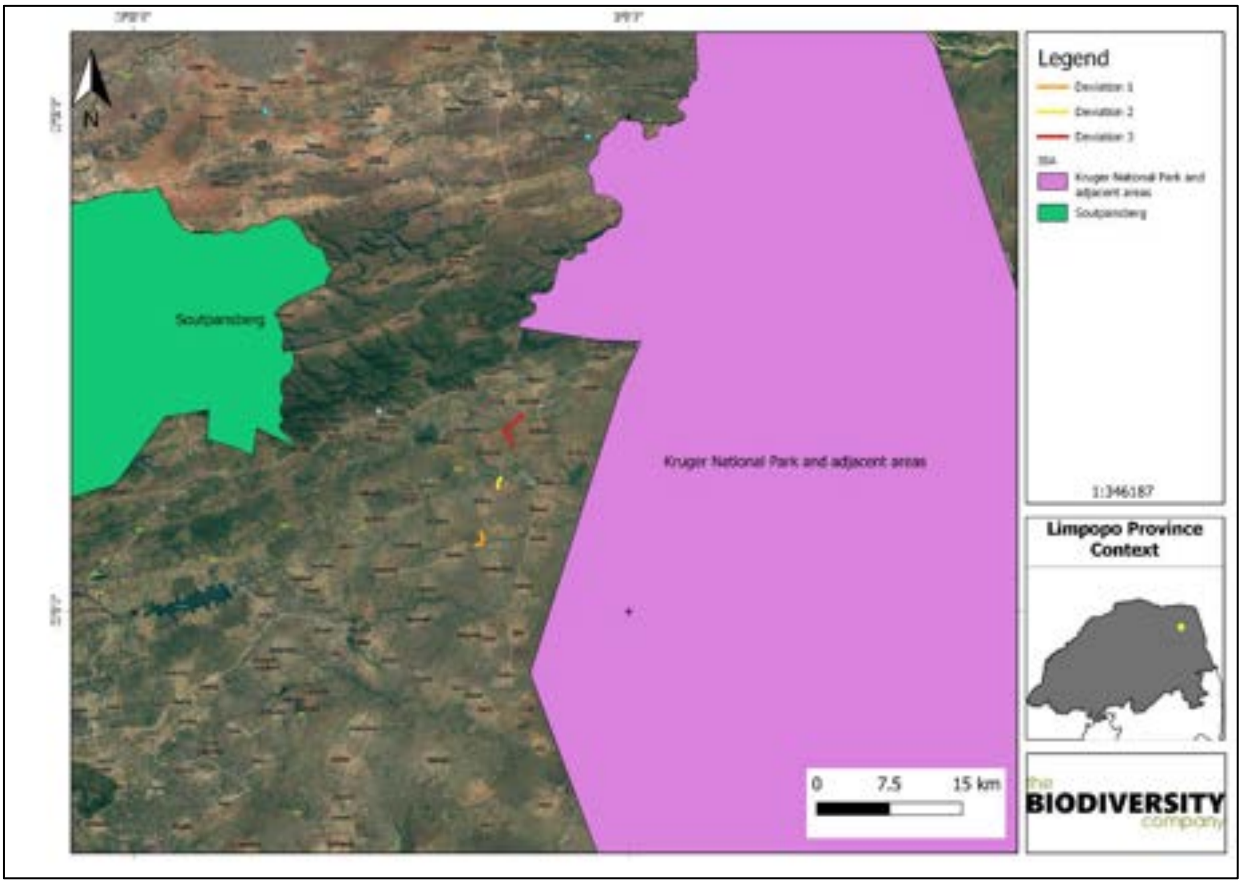

Figure 7-3 ***Map illustrating the location of the nearest Important Bird & Biodiversity Areas to the proposed Mhinga project area***

7.1.1.4 Vegetation Types

The project areas fall across the Savanna biome. This biome comprises many different vegetation types. Deviation 1 project area is situated within the Granite Lowveld, while the Deviation 2 project area is found across the Granite Lowveld and Makuleke Sandy Bushveld. The Deviation 3 project area is found in the Makuleke Sandy Bushveld vegetation type (Figure 7-4). Avifauna species nesting and feeding in trees and shrubs are dominant in this habitat type. This includes species such as Mousebirds, Robins, Prinias and Cisticolas.

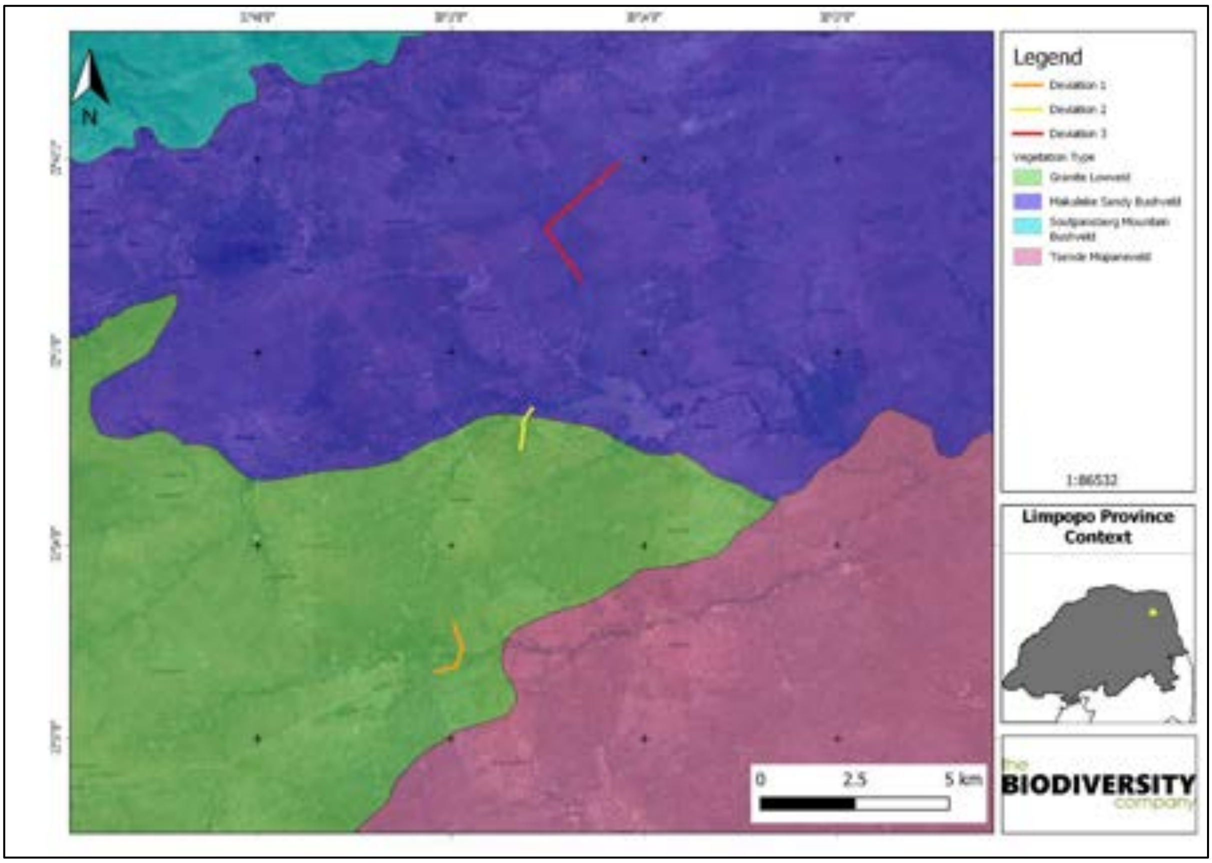

Figure 7-4 ***The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018)***

7.1.1.5 Hydrological Setting

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). A Least Threatened (LT) river runs through Deviation 1 and 2, while a poorly protected wetland can be found in the Deviation 2 project area as well (Figure 7-5). These water sources depending on their state will support a number of avifaunal species.

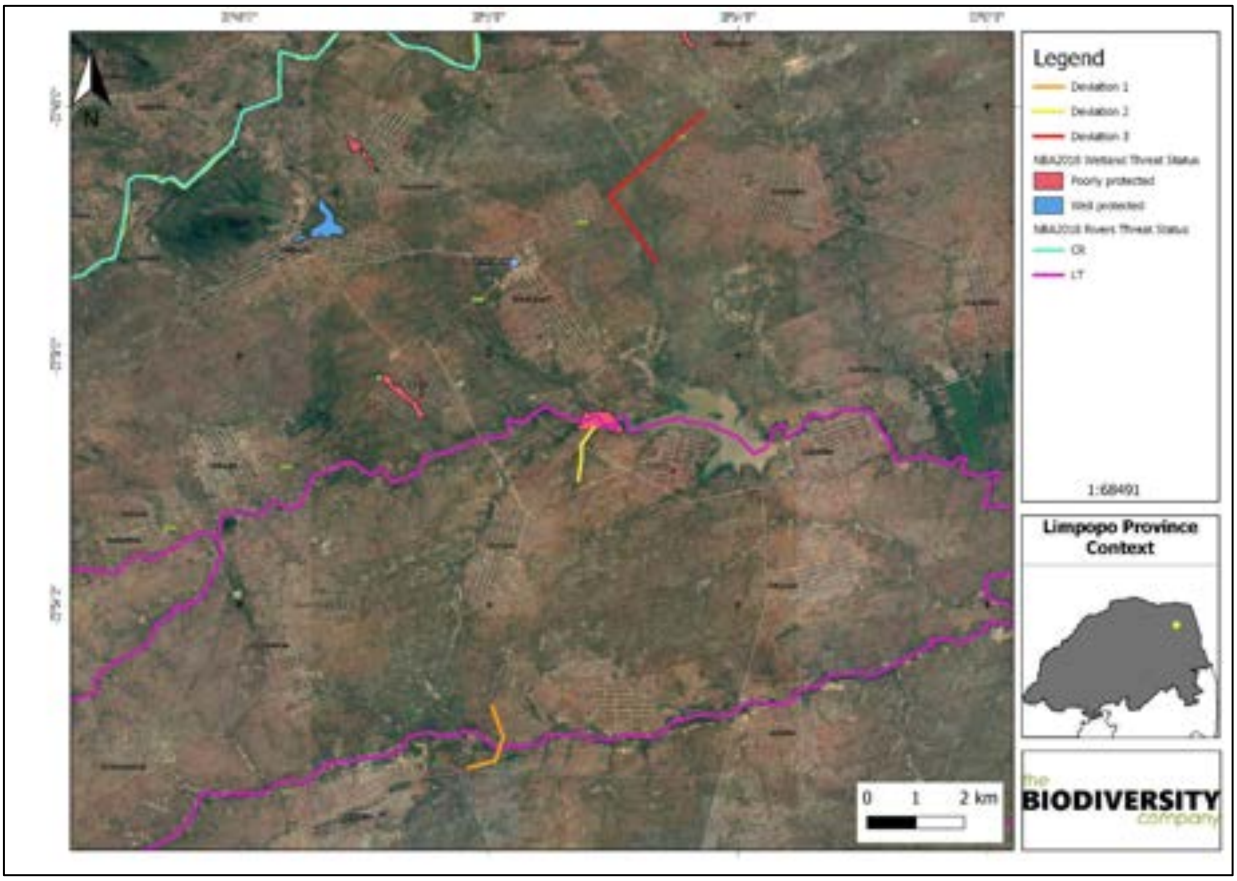

Figure 7-5 ***Map illustrating the hydrological setting of the proposed Mhinga project areas***

7.1.2 Expected Avifauna

Based on the South African Bird Atlas Project, Version 2 (SABAP2) database, 226 bird species have the potential to occur in the vicinity of the project area. The full list of potential bird species is provided in Appendix B. Of the potential bird species, eight (8) species are listed as SCC either on a regional or global scale (Table 7-2). The SABAP reporting rate of the various species are represented in the table below to provides a rough indication of the residency or commonness of these species.

Table 7-2 ***List of bird species of regional or global conservation importance that are expected to occur in close vicinity to the project area.***

Species	Common Name	Conservation Status		Reporting rate				
		Regional (SANBI, 2016)	IUCN (2017)	2245_3050	2250_3050	2255_3050	2300_3050	2255_3045
Aquila rapax	Eagle, Tawny	EN	LC				25	
Ciconia episcopus	Stork, Woolly-necked	NT	NT		15.4			
Ciconia nigra	Stork, Black	VU	LC		7.7			
Coracias garrulus	Roller, European	NT	LC		7.7		25	
Falco biarmicus	Falcon, Lanner	VU	LC		7.7			
Gyps africanus	Vulture, White-backed	CR	CR				25	
Pelecanus onocrotalus	Pelican, Great White	VU	LC		15.4			
Rynchops flavirostris	Skimmer, African	NA	NT		53.8			

Terathopius ecaudatus	Bateleur	EN	NT	25

Table 7-3 The likelihood of occurrence ratings of the expected SCCs at the various deviations

Species	Common Name	Likelihood of occurrence		
		Deviation 1	Deviation 2	Deviation 3
Aquila rapax	Eagle, Tawny	Moderate	Moderate	Moderate
Ciconia episcopus	Stork, Woolly-necked	Observed	Observed	Observed
Ciconia nigra	Stork, Black	Observed	Observed	Observed
Coracias garrulus	Roller, European	High	High	High
Falco biarmicus	Falcon, Lanner	High	High	High
Gyps africanus	Vulture, White-backed	High	High	High
Pelecanus onocrotalus	Pelican, Great White	Low	Moderate	Low
Rynchops flavirostris	Skimmer, African	Moderate	Moderate	Low
Terathopius ecaudatus	Bateleur	High	High	High

Aquila rapax (Tawny Eagle) is listed as EN on a regional scale and occupies dry open habitats from sea level to 3000 m. It will occupy both woodland and wooded savannah (IUCN, 2017). Due to its large distributional range the likelihood of occurrence of this species is rated as moderate, prey species are also present in the project areas which might increase the likelihood of occurrence.

Ciconia episcopus (Woolly-necked Stork) is categorised as NT on a global scale. A major threat to this species in South East Asia is hunting, it also threatened by severe habitat loss and fragmentation, particularly that of lowland forests with tall trees used for nesting although much suitable habitat remains that is not inhabited. Three individuals of this species were recorded in the project area.

Ciconia nigra (Black Stork) is native to South Africa, and inhabits old, undisturbed, open forests. They are known to forage in shallow streams, pools, marshes swampy patches, damp meadows, flood-plains, pools in dry riverbeds and occasionally grasslands, especially where there are stands of reeds or long grass (IUCN, 2017). This species was observed in deviation 2, however suitable habitat can be found in and around all the deviations for this species.

Coracias garrulous (European Roller) is a winter migrant from most of South-central Europe and Asia occurring throughout sub-Saharan Africa (IUCN, 2017). The European Roller has a preference for bushy plains and dry savannah areas (IUCN, 2017). There is a high chance of this species occurring in the project area as they prefer to forage in open/disturbed agricultural areas, which is present at the deviations.

Falco biarmicus (Lanner Falcon) is native to South Africa and inhabits a wide variety of habitats, from lowland deserts to forested mountains (IUCN, 2017). They may occur in groups up to 20 individuals, but have also been observed solitary. Their diet is mainly composed of small birds such as pigeons and francolins. The likelihood of incidental records of this species in the project area is rated as high due to the natural veld condition and the presence of many bird species on which Lanner Falcons may predate.

Gyps africanus (White-backed Vulture) has a large range and only occurs throughout sub-Saharan Africa. Primarily a lowland species of open wooded savanna, particularly areas of *Vachellia* and *Senegalia.* It requires tall trees for nesting. According to the IUCN (2017) this species faces similar threats to other African vultures, being susceptible to habitat conversion to agro-pastoral systems, loss of wild ungulates leading to a reduced availability of carrion, hunting for trade, persecution and poisoning. A number of large trees can be found in the project area for nesting, the likelihood of occurrence was increased based on the observation of the Hooded Vulture in the project area.

Pelecanus onocrotalus (Great White Pelican) is listed as VU in South Africa as its breeding attempts regularly fail due to human disturbance, such as fishing activities and nest robbing. They prefer shallow lakes, estuaries, flood plain pans, dams, sheltered coastal bays and lagoons. The wetland area in deviation 2 could possibly provide suitable habitat, therefore the likelihood of occurrence was rated as moderate.

Rynchops flavirostris (African Skimmer) is categorised as NT globally. This species requires expanses of calm water for feeding. Dam-building has flooded some upstream areas and reduced downstream flows, destroying suitable habitat. Farming practices have also caused siltation of many rivers, raising river levels and swamping breeding islands. The rivers in deviation 1 and 2 could possibly provide suitable habitat, however their degraded/disturbed state could lower the likelihood of this.

Terathopius ecaudatus (Bateleur) is categorised as EN on a regional scale and NT on a international scale. This species prefer open grassland and savanna, it is not found in thick forested areas. A high number of bateleurs can be found in the Kruger national park (8 km) from the project area, as their home range area is between 55–200 km² (BirdLife International, 2019) it is highly likely that the species would be found in the project area.

7.1.3 Coordinated Avifaunal Roadcount (CAR)

The ADU/Cape bird club pioneered avifaunal roadcount of larger birds in 1993 in South Africa. Originally it was started to monitor the Blue Crane *Anthropoides paradiseus* and Denham's/Stanley's Bustard *Neotis denhami*. Today it has been expanded to the monitoring of 36 species of large terrestrial birds (cranes, bustards, korhaans, storks, Secretarybird and Southern Bald Ibis) along 350 fixed routes covering over 19 000 km. Twice a year, in midsummer (the last Saturday in January) and midwinter (the last Saturday in July), roadcounts are carried out using this standardised method. These counts are important for the conservation of these larger species that are under threat due to loss of habitat through changes in land use, increases in crop agriculture and human population densities, poisoning as well as man-made structures like power lines. With the prospect of wind and solar farms to increase the use of renewable energy sources monitoring of these species is most important (CAR, 2020). Figure 7-6 shows that the project area is 274 km from the closest CAR route.

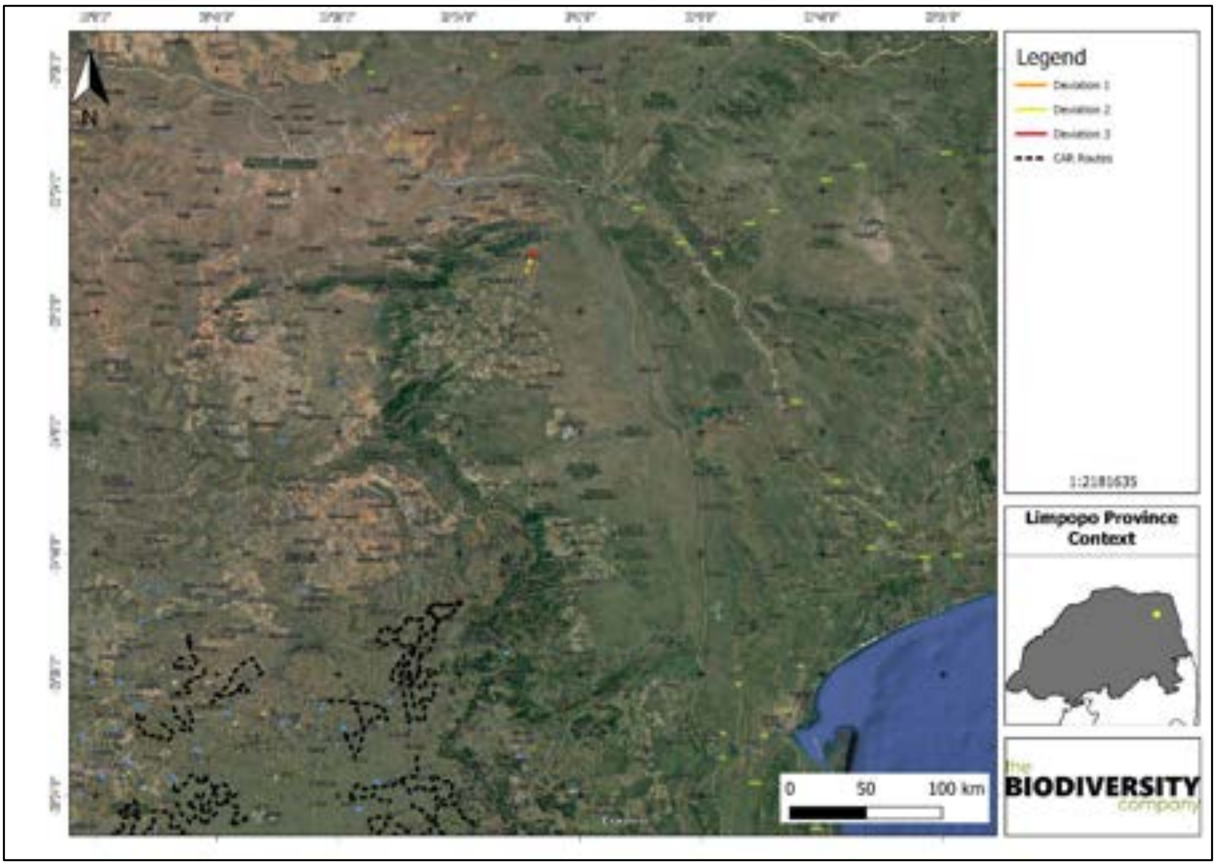

Figure 7-6 The project area in relation to the Coordinated Avifaunal Roadcount route

7.1.4 Review of previous report

In 2010 an Ecological assessment was conducted by Dr Wynand Vlok, the report was called: Proposed new Mhinga substation (Sub G of the Spencer NDP project), power lines from Sub E to Sub G and associated communications tower. During the assessment no avifaunal species of conservation concern were observed.

The original avifaunal assessment was requested from Eskom, but due to the date of the original study was not available.

7.2 Field Assessment

7.2.1 Avifauna Species

One hundred and thirty-seven (137) bird species were recorded in the project area survey footprint. The full list of species recorded, their threat status, guild and location observed is shown in Appendix A. Of the 137 species five (5) species are species of conservation concern (Table 7-4, Figure 7-7 and Figure 7-8). These species were recoded across all three of the deviations, some seen moving between the deviations.

Table 7-4 Summary of avifauna SCCs recorded within the assessment area associated with the proposed Mhinga project area during the field survey. CR- Critically Endangered, EN = Endangered, LC = Least Concern, NT= Near Threatened and VU = Vulnerable. CGD, carnivore ground diurnal; CWD, carnivore water diurnal, IAD, insectivore air diurnal.

Species	Common Name	Conservation Status	
		Regional (SANBI, 2016)	IUCN (2020)

Aquila nipalensis	Eagle, Steppe	LC	EN
Ciconia episcopus	Stork, Woolly-necked	NT	NT
Ciconia nigra	Stork, Black	VU	LC
Necrosyrtes monachus	Vulture, Hooded	CR	CR
Platysteira peltata	Wattle-eye, Black-throated	NT	LC

The Steppe Eagle (*Aquila nepalensis)* is a migrant bird species that over-winters in South Africa and has undergone extremely rapid population declines within its range. This species does not breed in South Africa. Their diet consists of prey ranging from mammals, birds, reptiles, insects, to carrion, usually from 50-250 g in weight. Steppe Eagles are under threat from habitat loss, persecution, predation of chicks, and electrocution or injury from power lines. One bird was recorded perching in a tree on the side of an agricultural field in Deviation 2. As this was early morning it can be assumed that this is part of the birds hunting range.

The Woolly-necked Stork (*Ciconia episcopus)* occurs from India and Sri Lanka to the Phillippines, with a separate population in sub-Saharan Africa. They have been known to occur in man made habitats such as golf courses, firebreaks and plantation roads. Naturally their preferred habitat includes flood plains, rivers, pans, ponds, dams, lagoons, swamp forests, mangrove swamps, tidal mudflats and estuaries. Threats to them includes habitat destruction mainly by agriculture and plantations. Three birds were seen flying over from Deviation 2 in the direction of Deviation 3, with the wetland area at Deviation 2 it was assumed they were foraging in that area.

The Black Stork (*Ciconia nigra)* has a separate resident population that is found in Zambia, Angola and southern Africa, bordering on Mozambique and Botswana. They occur in any type of wetland from pans, rivers, flood plains, ponds, lagoons, dams, swamp forests, mangrove swamps to estuaries. The local population nests on cliffs with the main breeding season peaking from May to August. Threats to this species just like the Woolly-necked Stork is mainly habitat destruction. One stork was noted in Deviation 2 close to a dam but also in relative close proximity to the housing developments.

The Hooded Vulture (*Necrosyrtes monachus*) is found in much of Sub-Saharan Africa, in South Africa they are found mostly in the North Eastern parts. Their nests are found in large well foliaged trees such as Jackal-berry (*Diospyros mespiliformis*) or Nyala-tree (*Xanthocercis zambesiaca*). This scavenger will feed on meat, eyes, offal and bones; they might also take maggots, termites and nestlings of other bird species. Recent published evidence suggests the population is experiencing a rapid decline which is attributed to indiscriminate poisoning, trade for traditional medicine, hunting, persecution and electrocution, as well as habitat loss and degradation. A juvenile Hooded Vulture was recorded in Deviation 3, the bird was only recorded once during the survey.

The Black Throated Wattle Eye (*Platysteira peltata)* occurs from Angola to Kenya south to southern Africa. It usually occupies Afromontane and coastal forests, but can also be found in dense undergrowth near rivers. This insectivore builds nests in bushy tree branches from September to November. Habitat destruction is said to be its mayor cause for decline. Two of these birds were found in the riparian area of Deviation 2, no nests were noticed, it is however still likely that they are nesting there.

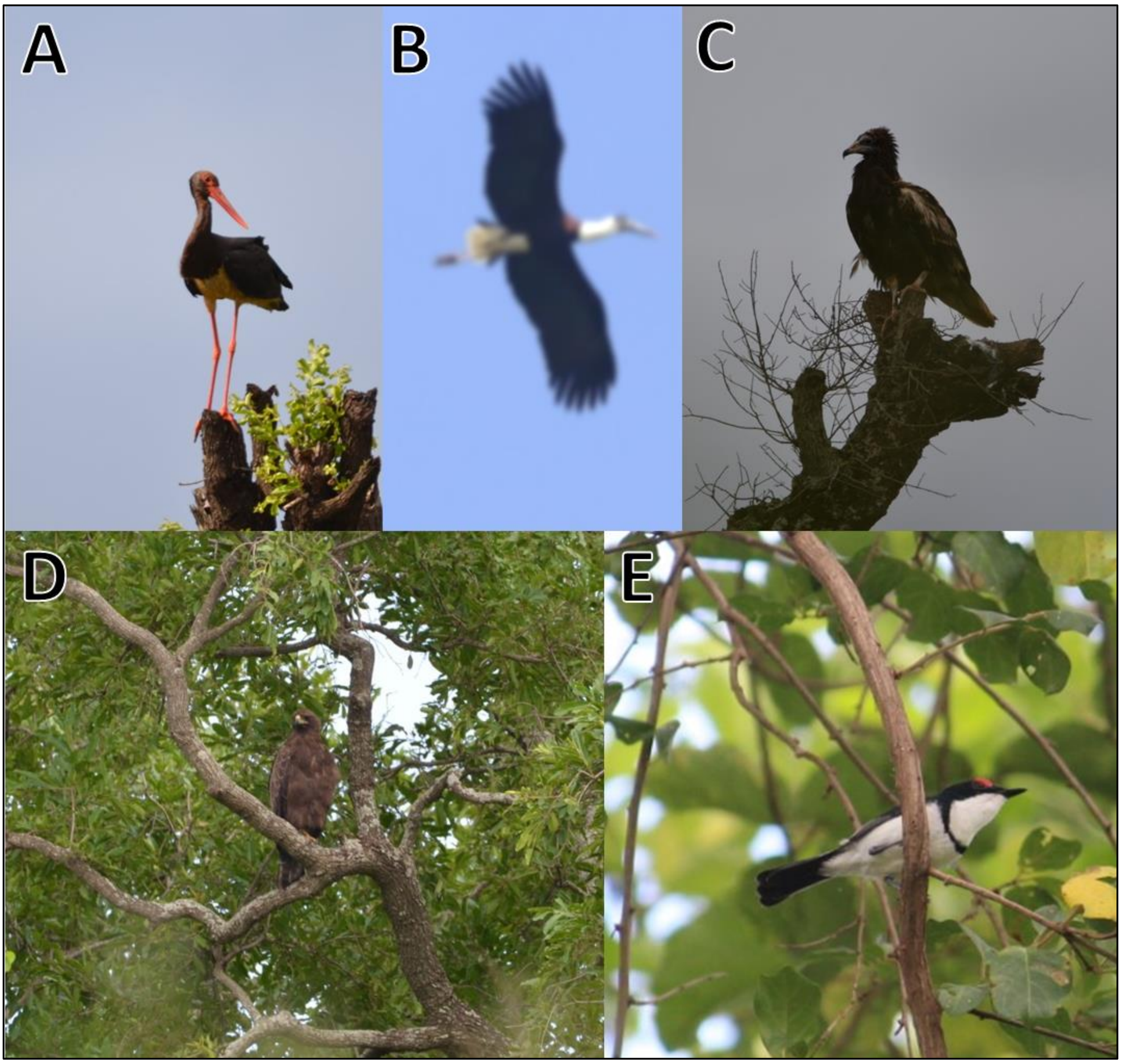

Figure 7-7 ***The avifauna SCCs recorded in the project area: A) Black Stork (Ciconia nigra), B) Woolly necked Stork (Ciconia episcopus), C) Hooded Vulture (Necrosyrtes monachus), D) Steppe Eagle (Aquila nipalensis) and E) Black Throated Wattle Eye (Platysteira peltata)***

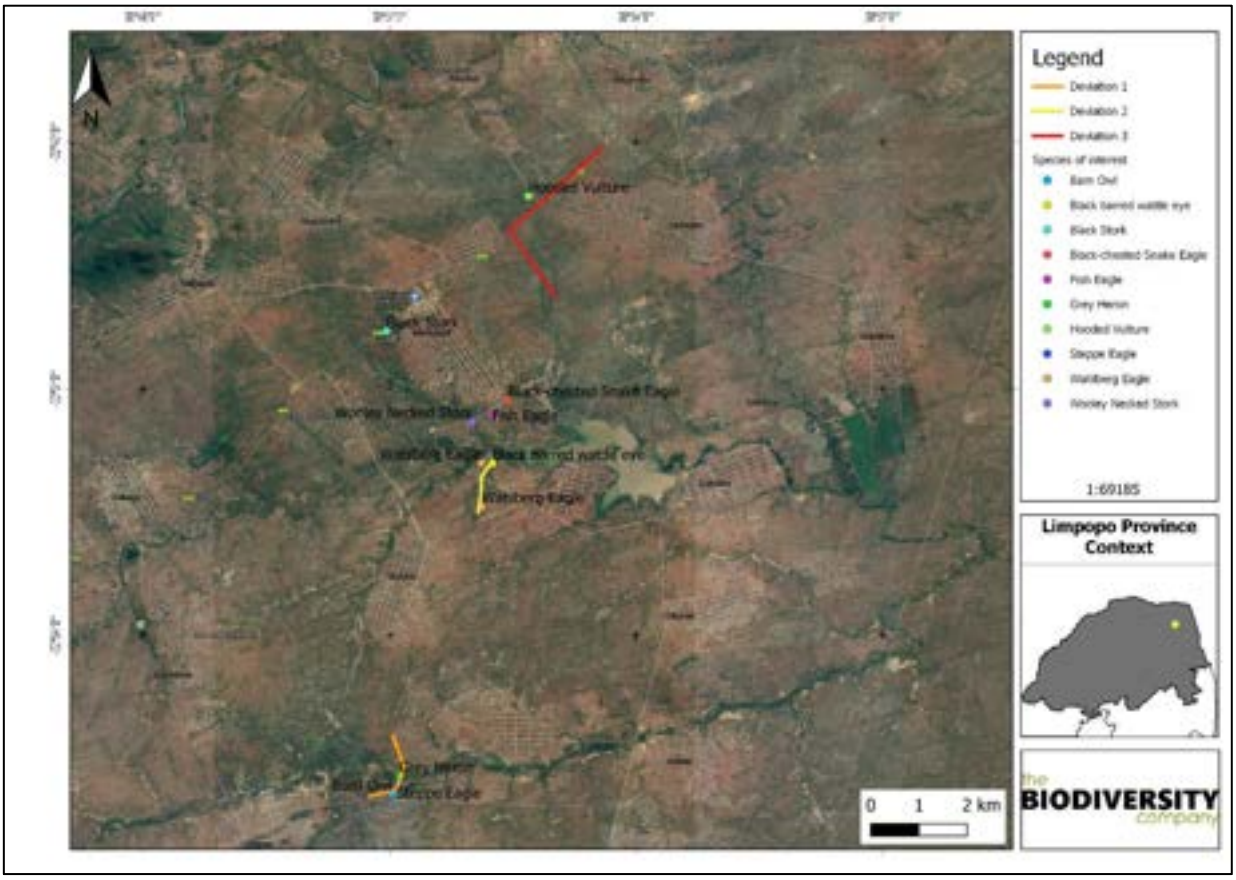

Figure 7-8 Locations of some of the species of interest found in the project area.

The principle impacts of the powerlines are electrocution and collisions. Birds prone to collisions can be divided into five categories; 1) large species with high body weight ratio to wing span resulting in low manoeuvrability, 2) species that are distracted in flight this include predatory birds and smaller species with areal displays, 3) species flying at high speeds, 4) crepuscular species that are active in low light conditions, and 5) species with limited narrow forward vision (Jenkins *et al.,* 2010; Noguera *et al.,* 2010). Species that tend to fly in flocks also may be influenced more by collisions as the birds flying in the rear will not be able to detect the powerlines. Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices are simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties. Winds parallel or diagonal to cross-arms are the most detrimental, due to exacerbating the difficulty in manoeuvrability during landing or take-off.

The species that are known to occur within the broader landscape (SABAP 2) that exhibits a high potential for impacts by energy generation and distribution are provided in Table 7-5. Eleven of these species were recorded in the project area. Some of the bird species commonly impacted by powerlines are also shown in Appendix D as per EWT (2017).

Table 7-5 Summary of avifauna species within the assessment area that are prone to impacts by the energy production and distribution

Species	Common Name	Collisions	Electrocution	Species recorded
Alopochen aegyptiacus	Goose, Egyptian	X	X	X

Anas sparsa	Duck, African Black	X		
Anastomus lamelligerus	Openbill, African	X	X	
Anhinga rufa	Darter, African	X	X	
Aquila rapax	Eagle, Tawny	X	X	
Aquila spilogaster	Hawk-eagle, African	X	X	
Aquila wahlbergi	Eagle, Wahlberg's	X	X	X
Ardea cinerea	Heron, Grey	X	X	X
Ardea goliath	Heron, Goliath	X	X	
Ardea purpurea	Heron, Purple	X	X	
Bostrychia hagedash	Ibis, Hadeda	X	X	X
Buteo vulpinus	Buzzard, Common	X	X	
Ciconia episcopus	Stork, Woolly-necked	X	X	X
Ciconia nigra	Stork, Black	X	X	X
Circaetus cinereus	Snake-eagle, Brown	X	X	
Circaetus pectoralis	Snake-eagle, Black-chested	X	X	X
Corvus albus	Crow, Pied		X	X
Gyps africanus	Vulture, White-backed	X	X	
Haliaeetus vocifer	Fish-eagle, African	X	X	X
Lophotis ruficrista	Korhaan, Red-crested	X		
Numida meleagris	Guineafowl, Helmeted		X	X
Pelecanus onocrotalus	Pelican, Great White	X	X	
Phalacrocorax africanus	Cormorant, Reed	X		
Phalacrocorax carbo	Cormorant, White-breasted	X		
Platalea alba	Spoonbill, African	X		
Plectropterus gambensis	Goose, Spur-winged	X	X	
Polyboroides typus	Harrier-Hawk, African	X	X	
Terathopius ecaudatus	Bateleur, Bateleur	X	X	
Threskiornis aethiopicus	Ibis, African Sacred		X	
Tyto alba	Owl, Barn	X	X	X

7.2.1.1 Trophic Guilds

Trophic guilds are defined as a group of species that exploit the same class of environmental resources in a similar way (González-Salazar *et al,* 2014). The guild classification used in this assessment is as per González-Salazar *et al* (2014); they divided avifauna into 13 major groups based on their diet, habitat, and main area of activity. The analysis of the major avifaunal guilds reveals that the species composition is dominated by insectivores (IGD), omnivores (OMD) and granivores (GGD) (Figure 7-9). Nocturnal birds are low as they would just have been observed by chance. No nocturnal studies were performed as there was a safety risk. Based on the amount of water resources in the project area the number of water birds recorded were lower than expected, it is possible that due to the delayed rains that these numbers were low and could increase with more rainfall.

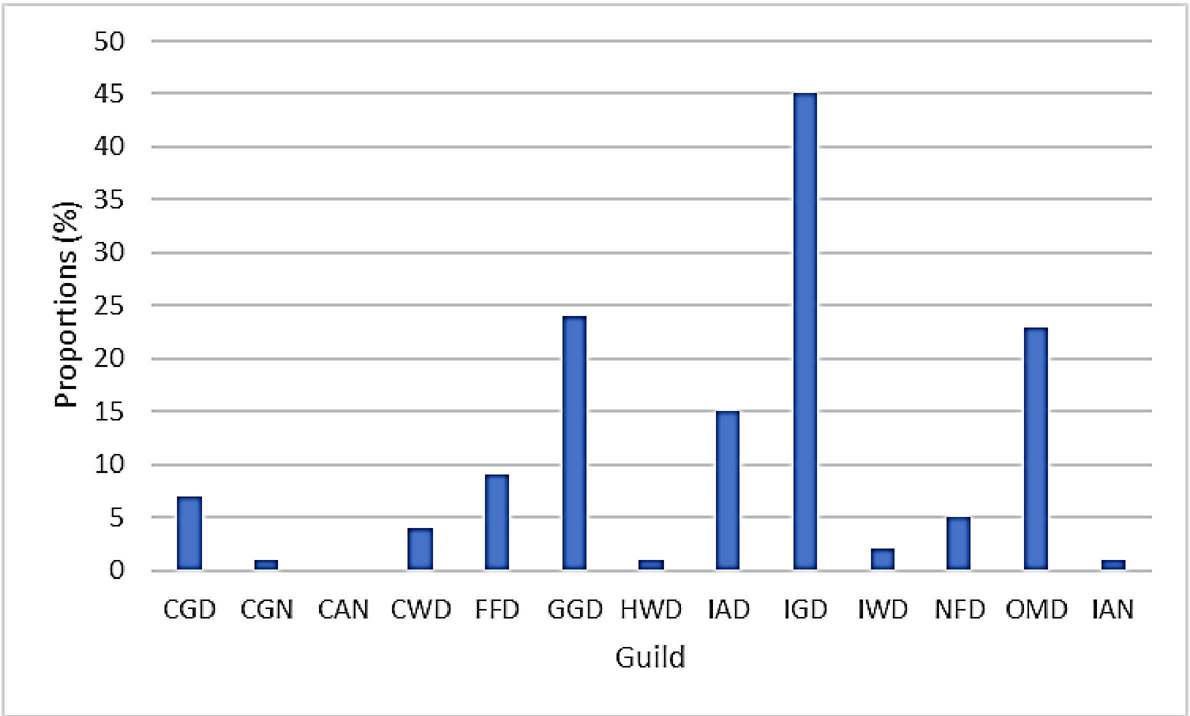

Figure 7-9 ***Avifaunal trophic guilds. CGD, carnivore ground diurnal; CGN, carnivore ground nocturnal, CAN, carnivore air nocturnal, CWD, carnivore water diurnal; FFD, frugivore foliage diurnal; GCD, granivore ground diurnal; HWD, herbivore water diurnal; IAD, insectivore air diurnal; IGD, insectivore ground diurnal; IWD, insectivore water diurnal; NFD, nectivore foliage diurnal; OMD, omnivore multiple diurnal; IAN, Insectivore air nocturnal.***

7.2.1.2 Dominant species

Table 7-6 provides a list of the dominant species for the project area together with the frequency with which each species appeared in the point count samples. The data shows the Tawny-Flanked Prinia, Zitting and Rattling Cisticola, Pied Crow, Southern Masked Weaver and Common Swift were the most abundant species. The frequency with which a species was recorded provides an overview of the spread of the species in the project area. Twenty-five (25) species were recorded in more than 2 habitats, while nine (9) species are found in three habitats. Species with the highest frequency includes: Zitting Cisticola, Rattling Cisticola and the Tawny-flanked Prinia. From the type of species with the highest abundance and frequency one can extrapolate that the habitat was more suitable for species that are present in shrub habitat.

Table 7-6 Dominant avifaunal species within the project area as defined as those species whose relative abundances cumulatively account for more than 66.4% of the overall abundance shown alongside the frequency with which a species was detected among point counts.

Species	Common Name	Relative Abundance	Frequency (%)
Apus apus	Swift, Common	0.062	1.667
Cercotrichas leucophrys	Scrub-robin, White-browed	0.020	20.000
Cercotrichas paena	Scrub-robin, Kalahari	0.015	8.333
Chrysococcyx caprius	Cuckoo, Diderick	0.011	11.667
Cinnyris talatala	Sunbird, White-bellied	0.014	13.333
Cisticola chiniana	Cisticola, Rattling	0.037	35.000
Cisticola juncidis	Cisticola, Zitting	0.036	28.333
Clamator levaillantii	Cuckoo, Levaillant's	0.014	16.667
Colius striatus	Mousebird, Speckled	0.011	5.000
Corvus albus	Crow, Pied	0.047	20.000
Corythaixoides concolor	Go-away-bird, Grey	0.025	16.667
Crithagra mozambicus	Canary, Yellow-fronted	0.012	11.667
Dicrurus adsimilis	Drongo, Fork-tailed	0.012	13.333
Hirundo abyssinica	Swallow, Lesser Striped	0.020	10.000
Lybius torquatus	Barbet, Black-collared	0.017	11.667
Merops apiaster	Bee-eater, European	0.012	6.667
Passer domesticus	Sparrow, House	0.016	6.667
Phoeniculus purpureus	Wood-hoopoe, Green	0.014	10.000
Ploceus cucullatus	Weaver, Village	0.014	8.333
Ploceus velatus	Masked-weaver, Southern	0.047	21.667
Prinia subflava	Prinia, Tawny-flanked	0.035	31.667
Pycnonotus tricolor	Bulbul, Dark-capped	0.017	11.667
Streptopelia capicola	Turtle-dove, Cape	0.020	20.000
Streptopelia senegalensis	Dove, Laughing	0.025	21.667
Sylvietta rufescens	Crombec, Long-billed	0.022	18.333
Terpsiphone viridis	Paradise-flycatcher, African	0.014	11.667
Turdoides jardineii	Babbler, Arrow-marked	0.026	6.667
Turtur chalcospilos	Wood-dove, Emerald-spotted	0.011	11.667
Uraeginthus angolensis	Waxbill, Blue	0.020	15.000
Urocolius indicus	Mousebird, Red-faced	0.019	6.667

7.2.2 Flight Paths and Nest Locations

Observing and monitoring flight paths and nesting sites are important in ascertaining habitat sensitivity and evaluating the impact risk significance of any proposed development. However, due to the extensive time required for determining flight-path patterns, and given the limited time available for the survey, no flight paths were recorded for any specific species.

Nevertheless, nesting sites were observed within the assessment area, with the locations of these illustrated in Figure 7-10 and Figure 7-11 below. The nests observed we mostly those of smaller bird, the development will only influence these species through habitat destruction. A number of pied crow nests were observed on the existing pylons, this indicates that the design of the existing pylons is of such a nature that larger bodied birds cannot get electrocuted. Electrocutions tend to take place if they are able to touch conductors and ground/earth wires or earthed devices simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties.

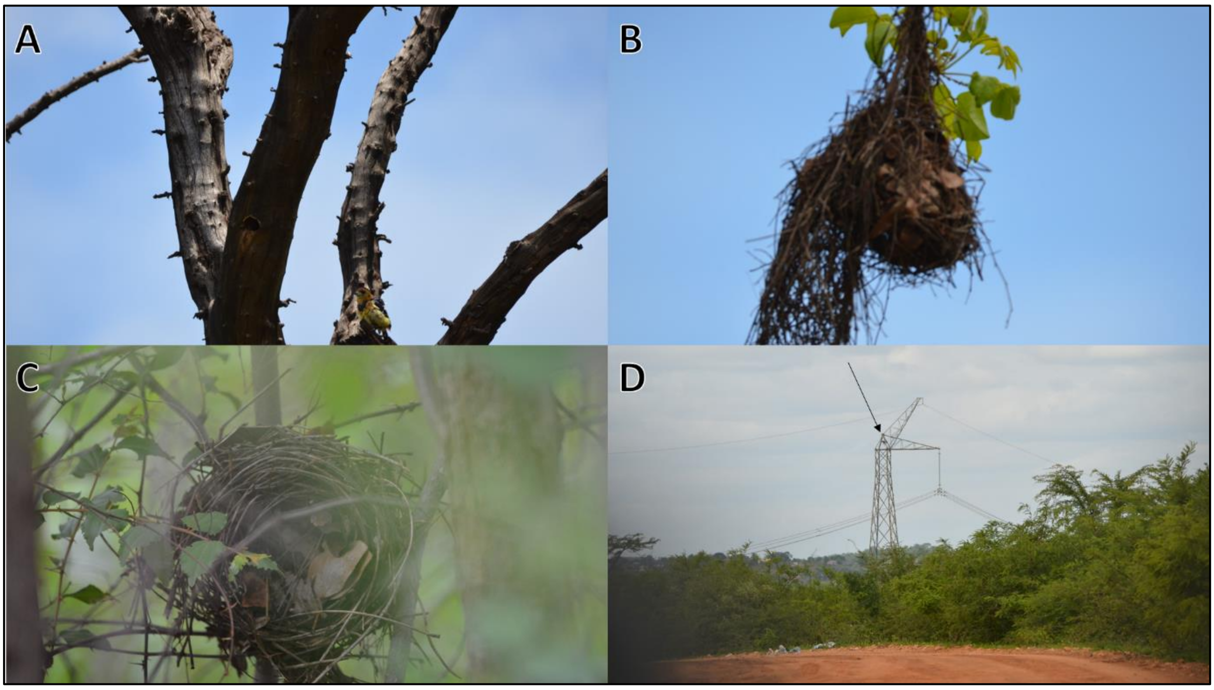

Figure 7-10 Nests observed in the project area: A) Crested Barbet, B) Red headed Finch (abandoned), C) Robin sp. (abandoned) and D) Pied crow.

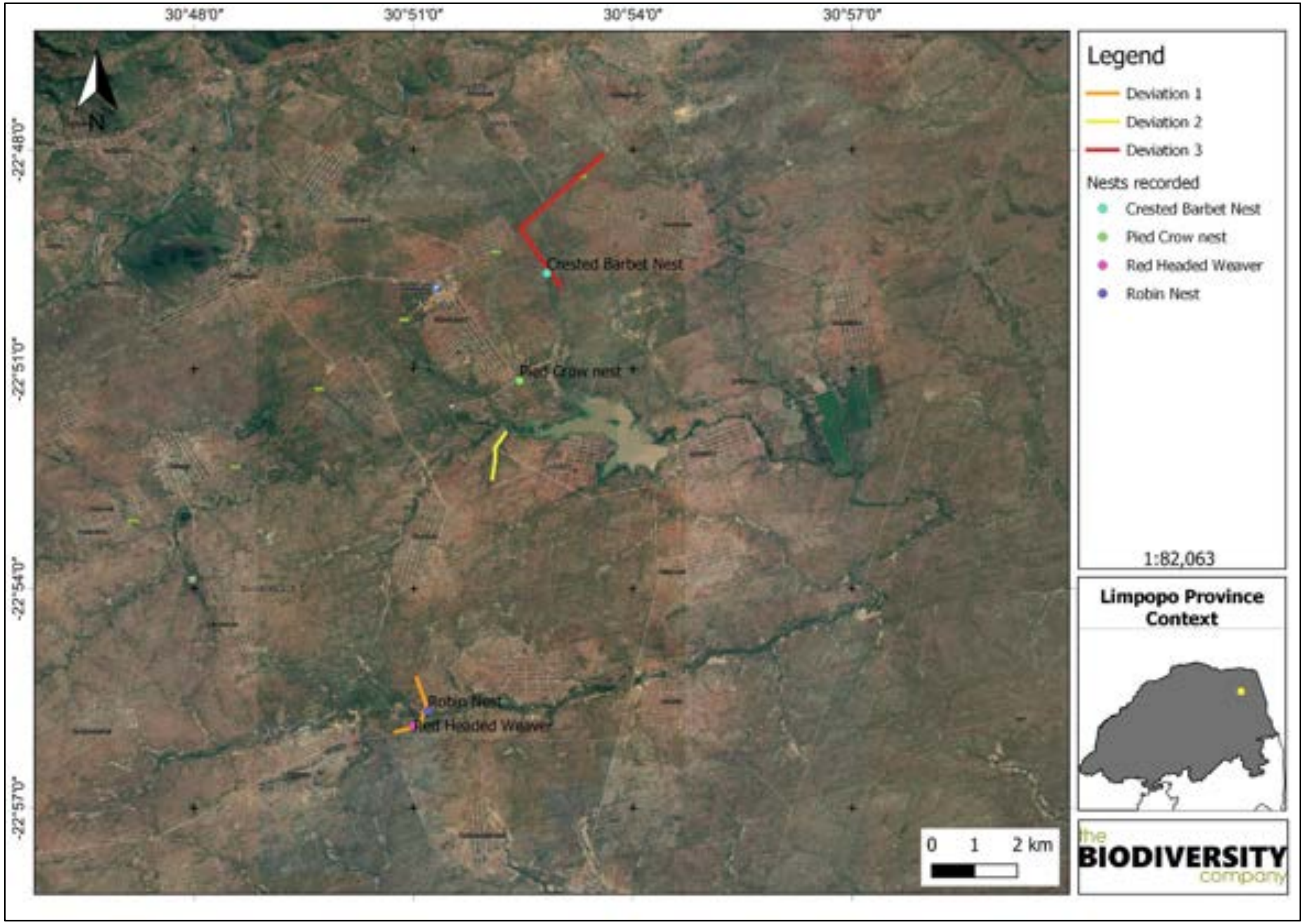

Figure 7-11 ***Map illustrating the nests observed within the assessment area associated with the proposed Mhinga Powerline deviations***

7.2.3 Fine-Scale Habitat Use

Fine-scale habitats within the landscape are important in supporting a diverse avifauna community as they provide differing nesting, foraging and reproductive opportunities. The assessment area overlaps with three avifaunal fine-scale habitats, namely riparian (wetlands), Degraded bushveld (small patches of grassland habitat can be found here) and Transformed (Figure 7-12). The grassland patches was not delineated separately as they are intertwined in between the bushveld. A fourth vegetation type Disturbed Grassland can be found in the TBC 2021 terrestrial report, this habitat from an avifauna perspective is similar to the Degraded Bushveld.

The bushveld habitat made up majority of the project area and consisted of shrublands (shrubs up to a height of 1 m-1.5 m), large trees (around 5 m in height) and some patches of grassland. The bushveld possessed a higher richness and abundance of passerine birds than the open transformed areas. This habitat type supported a large number of insectivorous and granivorous ground dwelling species such as Zitting Cisticola (*Cisticola juncidis*), Long-billed crombec (*Sylvietta rufescens*), White-browed Scrub Robin (*Cercotrichas leucophrys*), and Blue Waxbill (*Uraeginthus angolensis*). Priority species found here included Steppe Eagle (*Aquila nipalensis*), Woolly-necked Stork (*Ciconia episcopus*) and Black Stork (*Ciconia nigra*). All three species were found perched here, for the latter two it is likely that they were just resting here as they forage mainly in wetland areas.

The riparian/wetland habitat made up a small portion of the project area with a river found in deviation 3 and a river as well as a wetland system found in deviation 2. Majority of the smaller drainage lines did not have water at the time of the survey. Species such as the Grey Heron (*Ardea cinerea*), Three Banded Plover (*Charadrius tricollaris*) and Egyptian Goose (*Alopochen aegyptiacus*) were found on the edge of the water while the Little Rush Warbler (*Bradypterus baboecala*), Sombre Greenbul (*Andropadus importunus*) and Woodlands Kingfisher (*Halcyon senegalensis*) occurred in the vegetation on the edges of the water sources. These species exhibited a preference for the denser areas with a higher level of coverage from predatory birds. The specie of conservation concern found in this habitat was the Black Throated Wattle-eye (*Platysteira peltata*), as two were found in close proximity to one another it can be assumed they are a breeding pair.

The transformed habitat unit represents areas such as the roads, agricultural fields, areas cleared for the existing powerlines and housing. Although these areas are disturbed, they do still support some generalist avifauna species. Some of these areas had camps with cattle and goats, these livestock species draws insects which in turn draws insectivorous birds. Species found here included, Hadeda Ibis (*Bostrychia hagedash*), Cattle Egret (*Bubulcus ibis*), House Sparrow (*Passer domesticus*), Common Myna (*Acridotheres tristis*) and Rock Dove (*Columba livia*) were found here. The Hooded Vulture (*Necrosyrtes monachus*) were seen perched on a tree in this area, without long term studies it cannot be said if this species is a resident in the area.

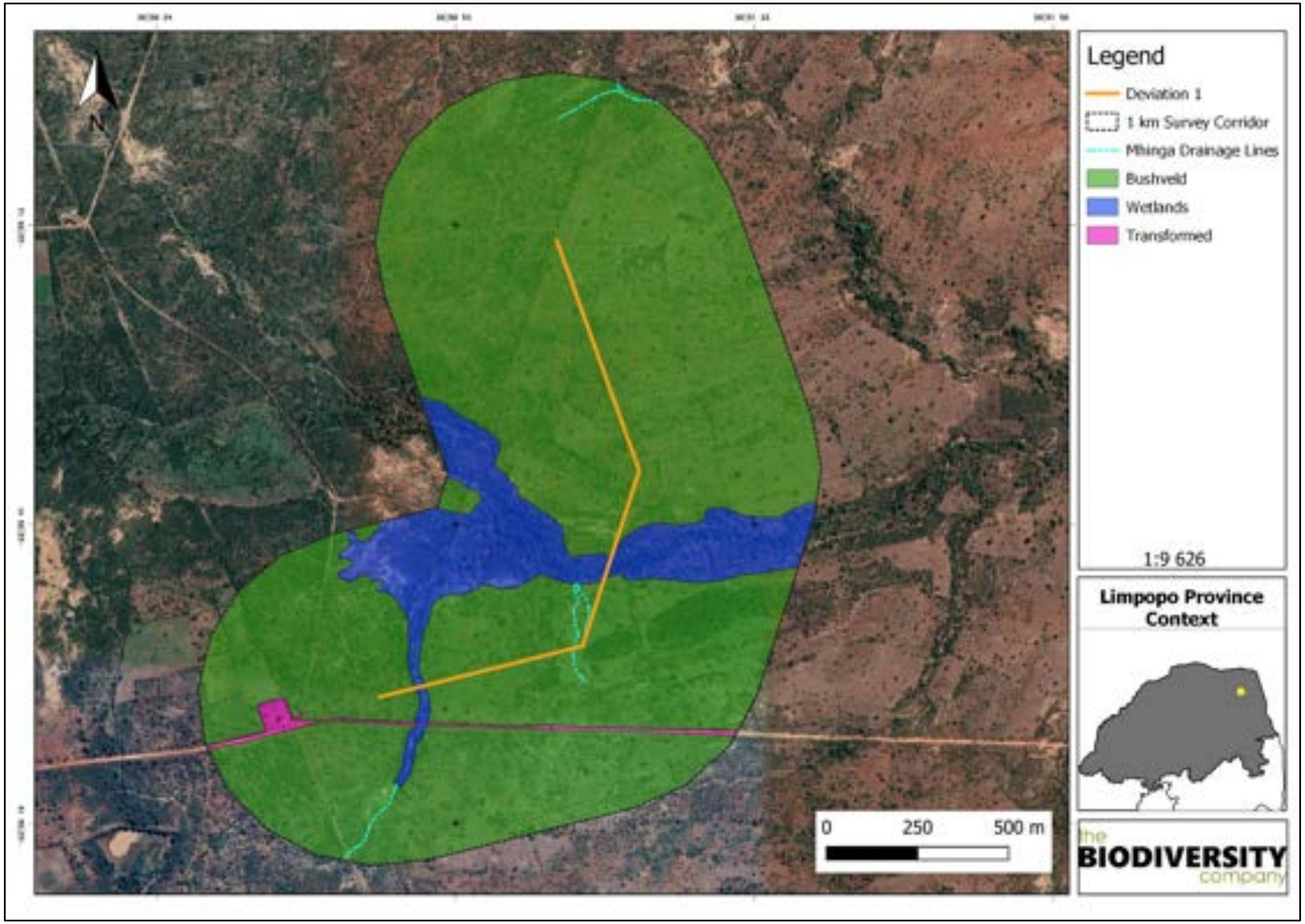

Figure 7-12 The habitats found in deviation 1 of the project area

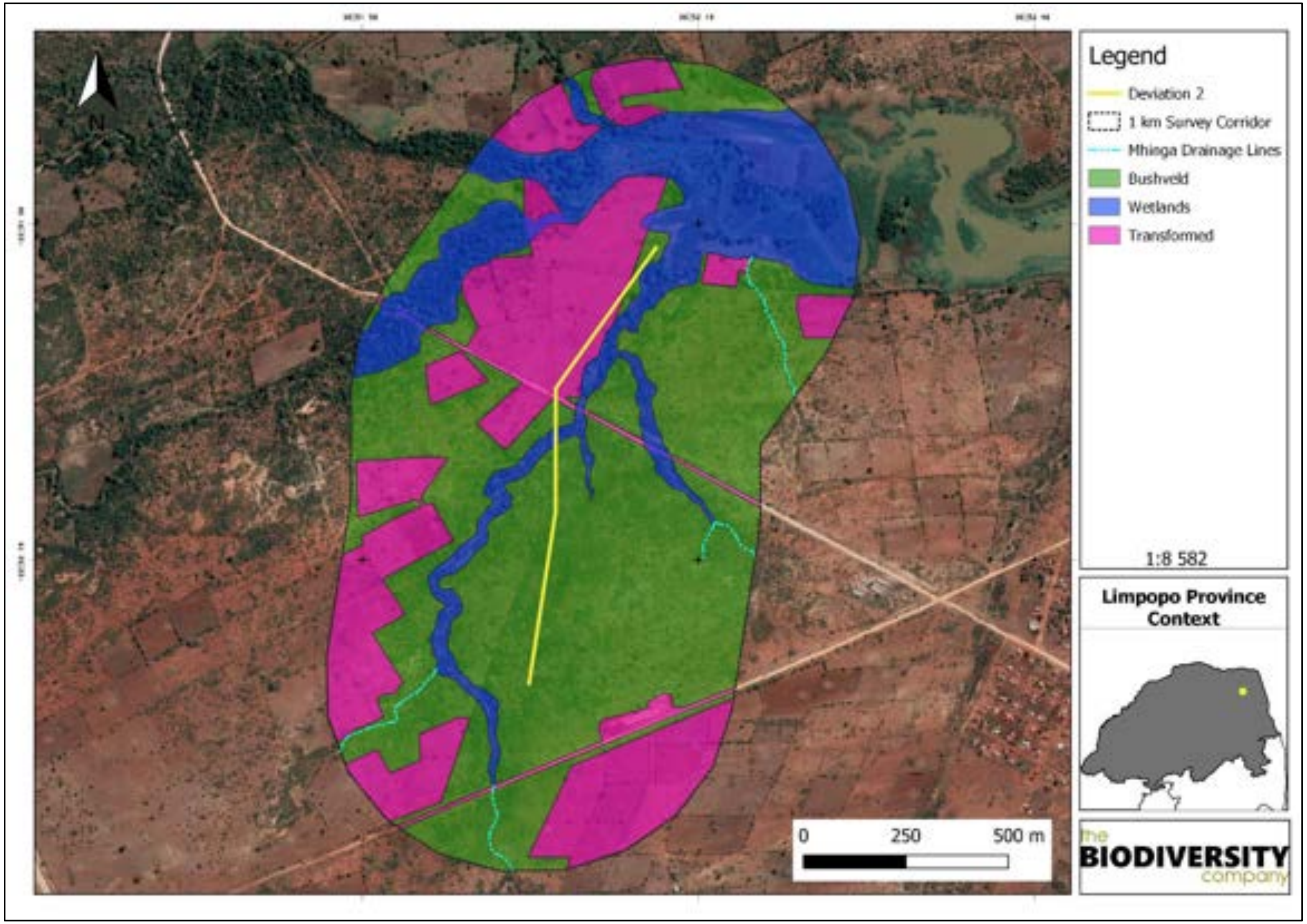

Figure 7-13 The habitats found in deviation 2 of the project area

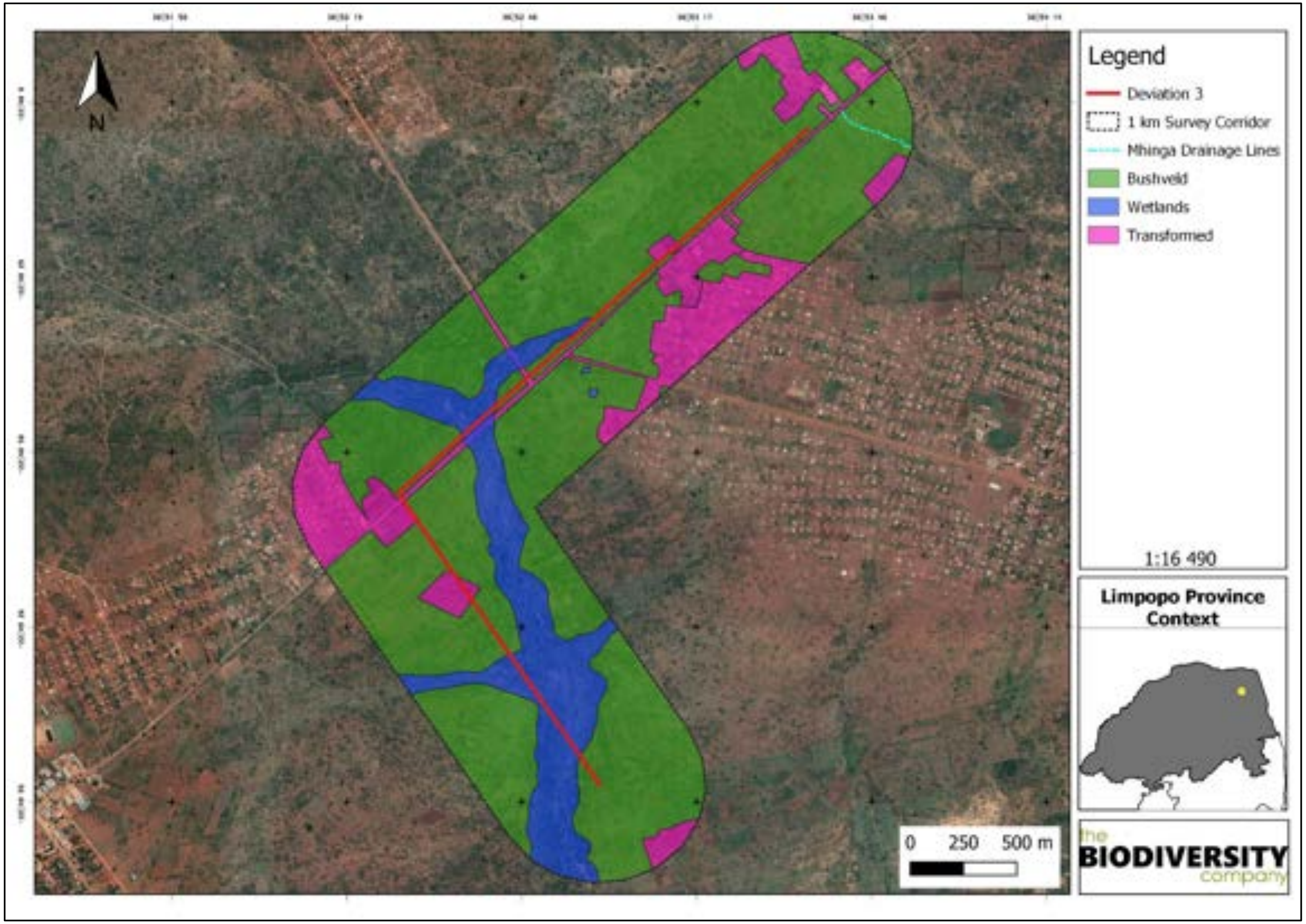

Figure 7-14 The habitats found in deviation 3 of the project area

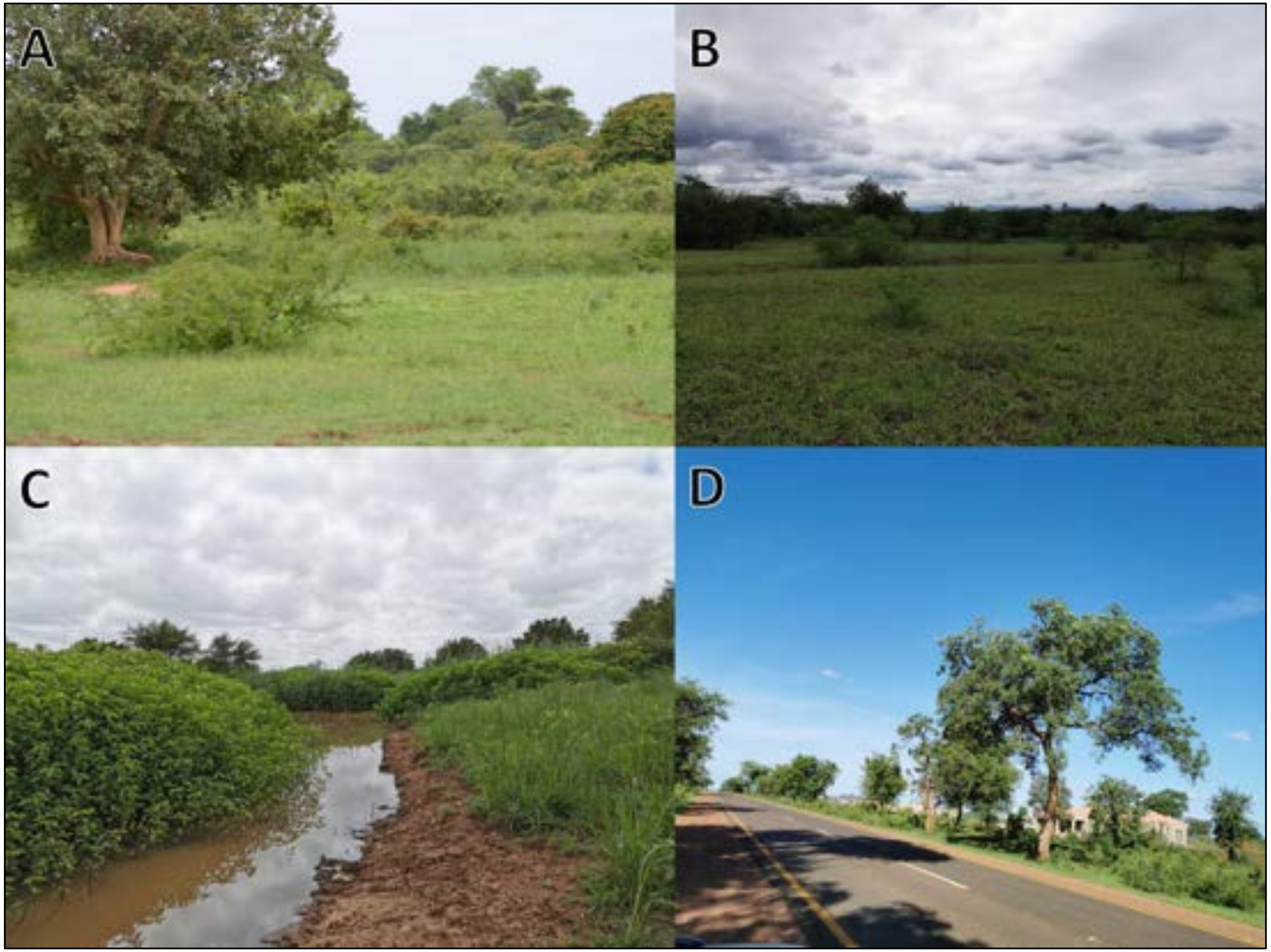

Figure 7-15 ***Photographs illustrating examples of the habitat types delineated within the assessment area associated with the proposed Mhinga project. A) Bushveld with areas of grassland intertwined, C) Riparian area and D) Transformed***

7.2.3.1 Avifaunal Habitat Association

The Principal Component Analysis (PCA) ordination shown in Figure 7-16 provides a visual representation of the correlation of the species among the four habitats types. From the ordination plot it can be observed that the bird assemblage is largely distinct, with the closest association being between the species found in the bushveld and the riparian habitat. The degraded/transformed habitats species assemblages are mostly unique (cumulative variation of 97.21).

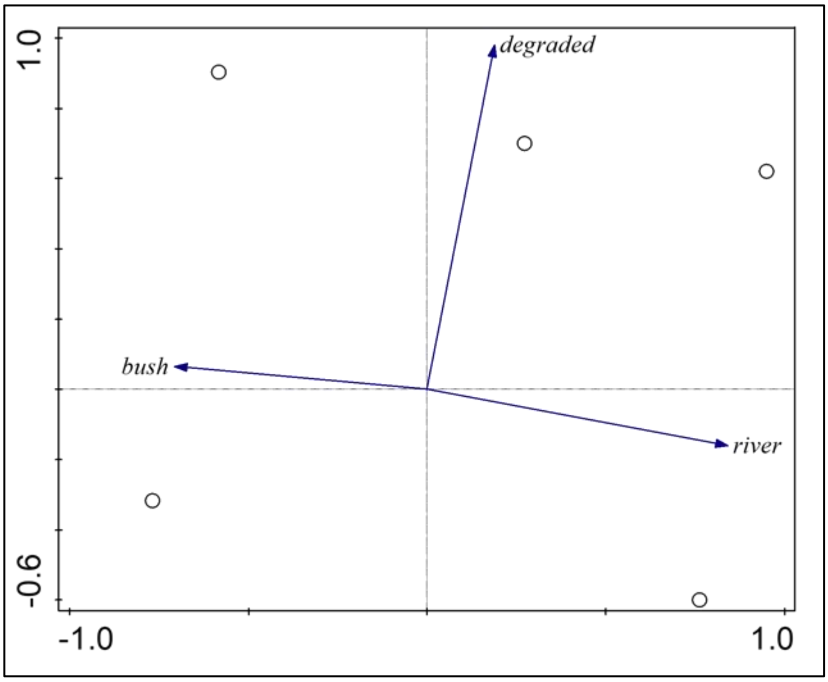

Figure 7-16 A Principal component analysis ordination of the relative abundances of bird species between the three different areas.

7.3 Site Ecological Importance (SEI)

The biodiversity theme sensitivity as indicated in the screening report was derived to be Very High and Low (Figure 7-17), while the animal species theme sensitivity shows that majority of the area is classified as medium sensitivity with small sections of Low and High sensitivities (Figure 7-18). The completion of the avifaunal assessment does not corroborate this medium and low sensitivity ratings and was found to be very high sensitivity.

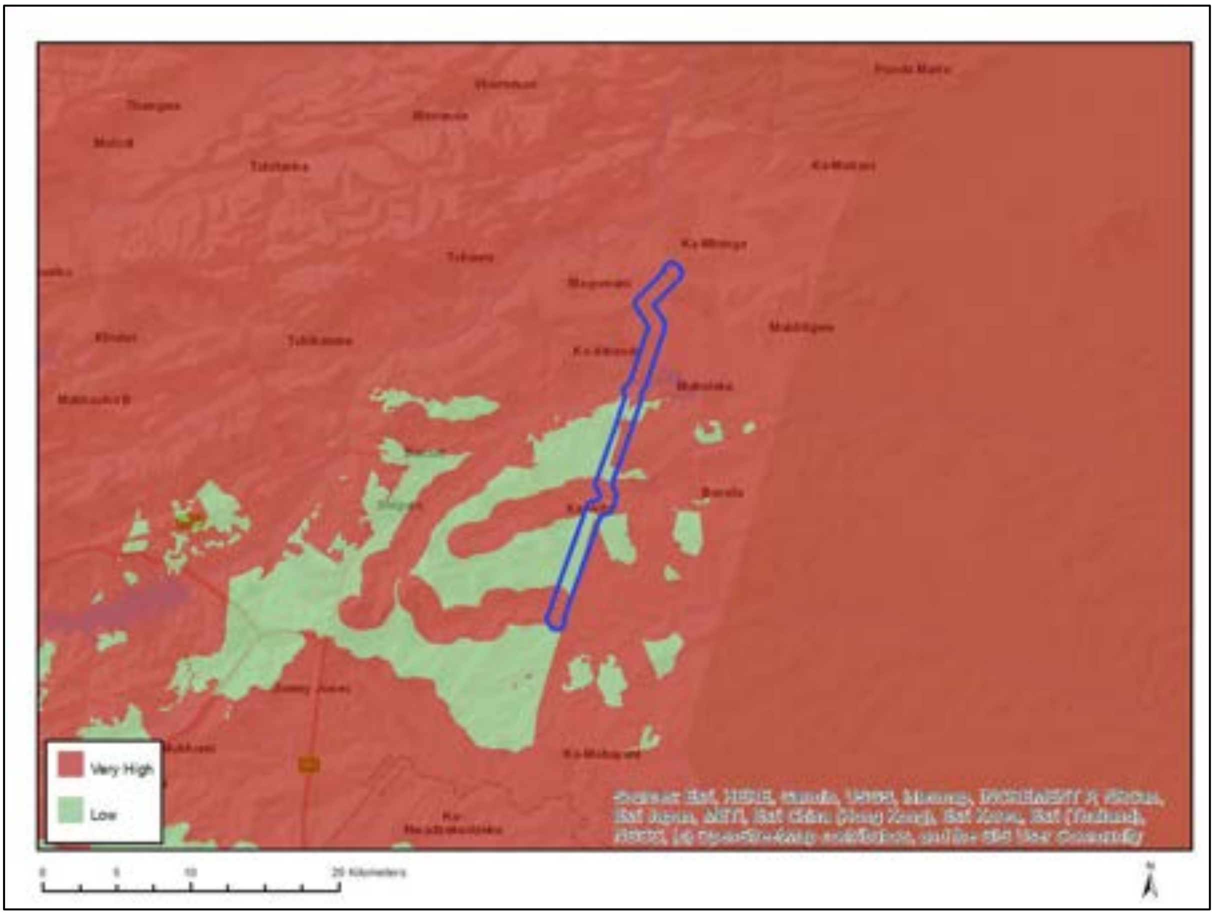

Figure 7-17 Terrestrial Biodiversity Theme Sensitivity, TBC Screening Report

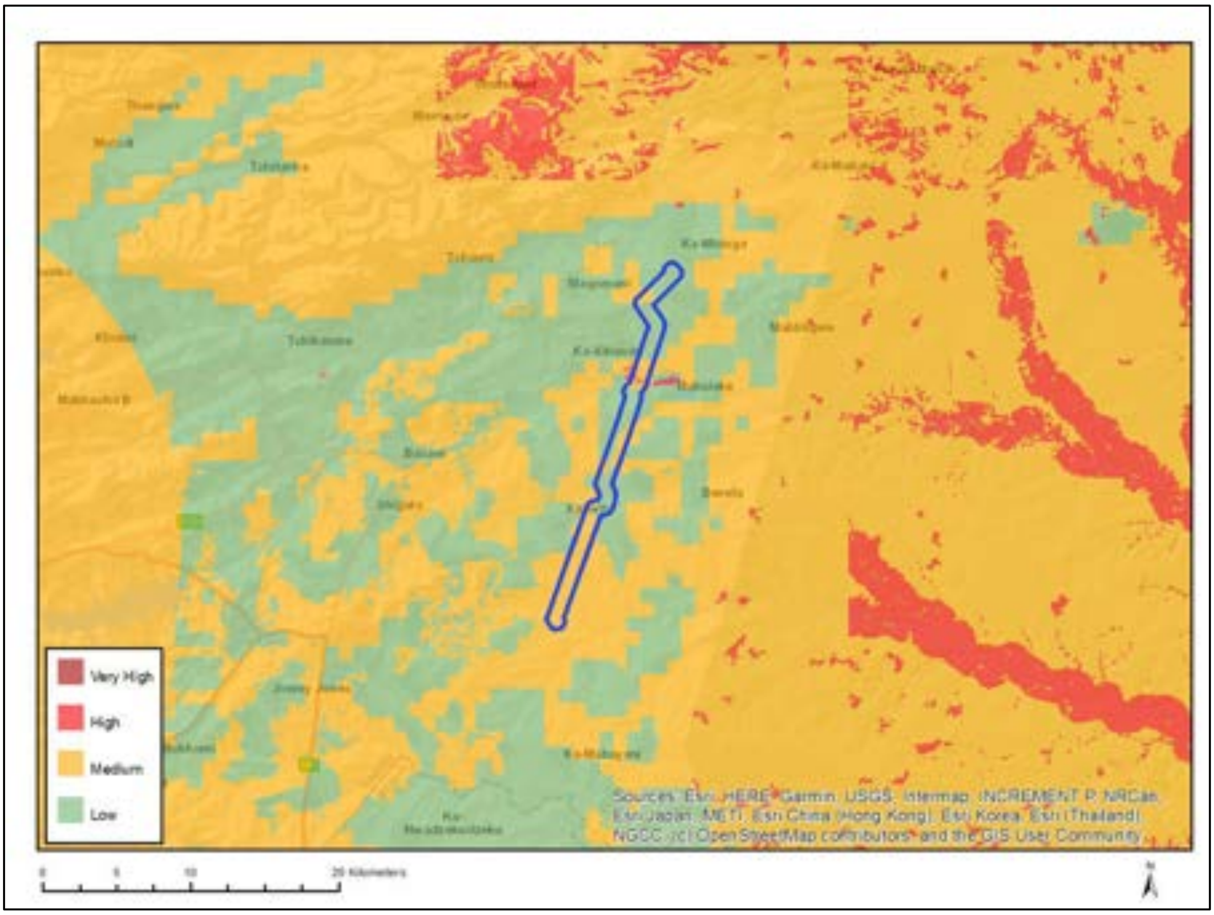

Figure 7-18 Animal species Theme Sensitivity, TBC Screening Report

Three (3) different habitat types were delineated within the assessment areas (Table 7-7). These habitats were found in all three deviations, in these various habitats the 5 SCCs were found. Without long term studies it was assumed that these areas are critical habitat for the species and as such their site ecological importance was said to be very high. The location and extent of these habitats are illustrated in Figure 7-12 to Figure 7-15. Based on the criteria provided in Section 6.3 of this report, all habitats within the assessment area of the proposed development were allocated a sensitivity category. The sensitivities of the habitat types delineated are illustrated in Figure 7-19.

Table 7-7 Summary of habitat types delineated within the field assessment area of the Mhinga Powerline.

Habitat (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Riparian (Wetlands)	High	Very High	Very High	Very Low	Very High
Degraded Bushveld	High	High	High	Very Low	Very High
Transformed	High	High	High	Very High	Low

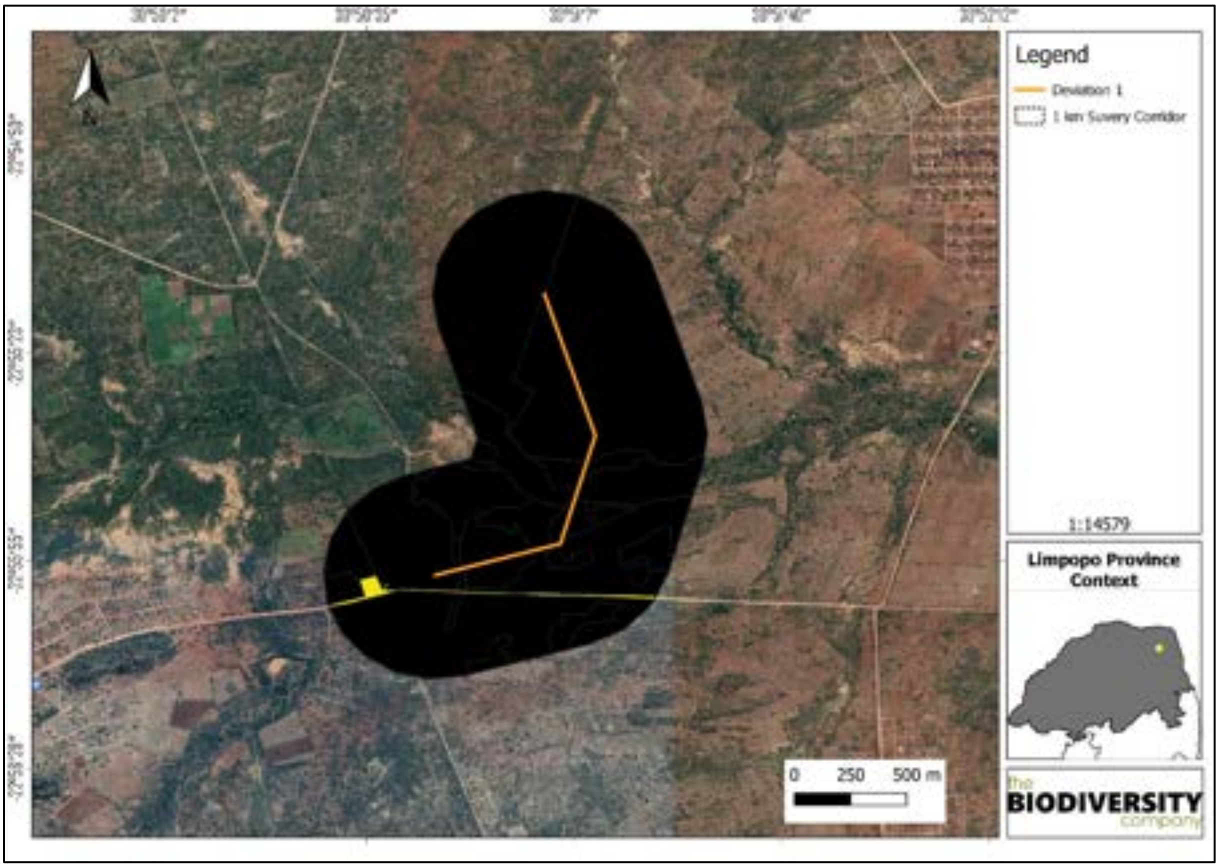

Figure 7-19 Avifauna sensitivity of deviation 1 of the project area

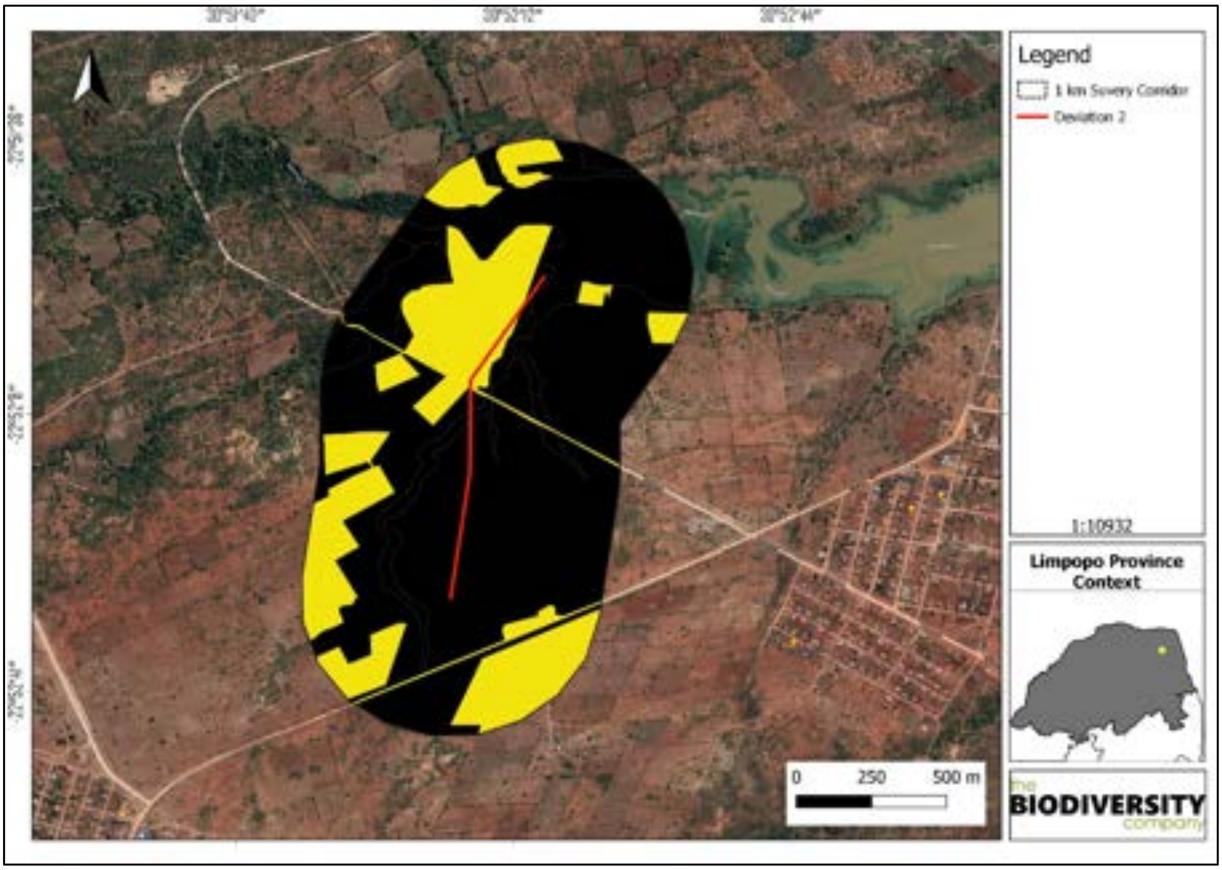

Figure 7-20 Avifauna sensitivity of deviation 2 of the project area

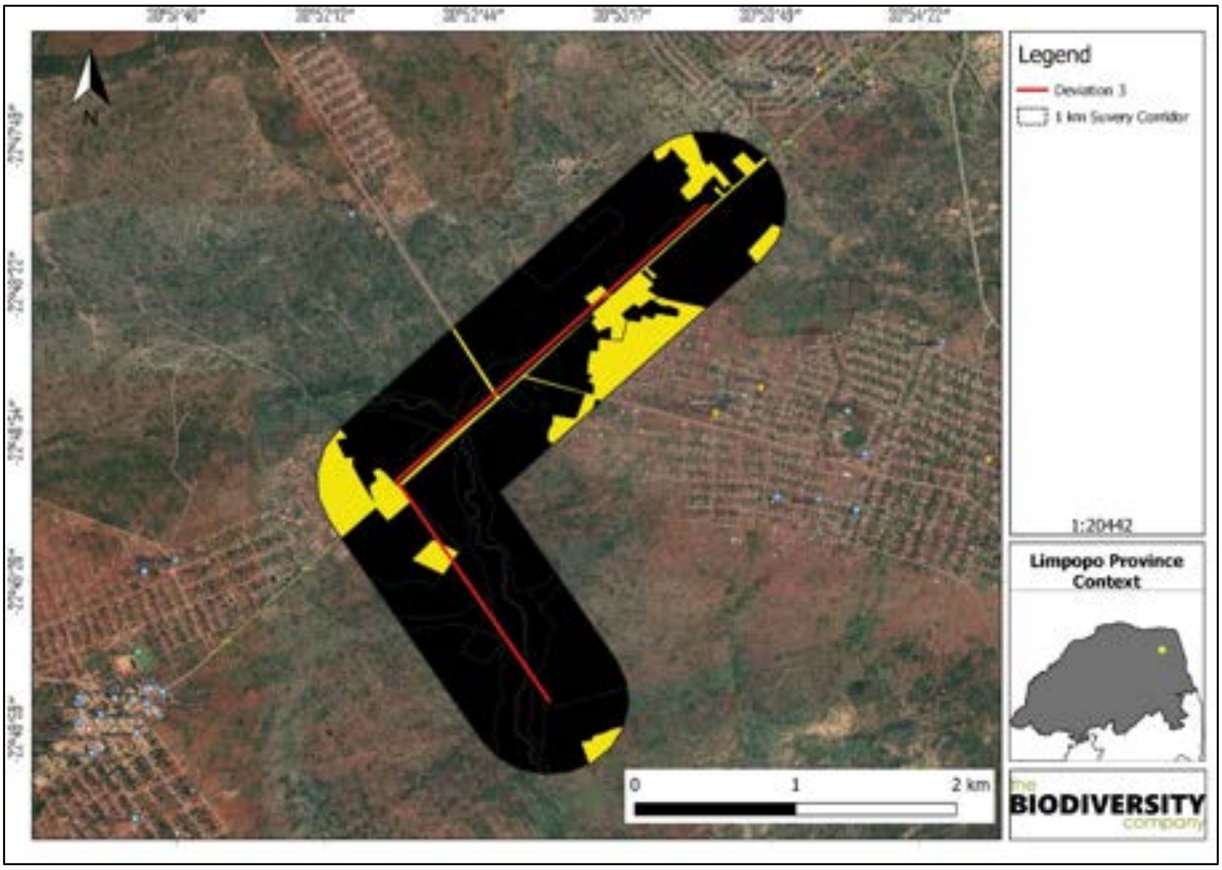

Figure 7-21 Avifauna sensitivity of deviation 3 of the project area

8 Avifauna Risk Assessment

The proposed project will entail the establishment of the following infrastructure: A 132kV overhead powerline (double circuit line) in three areas away from the approved route.

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed development footprint area. The relevant impacts were then subjected to a prescribed impact assessment methodology. The details of this methodology can be provided on request.

8.1 Present Impacts to Avifauna

Considering the anthropogenic activities and influences within the landscape, several negative impacts to the avifauna community were observed within the assessment area. These include:

- Livestock trampling habitat and nests;
- Invasive Alien Plants;
- Cutting down of trees for firewood;
- Roads and associated vehicle traffic;
- Powerlines; and
- Fences.

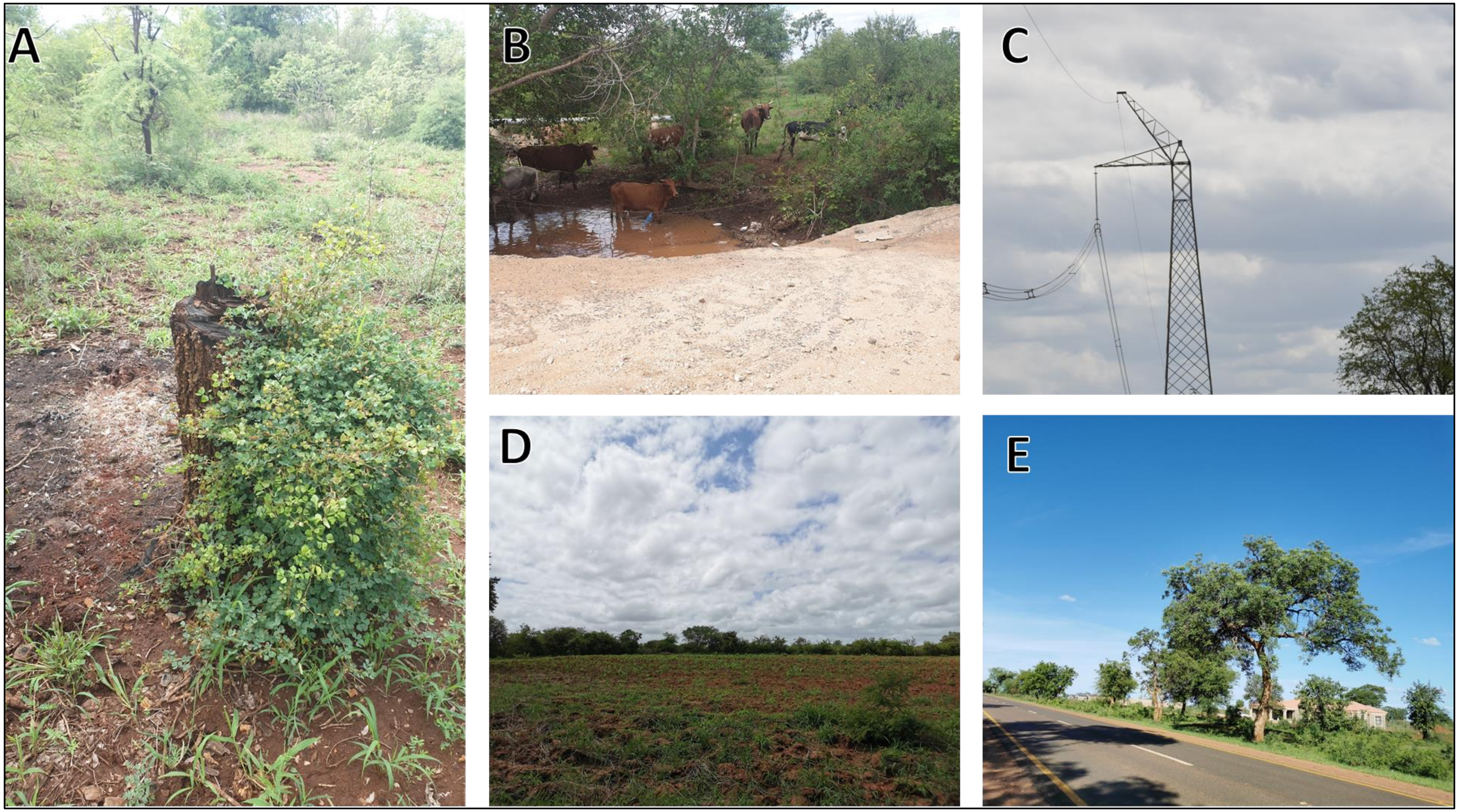

Figure 8-1 ***Some of the impacts observed in the project area; A) Cutting down of trees, B) Cattle and slack fences, C) Existing powerlines, D) Agricultural fields and E) Roads***

8.2 Identification of Additional Potential Impacts

This section describes the potential impacts on avifauna associated with the construction, operational and decommissioning phases of the proposed development. During the construction phase vegetation clearing for the associated infrastructure will lead to direct habitat loss. Vegetation clearing will create a disturbance and will therefore potentially lead to the displacement of avifaunal species. The operation of construction machinery on site will create will generate noise and dust pollution. Increased human presence can lead to poaching and the increase in vehicle traffic will potentially lead to roadkill.

The principle impacts of the operational phase are electrocution and collisions due to the powerlines. Birds prone to collisions can be divided into five categories;

1) large species with high body weight ratio to wing span resulting in low manoeuvrability,

2) species that are distracted in flight this include predatory birds and smaller species with areal displays,

3) species flying at high speeds,

4) crepuscular species that are active in low light conditions, and

5) species with limited narrow forward vision (Jenkins *et al.,* 2010; Noguera *et al.,* 2010).

Species that tend to fly in flocks also may be influenced more by collisions as the birds flying in the rear will not be able to detect the powerlines. Large passerines are particularly susceptible to electrocution because owing to their relatively large bodies, they are able to touch conductors and ground/earth wires or earthed devices are simultaneously. The chances of electrocution are increased when feathers are wet, during periods of high humidity or during defecation. Prevailing wind direction also influences the rate of electrocution casualties. Winds parallel or diagonal to cross-arms are the most detrimental, due to exacerbating the difficulty in manoeuvrability during landing or take-off.

The decommissioning phase will cause disturbance due to the removal of associated infrastructure. Furthermore, if the area is not rehabilitated, this will likely result in habitat degradation due to erosion and the encroachment of invasive alien plants.

A summary of the potential impacts during the construction, operation and decommissioning phases of the proposed activity are presented in Table 8-1.

Table 8-1 Summary of expected impacts due to the proposed development

Phase	Expected Impacts
Construction Phase	• Habitat loss and degradation • Noise and dust pollution from heavy machinery use • Collection of eggs and poaching • Roadkill
Operational Phase	• Collisions with powerlines • Electrocution with powerlines • Roadkill during maintenance procedures • Habitat degradation
Decommissioning Phase	• Disturbance • Habitat degradation

8.3 Alternatives

No alternatives were considered in this assessment as the original design was already assessed and authorised.

8.4 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Although different species and groups will react differently to the development, the risk assessment was undertaken bearing in mind the potential impacts to the priority species listed in section 7.1.2 of this report. More mitigations can be seen in section 8.5.

8.4.1 Construction Phase

The construction of the powerline in the various deviations has been assessed collectively as their impacts overlap. The following potential impacts were considered:

- Destruction, fragmentation and degradation of habitats;
- Displacement of avifaunal community (Including several SCC) due to disturbance such as noise, light, dust, vibration;
- Collection of eggs and poaching;
- Roadkill.

Table 8-2 summarises the significance of potential impacts associated with the powerline on avifauna before and after implementation of mitigation measures. Prior to implementation of mitigation measures the significance of impact to the habitat were rated as ‘High’. Implementation of mitigation measures reduced the significance of potential impact on the vegetation community to a ‘Moderate’ level. This cannot be mitigated completely as the habitat will still be lost, however an attempt can be made to decrease the impact in dense areas by minimising the number of pylons in these areas by maximising the span lengths.

Table 8-2 Construction activities impacts on the avifauna for the powerline

	Prior to mitigation						Post mitigation					
Impact	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	3	4	4	5		4	2	3	3	4	
	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Definite	**High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ important	Highly likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	4		3	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Collection of eggs and poaching	3	3	3	3	4		2	2	2	2	3	
	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted /	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha	Small / ecosystem structure and function	Ecology with limited sensitivity/importance	Likely	**Low**

		Linear features affected < 1000m						impacted / Linear features affected < 100m	largely unchanged			
	3	3	3	3	4		2	2	2	2	3	
Roadkill	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

8.4.2 Operational Phase

The operational phase of the impact of daily activities is anticipated to lead to powerline collisions and electrocutions. Moving vehicles do not only cause sensory disturbances to avifauna, affecting their life cycles and movement, but will lead to direct mortalities due to collisions. The corridor of the powerline is expected to be maintained to prevent uncontrolled events such as fire, this practice will however result in the disturbance and displacement of breeding and non-breeding species.

The following potential impacts were considered (Table 8-3):

- Collisions with powerlines;
- Electrocution with powerlines;
- Roadkill during maintenance procedures; and
- Habitat degradation and displacement of resident, visiting and breeding species (as well as SCCs).

Table 8-3 summarises the significance of the operational phase impacts on avifauna before and after implementation of mitigation measures. The impact significance of electrocution was rated as ‘Critical’ prior to mitigation, this is true for all the deviations as SCCs prone to collisions and electrocutions were present at all three areas. Even though the impact can be mitigated to some extend through the installation of bird flappers and ensuring the design of the proposed power line is of a similar structure as what is endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy. This is still regarded a critical impact based on the presence of the Critically Endangered Hooded Vulture in the area. Without a long term study, it cannot be said if this species is a resident in the area.

Table 8-3 *Operational activities impacts on the avifauna for the powerline*

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Habitat Loss (Destroy, fragment and degrade habitat, ultimately displacing avifauna)	5	4	4	3	4		4	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	3		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Collection of eggs and poaching	4	4	3	4	3		3	2	2	2	2	
	Life of operation or less than 20 years: Long Term	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Likely	**Moderately High**	One year to five years: Medium Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Possible	**Low**

								affected < 100m				
	4	3	4	4	4		2	2	2	2	3	
Roadkill	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
	5	5	5	5	5		5	5	5	5	5	
Collisions powerline	Permanent	Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology critically sensitive /important	Definite	**Critical**	Permanent	Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology critically sensitive /important	Definite	**Critical**
	5	4	4	4	4		3	3	3	2	2	
Electrocution by infrastructure	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**High**	One year to five years: Medium Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology with limited sensitivity/importance	Possible	**Low**

8.4.3 Decommissioning Phase

This phase is when the scaling down of activities ahead of temporary or permanent closure is initiated. During this phase, the operational phase impacts will persist until of the activity reduces and the rehabilitation measures are implemented.

The following potential impacts were considered (Table 8-4):

- Continued fragmentation and degradation of habitats;
- Sensory disturbances (e.g. noise, dust, vibrations)
- Collisions with powerline.
- Collection of eggs and poaching; and
- Roadkill.

Table 8-4 summarises the significance of the decommissioning phase impacts on avifauna before and after implementation of mitigation measures. In order for the decommissioning phase to be successful, the transmission lines will have to be removed. It is not sufficient for just the electrical supply be removed from the lines. Without an electrical current, electrocutions are no longer a risk, but collisions will remain a risk if the lines are not removed. The removal of the lines mitigates this impact to an “Absent” level.

Table 8-4 Decommissioning activities impacts on the avifauna for the powerline

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued fragmentation and degradation of habitats	5	4	4	3	4		4	3	3	3	3	
	Permanent	Regional within 5 km of the site boundary / < 2000ha impacted / Linear features affected < 3000m	Great / harmful/ ecosystem structure and function largely altered	Ecology moderately sensitive/ /important	Highly likely	**High**	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**
Sensory disturbances (e.g. noise, dust, vibrations)	4	3	3	3	3		2	2	2	2	1	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Highly unlikely	**Absent**
Collection of eggs and poaching	4	4	3	4	3		3	2	2	2	1	
	Life of operation or less than 20	Regional within 5 km of the site	Significant / ecosystem structure	Ecology highly sensitive /important	Likely	**Moderately High**	One year to five years:	Development specific/ within the site	Small / ecosystem structure and	Ecology with limited sensitivity/importance	Highly unlikely	**Absent**

	years: Long Term	boundary / < 2000ha impacted / Linear features affected < 3000m	and function moderately altered				Medium Term	boundary / < 100 ha impacted / Linear features affected < 100m	function largely unchanged			
	4	3	4	4	4		2	2	2	2	1	
Roadkill	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Highly unlikely	**Absent**
	5	5	5	5	5		1	1	1	1	1	
Collisions with powerlines	Permanent	Entire habitat unit / Entire system/ > 2000ha impacted / Linear features affected > 3000m	Disastrous / ecosystem structure and function seriously to critically altered	Ecology critically sensitive /important	Definite	**Critical**	One day to one month: Temporary	Activity specific/ < 5 ha impacted / Linear features affected < 100m	Insignificant / ecosystem structure and function unchanged	Ecology not sensitive/important	Highly unlikely	**Absent**

8.4.4 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for avifauna.

As a number of existing powerlines can be found in the area, the habitat and risk are already present. This combined with the overall small footprint of the development are limited and as such would have a low cumulative impact.

8.5 Biodiversity Management Outcomes

The purpose of the management outcomes is to allow for the mitigations associated with the impact assessment to be incorporated into the EMPr. These are provided in Table 8-5.

Table 8-5 Summary of management outcomes pertaining to impacts to avifauna and their habitats

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Management outcome: Habitats				
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation	Ongoing
Where possible, existing access routes and walking paths must be made use of.	Construction/Operational Phase	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood and wind events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure
Areas with thick tree clumps and rivers should be avoided, if this is not possible for the route the number of pylons needs to be reduced by maximising the span lengths as far as technically possible.	Construction/Operational Phase	Environmental Officer & Design Engineer	Destruction of sensitive habitats	During Phase
Rehabilitation of the disturbed areas existing in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.	Operational/Closure Phase/ Post Closure Phase	Environmental Officer & Contractor	Road edges and footprint	Ongoing
Erosion control and alien invasive management plan	Life of operation	Environmental Officer & Contractor	Erosion and alien invasive species	Ongoing

A fire management plan needs to be complied and implemented to restrict the impact fire might have on the surrounding areas.	Life of operation	Environmental Officer & Contractor	Fire Management	During Phase

Management outcome: Avifauna

Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
The areas to be developed must be specifically demarcated to prevent movement of staff or any individual into the surrounding environments, • Signs must be put up to enforce this	Construction/Operational Phase	Project manager, Environmental Officer	Infringement into these areas	Ongoing
All personnel should undergo environmental induction with regards to avifauna and in particular awareness about not harming, collecting or hunting terrestrial species (e.g. guineafowl and francolin), and owls, which are often persecuted out of superstition. Signs must be put up to enforce this.	Life of operation	Environmental Officer	Evidence of trapping etc	Ongoing
The duration of the construction should be minimized to as short term as possible, to reduce the period of disturbance on avifauna	Construction/Operational Phase	Project manager, Environmental Officer & Design Engineer	Construction/Closure Phase	Ongoing
All construction and maintenance motor vehicle operators should undergo an environmental induction that includes instruction on the need to comply with speed limit (40km/h), to respect all forms of wildlife. Speed limits must still be enforced to ensure that road killings and erosion is limited.	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing
Schedule activities and operations during least sensitive periods, to avoid migration, nesting and breeding seasons (July – September)	Life of operation	Project manager, Environmental Officer & Design Engineer	Activities should take place during the day in the case.	Ongoing
All areas to be developed must be walked through prior to any activity to ensure no nests or avifauna species are found in the area. Should any Species of Conservation Concern not move out of the area or their nest be found in the area a suitably qualified specialist must be consulted to advise on the correct actions to be taken.	Planning, Construction and Decommissioning	Project manager, Environmental Officer	Presence of Nests and faunal species	Planning, Construction and Decommissioning
The design of the proposed power line must be of a type or similar structure as endorsed by the Eskom-EWT Strategic Partnership on Birds and Energy, considering the mitigation guidelines recommended by Birdlife South Africa.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds or bird strikes	Ongoing
Infrastructure should be consolidated where possible in order to minimise the amount of ground and air space used. This would involve using existing/approved pylons and associated infrastructure for different lines.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
Bird flappers must be installed on the lines at 10m intervals. This must be done for the whole powerline.	Planning and construction	Environmental Officer &	Presence of bird strikes	During phase

		Contractor, Engineer		
Perch structures must be installed. South African standards state 270 cm above the cross arm (Prinsen *et al.,* 2012).	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
Ensure that the phase cables are spaced far enough apart to reduce the risk of large birds touching both simultaneously (2 m for large raptors) (Prinsen et al., 2012). If such separation (isolation) cannot be provided, exposed parts must be covered (insulated) to reduce electrocution risk.	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
Any exposed parts must be covered (insulated) to reduce electrocution risk	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
All the parts of the infrastructure must be nest proofed and place anti perch devices on areas that can lead to electrocution	Planning and construction	Environmental Officer & Contractor, Engineer	Presence of electrocuted birds	During phase
All carcasses must be removed as they are seen to avoid collisions for vultures	Lifetime of project	Environmental Officer & Contractor	Presence of carcasses	Ongoing
Powerlines must be removed during the decommissioning phase to ensure no further collisions occur	Decommissioning	Environmental Officer & Contractor	Presence of transmission lines	During Phase

9 Conclusion and Impact Statement

9.1 Conclusion

The proposed development overlaps with the Vhembe Biosphere Reserves transitional zone, is in close proximity to the Kruger National Park and the Mphaphuli Protected Environment. These areas host a number of different habitats ranging from Savanna to Grasslands, this combined with the nearby Soutpansberg mountain range makes an ideal movement corridor for larger birds between nesting cliff sites foraging areas. As this development is for the construction of a powerline development this is reason for concern, as powerline collisions and electrocutions are the regarded as the greatest risk for this type of development.

During the field survey one hundred and thirty-seven (137) bird species were recorded in the survey footprint. Of the 137 species five (5) species are species of conservation concern (SCCs), they were Steppe Eagle (*Aquila nipalensis*), Woolly-necked Stork (*Ciconia episcopus*), Black Stork (*Ciconia nigra*), Black Throated Wattle-eye (*Platysteira peltata*) and the Hooded Vulture (*Necrosyrtes monachus*). These species ranged from Near Threatened too Critically Endangered. These species were recoded across all three of the deviations, some seen moving between the deviations. Only the Black Throated Wattle-eye is likely breeding in the project area and their location must be avoided. In order to determine if the other SCCs are residents in the area a long term monitoring programme will need to be conducted.

Three habitat types were found in the survey areas, these were the Bushveld, Riparian/wetlands and Transformed areas. The species compositions in the habitats were found to be dominated by diurnal ground feeding insectivores (IGD), diurnal multiple location omnivores (OMD) and diurnal ground feeding granivores (GGD). These species compositions speak to the shrubland habitat of which majority of the project area is made up of.

The overall sensitivity of the deviations were found to be very highly sensitive based on the species of conservation concern that occurs here and their risks of collisions.

9.2 Impact Statement

The main expected impacts of the proposed infrastructure will include the following:

- habitat loss and fragmentation;
- degradation of surrounding habitat;
- disturbance and displacement caused during the construction and maintenance phases;
- collisions with powerlines; and
- electrocution by powerlines.

Mitigation measures as described in this report can be implemented to reduce the significance of the risk but there is still a possibility of collision by large non-passerine avifauna species. Based on the number and status (e.g. CR) of the large SCCs recorded, the area is seen as very highly sensitive. Considering the project was previously approved the decision must be made by the issuing authority. This decision should include whether a long term monitoring study should be conducted prior to the approval of this project.

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11 Appendix Items

11.1 Appendix A - Declaration

I, Lindi Steyn, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Lindi Steyn

Biodiversity Specialist

The Biodiversity Company

February 2021

11.2 Appendix B – Avifauna species expected to occur within the project area

Species	Common Name	Conservation Status		Reporting rate				
		Regional (SANBI, 2016)	IUCN (2017)	2245_3050	2250_3050	2255_3050	2300_3050	2255_3045
Accipiter badius	Shikra	Unlisted	LC		7.7			
Acridotheres tristis	Myna, Common	Unlisted	LC	0	15.4	100	25	
Acrocephalus schoenobaenus	Warbler, Sedge	Unlisted	LC		15.4			
Actitis hypoleucos	Sandpiper, Common	Unlisted	LC		30.8			
Actophilornis africanus	Jacana, African	Unlisted	LC		92.3			
Alcedo cristata	Kingfisher, Malachite	Unlisted	Unlisted		76.9			
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC		84.6	100		50
Amadina fasciata	Finch, Cut-throat	Unlisted	Unlisted				25	
Anaplectes rubriceps	Weaver, Red-headed	Unlisted	LC	0				
Anas erythrorhyncha	Teal, Red-billed	Unlisted	LC		38.5			
Anas sparsa	Duck, African Black	Unlisted	LC				25	
Anastomus lamelligerus	Openbill, African	Unlisted	LC		69.2			
Andropadus importunus	Greenbul, Sombre	Unlisted	LC	33.3	23.1		25	50
Anhinga rufa	Darter, African	Unlisted	LC		53.8			
Anthus cinnamomeus	Pipit, African	Unlisted	LC	33.3	92.3		25	50
Apalis flavida	Apalis, Yellow-breasted	Unlisted	LC	33.3	46.2		75	
Apus affinis	Swift, Little	Unlisted	LC		7.7		25	
Apus caffer	Swift, White-rumped	Unlisted	LC		7.7			
Apus horus	Swift, Horus	Unlisted	LC				25	
Aquila rapax	Eagle, Tawny	EN	LC				25	0
Aquila spilogaster	Hawk-eagle, African	Unlisted	LC					50
Aquila wahlbergi	Eagle, Wahlberg's	Unlisted	LC		15.4		25	
Ardea cinerea	Heron, Grey	Unlisted	LC		61.5			
Ardea goliath	Heron, Goliath	Unlisted	LC		46.2			
Ardea purpurea	Heron, Purple	Unlisted	LC		7.7			

Batis molitor	Batis, Chinspot	Unlisted	LC	66.7	46.2	100	75	50
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC		7.7			
Bradornis pallidus	Flycatcher, Pale	Unlisted	LC	33.3	15.4		50	
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC		7.7			
Bubalornis niger	Buffalo-weaver, Red-billed	Unlisted	LC				50	
Bubulcus ibis	Egret, Cattle	Unlisted	LC	33.3	92.3			50
Buphagus erythrorhynchus	Oxpecker, Red-billed	Unlisted	Unlisted	33.3	23.1	100	75	
Burhinus vermiculatus	Thick-knee, Water	Unlisted	LC					0
Buteo vulpinus	Buzzard, Common	Unlisted	Unlisted		7.7			
Butorides striata	Heron, Green-backed	Unlisted	LC		15.4			
Calamonastes stierlingi	Wren-Warbler, Stierling's	Unlisted	LC				75	
Calendulauda sabota	Lark, Sabota	Unlisted	LC	33.3	7.7		50	50
Calidris minuta	Stint, Little	LC	LC		7.7			
Camaroptera brachyura	Camaroptera, Green-backed	Unlisted	LC		7.7			
Camaroptera brevicaudata	Camaroptera, Grey-backed	Unlisted	Unlisted	33.3	15.4		75	
Campephaga flava	Cuckoo-shrike, Black	Unlisted	LC		23.1		25	
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC				25	50
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC	0				
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted		15.4		25	
Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC	100	61.5	0	100	50
Cercotrichas quadrivirgata	Scrub Robin, Bearded	Unlisted	LC		7.7			
Ceryle rudis	Kingfisher, Pied	Unlisted	LC		61.5			
Chalcomitra senegalensis	Sunbird, Scarlet-chested	Unlisted	LC	66.7	15.4		25	
Charadrius marginatus	Plover, White-fronted	Unlisted	LC		38.5			
Charadrius pecuarius	Plover, Kittlitz's	Unlisted	LC		76.9			
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC		69.2			
Chlorocichla flaviventris	Greenbul, Yellow-bellied	Unlisted	LC		15.4			
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC	0	7.7			
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC			0		

Ciconia episcopus	Stork, Woolly-necked	Unlisted	VU		15.4			
Ciconia nigra	Stork, Black	VU	LC		7.7			
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC				50	
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC	33.3	23.1		50	
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC	100	46.2	100	25	50
Circaetus cinereus	Snake-eagle, Brown	Unlisted	LC		7.7			
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC		7.7			
Cisticola aridulus	Cisticola, Desert	Unlisted	LC		7.7			
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC	100	84.6	100	75	0
Cisticola erythrops	Cisticola, Red-faced	Unlisted	LC		38.5		25	
Cisticola fulvicapilla	Neddicky, Neddicky	Unlisted	LC				25	
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC		7.7			
Clamator glandarius	Cuckoo, Great Spotted	Unlisted	LC				25	
Clamator jacobinus	Cuckoo, Jacobin	Unlisted	LC		7.7		50	
Colius striatus	Mousebird, Speckled	Unlisted	LC	33.3	30.8		25	
Columba livia	Dove, Rock	Unlisted	LC	33.3	30.8	100	25	
Columba guinea	Pigeon, Speckled	Unlisted	LC	66.7	38.5	100	100	50
Coracias garrulus	Roller, European	NT	LC		7.7		25	
Coracias naevius	Roller, Purple	Unlisted	LC	33.3	7.7		50	
Corvus albus	Crow, Pied	Unlisted	LC	66.7	84.6	100	25	
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC	66.7	76.9		100	50
Cossypha heuglini	Robin-Chat, White-browed	Unlisted	LC	0	15.4		25	
Cossypha humeralis	Robin-chat, White-throated	Unlisted	LC	66.7	7.7		50	50
Crithagra gularis	Seedeater, Streaky-headed	Unlisted	LC					50
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC	100	84.6	100	75	50
Cuculus gularis	Cuckoo, African	Unlisted	LC					50
Cursorius temminckii	Courser, Temminck's	Unlisted	LC		7.7			
Cypsiurus parvus	Palm-swift, African	Unlisted	LC	0	46.2			
Delichon urbicum	House-martin, Common	Unlisted	LC		15.4		25	

Dendrocygna viduata	Duck, White-faced Whistling	Unlisted	LC		100			
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC			100	50	
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC		15.4		75	50
Dendropicos namaquus	Woodpecker, Bearded	Unlisted	LC				50	
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC	100	53.8	100	100	50
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC	66.7	46.2	100	75	100
Egretta alba	Egret, Great	Unlisted	LC		38.5			
Egretta garzetta	Egret, Little	Unlisted	LC		53.8			
Egretta intermedia	Egret, Yellow-billed	Unlisted	LC		7.7			
Elanus caeruleus	Kite, Black-shouldered	Unlisted	LC	0	7.7			
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC	66.7	23.1		50	50
Emberiza tahapisi	Bunting, Cinnamon-breasted	Unlisted	LC		15.4		25	0
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC	33.3				50
Eremomela usticollis	Eremomela, Burnt-necked	Unlisted	LC				25	
Eremopterix leucotis	Sparrowlark, Chestnut-backed	Unlisted	LC		7.7			
Estrilda astrild	Waxbill, Common	Unlisted	LC		7.7			
Euplectes afer	Bishop, Yellow-crowned	Unlisted	LC		15.4			
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC		38.5			
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC		7.7			
Euplectes capensis	Bishop, Yellow	Unlisted	LC	0	23.1			50
Euplectes orix	Bishop, Southern Red	Unlisted	LC		53.8			
Eurocephalus anguitimens	Shrike, Southern White-crowned	Unlisted	LC				25	
Falco biarmicus	Falcon, Lanner	VU	LC		7.7			
Falco peregrinus	Falcon, Peregrine	Unlisted	LC		15.4		25	
Glareola pratincola	Pratincole, Collared	Unlisted	LC		23.1			
Gyps africanus	Vulture, White-backed	CR	CR				25	
Halcyon albiventris	Kingfisher, Brown-hooded	Unlisted	LC		15.4		25	
Halcyon chelicuti	Kingfisher, Striped	Unlisted	LC		15.4		25	
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC		7.7	100	50	

Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC		38.5		25	0
Hedydipna collaris	Sunbird, Collared	Unlisted	LC				25	
Himantopus himantopus	Stilt, Black-winged	Unlisted	LC		76.9			
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC	66.7	15.4		25	50
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC		7.7			
Hirundo rustica	Swallow, Barn	Unlisted	LC	33.3	7.7	100	50	
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC	33.3	38.5	100		
Hirundo senegalensis	Mosque Swallow	LC	LC	33.3			25	
Hirundo smithii	Swallow, Wire-tailed	Unlisted	LC		61.5			0
Indicator indicator	Honeyguide, Greater	Unlisted	LC				25	
Indicator minor	Honeyguide, Lesser	Unlisted	LC				25	
Ixobrychus sturmii	Bittern, Dwarf	Unlisted	LC		15.4			
Lagonosticta rhodopareia	Firefinch, Jameson's	Unlisted	LC	33.3	15.4			
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC		61.5		25	
Lamprotornis chalybaeus	Starling, Greater Blue-eared	Unlisted	LC	33.3			25	
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC	33.3	23.1	100	75	50
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC	66.7	46.2		25	100
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC		7.7			
Lanius collurio	Shrike, Red-backed	Unlisted	LC		15.4		50	
Lanius minor	Shrike, Lesser Grey	Unlisted	LC		15.4			
Larus cirrocephalus	Gull, Grey-headed	Unlisted	LC		7.7			
Lophotis ruficrista	Korhaan, Red-crested	Unlisted	LC				25	
Lybius torquatus	Barbet, Black-collared	Unlisted	LC	33.3	53.8	0	50	100
Macrodipteryx vexillarius	Pennant-winged nightjar	LC	LC	0				
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC	33.3			100	
Megaceryle maximus	Kingfisher, Giant	Unlisted	Unlisted	0				
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC	33.3	7.7		25	
Melierax gabar	Goshawk, Gabar	Unlisted	LC		7.7			
Melierax metabates	Goshawk, Dark Chanting	Unlisted	LC				25	

Merops apiaster	Bee-eater, European	Unlisted	LC	0	15.4	100	75	
Merops bullockoides	Bee-eater, White-fronted	Unlisted	LC	33.3	7.7			
Merops nubicoides	Bee-eater, Southern Carmine	Unlisted	LC			100		
Merops persicus	Bee-eater, Blue-cheeked	Unlisted	LC		15.4			
Merops pusillus	Bee-eater, Little	Unlisted	LC	33.3	23.1		75	50
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted	66.7	0			
Mirafra africana	Lark, Rufous-naped	Unlisted	LC		7.7			
Motacilla aguimp	Wagtail, African Pied	Unlisted	LC		76.9			
Motacilla capensis	Wagtail, Cape	Unlisted	LC		23.1			
Muscicapa striata	Flycatcher, Spotted	Unlisted	LC		23.1			
Nilaus afer	Brubru	Unlisted	LC	33.3	23.1		50	50
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC				25	
Oena capensis	Dove, Namaqua	Unlisted	LC		7.7	0	25	
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC	33.3	15.4		75	
Parus niger	Tit, Southern Black	Unlisted	Unlisted		7.7		75	50
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC	66.7	30.8	100	100	50
Passer domesticus	Sparrow, House	Unlisted	LC	66.7	69.2	100	50	50
Passer melanurus	Sparrow, Cape	Unlisted	LC	33.3	46.2			
Pelecanus onocrotalus	Pelican, Great White	VU	LC		15.4			
Peliperdix coqui	Francolin, Coqui	Unlisted	LC				25	
Phalacrocorax africanus	Cormorant, Reed	Unlisted	LC		69.2			
Phalacrocorax carbo	Cormorant, White-breasted	LC	LC		53.8			
Philomachus pugnax	Ruff	Unlisted	LC		15.4			
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC				25	
Phyllastrephus terrestris	Brownbul, Terrestrial	Unlisted	LC	33.3	23.1		25	
Phylloscopus trochilus	Warbler, Willow	Unlisted	LC		15.4		25	
Platalea alba	Spoonbill, African	Unlisted	LC		61.5			
Plectropterus gambensis	Goose, Spur-winged	Unlisted	LC		46.2			
Ploceus cucullatus	Weaver, Village	Unlisted	LC	66.7	7.7			

Ploceus intermedius	Masked-weaver, Lesser	Unlisted	LC	33.3	7.7			
Ploceus ocularis	Weaver, Spectacled	Unlisted	LC	33.3	38.5		25	
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC	33.3	46.2		75	50
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC	33.3				
Poicephalus cryptoxanthus	Parrot, Brown-headed	Unlisted	LC				25	
Polyboroides typus	Harrier-Hawk, African	Unlisted	LC		15.4			
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC	66.7	53.8	100	75	100
Prionops plumatus	Helmet-shrike, White-crested	Unlisted	LC				50	
Prionops retzii	Helmet-Shrike, Retz's	Unlisted	LC				25	
Pseudhirundo griseopyga	Swallow, Grey-rumped	Unlisted	LC		46.2			
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted	33.3			50	0
Pternistis natalensis	Spurfowl, Natal	Unlisted	LC		15.4		25	0
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC				25	
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted	100	61.5		50	100
Pytilia melba	Pytilia, Green-winged	Unlisted	LC	66.7	38.5		75	50
Quelea quelea	Quelea, Red-billed	Unlisted	LC		30.8		50	0
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC		30.8	100	75	50
Rynchops flavirostris	Skimmer, African	NA	NT		53.8			
Sarkidiornis melanotos	Duck, Comb	Unlisted	LC		53.8			
Saxicola torquatus	Stonechat, African	Unlisted	LC		7.7			
Spermestes cucullatus	Mannikin, Bronze	Unlisted	Unlisted	33.3	53.8			50
Spermestes nigriceps	Brown Backed Munia	Unlisted	LC	33.3				
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC	66.7	46.2		100	
Streptopelia decipiens	Dove, African Mourning	Unlisted	LC		23.1			
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC	33.3	30.8		25	
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC	33.3	76.9		50	50
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC	100	46.2		100	50
Tachybaptus ruficollis	Grebe, Little	Unlisted	LC		84.6			
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC	33.3	61.5		50	50

Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC		15.4		75	50
Telophorus sulfureopectus	Bush-shrike, Orange-breasted	Unlisted	LC	33.3	30.8		50	
Terathopius ecaudatus	Bateleur, Bateleur	EN	NT				25	0
Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC		7.7	100	50	
Threskiornis aethiopicus	Ibis, African Sacred	Unlisted	LC		15.4			
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC	33.3	15.4	100	100	50
Tockus nasutus	Hornbill, African Grey	Unlisted	LC		23.1		75	
Tockus rufirostris	Hornbill, Southern Red-billed	Unlisted	Unlisted				25	
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC	33.3	15.4		50	50
Treron calvus	Green-pigeon, African	Unlisted	LC		7.7		25	
Tricholaema leucomelas	Barbet, Acacia Pied	Unlisted	LC	33.3	30.8		50	**50**
Tringa glareola	Sandpiper, Wood	Unlisted	LC		23.1			
Tringa nebularia	Greenshank, Common	Unlisted	LC		15.4			
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC	33.3	30.8		25	0
Turdus libonyanus	Thrush, Kurrichane	Unlisted	Unlisted	33.3	15.4		25	
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC	66.7	46.2	100	100	50
Tyto alba	Owl, Barn	Unlisted	LC	0				
Upupa africana	Hoopoe, African	Unlisted	LC		7.7	100		50
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC	66.7	84.6	100	100	50
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC	66.7	53.8		75	50
Urolestes melanoleucus	Shrike, Magpie	Unlisted	LC				50	
Vanellus armatus	Lapwing, Blacksmith	Unlisted	LC		84.6			
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC		38.5		25	
Vidua chalybeata	Indigobird, Village	Unlisted	LC		15.4			
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC		69.2			50
Vidua paradisaea	Paradise-whydah, Long-tailed	Unlisted	LC		23.1		25	
Vidua purpurascens	Indigobird, Purple	Unlisted	LC					50

11.3 Appendix C – Avifauna species recorded in the project area

Species	Common Name	Conservation Status		Guild code	Total number of birds in all 3 deviations	Number of observations in all 3 sites	Relative abundance	Frequency
		Regional (SANBI, 2016)	IUCN (2017)					
Acridotheres tristis	Myna, Common	Unlisted	LC	OMD	7	4	0.009	6.667
Alopochen aegyptiacus	Goose, Egyptian	Unlisted	LC	HWD	1	1	0.001	1.667
Amblyospiza albifrons	Weaver, Thick-billed	Unlisted	LC	GGD	2	1	0.003	1.667
Anaplectes rubriceps	Weaver, Red-headed	Unlisted	LC	GGD	2	2	0.003	3.333
Andropadus importunus	Greenbul, Sombre	Unlisted	LC	OMD	7	7	0.009	11.667
Apalis flavida	Apalis, Yellow-breasted	Unlisted	LC	IGD	1	1	0.001	1.667
Apalis ruddi	Apalis, Rudd’s	Unlisted	LC	IGD	1	1	0.001	1.667
Apalis thoracica	Apalis, Bar-throated	Unlisted	LC	IGD	4	2	0.005	3.333
Apus apus	Swift, Common	Unlisted	LC	IAD	50	1	0.063	1.667
Apus caffer	Swift, White-rumped	Unlisted	LC	IAD	2	2	0.003	3.333
Aquila nipalensis	Eagle, Steppe	LC	EN	CGD	1	1	0.001	1.667
Ardea cinerea	Heron, Grey	Unlisted	LC	CWD	1	1	0.001	1.667
Batis molitor	Batis, Chinspot	Unlisted	LC	IGD	1	1	0.001	1.667
Bostrychia hagedash	Ibis, Hadeda	Unlisted	LC	OMD	2	3	0.003	5.000
Bradypterus baboecala	Rush-warbler, Little	Unlisted	LC	IWD	1	1	0.001	1.667
Bubulcus ibis	Egret, Cattle	Unlisted	LC	IGD	6	2	0.008	3.333
Buphagus erythrorhynchus	Oxpecker, Red-billed	Unlisted	Unlisted	IGD	5	1	0.006	1.667
Burhinus capensis	Thickknee, Spotted	Unlisted	LC	IGD	1	1	0.001	1.667
Calendulauda sabota	Lark, Sabota	Unlisted	LC	OMD	1	1	0.001	1.667
Campethera abingoni	Woodpecker, Golden-tailed	Unlisted	LC	IGD	1	1	0.001	1.667
Caprimulgus pectoralis	Nightjar, Fiery-necked	Unlisted	LC	IAN	1	1	0.001	1.667
Centropus burchellii	Coucal, Burchell's	Unlisted	Unlisted	OMD	4	3	0.005	5.000

Cercotrichas leucophrys	Scrub-robin, White-browed	Unlisted	LC	IGD	16	12	0.020	20.000
Cercotrichas paena	Scrub-robin, Kalahari	Unlisted	LC	IGD	12	5	0.015	8.333
Chalcomitra amethystina	Sunbird, Amethyst	Unlisted	LC	NFD	7	2	0.009	3.333
Chalcomitra senegalensis	Sunbird, Scarlet-chested	Unlisted	LC	NFD	2	1	0.003	1.667
Charadrius tricollaris	Plover, Three-banded	Unlisted	LC	IWD	4	1	0.005	1.667
Chlorocichla flaviventris	Greenbul, Yellow-bellied	Unlisted	LC	OMD	3	3	0.004	5.000
Chrysococcyx caprius	Cuckoo, Diderick	Unlisted	LC	IGD	9	7	0.011	11.667
Chrysococcyx klaas	Cuckoo, Klaas's	Unlisted	LC	IGD	2	2	0.003	3.333
Ciconia episcopus	Stork, Woolly-necked	NT	NT	CWD	2	1	0.003	1.667
Ciconia nigra	Stork, Black	VU	LC	CWD	1	1	0.001	1.667
Cinnyricinclus leucogaster	Starling, Violet-backed	Unlisted	LC	OMD	1	1	0.001	1.667
Cinnyris mariquensis	Sunbird, Marico	Unlisted	LC	NFD	1	1	0.001	1.667
Cinnyris talatala	Sunbird, White-bellied	Unlisted	LC	NFD	11	8	0.014	13.333
Circaetus pectoralis	Snake-eagle, Black-chested	Unlisted	LC	CGD	1	1	0.001	1.667
Cisticola aridulus	Cisticola, Desert	Unlisted	LC	IGD	1	1	0.001	1.667
Cisticola chiniana	Cisticola, Rattling	Unlisted	LC	IGD	30	21	0.038	35.000
Cisticola fulvicapilla	Neddicky	Unlisted	LC	IGD	1	1	0.001	1.667
Cisticola juncidis	Cisticola, Zitting	Unlisted	LC	IGD	29	17	0.036	28.333
Cisticola natalensis	Cisticola, Croaking	Unlisted	LC	IGD	5	5	0.006	8.333
Cisticola tinniens	Cisticola, Levaillant's	Unlisted	LC	IGD	7	3	0.009	5.000
Clamator glandarius	Cuckoo, Great Spotted	Unlisted	LC	IGD	0	0	0.000	0.000
Clamator levaillantii	Cuckoo, Levaillant's	Unlisted	LC	IGD	11	10	0.014	16.667
Colius striatus	Mousebird, Speckled	Unlisted	LC	FFD	9	3	0.011	5.000
Columba guinea	Pigeon, Speckled	Unlisted	LC	FFD	0	0	0.000	0.000
Columba livia	Dove, Rock	Unlisted	LC	FFD	0	0	0.000	0.000
Coracias caudatus	Roller, Lilac Breasted	LC	LC	IGD	0	0	0.000	0.000

Corvus albus	Crow, Pied	Unlisted	LC	OMD	38	12	0.048	20.000
Corythaixoides concolor	Go-away-bird, Grey	Unlisted	LC	FFD	20	10	0.025	16.667
Cossypha caffra	Robin-chat, Cape	Unlisted	LC	OMD	4	4	0.005	6.667
Crithagra mozambicus	Canary, Yellow-fronted	Unlisted	LC	GGD	10	7	0.013	11.667
Crithagra sulphuratus	Canary, Brimstone	Unlisted	LC	GGD	3	2	0.004	3.333
Cuculus clamosus	Cuckoo, Black	Unlisted	LC	IGD	5	5	0.006	8.333
Delichon urbicum	House-martin, Common	Unlisted	LC	IAD	0	0	0.000	0.000
Dendroperdix sephaena	Francolin, Crested	Unlisted	LC	OMD	2	2	0.003	3.333
Dendropicos fuscescens	Woodpecker, Cardinal	Unlisted	LC	IGD	4	3	0.005	5.000
Dendropicos namaquus	Woodpecker, Bearded	Unlisted	LC	IGD	1	1	0.001	1.667
Dicrurus adsimilis	Drongo, Fork-tailed	Unlisted	LC	IAD	10	8	0.013	13.333
Dryoscopus cubla	Puffback, Black-backed	Unlisted	LC	OMD	5	3	0.006	5.000
Emberiza flaviventris	Bunting, Golden-breasted	Unlisted	LC	OMD	4	4	0.005	6.667
Eremomela icteropygialis	Eremomela, Yellow-bellied	Unlisted	LC	IGD	2	2	0.003	3.333
Eremomela usticollis	Eremomela, Burnt-necked	Unlisted	LC	IGD	1	1	0.001	1.667
Estrilda astrild	Waxbill, Common	Unlisted	LC	GGD	6	3	0.008	5.000
Euplectes albonotatus	Widowbird, White-winged	Unlisted	LC	GGD	4	3	0.005	5.000
Euplectes ardens	Widowbird, Red-collared	Unlisted	LC	GGD	1	1	0.001	1.667
Euplectes capensis	Bishop, Yellow	Unlisted	LC	GGD	1	1	0.001	1.667
Eurocephalus anguitimens	Shrike, Southern White-crowned	Unlisted	LC	IGD	5	2	0.006	3.333
Halcyon senegalensis	Kingfisher, Woodland	Unlisted	LC	CWD	4	4	0.005	6.667
Haliaeetus vocifer	Fish-eagle, African	Unlisted	LC	CGD	0	0	0.000	0.000
Hedydipna collaris	Sunbird, Collared	Unlisted	LC	NFD	1	1	0.001	1.667
Hieraaetus wahlbergi	Eagle, Wahlberg's	Unlisted	LC	CGD	2	2	0.003	3.333
Hirundo abyssinica	Swallow, Lesser Striped	Unlisted	LC	IAD	16	6	0.020	10.000
Hirundo cucullata	Swallow, Greater Striped	Unlisted	LC	IAD	4	1	0.005	1.667

Hirundo rustica	Swallow, Barn	Unlisted	LC	IAD	3	1	0.004	1.667
Hirundo semirufa	Swallow, Red-breasted	Unlisted	LC	IAD	0	0	0.000	0.000
Indicator minor	Honeyguide, Lesser	Unlisted	LC	IGD	1	1	0.001	1.667
Jynx ruficollis	Wryneck, Red-throated	Unlisted	LC	IGD	1	1	0.001	1.667
Kaupifalco monogrammicus	Buzzard, Lizard	Unlisted	LC	CGD	0	0	0.000	0.000
Lagonosticta senegala	Firefinch, Red-billed	Unlisted	LC	GGD	0	0	0.000	0.000
Lamprotornis nitens	Starling, Cape Glossy	Unlisted	LC	IGD	1	1	0.001	1.667
Laniarius ferrugineus	Boubou, Southern	Unlisted	LC	IAD	6	5	0.008	8.333
Lanius collaris	Fiscal, Common (Southern)	Unlisted	LC	IAD	3	2	0.004	3.333
Lanius collurio	Shrike, Red-backed	Unlisted	LC	IGD	1	1	0.001	1.667
Lanius minor	Shrike, Lesser Grey	Unlisted	LC	IGD	1	1	0.001	1.667
Lonchura cucullata	Mannikin, Bronze	Unlisted	LC	GGD	1	1	0.001	1.667
Lybius torquatus	Barbet, Black-collared	Unlisted	LC	FFD	14	7	0.018	11.667
Malaconotus blanchoti	Bush-shrike, Grey-headed	Unlisted	LC	OMD	4	4	0.005	6.667
Mandingoa nitidula	Twinspot, Green	Unlisted	LC	GGD	3	1	0.004	1.667
Melaenornis pammelaina	Flycatcher, Southern Black	Unlisted	LC	IAD	0	0	0.000	0.000
Merops apiaster	Bee-eater, European	Unlisted	LC	IAD	10	4	0.013	6.667
Merops pusillus	Bee-eater, Little	Unlisted	LC	IAD	5	4	0.006	6.667
Milvus aegyptius	Kite, Yellow-billed	Unlisted	Unlisted	CGD	1	1	0.001	1.667
Muscicapa caerulescens	Flycatcher, Ashy	Unlisted	LC	IGD	1	1	0.001	1.667
Necrosyrtes monachus	Vulture, Hooded	CR	CR	CGD	1	1	0.001	1.667
Nilaus afer	Brubru	Unlisted	LC	IGD	2	2	0.003	3.333
Numida meleagris	Guineafowl, Helmeted	Unlisted	LC	OMD	6	2	0.008	3.333
Oena capensis	Dove, Namaqua	Unlisted	LC	GGD	3	2	0.004	3.333
Oriolus larvatus	Oriole, Black-headed	Unlisted	LC	OMD	5	5	0.006	8.333
Parisoma subcaeruleum	Tit-babbler, Chestnut-vented	Unlisted	Unlisted	IGD	1	1	0.001	1.667

Parus niger	Tit, Southern Black	Unlisted	Unlisted	IGD	1	1	0.001	1.667
Passer diffusus	Sparrow, Southern Grey-headed	Unlisted	LC	GGD	1	1	0.001	1.667
Passer domesticus	Sparrow, House	Unlisted	LC	GGD	13	4	0.016	6.667
Phoeniculus purpureus	Wood-hoopoe, Green	Unlisted	LC	IGD	11	6	0.014	10.000
Platysteira peltata	Wattle-eye, Black-throated	NT	LC	IAD	2	1	0.003	1.667
Ploceus capensis	Weaver, Cape	Unlisted	LC	GGD	7	2	0.009	3.333
Ploceus cucullatus	Weaver, Village	Unlisted	LC	GGD	11	5	0.014	8.333
Ploceus ocularis	Weaver, Spectacled	Unlisted	LC	GGD	1	1	0.001	1.667
Ploceus velatus	Masked-weaver, Southern	Unlisted	LC	GGD	38	13	0.048	21.667
Pogoniulus chrysoconus	Tinkerbird, Yellow-fronted	Unlisted	LC	FFD	2	2	0.003	3.333
Prinia flavicans	Prinia, Black-chested	Unlisted	LC	IGD	8	6	0.010	10.000
Prinia subflava	Prinia, Tawny-flanked	Unlisted	LC	IGD	28	19	0.035	31.667
Psophocichla litsipsirupa	Thrush, Groundscraper	Unlisted	Unlisted	IGD	1	1	0.001	1.667
Pternistis swainsonii	Spurfowl, Swainson's	Unlisted	LC	OMD	2	1	0.003	1.667
Pycnonotus tricolor	Bulbul, Dark-capped	Unlisted	Unlisted	OMD	14	7	0.018	11.667
Rhinopomastus cyanomelas	Scimitarbill, Common	Unlisted	LC	IGD	4	3	0.005	5.000
Sigelus silens	Flycatcher, Fiscal	Unlisted	LC	OMD	2	2	0.003	3.333
Streptopelia capicola	Turtle-dove, Cape	Unlisted	LC	GGD	16	12	0.020	20.000
Streptopelia decipiens	Dove, African Mourning	Unlisted	LC	GGD	6	5	0.008	8.333
Streptopelia semitorquata	Dove, Red-eyed	Unlisted	LC	GGD	2	1	0.003	1.667
Streptopelia senegalensis	Dove, Laughing	Unlisted	LC	GGD	20	13	0.025	21.667
Sylvietta rufescens	Crombec, Long-billed	Unlisted	LC	IGD	18	11	0.023	18.333
Tchagra australis	Tchagra, Brown-crowned	Unlisted	LC	OMD	5	4	0.006	6.667
Tchagra senegalus	Tchagra, Black-crowned	Unlisted	LC	OMD	1	1	0.001	1.667
Telophorus sulfureopectus	Bush-shrike, Orange-breasted	Unlisted	LC	GGD	1	1	0.001	1.667

Terpsiphone viridis	Paradise-flycatcher, African	Unlisted	LC	IAD	11	7	0.014	11.667
Tockus leucomelas	Hornbill, Southern Yellow-billed	Unlisted	LC	IGD	2	1	0.003	1.667
Tockus nasutus	Hornbill, African Grey	Unlisted	LC	OMD	6	4	0.008	6.667
Trachyphonus vaillantii	Barbet, Crested	Unlisted	LC	FFD	7	6	0.009	10.000
Treron calvus	Green-pigeon, African	Unlisted	LC	FFD	3	2	0.004	3.333
Turdoides jardineii	Babbler, Arrow-marked	Unlisted	LC	IGD	21	4	0.026	6.667
Turtur chalcospilos	Wood-dove, Emerald-spotted	Unlisted	LC	OMD	9	7	0.011	11.667
Tyto alba	Owl, Barn	Unlisted	LC	CGN	1	1	0.001	1.667
Upupa africana	Hoopoe, African	Unlisted	LC	IGD	1	1	0.001	1.667
Uraeginthus angolensis	Waxbill, Blue	Unlisted	LC	GGD	16	9	0.020	15.000
Urocolius indicus	Mousebird, Red-faced	Unlisted	LC	FFD	15	4	0.019	6.667
Vanellus coronatus	Lapwing, Crowned	Unlisted	LC	IGD	0	0	0.000	0.000
Vidua macroura	Whydah, Pin-tailed	Unlisted	LC	GGD	4	2	0.005	3.333
Zosterops virens	White-eye, Cape	Unlisted	LC	OMD	2	2	0.003	3.333

11.4 Appendix D - Some of the bird species most commonly impacted by powerlines (The Endangered Wildlife Trust, 2017).

BOTANICAL ASSESSMENT FOR THE MHINGA POWERLINE DEVIATIONS

Mhinga, Limpopo

February 2021

CLIENT

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Figure 7-17 Botanical sensitivity of the field survey area of deviation 1. 40

Figure 7-18 Botanical sensitivity of the field survey area of deviation 2 41

Figure 7-19 Botanical sensitivity of the field survey area of deviation 3. 42

Figure 8-1 Some of the impacts observed in the project area; A) Existing infrastructure, B) Cattle and transformed areas, C) and F) Vegetation removal and wood collection, D) Historic subsistence agricultural fields and E) Existing subsistence agricultural fields 44

1 Introduction

The Biodiversity Company was commissioned to conduct a botanical assessment for the proposed deviations of 8 km (3 areas proposed for deviations from original authorised route) of 132 kV powerlines stretching between Phugwane and Mhinga Substation within the Limpopo province. The original line was approved under authorisation number 12/12/20/1667. Eskom proposes to deviate the authorised Kingbird 132kV powerlines in three sections due to streams being located on the authorised route as well as houses being constructed since the authorisation was received in 2010. The deviations total distance is approximately 8 km whilst the actual line is 25 kms in length (Kantey and Templer, 2021). Deviation 1 is said to be 4.421 km long, following the R524 and stretching into a portion of Nkavele Village. Deviation 2 is 1.224 km long and deviates just after the Nkavele road just after the town of Saselemane. Deviation 3 is 1.834 km moving east from the Xaswita village (Figure 1-1).

The centre points of the deviations are:

- Deviation 1, centre point: 22° 55’ 43.01” S and 30° 51’ 08.41” E
- Deviation 2, centre point: 22° 51’ 58.73” S and 30° 52’ 10.13” E
- Deviation 3, centre point: 22° 49’ 11.77” S and 30° 52’ 46.61”E

The deviations fall on the following properties:

Deviation 1:

- Remaining Extent of the farm Mhinga's Location 258 MT
- Remaining Extent of the farm Mhinga's Location Extension 259 MT
- Remaining Extent of the farm Tshikundu Location Extension 260 MT
- Remaining Extent of the farm Tshikundu Location 262 MT.

Deviation 2 and Deviation 3

- Remaining Extent of the farm Nthlaveni 2 MU (Kantey and Templer, 2021).

The approach adopted for the assessments has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 30 October 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The National Web based Environmental Screening Tool has characterised the relative plant species theme sensitivity for the project areas as “low-medium sensitivity” and that a botanical assessment must be undertaken prior to authorization.

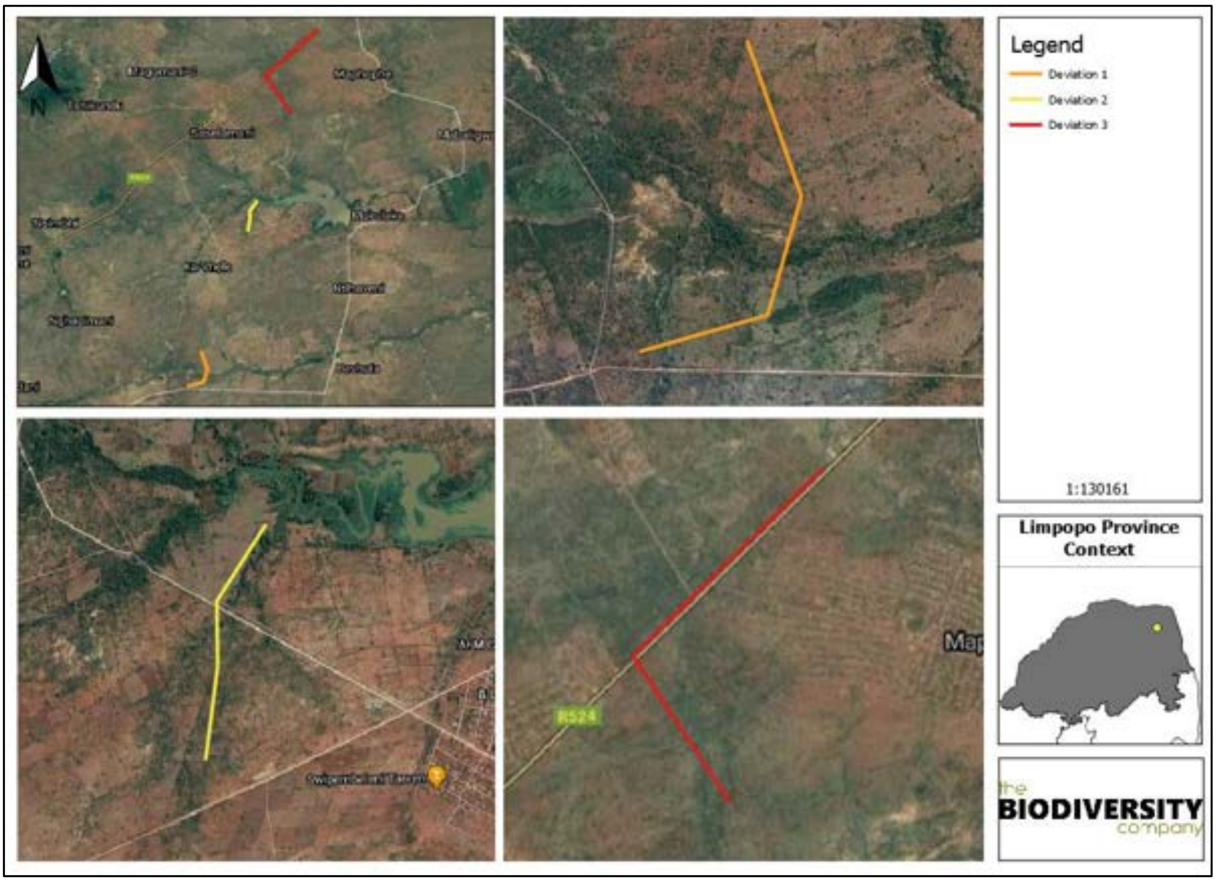

Figure 1-1 The deviations for the Mhinga Powerline

1.1 Assumptions and Limitations

The following assumptions and limitations are applicable for this assessment:

- A single season survey was conducted for the study, which would constitute a summer season survey;
- This assessment has not assessed any temporal trends for the project;
- It was assumed the information provided for the deviations and previous report is accurate.

2 Specialist details

Report Name	**BOTANICAL ASSESSMENT FOR THE MHINGA POWERLINE DEVIATIONS**	
Reference	**Mhinga Botanical**	
Submitted to	K&T	
Report Writer	**Martinus Erasmus**	
	Martinus Erasmus obtained his B-Tech degree in Nature Conservation in 2016 at the Tshwane University of Technology. Martinus has been conducting EIAs, basic assessments and assisting specialists in field during his studies since 2015. Martinus is a specialist terrestrial ecologist and botanist which conducts floral and faunal surveys which include mammals, birds, amphibians and reptiles.	
Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

3 Scope of Work

The principle aim of the assessment was to provide information to guide the risk of the proposed activity to the vegetation community of the associated ecosystems within the project areas. This was achieved through the following:

- Desktop assessment to identify the relevant ecologically important geographical features within the proposed development area and surrounding landscape;

- Desktop assessment to compile an expected species list and possible threatened avifauna species that occur within the proposed landscape;
- Field survey to ascertain the species of the vegetation community and their habitat associations within the proposed development area;
- Identify the manner that the proposed development impacts the vegetation community and evaluate the level of risk of these potential impacts; and
- The prescription of mitigation measures and recommendations for identified risks.

4 Project Area

The Mhinga Powerline project area is situated between the Phugwane and Mhinga Substation within the Limpopo province. The predominant land uses surrounding the project area includes formal and informal housing, open spaces and protected areas (Figure 4-1). A locality map of the project area is shown in Figure 4-1.

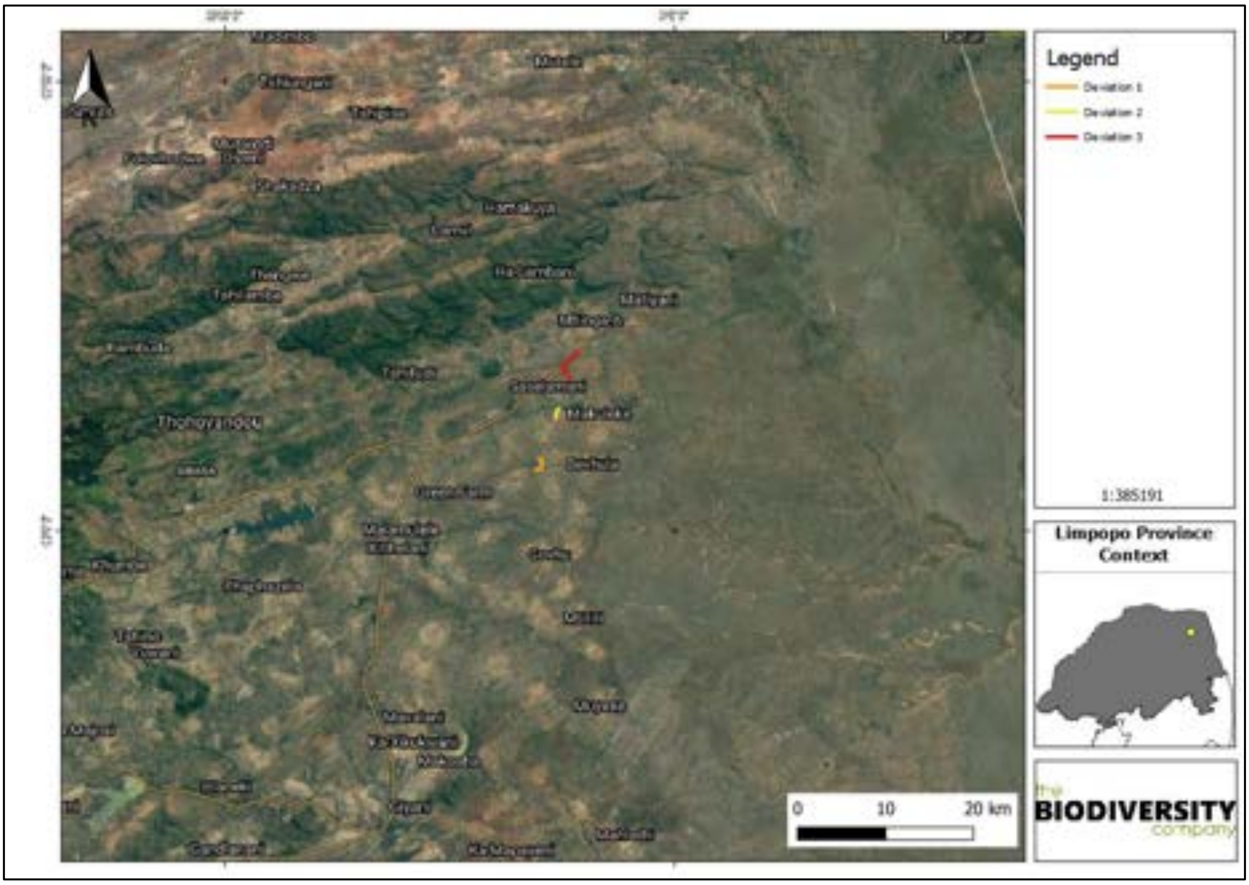

Figure 4-1 Map illustrating the location of the proposed Mhinga project area.

5 Key Legislative Requirements

The legislation, policies and guidelines listed below in Table 5-1 are applicable to the current project in terms of biodiversity and ecological support systems. The list below, although extensive, may not be complete and other legislation, policies and guidelines may apply in addition to those listed below.

Table 5-1 A list of key legislative requirements relevant to biodiversity and conservation in Limpopo Province

Region	Legislation
International	Convention on Biological Diversity (CBD, 1993)
	The Convention on Wetlands (RAMSAR Convention, 1971)
	The United Nations Framework Convention on Climate Change (UNFCC,1994)
	The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
	The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention, 1979)
National	Constitution of the Republic of South Africa (Act No. 108 of 2006)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 42946 (January 2020)
	The National Environmental Management Act (NEMA) (Act No. 107 of 1998) Section 24 , No 43110 (March 2020)
	The National Environmental Management Protected Areas Act (Act No. 57 of 2003)
	The National Environmental Management Biodiversity Act (Act No. 10 of 2004)
	The National Environmental Management: Waste Act, 2008 (Act 59 of 2008);
	The Environment Conservation Act (Act No. 73 of 1989) and associated EIA Regulations
	National Environmental Management Air Quality Act (No. 39 of 2004)
	National Protected Areas Expansion Strategy (NPAES)
	Environmental Conservation Act (Act No. 73 of 1983)
	Natural Scientific Professions Act (Act No. 27 of 2003)
	National Biodiversity Framework (NBF, 2009)
	National Forest Act (Act No. 84 of 1998)
	National Veld and Forest Fire Act (101 of 1998)
	National Spatial Biodiversity Assessment (NSBA)
	World Heritage Convention Act (Act No. 49 of 1999)
	National Heritage Resources Act, 1999 (Act 25 of 1999)
	Municipal Systems Act (Act No. 32 of 2000)
	Alien and Invasive Species Regulations, 2014
	South Africa's National Biodiversity Strategy and Action Plan (NBSAP)
	Conservation of Agricultural Resources Act, 1983 (Act 43 of 1983)
	Sustainable Utilisation of Agricultural Resources (Draft Legislation).
	White Paper on Biodiversity
	National Water Act (NWA, 1998)
Provincial	Limpopo Conservation Plan (2018)
	Limpopo Environmental Management Act (2003)
	Vhembe District Bioregional Plan (LEDET, 2017)

6 Methodology

6.1 Desktop Assessment

The desktop assessment was principally undertaken using a Geographic Information System (GIS) to access the latest available spatial datasets in order to develop digital cartographs and species lists. These datasets and their date of publishing are provided below.

6.1.1 Ecologically Important Landscape Features

Existing ecologically relevant data layers were incorporated into a GIS to establish how the proposed development might interact with any ecologically important entities. Emphasis was placed around the following spatial datasets:

Protected areas:

South Africa Protected Areas Database (SAPAD) (DEA, 2020) – The South African Protected Areas Database (SAPAD) contains spatial data for the conservation of South Africa. It includes spatial and attribute information for both formally protected areas and areas that have less formal protection. SAPAD is updated on a continuous basis and forms the basis for the Register of Protected Areas which is a legislative requirement under the National Environmental Management: Protected Areas Act, Act 57 of 2003; and

National Protected Areas Expansion Strategy (NPAES) (SANBI, 2010) – The National Protected Area Expansion Strategy (NPAES) provides spatial information on areas that are suitable for terrestrial ecosystem protection. These focus areas are large, intact and unfragmented and are therefore, of high importance for biodiversity, climate resilience and freshwater protection.

Critical Biodiversity Areas (Limpopo Conservation Plan, Version 2 (LCPv2), (Desmet et al., 2018) – Critical Biodiversity Areas (CBAs) are natural or near-natural features, habitats or landscapes that include terrestrial, aquatic and marine areas that are considered critical for:

- Meeting national and provincial biodiversity targets and thresholds.
- Safeguarding areas required to ensure the persistence and functioning of species and ecosystems, including the delivery of ecosystem services; and/or
- Conserving important locations for biodiversity features or rare species.

The key output of a systematic biodiversity plan is a map of biodiversity priority areas. The CBA map delineates Critical Biodiversity Areas 1 and 2 (CBAs), Ecological Support Areas 1 and 2 (ESAs), Other Natural Areas (ONAs), Protected Areas (PAs), and areas that have been irreversibly modified from their natural state (Desmet et al., 2018); and

South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer et al., 2018) – A South African Inventory of Inland Aquatic Ecosystems (SAIIAE) was established during the National Biodiversity Assessment of 2018. It is a collection of data layers that represent the extent of river and inland wetland ecosystem types as well as pressures on these systems.

6.1.2 Botanical Assessment

The desktop component of the botanical assessment comprised of:

- Literature review of plant species that are likely to be impacted by the development of developments;
- Identification of expected floral Red Data species; and
- Review of the previous assessments (Section 8.1.4).

A literature review was conducted as part of the desktop study to identify the potential habitats present within the project area. The South African National Biodiversity Institute (SANBI) provides an electronic database system, namely the Botanical Database of Southern Africa

(BODATSA), to access distribution records on southern African plants. This is a new database which replaces the old Plants of Southern Africa (POSA) database. The POSA database provided distribution data of flora at the quarter degree square (QDS) resolution.

The Red List of South African Plants website (SANBI, 2017) will be utilized to provide the most current account of the national status of flora. Relevant field guides and texts consulted for identification purposes in the field during the surveys included the following:

- A Field Guide to Wild Flowers (Pooley, 1998);
- Guide to Grasses of Southern Africa (Van Oudtshoorn, 1999);
- Orchids of South Africa (Johnson & Bytebier, 2015);
- Guide to the Aloes of South Africa (Van Wyk & Smith, 2014);
- Medicinal Plants of South Africa (Van Wyk *et al.,* 2013);
- Freshwater Life: A field guide to the plants and animals of southern Africa (Griffiths & Day, 2016); and
- Identification Guide to Southern African Grasses. An identification manual with keys, descriptions and distributions (Fish *et al.,* 2015).

Additional information regarding ecosystems, vegetation types, and species of conservation concern (SCC) included the following sources:

- The Vegetation of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2012);
- Grassland Ecosystem Guidelines: landscape interpretation for planners and managers (SANBI, 2013); and
- Red List of South African Plants (Raimondo *et al.,* 2009; SANBI, 2016).

The protected trees considered were based on the List of Protected Tree Species under the National Forests Act, 1998 (Act No. 84 of 1998). The Red List of South African Plants website (SANBI, 2016) was utilized to provide the most current account of the national conservation status of these flora species. The IUCN (2020) was used for the international conservation status and the Limpopo Environmental Management Act (Act No. 7 of 2003) (LEMA) was consulted for the provincial protection status.

6.2 Field Assessment

A single field survey was undertaken during the 7th to the 10th of December 2020 (wet season) to determine the presence of Species of Conservation Concern (SCC). Effort was made to cover all the different habitat types within the limits of time and access within the 1 km survey corridor.

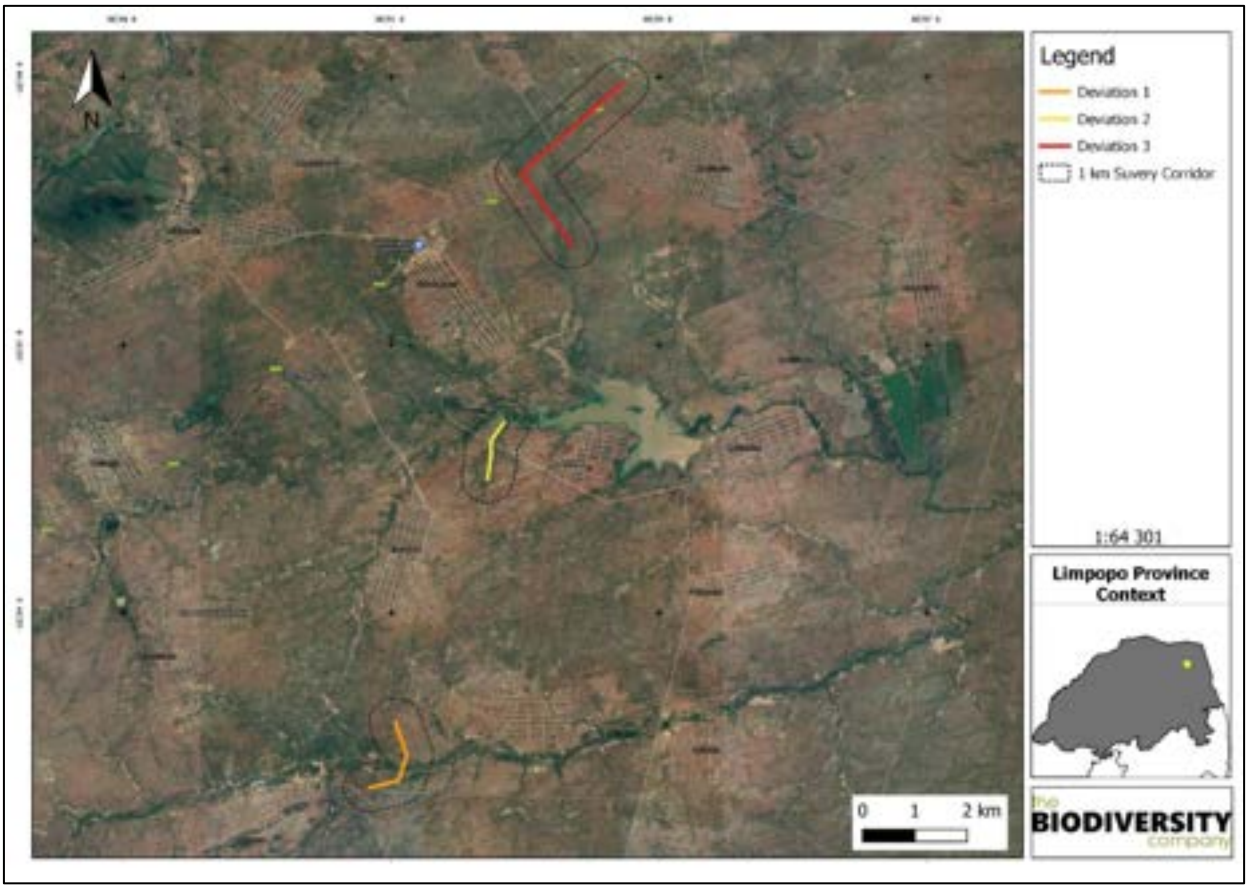

Figure 6-1 Map illustrating the field survey corridor.

The field work methodology included the following survey techniques:

- Timed meanders;
- Sensitivity analysis based on structural and species diversity; and
- Identification of floral red-data species.

The surveys and sample sites were placed within targeted areas (i.e., target sites) perceived as ecologically sensitive based on the preliminary interpretation of satellite imagery (Google Corporation) and GIS analysis (which included the latest applicable biodiversity datasets) available prior to the fieldwork. The focus of the fieldwork was therefore to maximise coverage and navigate to each target site in the field in order to perform a rapid vegetation and ecological assessment at each sample site. Emphasis was placed on sensitive habitats, especially those overlapping with the proposed deviation area.

Homogenous vegetation units were subjectively identified using satelite imagery and existing land cover maps. The floristic diversity and search for flora SCC were conducted through timed meanders within representative habitat units delineated during the scoping fieldwork. Emphasis was placed mostly on sensitive habitats overlapping with the proposed project areas.

The timed random meander method is a highly efficient method for conducting floristic analysis, specifically in detecting flora SCC and maximising floristic coverage. In addition, the method is time and cost effective and highly suited for compiling flora species lists and therefore gives a rapid indication of flora diversity. The timed meander search was performed based on the original technique described by Goff *et al.* (1982). Suitable habitat for SCC were identified according to Raimondo *et al.* (2009) and targeted as part of the timed meanders.

At each sample site notes were made regarding current impacts (e.g. livestock grazing, erosion etc.), subjective recording of dominant vegetation species and any sensitive features (e.g. wetlands, outcrops etc.). In addition, opportunistic observations were made while navigating through the project area.

6.2.1 Site Ecological Importance (SEI)

The different habitat types within the assessment area were delineated and identified based on observations during the field assessment as well as available satellite imagery. These habitat types were assigned Ecological Importance (EI) categories based on their ecological integrity, conservation value, the presence of species of conservation concern and their ecosystem processes.

Site Ecological Importance (SEI) is a function of the Biodiversity Importance (BI) of the receptor (e.g., SCC, the vegetation/fauna community or habitat type present on the site) and Receptor Resilience (RR) (its resilience to impacts) as follows.

BI is a function of Conservation Importance (CI) and the Functional Integrity (FI) of the receptor as follows. The criteria for the CI and FI ratings are provided in Table 6-1 and

Table 6-2 , respectively.

Table 6-1 Summary of Conservation Importance (CI) criteria

Conservation Importance	Fulfilling Criteria
Very High	Confirmed or highly likely occurrence of CR, EN, VU or Extremely Rare or Critically Rare species that have a global EOO of < 10 km^2. Any area of natural habitat of a CR ecosystem type or large area (> 0.1% of the total ecosystem type extent) of natural habitat of an EN ecosystem type. Globally significant populations of congregatory species (> 10% of global population).
High	Confirmed or highly likely occurrence of CR, EN, VU species that have a global EOO of > 10 km^2. IUCN threatened species (CR, EN, VU) must be listed under any criterion other than A. If listed as threatened only under Criterion A, include if there are less than 10 locations or < 10 000 mature individuals remaining. Small area (> 0.01% but < 0.1% of the total ecosystem type extent) of natural habitat of EN ecosystem type or large area (> 0.1%) of natural habitat of VU ecosystem type. Presence of Rare species. Globally significant populations of congregatory species (> 1% but < 10% of global population).
Medium	Confirmed or highly likely occurrence of populations of NT species, threatened species (CR, EN, VU) listed under Criterion A only and which have more than 10 locations or more than 10 000 mature individuals. Any area of natural habitat of threatened ecosystem type with status of VU. Presence of range-restricted species. > 50% of receptor contains natural habitat with potential to support SCC.
Low	No confirmed or highly likely populations of SCC. No confirmed or highly likely populations of range-restricted species. < 50% of receptor contains natural habitat with limited potential to support SCC.
Very Low	No confirmed and highly unlikely populations of SCC. No confirmed and highly unlikely populations of range-restricted species. No natural habitat remaining.

Table 6-2 Summary of Functional Integrity (FI) criteria

Functional Integrity	Fulfilling Criteria
Very High	Very large (> 100 ha) intact area for any conservation status of ecosystem type or > 5 ha for CR ecosystem types. High habitat connectivity serving as functional ecological corridors, limited road network between intact habitat patches. No or minimal current negative ecological impacts with no signs of major past disturbance.
High	Large (> 20 ha but < 100 ha) intact area for any conservation status of ecosystem type or > 10 ha for EN ecosystem types. Good habitat connectivity with potentially functional ecological corridors and a regularly used road network between intact habitat patches. Only minor current negative ecological impacts with no signs of major past disturbance and good rehabilitation potential.
Medium	Medium (> 5 ha but < 20 ha) semi-intact area for any conservation status of ecosystem type or > 20 ha for VU ecosystem types. Only narrow corridors of good habitat connectivity or larger areas of poor habitat connectivity and a busy used road network between intact habitat patches. Mostly minor current negative ecological impacts with some major impacts and a few signs of minor past disturbance. Moderate rehabilitation potential.
Low	Small (> 1 ha but < 5 ha) area. Almost no habitat connectivity but migrations still possible across some modified or degraded natural habitat and a very busy used road network surrounds the area. Low rehabilitation potential. Several minor and major current negative ecological impacts.
Very Low	Very small (< 1 ha) area. No habitat connectivity except for flying species or flora with wind-dispersed seeds. Several major current negative ecological impacts.

BI can be derived from a simple matrix of CI and FI as provided in Table 6-3

Table 6-3 Matrix used to derive Biodiversity Importance (BI) from Functional Integrity (FI) and Conservation Importance (CI)

Biodiversity Importance (BI)		Conservation Importance (CI)				
		Very high	**High**	**Medium**	**Low**	**Very low**
Functional Integrity (FI)	**Very high**	Very high	Very high	High	Medium	Low
	High	Very high	High	Medium	Medium	Low
	Medium	High	Medium	Medium	Low	Very low
	Low	Medium	Medium	Low	Low	Very low
	Very low	Medium	Low	Very low	Very low	Very low

The fulfilling criteria to evaluate RR are based on the estimated recovery time required to restore an appreciable portion of functionality to the receptor as summarised in Table 6-4.

Table 6-4 Summary of Resource Resilience (RR) criteria

Resilience	Fulfilling Criteria
Very High	Habitat that can recover rapidly (~ less than 5 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a very high likelihood of remaining at a site even

	when a disturbance or impact is occurring, or species that have a very high likelihood of returning to a site once the disturbance or impact has been removed.
High	Habitat that can recover relatively quickly (~ 5–10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a high likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a high likelihood of returning to a site once the disturbance or impact has been removed.
Medium	Will recover slowly (~ more than 10 years) to restore > 75% of the original species composition and functionality of the receptor functionality, or species that have a moderate likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a moderate likelihood of returning to a site once the disturbance or impact has been removed.
Low	Habitat that is unlikely to be able to recover fully after a relatively long period: > 15 years required to restore ~ less than 50% of the original species composition and functionality of the receptor functionality, or species that have a low likelihood of remaining at a site even when a disturbance or impact is occurring, or species that have a low likelihood of returning to a site once the disturbance or impact has been removed.
Very Low	Habitat that is unable to recover from major impacts, or species that are unlikely to remain at a site even when a disturbance or impact is occurring, or species that are unlikely to return to a site once the disturbance or impact has been removed.

Subsequent to the determination of the BI and RR, the SEI can be ascertained using the matrix as provided in Table 6-5.

Table 6-5 Matrix used to derive Site Ecological Importance (SEI) from Receptor Resilience (RR) and Biodiversity Importance (BI)

Site Ecological Importance (SEI)		Biodiversity Importance (BI)				
		Very high	**High**	**Medium**	**Low**	**Very low**
Receptor Resilience (RR)	**Very Low**	Very high	Very high	High	Medium	Low
	Low	Very high	Very high	High	Medium	Very low
	Medium	Very high	High	Medium	Low	Very low
	High	High	Medium	Low	Very low	Very low
	Very High	Medium	Low	Very low	Very low	Very low

Interpretation of the SEI in the context of the proposed development activities is provided in Table 6-6.

Table 6-6 Guidelines for interpreting Site Ecological Importance (SEI) in the context of the proposed development activities

Site Ecological Importance (SEI)	Interpretation in relation to proposed development activities
Very High	Avoidance mitigation – no destructive development activities should be considered. Offset mitigation not acceptable/not possible (i.e., last remaining populations of species, last remaining good condition patches of ecosystems/unique species assemblages). Destructive impacts for species/ecosystems where persistence target remains.
High	Avoidance mitigation wherever possible. Minimisation mitigation – changes to project infrastructure design to limit the amount of habitat impacted, limited development activities of low impact acceptable. Offset mitigation may be required for high impact activities.
Medium	Minimisation and restoration mitigation – development activities of medium impact acceptable followed by appropriate restoration activities.
Low	Minimisation and restoration mitigation – development activities of medium to high impact acceptable followed by appropriate restoration activities.
Very Low	Minimisation mitigation – development activities of medium to high impact acceptable and restoration activities may not be required.

The SEI evaluated for each taxon can be combined into a single multi-taxon evaluation of SEI for the assessment area. Either a combination of the maximum SEI for each receptor should be applied, or the SEI may be evaluated only once per receptor but for all necessary taxa simultaneously. For the latter, justification of the SEI for each receptor is based on the criteria that conforms to the highest CI and FI, and the lowest RR across all taxa.

7 Results & Discussion

7.1 Desktop Assessment

7.1.1 Ecologically Important Landscape Features

The GIS analysis pertaining to the relevance of the proposed development to ecologically important landscape features are summarised in Table 7-1.

Table 7-1 Summary of relevance of the proposed Mhinga to ecologically important landscape features.

Desktop Information Considered	Relevant/Irrelevant	Section
Critical Biodiversity Area	All the deviations intersect with either an ESA1 or an ESA2 or both of these classified areas	7.1.1.1
Protected Areas	The project area falls in the Vhembe Biosphere Reserve transitional zone, is 8.11 km from the Kruger National Park and also located 3.47 km from the Mphaphuli Protected Environment.	7.1.1.2
South African Inventory of Inland Aquatic Ecosystems	Deviation 1 and 2 falls across an LC river and deviation 2 crosses a poorly protected wetland	7.1.1.5
Ecosystem Threat Status	The project area is situated within an ecosystem that are listed as LC	
Ecosystem Protection Level	The terrestrial ecosystems associated with the project area is rated as well protected	

7.1.1.1 Limpopo Biodiversity Conservation Plan

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2018 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2018). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2018). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes:

- Critical Biodiversity Area 1 (CBA1);
- Critical Biodiversity Area 2 (CBA2);
- Ecological Support Area 1 (ESA1);
- Ecological Support Area 2 (ESA2);
- Other Natural Area (ONA);
- Protected Area (PA); and
- No Natural Remaining (NNR).

Critical Biodiversity Areas (CBAs) are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2018).

Ecological Support Areas (ESA's) are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

Other Natural Areas (ONAs) consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Desmet *et al.,* 2018).

Areas with No Natural Habitat Remaining (NNR) are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Desmet *et al.,* 2018).

Figure 7-1 shows the project area superimposed on the Terrestrial CBA map. The project area overlaps with ESA1 and ESA2 areas.

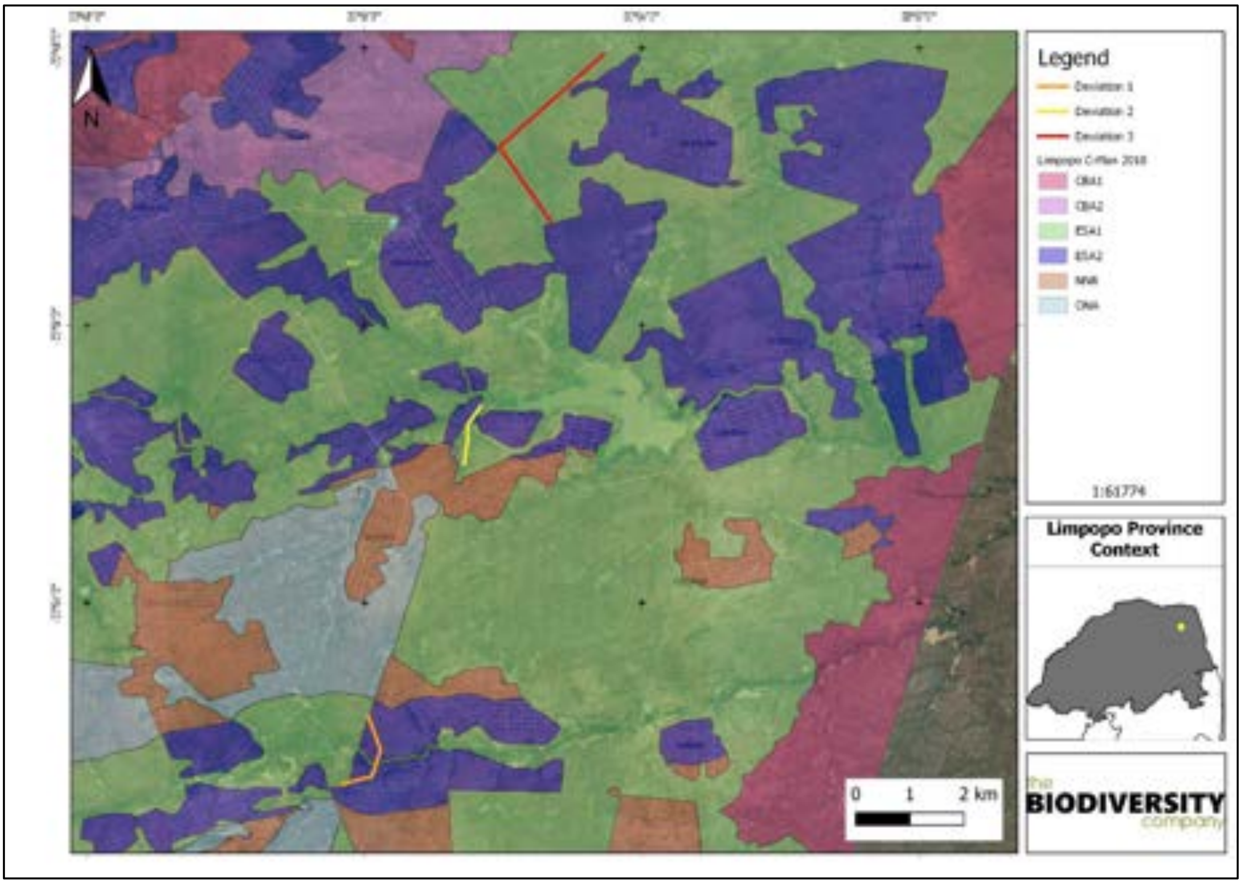

Figure 7-1 Map illustrating the locations of Critical Biodiversity Areas proximal to the proposed Mhinga project area

7.1.1.2 Protected Areas

The Department of Environmental Affairs maintains a spatial database on Protected Areas and Conservation Areas. Protected Areas and Conservation Areas (PACA) Database scheme that used for classifying protected areas (South Africa Protected Areas Database-SAPAD) and conservation areas (South Africa Conservation Areas Database-SACAD) into types and sub-types in South Africa.

The definition of protected areas used in these documents follows the definition of a protected area as defined in the National Environmental Management: Protected Areas Act, (Act 57 of 2003). Chapter 2 of the National Environmental Management: Protected Areas Act, 2003 sets out the “System of Protected Areas”, which consists of the following kinds of protected areas:

- Special nature reserves:
- National parks:
- Nature reserves and
- Protected environments (1-4 declared in terms of the National Environmental Management: Protected Areas Act, 2003);
- World heritage sites declared in terms of the World Heritage Convention Act;
- Marine protected areas declared in terms of the Marine Living Resources Act;
- Specially protected forest areas, forest nature reserves, and forest wilderness areas declared in terms of the National Forests Act, 1998 (Act No. 84 of 1998); and
- Mountain catchment areas declared in terms of the Mountain Catchment Areas Act, 1970 (Act No. 63 of 1970).

The types of conservation areas that are currently included in the database are the following:

- Biosphere reserves;
- Ramsar sites;
- Stewardship agreements (other than nature reserves and protected environments);
- Botanical gardens;
- Transfrontier conservation areas;
- Transfrontier parks;
- Military conservation areas and
- Conservancies

Figure 7-2 shows that the project area falls in the Vhembe Biosphere Reserve transitional zone. It does also fall within 8.11 km of the Kruger National Park which means it falls in the 10 km protected area buffer. The project area is also located 3.47 km from the Mphaphuli Protected Environment and thus within its 5km buffer zone.

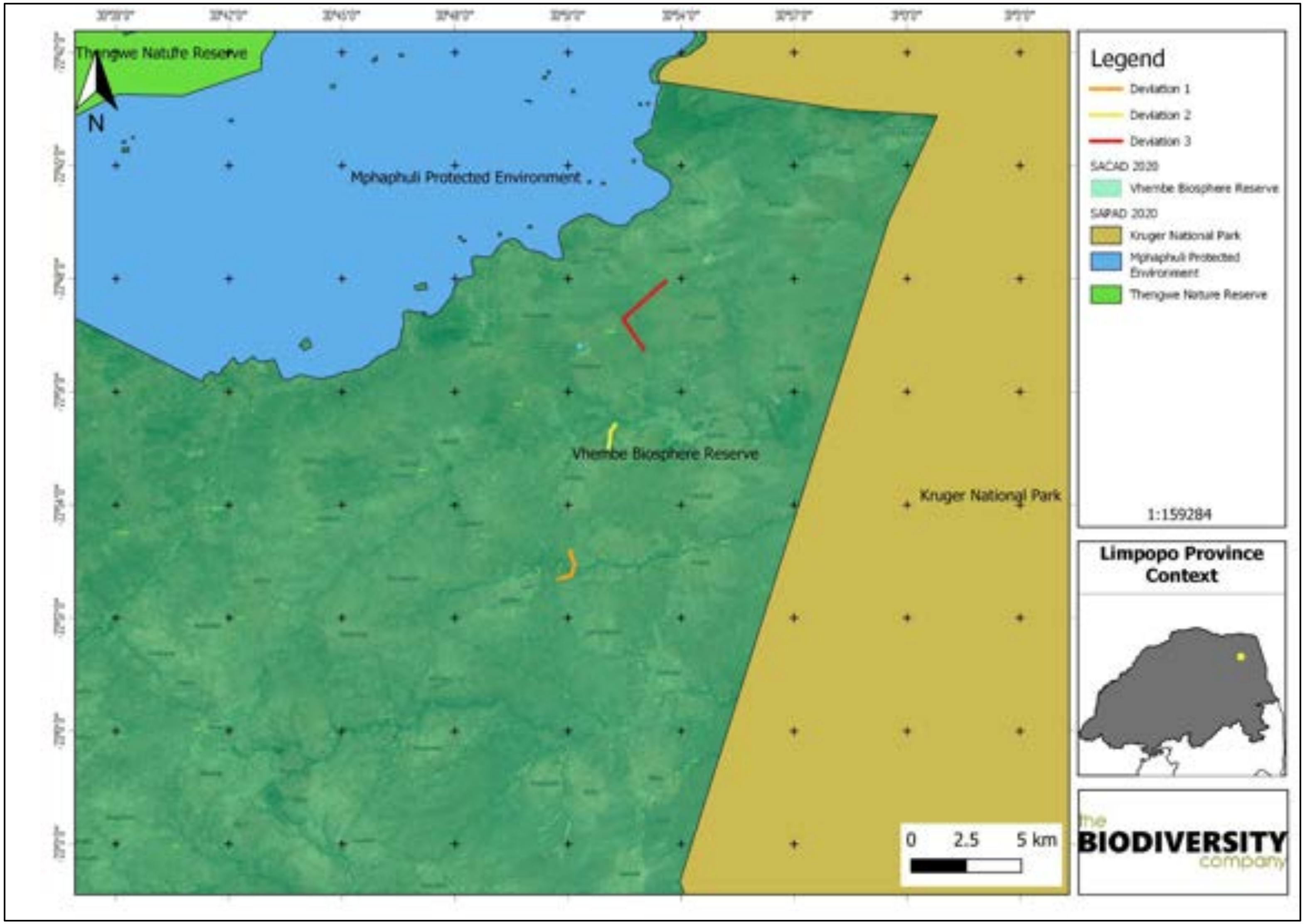

Figure 7-2 Map illustrating the location of protected areas proximal to the proposed Mhinga project area

7.1.1.3 Hydrological Setting

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA) 2018. National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) 2018. (Van Deventer *et al.,* 2019; Skowno *et al.,* 2019). A Least Threatened (LT) river runs through Deviation 1 and 2, while a poorly protected wetland can be found in the Deviation 2 project area as well (Figure 7-3). These water sources depending on their state will support a number of avifaunal species.

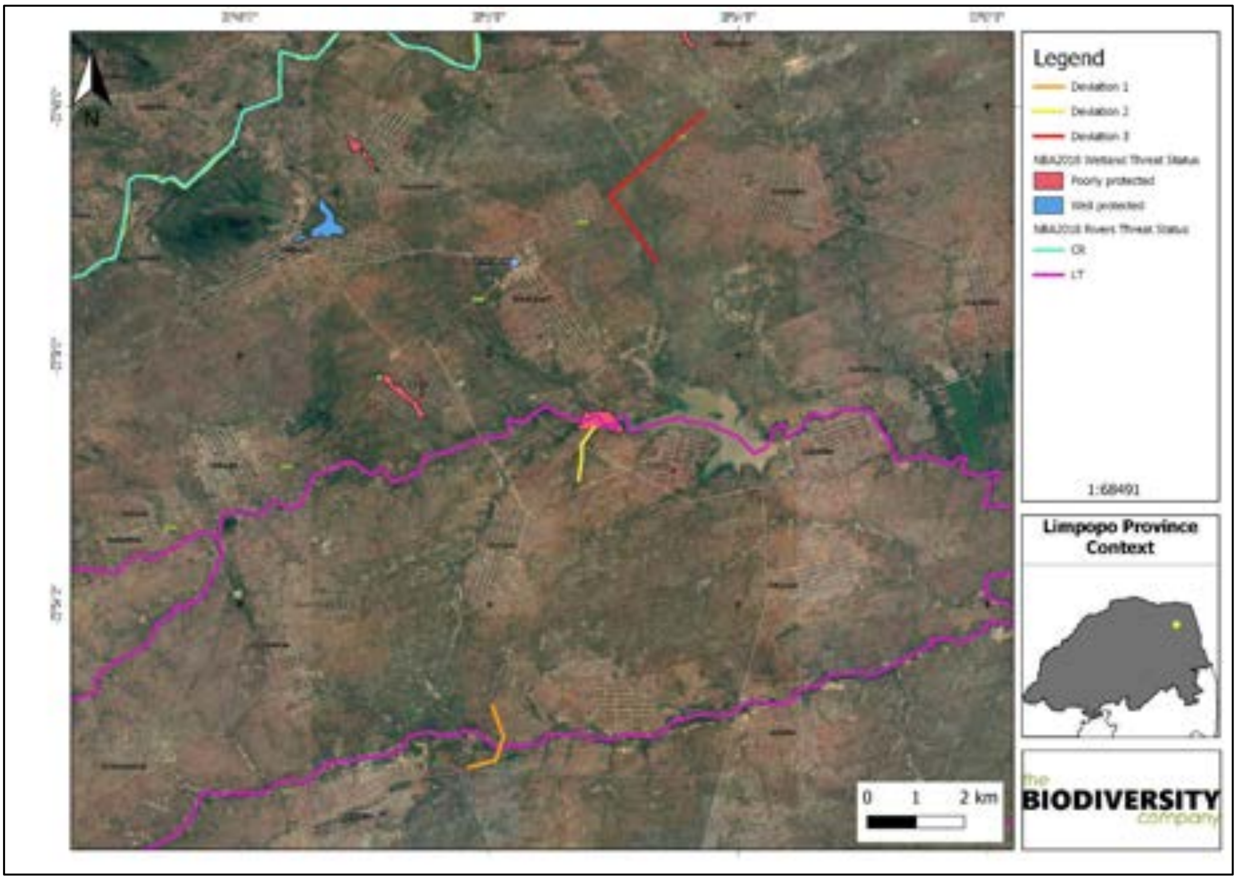

Figure 7-3 Map illustrating the hydrological setting of the proposed Mhinga project areas

7.1.2 Botanical Desktop Assessment

7.1.2.1 Vegetation Types

The site is situated in the Savanna biome. The savanna vegetation of South Africa represents the southernmost extension of the most widespread biome in Africa (Mucina & Rutherford, 2006). Major macroclimatic traits that characterise the Savanna biome include:

a) Seasonal precipitation; and

b) (Sub) tropical thermal regime with no or usually low incidence of frost (Mucina & Rutherford, 2006).

Most savanna vegetation communities are characterised by a herbaceous layer dominated by grasses and a discontinuous to sometimes very open tree layer (Mucina & Rutherford, 2006).

The savanna biome is the largest biome in South Africa, extending throughout the east and north-eastern areas of the country. Savannas are characterised by a dominant grass layers, over-topped by a discontinuous, but distinct woody plant layer. At a structural level, Africa's savannas can be broadly categorised as either fine-leaved savannas or broad-leaved savannas. Fine-leaved savannas typically occur on nutrient rich soils and are dominated by small-leaved woody plants of the Mimosaceae family (Common genera include Senegalia,Vachellia and Albizia) and a generally dense herbaceous layer (Scholes & Walker, 1993).

The project areas fall across the Savanna biome. This biome comprises many different vegetation types. Deviation 1 project area is situated within the Granite Lowveld, while the Deviation 2 project area is found across the Granite Lowveld and Makuleke Sandy Bushveld. The Deviation 3 project area is found in the Makuleke Sandy Bushveld vegetation type (Figure 7-4).

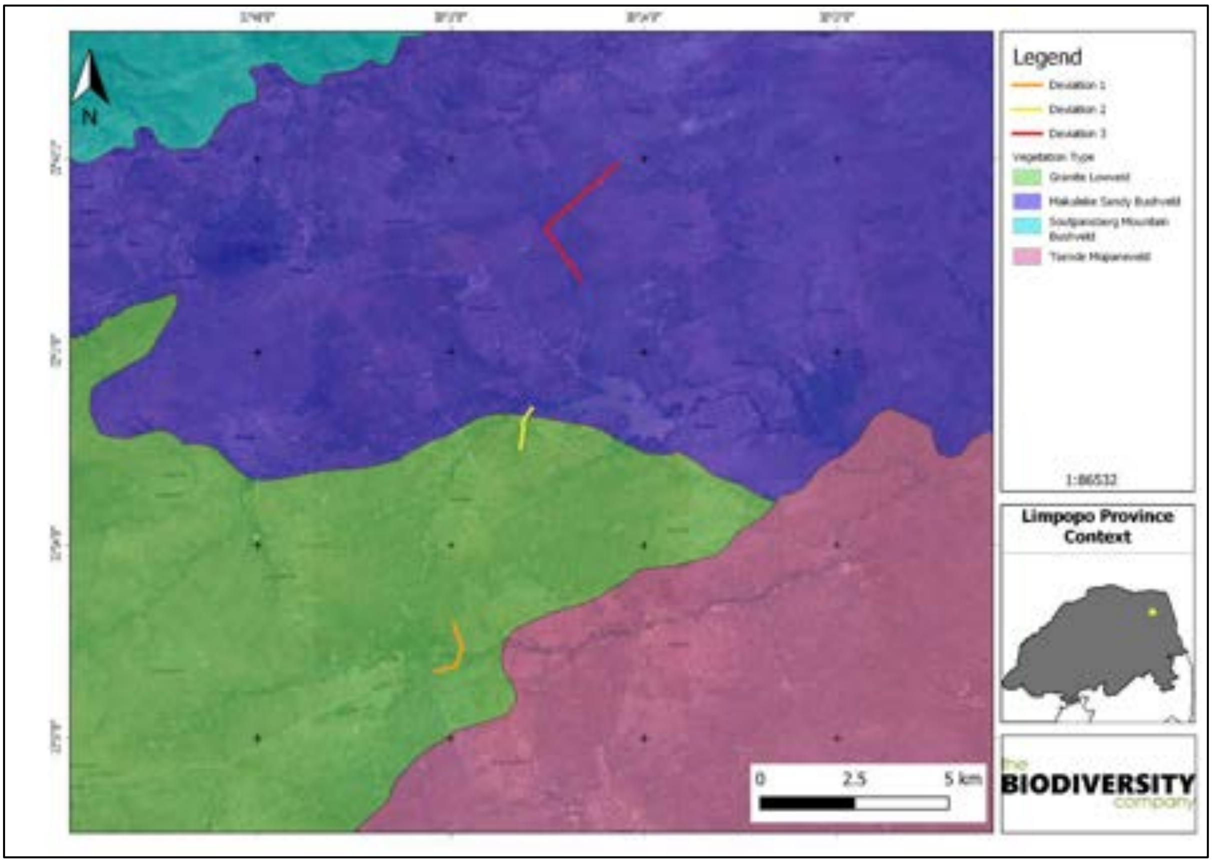

Figure 7-4 The project area showing the vegetation type based on the Vegetation Map of South Africa, Lesotho & Swaziland (BGIS, 2018)

7.1.2.1.1 Granite Lowveld SVI 3

The Granite Lowveld occurs in the Limpopo and Mpumalanga Provinces, Swaziland and marginally also KwaZulu-Natal. The vegetation consists of tall shrubland with few trees to moderately dense low woodland on the deep sandy uplands and dense thicket to open savanna in the bottomlands (Mucina & Rutherford, 2006).

Important Taxa (Mucina & Rutherford 2006)

Based on Mucina & Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type.

Tall Trees: *Senegalia nigrescens, Sclerocarya birrea subsp. caffra.*

Small Trees: *Vachellia nilotica, Albizia harveyi, Combretum apiculatum, C. imberbe, C. zeyheri , Ficus stuhlmannii , Peltophorum africanum , Pterocarpus rotundifolius , Terminalia sericea , Vachellia exuvialis, Vachellia gerrardii, Bolusanthus speciosus, Cassia abbreviata subsp. beareana, Combretum collinum subsp. suluense, Dalbergia melanoxylon, Gymnosporia glaucophylla, Lannea schweinfurthii var. stuhlmannii, Pavetta schumanniana, Plectroniella armata, Terminalia prunioides.*

Tall Shrubs: *Combretum hereroense, Dichrostachys cinerea, Euclea divinorum, Strychnos madagascariensis, Gardenia volkensii, Hibiscus micranthus, Tephrosia polystachya.*

Low Shrubs: *Abutilon austro-africanum, Agathisanthemum bojeri, Aptosimum lineare, Barleria elegans, Clerodendrum ternatum, Commiphora africana, Gossypium herbaceum subsp. africanum, Pavonia burchellii.*

Woody Climber: *Sphedamnocarpus pruriens subsp. pruriens.*

Herbaceous Climber: *Rhynchosia totta.*

Graminoids: *Brachiaria nigropedata, Digitaria eriantha subsp. eriantha, Eragrostis rigidior, Melinis repens, Panicum maximum, Pogonarthria squarrosa, Aristida congesta, Bulbostylis hispidula, Chloris mossambicensis, Enneapogon cenchroides, Heteropogon contortus, Leptochloa eleusine, Perotis patens, Schmidtia pappophoroides, Sehima galpinii, Tricholaena monachne, Urochloa mosambicensis. Herbs: Achyranthes aspera, Aspilia mossambicensis, Becium filamentosum, Chamaecrista absus, Commelina benghalensis, C. erecta, Cucumis africanus, Evolvulus alsinoides, Heliotropium strigosum, Hermbstaedtia odorata, Hibiscus praeteritus, Indigofera filipes, I. sanguinea, Kohautia virgata, Kyphocarpa angustifolia, Leucas glabrata, Ocimum gratissimum, Phyllanthus maderaspatensis, Pupalia lappacea, Vahlia capensis subsp. vulgaris, Waltheria indica.*

Succulent Herbs: *Orbea rogersii, Stapelia leendertziae.*

Conservation: According to Mucina and Rutherford (2006), this vegetation type is classified as VU. The national target for conservation protection for this vegetation types is 19%, with approximately 17% statutorily conserved in Kruger National Park. Approximately 20% of this area has been transformed and is mainly by cultivation and settlement development.

7.1.2.1.2 Makuleke Sandy Bushveld SVI 1

The Makuleke Sandy bushveld occurs mainly within the Limpopo Province and slightly into the Mpumalanga province (Mucina & Rutherford 2006). The landscape and vegetation features include low mountains and from irregular plains to hills. A tree savanna (or tall shrub in places) occurs on the deep sands.

Important Taxa (Mucina & Rutherford 2006)

Based on Mucina & Rutherford's (2006) vegetation classification, important plant taxa are those species that have a high abundance, a frequent occurrence (not being particularly abundant) or are prominent in the landscape within a particular vegetation type.

Small Trees: *Burkea africana, Kirkia acuminata, Pseudolachnostylis maprouneifolia, Terminalia sericea, Afzelia quanzensis, Bridelia mollis, Combretum apiculatum, C. collinum subsp. gazense, C. zeyheri, Croton gratissimus, Ficus abutilifolia, F. ingens, Guibourtia conjugata, Hymenocardia ulmoides, Lannea schweinfurthii var. stuhlmannii, Ochna pulchra, Ozoroa obovata var. elliptica, Peltophorum africanum, Phyllanthus reticulatus, Pterocarpus rotundifolius, Stadmannia oppositifolia subsp. rhodesica.*

Tall Shrubs: *Pteleopsis myrtifolia, Alchornea laxiflora, Boscia angustifolia var. corymbosa, Dichrostachys cinerea, Diospyros lycioides subsp. sericea, Diplorhynchus condylocarpon, Grewia hexamita, Gymnosporia mossambicensis, Hexalobus monopetalus, Monodora junodii var. junodii, Senna petersiana, Steganotaenia araliacea, Strychnos madagascariensis, Tricalysia junodii.*

Low Shrubs: *Agathisanthemum bojeri, Hermannia glanduligera, Pavetta harborii*.

Woody Climbers: *Artabotrys brachypetalus, Bauhinia galpinii, Cissus cornifolia, Rhoicissus revoilii.*

Herbaceous Climbers: *Merremia tridentata, Rhynchosia totta. Graminoids: Andropogon gayanus (d), Digitaria eriantha subsp. pentzii (d), Panicum maximum (d), Aristida mollissima subsp. argentea, A. stipitata subsp. graciliflora, Brachiaria serrata, Bulbostylis hispidula, Coleochloa setifera, Perotis patens, Pogonarthria squarrosa, Setaria incrassata, Tetrapogon tenellus, Tricholaena monachne.*

Herbs: *Vahlia capensis subsp. vulgaris, Vernonia fastigiata.*

Geophytic Herb: *Drimia altissima.*

Conservation*:* According to Mucina and Rutherford (2006), this vegetation type is classified as VU. The national target for conservation protection for this vegetation types is 19%. About 32% statutorily conserved in the Kruger National Park. Roughly 27% has been transformed, mostly through cultivation. Erosion is moderate to high in places (Mucina & Rutherford 2006).

7.1.2.2 Plant Species of Conservation Concern

Based on the Plants of Southern Africa (BODATSA-POSA, 2020) database, 105 plant species are expected to occur in the project area. Figure 7-5 shows the extent of the grid that was used to compile the expected species list based on the Plants of Southern Africa (BODATSA-POSA, 2016) database. The list of expected plant species is provided in Appendix B.

Of the 105-plant species, no species are listed as being SCCs according to the IUCN. Two (2) species are however listed as protected according to the National Forests Act. One species is listed as protected by LEMA.

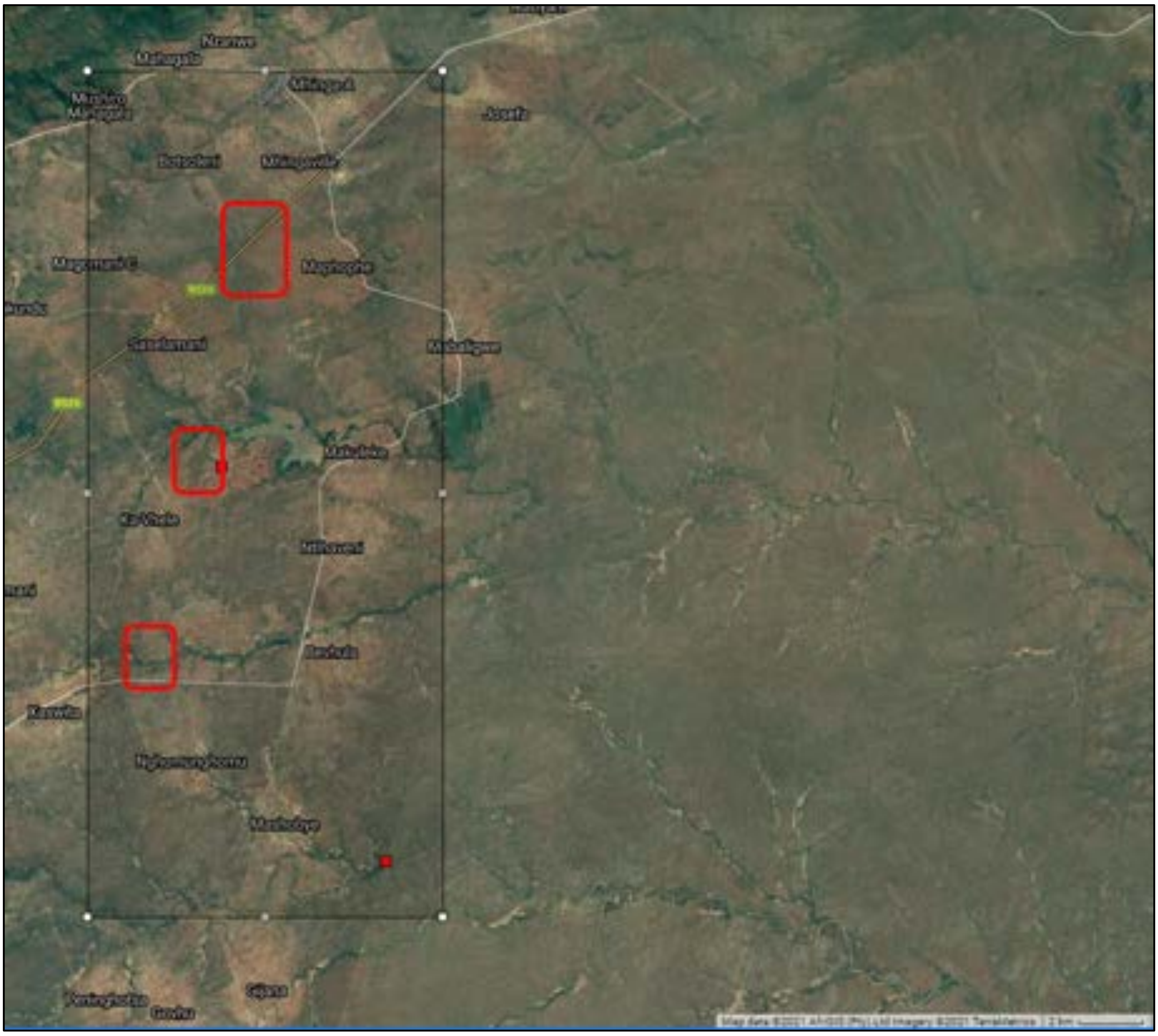

Figure 7-5 ***Map showing the grid drawn to compile an expected species list (BODATSA-POSA, 2020). Red rounded squares show deviation locations while red squares show previous observations as per POSA.***

7.1.2.2.1 Protected Tree species

According to the National Forests Act, 1998 (Act No.84 of 2014) in terms of section 15 (1) of the Forests Act,1998 (DAFF,2014), no person may cut, disturb, damage or destroy any protected tree or possess, collect, remove, transport, export, purchase, sell, donate, or in any other manner acquire or dispose of any protected tree or any product derived from a protected tree, except under a license or exemption granted by the Minister to an applicant and subject to such period and conditions as may be stipulated. Contravention of this declaration is regarded as a first category offence. Two plant species area expected to occur within the project area:

Sclerocarya birrea subsp. caffra (Marula) is a large deciduous tree with a rounded crown. The marula is widespread throughout Africa, where it is found from Ethiopia to South Africa. It naturally occurs in woodlands in sandy soils. The fruit leaves and bark from this tree functions as a crucial part of the food chain for species such as Elephants, antelope, giraffe, zebra and African moth *Argema mimosae* (Mutshinyalo & Tshisevhe, 2003).

Philenoptera violacea (Apple Leaf) is a medium/ large-sized, deciduous to semi-deciduous tree that can grow up to 15 m tall with a wide-spreading rounded crown. The main stem is tall, straight and bear with grey and flaking bark on older branches and stem, but smooth, light grey and covered with dense hairs on younger branches, a sticky red sap is evident when cut (Mnxati, 2009)

7.1.2.2.2 Limpopo Environmental Management Act (LEMA)

The provincial protection status of plants as per LEMA, one plant is expected to occur that is protected under Schedule 12 of this Act. Under this act no person may pick, be on possession, sell, purchase, donate receive as a gift, import into, export or remove from the Province, or convey without a permit.

Albizia amara subsp. sericocephala (Bitter albizia) is a small to medium-sized tree without thorns, sometimes found to be shrubby. Leaves compound with 15-35 pairs of pinnae, each with the associated leaflets. Flowers in white or pale-yellow heads. Pods linear-oblong, purplish when young with a distinct green margin, turning dark brown with age (Hyde et al, 2022)

7.1.3 Review of previous report

In 2010 an Ecological assessment was conducted by Dr Wynand Vlok, the report was called: Proposed new Mhinga substation (Sub G of the Spencer NDP project), power lines from Sub E to Sub G and associated communications tower. During the assessment no botanical species of conservation concern were observed, the protected *Sclerocarya birrea subsp. caffra* (Marula) was however, observed.

7.2 Field Assessment

7.2.1 Botanical Assessment

The main habitat types identified across the project area were initially delineated largely based on aerial imagery. Emphasis was placed on timed meander searches within the natural habitats within the 1 km survey corridor and therefore habitats with a higher potential of hosting SCC, especially along the proposed deviation areas. The remaining habitats were surveyed briefly, and time was mostly spent looking for obvious variation and/or areas of interest within these habitats. Each of the habitats identified are discussed in the sub-sections below.

A total of 77 tree, shrub and herbaceous plant species were recorded in the project area during the field assessment (Table 7-2). Plants listed as Category 1 alien or invasive species under the National Environmental Management: Biodiversity Act (NEMBA) appear in green text. Plants listed in Category 2 or as ‘not indigenous’ or ‘naturalised’ according to NEMBA, appear in blue text.

One plant was listed as NT by the IUCN and can be seen in red text, a collection of photos of the plant can be seen in Figure 7-6, and the location of individuals in Figure 7-7, Figure 7-8 and Figure 7-9.

Four (4) nationally protected tree species were recorded within the survey corridor and occurred numerous throughout The locations of these protected trees can be seen in Figure 7-7, Figure 7-8 and Figure 7-9. A collage of the three most abundant protected trees can be seen in Figure 7-10.

Table 7-2 ***Trees, shrubs and weeds recorded at the project area.***

Family	*Taxon*	Threat Status (SANBI, 2021)	SA Endemic/Indigenous	Protected Tree	Alien Category	DEV 1	DEV 2	DEV 3
Amaranthaceae	*Achyranthes aspera*		Not indigenous; Naturalised				X	X
Malvaceae	*Adansonia digitata*	LC	Indigenous	X		X	X	
Fabaceae	*Albizia harveyi*	LC	Indigenous			X	X	X
Papaveraceae	*Argemone mexicana*				NEMBA 1b		X	X
Poaceae	*Aristida congesta subsp. Congesta*	LC	Indigenous			X		
Asparagaceae	*Asparagus cooperi*	LC	Indigenous				X	
Fabaceae	*Bauhinia galpinii*	LC	Indigenous			X		X
Rhamnaceae	*Berchemia zeyheri*	LC	Indigenous				X	X
Acanthaceae	*Blepharis diversispina*	LC	Indigenous			X		
Fabaceae	*Bolusanthus speciosus*	LC	Indigenous			X	X	X
Poaceae	*Bothriochloa insculpta*	LC	Indigenous			X	X	X
Apocynaceae	*Carissa edulis*	LC	Indigenous			X		X
Fabaceae	*Cassia abbreviata subsp. Beareana*	LC	Indigenous			X	X	X
Pedaliaceae	*Ceratotheca triloba*	LC	Indigenous			X	X	X
Poaceae	*Chloris gayana*	LC	Indigenous			X	X	X
Fabaceae	*Colophospermum mopane*	LC	Indigenous			X	X	
Combretaceae	*Combretum apiculatum*	LC	Indigenous			X		
Combretaceae	*Combretum collinum*	LC	Indigenous			X	X	
Combretaceae	*Combretum hereroense*	LC	Indigenous			X	X	X
Combretaceae	*Combretum imberbe*	LC	Indigenous	X		X	X	X
Combretaceae	*Combretum molle*	LC	Indigenous			X		
Combretaceae	*Combretum zeyheri*	LC	Indigenous			X	X	X
Commelinaceae	*Commelina modesta*	LC	Indigenous			X	X	X

Burseraceae	*Commiphora africana*	LC	Indigenous			X		
Amaryllidaceae	*Crinum macowanii*	LC	Indigenous			X	X	
Euphorbiaceae	*Croton megalobotrys*	LC	Indigenous				X	
Fabaceae	*Dalbergia melanoxylon*	LC-NT IUCN	Indigenous			X	X	X
Fabaceae	*Dichrostachys cinerea subsp. nyassana*	LC	Indigenous			X	X	X
Ebenaceae	*Diospyros mespiliformis*	LC	Indigenous			X		X
Malvaceae	*Dombeya rotundifolia*	LC	Indigenous				X	
Salicaceae	*Dovyalis caffra*	LC	Indigenous				X	X
Hyacinthaceae	*Drimia altissima*	LC	Indigenous			X		
Poaceae	*Eragrostis superba*	LC	Indigenous			X		X
Ebenaceae	*Euclea crispa subsp. crispa*	LC	Indigenous			X	X	X
Convolvulaceae	*Evolvulus alsinoides*	LC	Indigenous			X	X	
Moraceae	*Ficus stuhlmannii*	LC	Indigenous					X
Moraceae	*Ficus sycomorus*	LC	Indigenous			X	X	
Amaranthaceae	*Gomphrena celosioides*		Not indigenous; Naturalised			X	X	X
Malvaceae	*Gossypium herbaceum*	LC	Indigenous				X	
Malvaceae	*Grewia hexamita*	LC	Indigenous			X	X	
Celastraceae	*Gymnosporia buxifolia*	LC	Indigenous			X		
Amaranthaceae	*Hermbstaedtia odorata*	LC	Indigenous			X	X	X
Convolvulaceae	*Ipomoea carnea*				NEMBA 1b		X	
Kirkiaceae	*Kirkia acuminata*	LC	Indigenous			X		
Anacardiaceae	*Lannea schweinfurthii*	LC	Indigenous			X		
Fabaceae	*Ormocarpum trichocarpum*	LC	Indigenous				X	X
Anacardiaceae	*Ozoroa obovata*	LC	Indigenous			X	X	X
Poaceae	*Panicum deustum*	LC	Indigenous			X	X	
Poaceae	*Panicum maximum*	LC	Indigenous			X	X	

Fabaceae	*Peltophorum africanum*	LC	Indigenous			X		X
Poaceae	*Perotis patens*	LC	Indigenous			X		
Polygonaceae	*Persicaria lapathifolia*		Not indigenous; Naturalised				X	
Fabaceae	*Philenoptera violacea*	LC	Indigenous	X		X	X	X
Poaceae	*Phragmites mauritianus*	LC	Indigenous					
Fabaceae	*Pterocarpus rotundifolius*	LC	Indigenous			X	X	
Euphorbiaceae	*Ricinus communis*				NEMBA 2		X	
Ruscaceae	*Sansevieria aethiopica*	LC	Indigenous			X		
Fabaceae	*Schotia brachypetala*	LC	Indigenous				X	X
Anacardiaceae	*Sclerocarya birrea subsp. caffra*	LC	Indigenous	X		X	X	X
Fabaceae	*Senegalia nigrescens*	LC	Indigenous			X	X	X
Fabaceae	*Senegalia polyacantha*	LC	Indigenous			X	X	X
Fabaceae	*Senna italica subsp. arachoides*	LC	Indigenous			X	X	
Malvaceae	*Sida chrysantha*	LC	Indigenous			X		
Solanaceae	*Solanum campylacanthum*	LC	Indigenous				X	X
Malvaceae	*Sterculia rogersii*	LC	Indigenous			X		
Talinaceae	*Talinum tenuissimum*	LC	Indigenous				X	
Combretaceae	*Terminalia sericea*	LC	Indigenous			X	X	
Poaceae	*Themeda triandra*	LC	Indigenous			X	X	X
Poaceae	*Tragus berteronianus*	LC	Indigenous			X	X	
Zygophyllaceae	*Tribulus terrestris*	LC	Indigenous			X	X	
Meliaceae	*Trichilia emetica*	LC	Indigenous				X	
Poaceae	*Urochloa mosambicensis*	LC	Indigenous			X	X	X
Fabaceae	*Vachellia karroo*	LC	Indigenous				X	X
Fabaceae	*Vigna vexillata*	LC	Indigenous				X	X
Asteraceae	*Xanthium strumarium*				NEMBA 1b	X		

Rhamnaceae	*Ziziphus mucronata*	LC	Indigenous			X	X	X
Rhamnaceae	*Ziziphus rivularis*	LC	Indigenous			X		

Figure 7-6 Pictures of the Near-Threatened Dalbergia armata (Zebrawood) that occurred within the survey corridor.

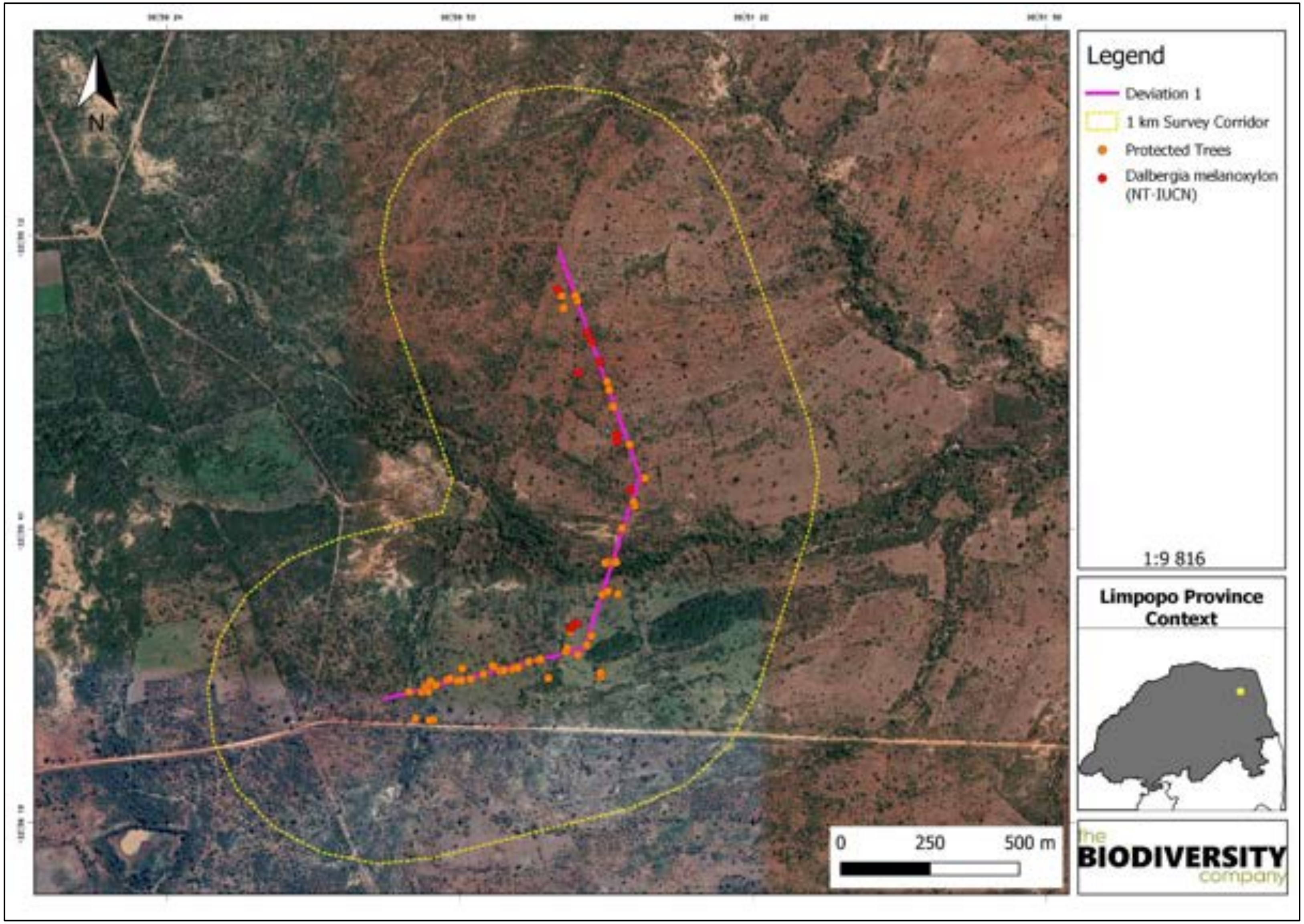

Figure 7-7 ***Locations of some of the protected tree species and the threatened plants, deviation 1.***

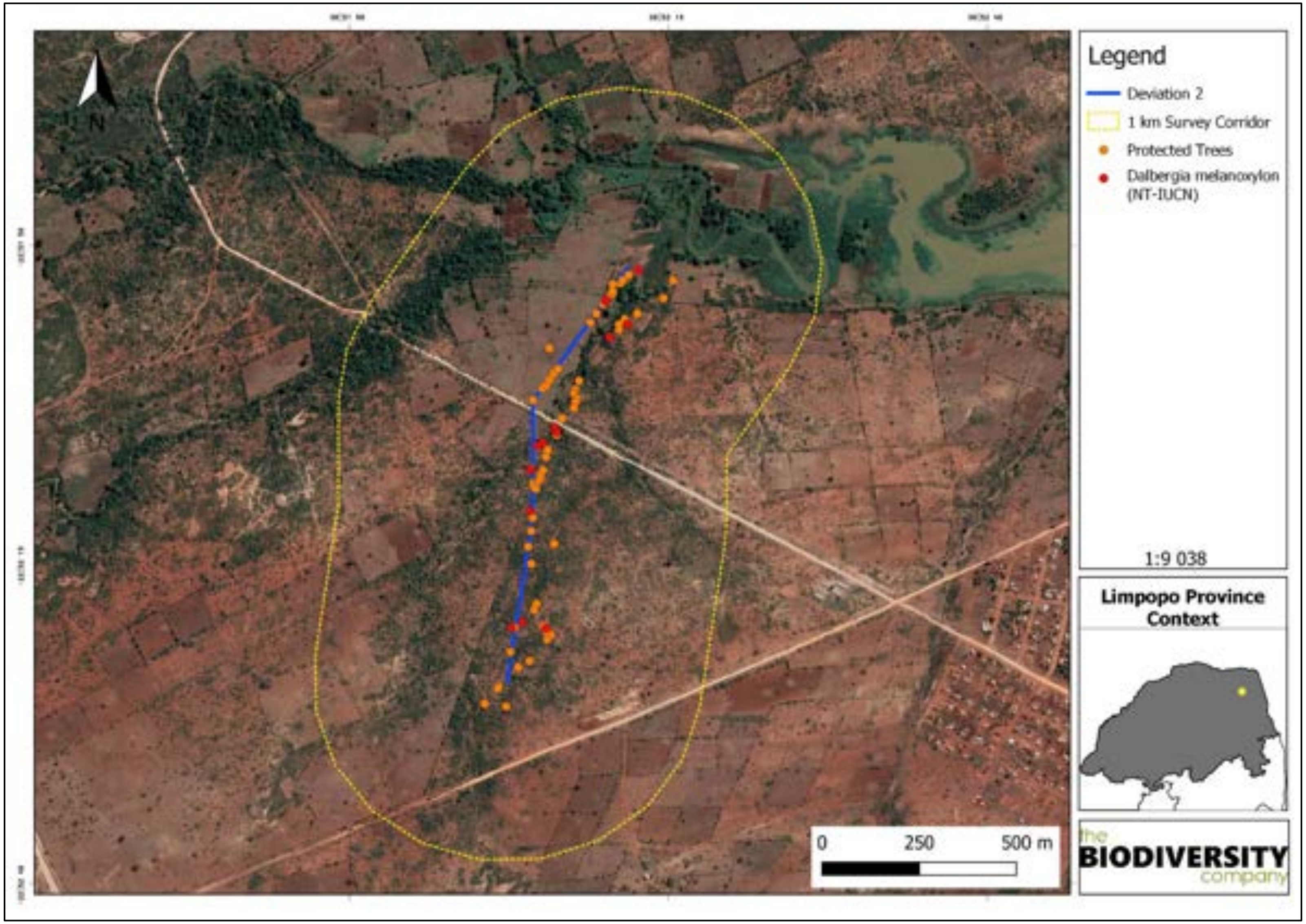

Figure 7-8 Locations of some of the protected tree species and the threatened plants, deviation 2.

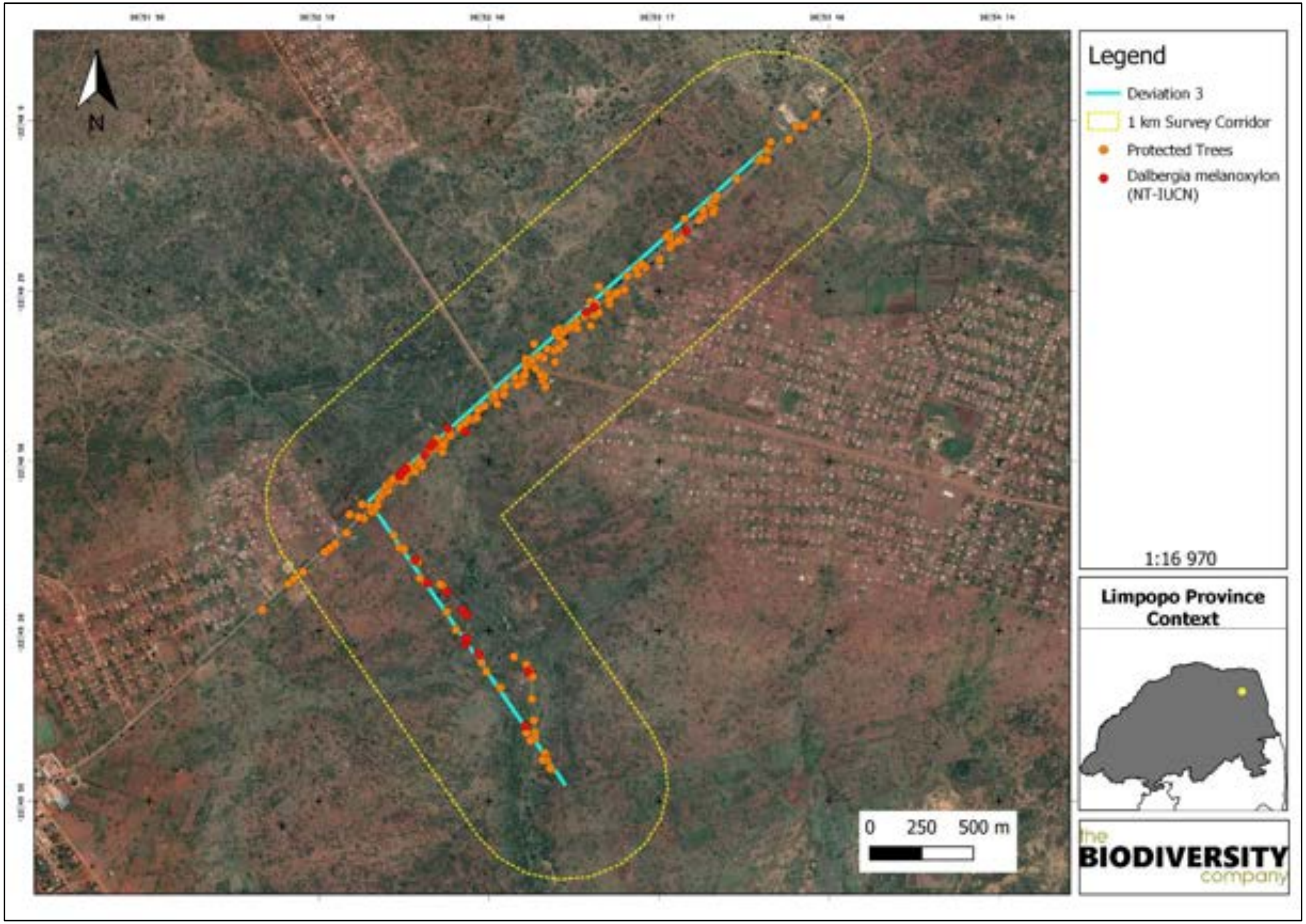

Figure 7-9 ***Locations of some of the protected tree species of interest found in the project area, deviation 3.***

Figure 7-10 ***Pictures of the three most abundant protected tree species that occurred within the survey corridor: A) Philenoptera violacea (Apple leaf), B) Combretum imberbe (Leadwood), C) Sclerocarya birrea subsp. caffra (Marula).***

7.2.1.1 Alien and Invasive Plants

Declared weeds and invader plant species have the tendency to dominate or replace the canopy or herbaceous layer of natural ecosystems, thereby transforming the structure, composition and function of these systems. Therefore, it is important that these plants are controlled and eradicated by means of an eradication and monitoring programme. Some invader plants may also degrade ecosystems through superior competitive capabilities to exclude native plant species.

The NEMBA is the most recent legislation pertaining to alien invasive plant species. In August 2014, the list of Alien Invasive Species was published in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (Government Gazette No 78 of 2014). The Alien and Invasive Species Regulations were published in the Government Gazette No. 37886, in September 2020 the most recent update was completed (Gazette number 43726). The legislation calls for the removal and / or control of alien invasive plant species (Category 1 species). In addition, unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow Category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland. Category 3 plants are also prohibited from occurring within proximity to a watercourse.

Below is a brief explanation of the three categories in terms of the National Environmental Management: Biodiversity Act (Act 10 of 2004) (NEMBA):

- Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
- Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
- Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Category 2 plants to exist in riparian zones.
- Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Category 3 plants to exist in riparian zones.

Note that according to the regulations, a person who has under his or her control a category 1b listed invasive species must immediately:

- Notify the competent authority in writing
- Take steps to manage the listed invasive species in compliance with:
  - Section 75 of the Act;

- The relevant invasive species management programme developed in terms of regulation 4; and
- Any directive issued in terms of section 73(3) of the Act.

Three (3) Category 1b invasive plant species were recorded within the project area and it is recommended that an alien invasive plant management programme be implemented in compliance of section 75 of the Act as stated above.

7.2.2 Habitat Assessment and Site Ecological Importance (SEI)

Degraded Bushveld

This habitat type is regarded as semi-natural bushveld but has been impacted over an extended period of time due historic local community presence and the associated impacts such as livestock and tree cutting for wood. Current human infringement still occurs throughout, especially in areas close to roads. The difference between this habitat and the disturbed grassland is the extent of the disturbance in the disturbed bushveld being more severe.

The unit acts are a buffer for the wetland habitats and is the only remaining greenlands which supports viable plant species populations and is also used for foraging. The unit also serves as a movement corridor for fauna within a landscape fragmented by subsistence agriculture and livestock grazing to more natural areas. The habitat sensitivity is regarded as moderate-high sensitivity due to the role of this intact habitat to biodiversity within a very fragmented local landscape, which is supported by the various ecological datasets. This habitat supports a large number of the protected tree species as well as the NT *Dalbergia melanoxylon*.

Disturbed Bushveld

This habitat is regarded as areas that have been impacted more by historic land clearing for subsistence agriculture and has received high grazing pressure. This habitat has also been impacted by edge effects of transformed areas as well as impacts from littering, dumping and infringement. These habitats aren't entirely transformed but in a constant disturbed state as it can't recover to a more natural state due to ongoing disturbances and impacts it receives from the surrounding transformed areas and local community. These areas are considered to have a low-moderate sensitivity due to the fact that these areas may be used as a movement corridor and in many cases form a barrier between the more natural bushveld and the disturbed/transformed areas.

Transformed

This habitat unit represents all areas of agriculture recent, roads and built. Due to the transformed nature of this habitat, it is regarded as having a low concern sensitivity.

Wetlands and watercourses

This habitat unit represents the active channels, riparian areas and the wetland areas. These habitats are represented in the wetland assessment as conducted by The Biodiversity Company (2021). Even though somewhat disturbed, the ecological integrity, importance and functioning of these areas play a crucial role as a water resource system and an important habitat for various fauna and flora, including the SCC recorded, *Dalbergia melanoxylon*.is known to occur in these areas. The preservation of this system is the most important aspect to consider for the proposed development, even more so due to the high sensitivity of the area according to the various ecological datasets. This habitat needs to be protected and improved due to the role of this habitat as a water resource.

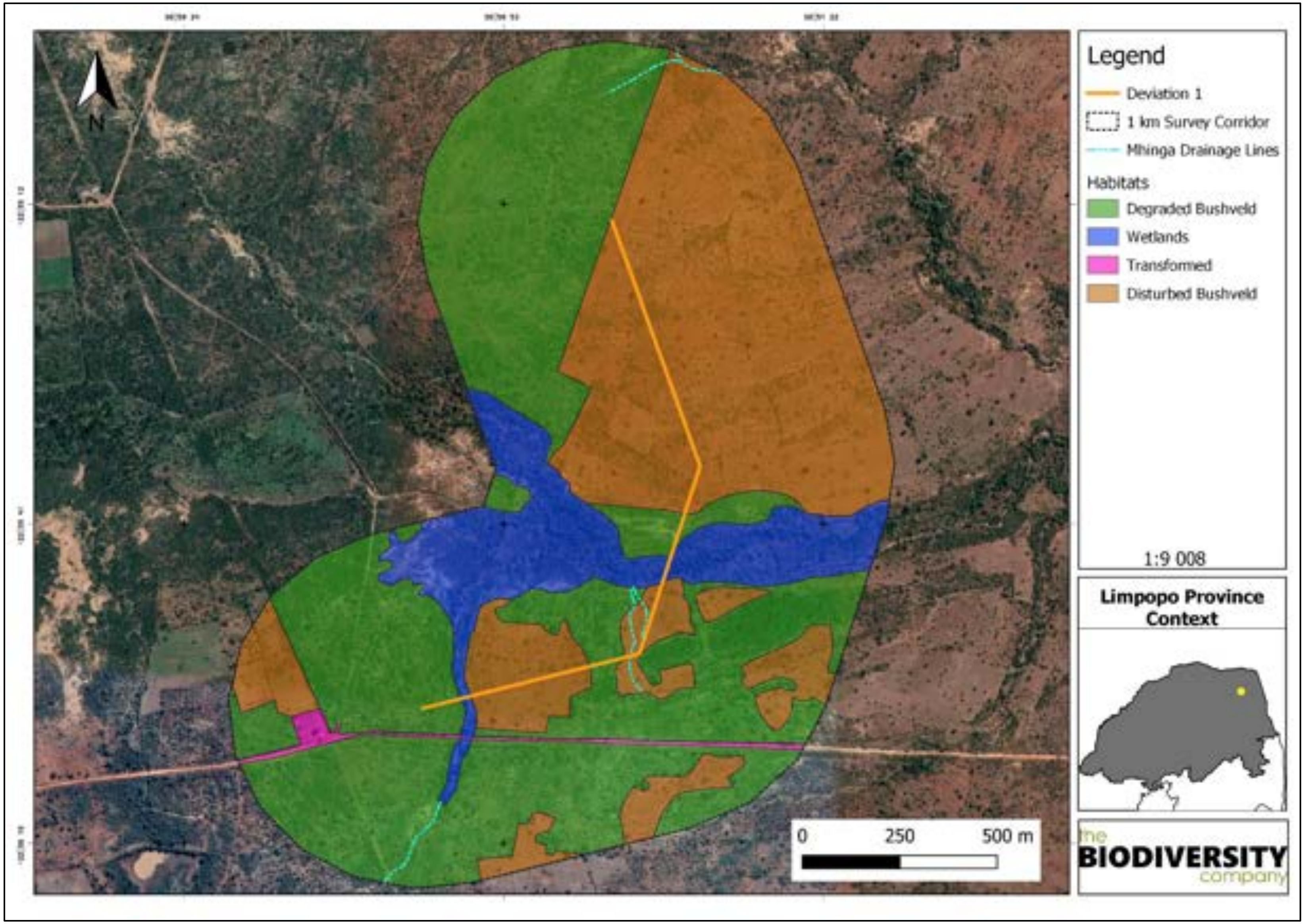

Figure 7-11 The habitats found in the field survey area as delineated with the use of Google Earth and field data, deviation 1.

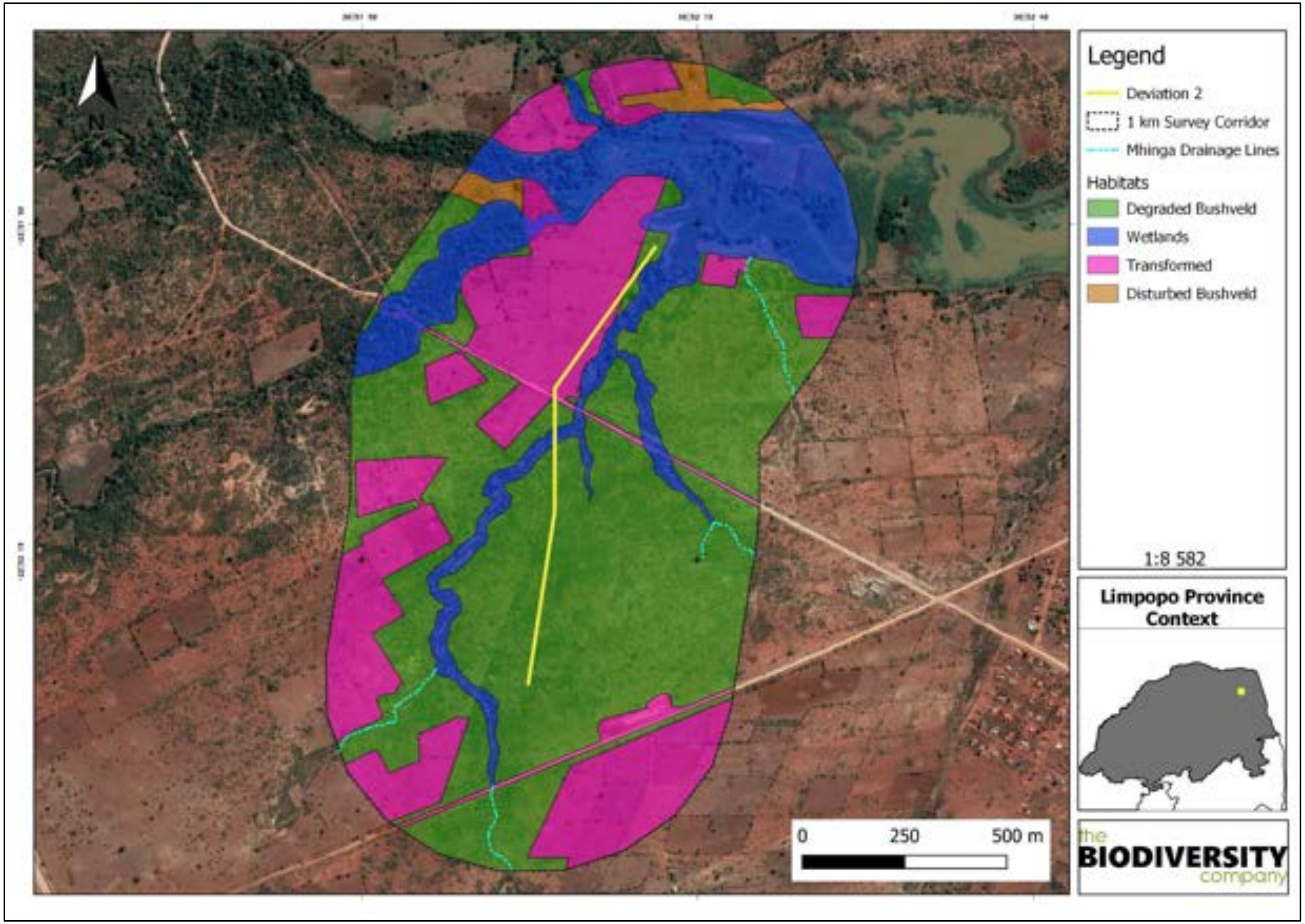

Figure 7-12 The habitats found in the field survey area as delineated with the use of Google Earth and field data, deviation 2.

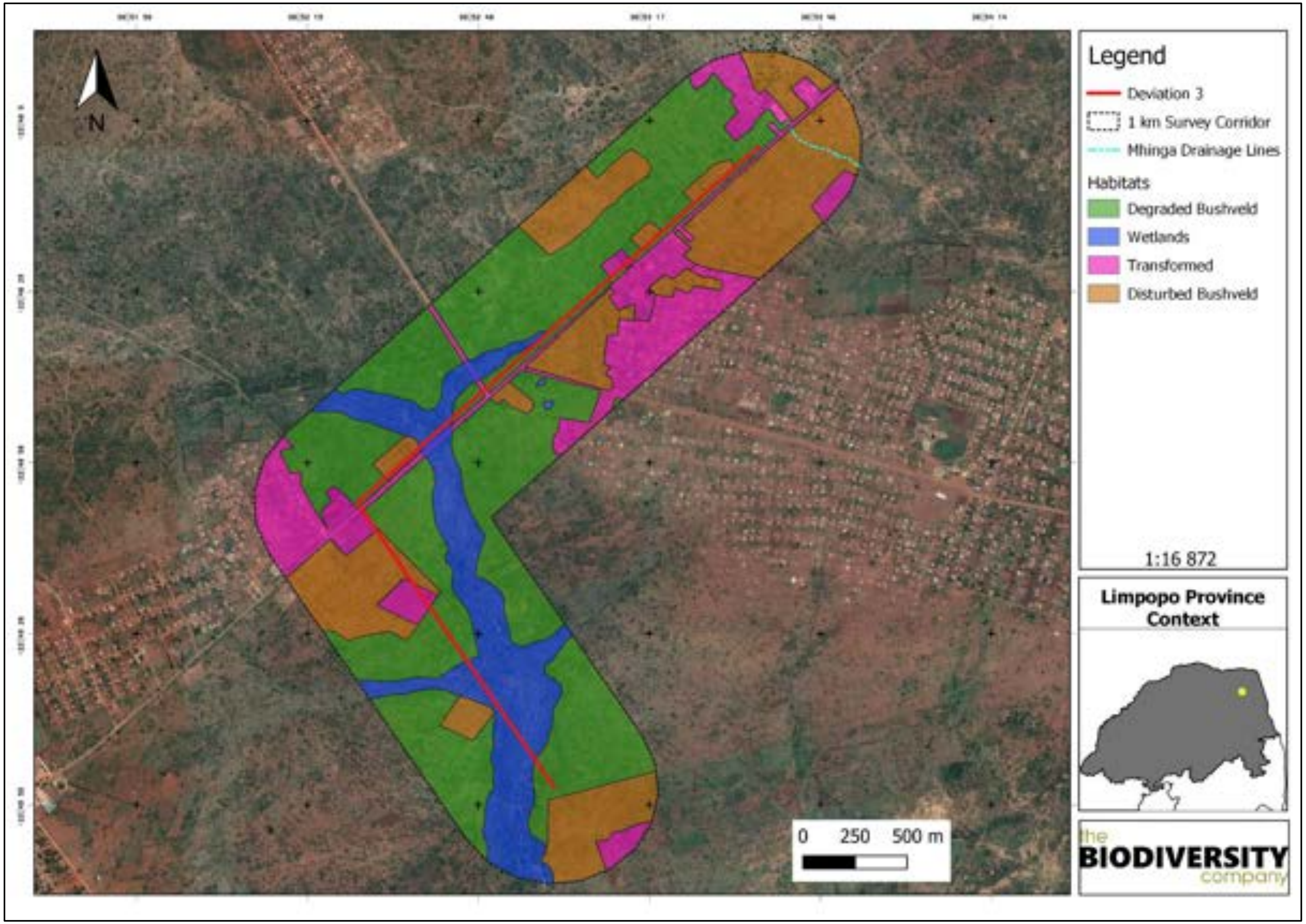

Figure 7-13 ***The habitats found in the field survey area as delineated with the use of Google Earth and field data, deviation 3.***

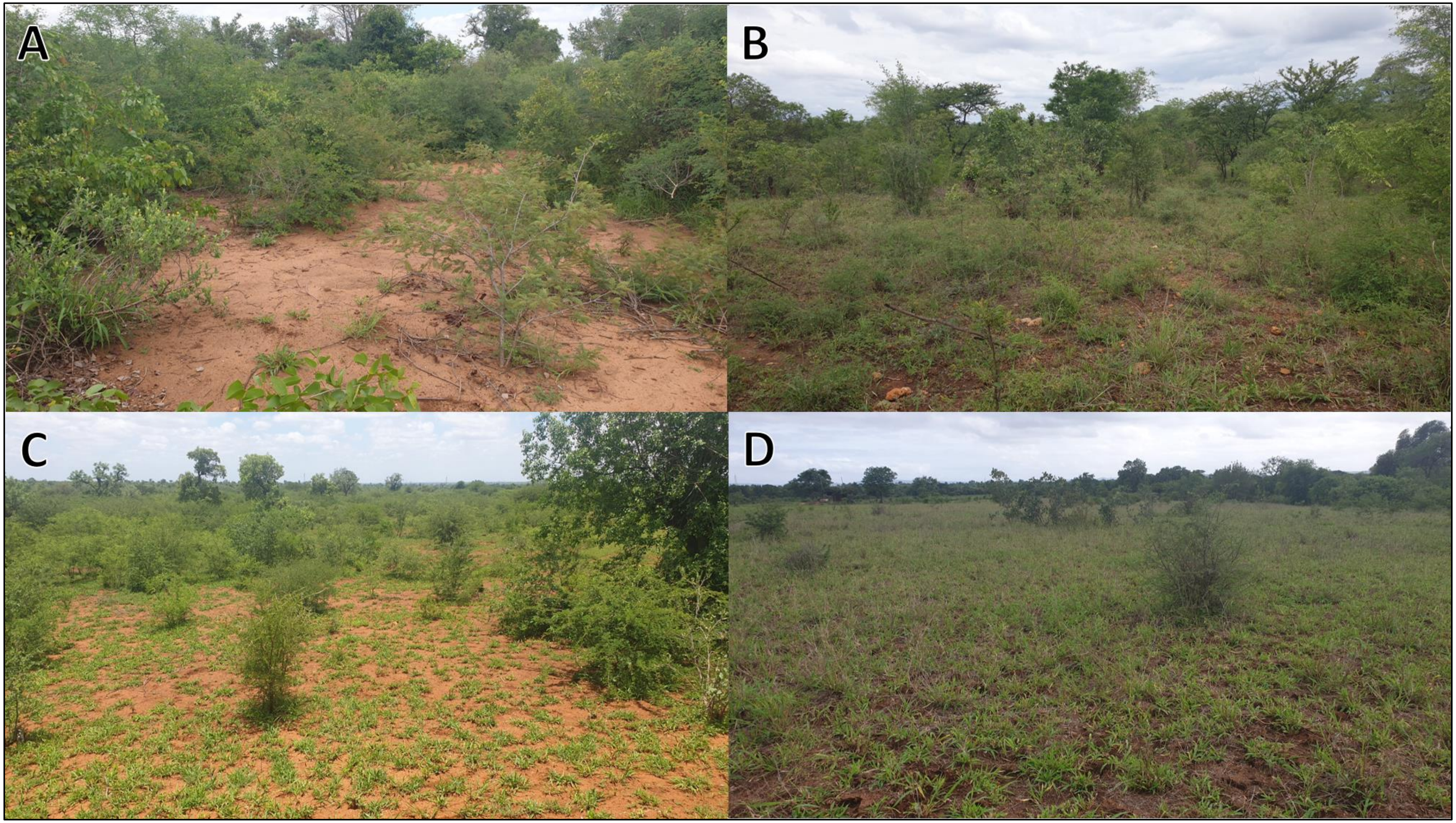

Figure 7-14 ***Photographs illustrating examples of the habitat types delineated within the assessment area associated with the proposed project. A & B) Degraded Bushveld, C & D) Disturbed Bushveld***

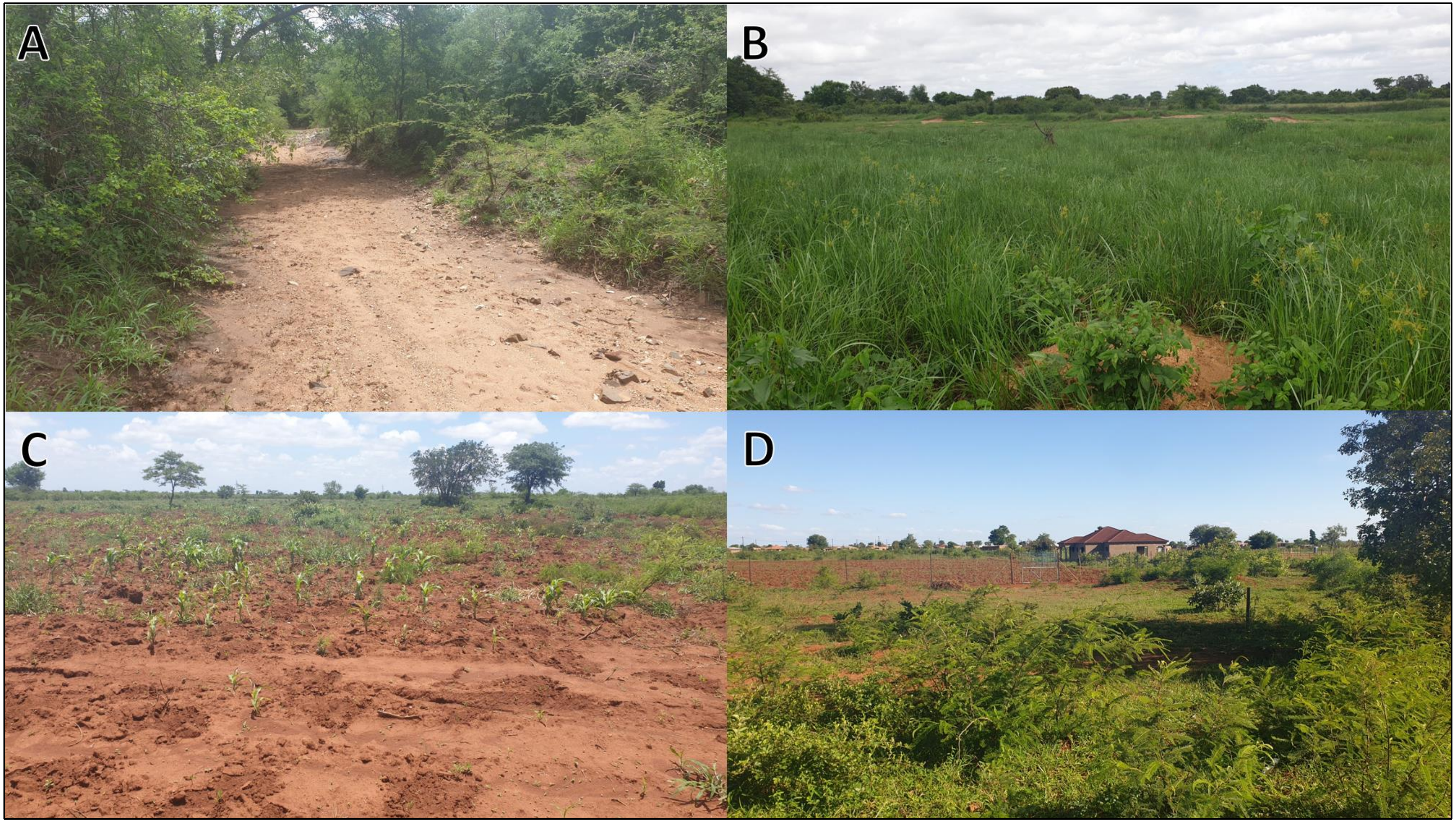

Figure 7-15 ***Photographs illustrating examples of the habitat types delineated within the assessment area associated with the proposed project. A & B) Wetland/Drainage Lines, C & D) Transformed***

7.2.2.1 Site Ecological Importance (SEI)

The plant species theme sensitivity as indicated in the screening report was derived to be Medium and Low (Figure 7-16.

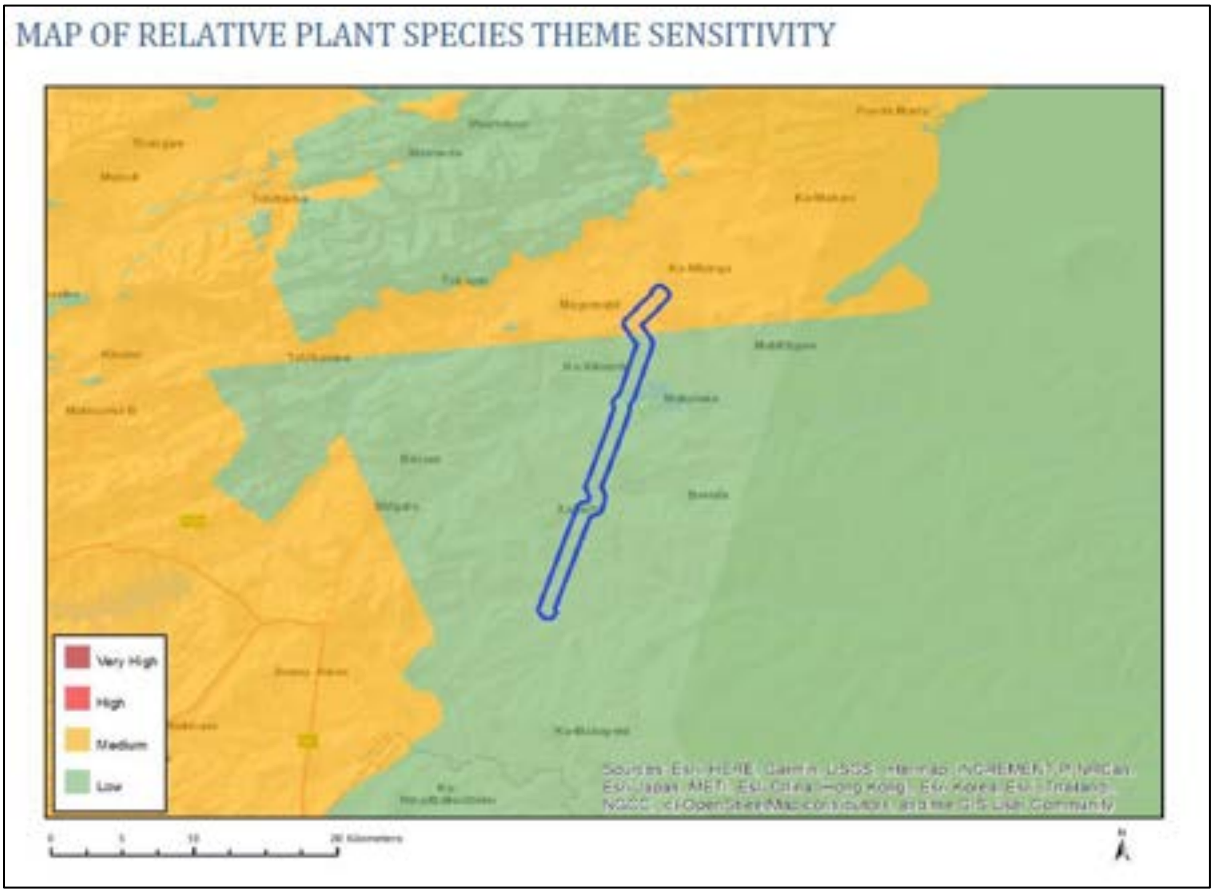

Figure 7-16 Plant Theme Sensitivity, TBC Screening Report

Four (4) different habitat types were delineated within the assessment areas. These habitats were found in all three deviations, in these various habitats the NT plant SCC and protected trees were found. The location and extent of these habitats are illustrated in Figure 7 12 to Figure 7 15. Based on the criteria provided in Section 6.2.1 of this report, all habitats within the assessment area of the proposed development were allocated a sensitivity category (Table 7-3. The sensitivities of the habitat types delineated are illustrated in Figure 7-17, Figure 7-18 and Figure 7-19.

Table 7-3 Summary of habitat types delineated within the field assessment area of the Mhinga Powerline.

Habitat (Area [ha])	Conservation Importance	Functional Integrity	Biodiversity Importance	Receptor Resilience	Site Ecological Importance
Wetlands	High	High	High	Low	Very High
Degraded Bushveld	Medium	Medium	Medium	Low	High
Disturbed Bushveld	Low	Low	Low	Low	Medium
Transformed	Very Low	Low	Very Low	Very Low	Low

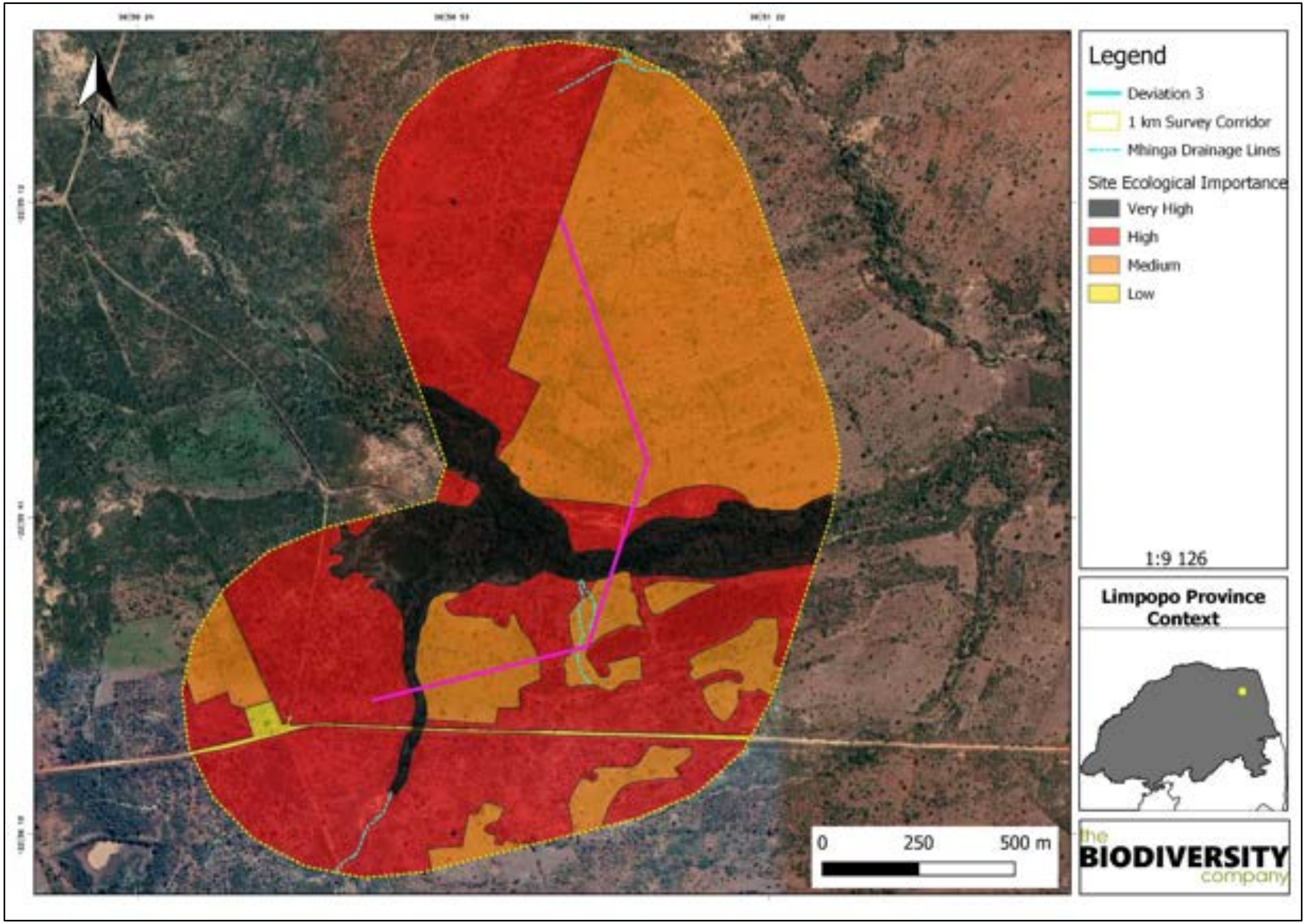

Figure 7-17 Botanical sensitivity of the field survey area of deviation 1.

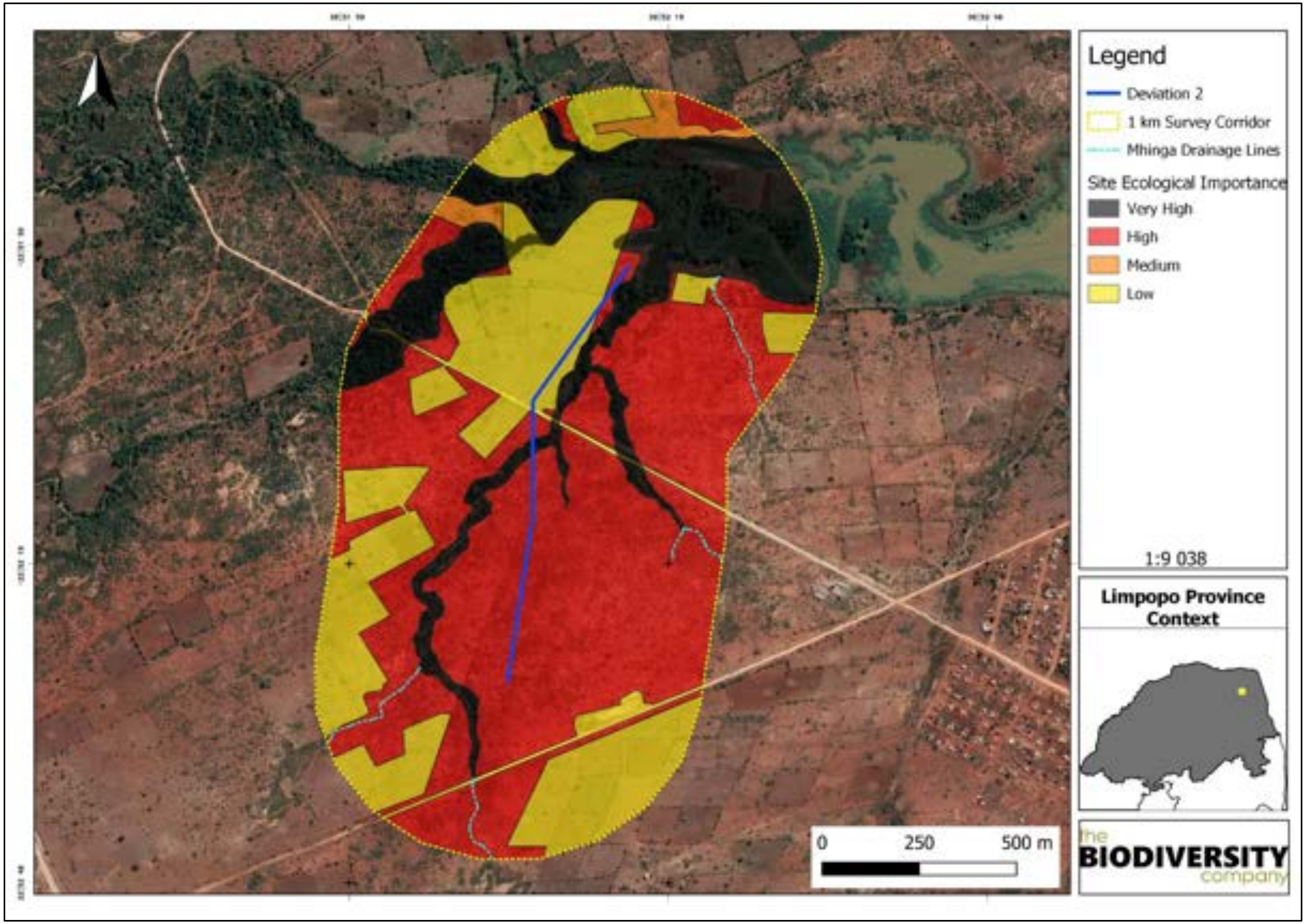

Figure 7-18 Botanical sensitivity of the field survey area of deviation 2 .

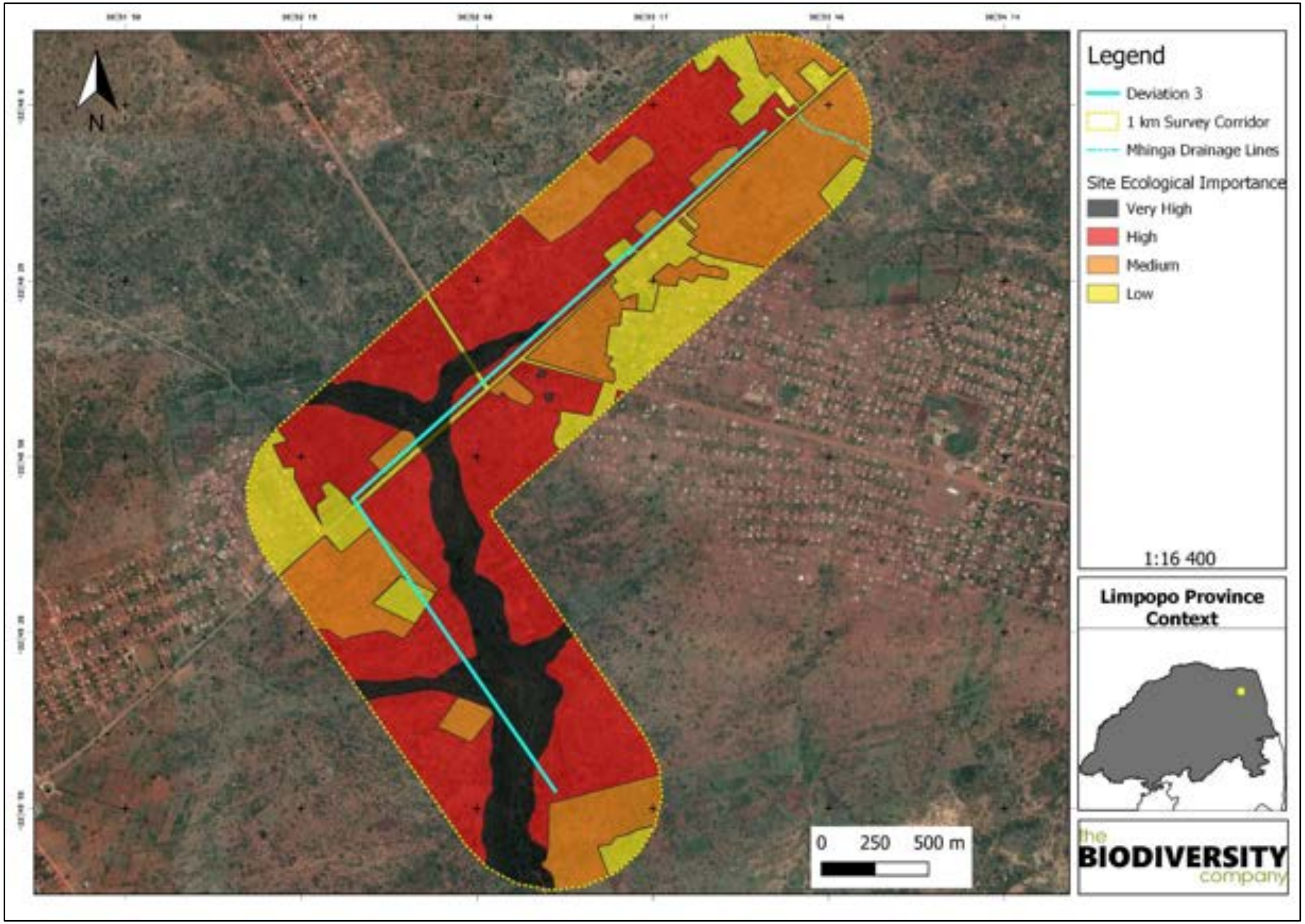

Figure 7-19 Botanical sensitivity of the field survey area of deviation 3.

8 Botanical Impact Assessment

The proposed project will entail the establishment of the following infrastructure: A 132kV overhead powerline (double circuit line) in three areas away from the approved route.

Potential impacts were evaluated against the data captured during the fieldwork to identify relevance to the project area, specifically the proposed development footprint area. The relevant impacts were then subjected to a prescribed impact assessment methodology. The details of this methodology can be provided on request.

8.1 Present Impacts to botany

Considering the anthropogenic activities and influences within the landscape, several negative impacts to the vegetation community were observed within the assessment area. These include:

- Overgrazing from livestock;
- Invasive Alien Plants;
- Cutting down of trees for wood;
- Roads and associated vehicle traffic;
- Existing Powerlines; and
- Fences.

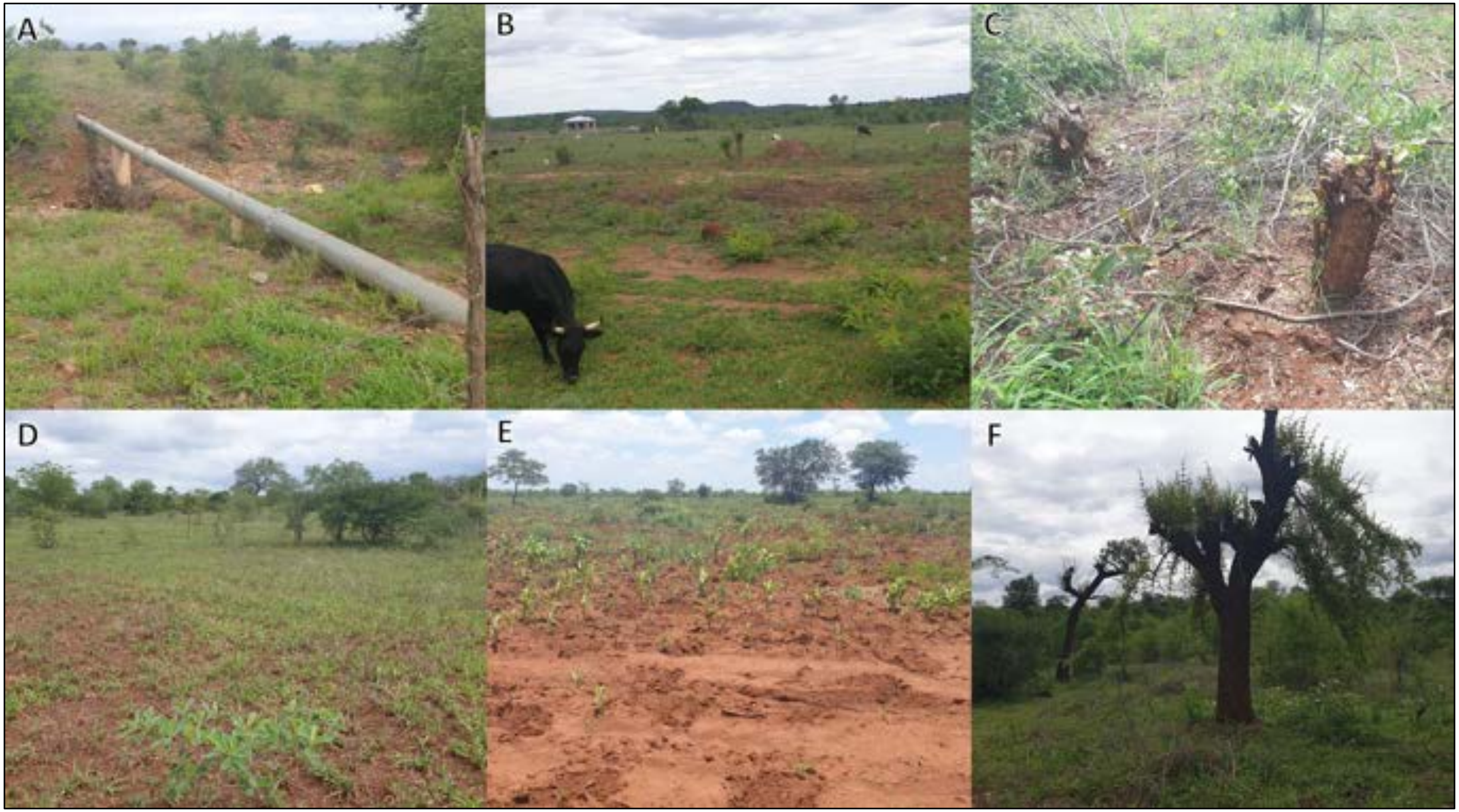

Figure 8-1 Some of the impacts observed in the project area; A) Existing infrastructure, B) Cattle and transformed areas, C) and F) Vegetation removal and wood collection, D) Historic subsistence agricultural fields and E) Existing subsistence agricultural fields

8.2 Identification of Additional Potential Impacts

Table 8-1 presents the aspects anticipated for the proposed development considered in order to predict and quantify these impacts and assess & evaluate the magnitude on the identified vegetation communities.

Table 8-1 Anticipated impacts for the proposed development on vegetation.

Main Impact	Project activities that can cause loss of habitat (especially with regard to the construction of proposed development):	Secondary impacts anticipated
1. Destruction, fragmentation and degradation of habitats and ecosystems	Physical removal of vegetation (Pylon footprint)	Displacement/loss of flora especially the threatened and protected trees recorded. Increased potential for soil erosion Habitat fragmentation Increased potential for establishment of alien & invasive vegetation
	Access roads	
	Soil dust precipitation	
	Water leakages	
	Dumping of waste products	
	Random events such as fire (cooking fires or cigarettes)	
Main Impact	**Project activities that can cause the spread and/or establishment of alien and/or invasive species**	**Secondary impacts anticipated**
2. Spread and/or establishment of alien and/or invasive species	Vegetation removal	Habitat loss for native flora Spreading of potentially dangerous diseases due to invasive and pest species Alteration of fauna assemblages due to habitat modification
	Vehicles potentially spreading seed	
	Unsanitary conditions surrounding infrastructure promoting the establishment of alien and/or invasive rodents	
	Creation of infrastructure suitable for breeding activities of alien and/or invasive birds	

8.3 Alternatives

No alternatives were considered in this assessment as the original design was already assessed and authorised.

8.4 Assessment of Impact Significance

The assessment of impact significance considers pre-mitigation as well as implemented of post-mitigation scenarios. Mitigations can be seen in section 8.5.

8.4.1 Construction Phase

This phase refers to the period when construction of the proposed infrastructure is built. This phase usually has the largest direct impact on vegetation and the main anticipated impact include the clearing of vegetation, thus may lead to the destruction of protected species, ultimately lead to the proliferation of alien plant species along the road and cleared areas.

The following potential impacts were considered:

- Destruction, fragmentation and degradation of vegetation communities, habitats and ecosystems;
- Loss of threatened and protected tree species; and
- Spread and/or establishment of alien and/or invasive species.

Table 8-2 Construction activities impacts on the vegetation communities for the powerline.

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
	5	3	3	4	5		4	2	2	2	4	
Destruction, fragmentation and degradation of vegetation communities, habitats and ecosystems.	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Definite	**Moderately High**	Life of operation or less than 20 years: Long Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Highly likely	**Low**
	5	3	4	4	4		2	2	2	2	3	
Loss of threatened and protected tree species.	Permanent	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Great / harmful/ ecosystem structure and function largely altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
	4	3	3	3	4		2	2	2	2	3	
Spread and/or establishment of alien and/or invasive species.	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

8.4.2 Operational Phase

The impacts of the operational phase are anticipated to further the spread of alien invasive plants, as well as result in the deterioration of the habitats due to the increase human movement associated with the servitude.

The following potential impacts were considered:

- Continued destruction, fragmentation and degradation of vegetation communities, habitats and ecosystems, especially under the powerline servitude; and
- Spread of alien and/or invasive species, especially under the powerline servitude and the recently placed pylon footprints.

Table 8-3 Operational activities impacts on the vegetation communities for the powerline.

Impact	Prior to mitigation						Post mitigation					
	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance	Duration of Impact	Spatial Scope	Severity of Impact	Sensitivity of Receiving Environment	Probability of Impact	Significance
Continued destruction, fragmentation and degradation of vegetation communities, habitats and ecosystems, especially under the powerline servitude.	4	3	3	4	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology highly sensitive /important	Highly likely	**Moderately High**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**
Spread of alien and/or invasive species, especially under the powerline servitude and the recently placed pylon footprints.	4	3	3	3	4		2	2	2	2	3	
	Life of operation or less than 20 years: Long Term	Local area/ within 1 km of the site boundary / < 5000ha impacted / Linear features affected < 1000m	Significant / ecosystem structure and function moderately altered	Ecology moderately sensitive/ /important	Highly likely	**Moderate**	One month to one year: Short Term	Development specific/ within the site boundary / < 100 ha impacted / Linear features affected < 100m	Small / ecosystem structure and function largely unchanged	Ecology with limited sensitivity/importance	Likely	**Low**

8.4.3 Cumulative Impacts

The impacts of projects are often assessed by comparing the post-project situation to a pre-existing baseline. Where projects can be considered in isolation this provides a good method of assessing a project's impact. However, in areas where baselines have already been affected, or where future development will continue to add to the impacts in an area or region, it is appropriate to consider the cumulative effects of development. This is similar to the concept of shifting baselines, which describes how the environmental baseline at a point in time may represent a significant change from the original state of the system. This section describes the potential impacts of the project that are cumulative for terrestrial flora.

Localised cumulative impacts include the cumulative effects from activities that are close enough to potentially cause additive effects on the environment or sensitive habitats and fauna.

The unmitigated placement and function of the infrastructure could cause a major impact as the infrastructure will become a new source of impacts to the existing vegetation communities and the associated impact to fauna; noise and alteration of movement patterns will have an impact. This is even more important to consider if further developments are considered, the overall impact would increase. Based on this the expected cumulative impact of the lodge is moderate.

8.4.4 Unplanned Events

The planned activities will have anticipated impacts as discussed; however, unplanned events may occur on any project and may have potential impacts which will need management.

Table 8-4 is a summary of the findings of an unplanned event assessment from a terrestrial ecology perspective. Note, not all potential unplanned events may be captured herein, and this must therefore be managed throughout all phases according to recorded events.

Table 8-4 Summary of unplanned events for terrestrial biodiversity

Unplanned Event	Potential Impact	Mitigation
Hydrocarbon spills into the surrounding environment	Contamination of habitat as well as water resources associated with a spillage.	A spill response kit must be available at all times. The incident must be reported on and if necessary, a biodiversity specialist must investigate the extent of the impact and provide rehabilitation recommendations.
Fire	Uncontrolled/unmanaged fire that spreads to the surrounding natural Bushveld and ridge.	Appropriate/Adequate fire management plan need to be implemented.

8.5 Specialist Management Outcomes

The purpose of the management outcomes is to allow for the mitigations associated with the impact assessment to be incorporated into the Environmental Management Programme (EMPr). These are provided in Table 8-5.

Table 8-5 Mitigation measures including requirements for timeframes, roles and responsibilities for this report.

Management outcome: Vegetation and Habitats				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Areas of indigenous vegetation, even secondary communities outside of the direct project footprint, should under no circumstances be fragmented or disturbed further. Clearing of vegetation should be minimized and avoided where possible. During the installation of the cables between the transmission towers, especially across the very high sensitivity area, care must be taken to avoid the cable and the machinery that will stretch the cable between supports do not alter these habitats. This can be done by ensuring that the ground staff are aware of which areas are sensitive.	Life of operation	Project manager, Environmental Officer	Areas of indigenous vegetation and very high sensitivity areas.	Ongoing
All construction/operational vehicles must make use of the existing roads. Access (footpaths and roads) within and around the pylon areas need to be strictly controlled in order to prevent the degradation of the surrounding habitats. Footpaths and roads need to be monitored for litter and erosion depending on the amount of traffic. The creation of new footpaths must be limited.	Life of operation	Environmental Officer & Design Engineer	Roads and paths used	Ongoing
No construction materials may not be stored for extended periods of time and must be removed from the project area once the construction phase has been concluded. No storage of vehicles or equipment will be allowed outside of the designated low sensitivity areas.	Construction/Operational Phase	Environmental Officer & Design Engineer	Laydown areas and material storage & placement.	Ongoing
All individuals of the globally threatened and nationally protected trees that were observed needs a relocation or destruction permit in order for any individual that may be removed or destroyed due to the development. Preferably, the trees/plants can be relocated within the property without a permit or otherwise left unharmed. If left undisturbed the sensitivity and importance of these species needs to be part of the environmental awareness program. Tree tags can be put up to assist with the identification and education.	Life of operation	Project manager, Environmental Officer	Threatened/ Protected Tree/	Ongoing
All areas to be developed must be demarcated so that during the construction phase, only the demarcated areas are impacted upon and to prevent movement of construction workers into sensitive surrounding environments.	Life of operation	Project manager, Environmental Officer	Access to surrounding areas outside development and demarcation.	Ongoing
Areas that are denuded during construction need to be re-vegetated with indigenous vegetation to prevent erosion during flood events. This will also reduce the likelihood of encroachment by alien invasive plant species.	Construction/Operational Phase	Environmental Officer & Contractor	Assess the state of rehabilitation and encroachment of alien vegetation	Quarterly for up to two years after the closure

All exposed areas to be rehabilitated after construction is complete. Rehabilitation of the disturbed areas in the project area must be made a priority. Topsoil must also be utilised, and any disturbed area must be re-vegetated with plant and grass species which are endemic to this vegetation type.	Construction/Operational Phase	Environmental Officer & Contractor	Footprint rehabilitation	Quarterly monitoring
Progressive rehabilitation will enable topsoil to be returned more rapidly, thus ensuring more recruitment from the existing seedbank Any woody material removed can be shredded and used in conjunction with the topsoil to augment soil moisture and prevent further erosion.	Closure Phase/Rehabilitation phase	Environmental Officer & Contractor	Footprint rehabilitation	During Phase
A hydrocarbon spill management plan must be put in place to ensure that should there be any chemical/hydrocarbon spill that it does not run into the surrounding areas. The Contractor shall be in possession of an emergency spill kit that must always be complete and available on site. Drip trays or any form of oil absorbent material must be placed underneath vehicles/machinery and equipment when not in use. No servicing of equipment on site unless necessary. All contaminated soil / yard stone shall be treated in situ or removed and be placed in containers	Life of operation	Environmental Officer & Contractor	Spill events, Vehicles dripping.	Ongoing
Leaking equipment and vehicles must be repaired immediately or be removed from project area to facilitate repair	Life of operation	Environmental Officer & Contractor	Leaks and spills	Ongoing
Storm Water run-off management plan must be compiled to restrict impacts such as erosion	Life of operation	Environmental Officer & Design Engineer	Storm water management must monitor indicators such as erosion	Monthly
It should be made an offence for any staff to take/bring any plant species into/out of any portion of the project area. No plant species whether indigenous or exotic should be brought into/taken from the project area, to prevent the spread of exotic or invasive species or the illegal collection of plants.	Life of operation	Project manager, Environmental Officer	Any instances	Ongoing
Any topsoil that is removed during construction must be appropriately removed and stored according to the national and provincial guidelines. This includes on-going maintenance of such topsoil piles so that they can be utilised during decommissioning phases and re-vegetation	Construction/Operational Phase	Project manager, Environmental Officer	Topsoil removal and storage	Ongoing
Compacted areas must be tilled, to ensure the surface ground gets loosened to assist with rehabilitation	Construction/Operational Phase	Project manager, Environmental Officer	Roads and project area rehabilitation	During Phase
The fire management plan needs to be updated to include the newly proposed Lodge.	Life of operation	Environmental Officer & Contractor	Fire Management	Ongoing
The ingoing maintenance of the vegetation directly under the powerline servitude should be conducted in such a manner not to cause proliferation of AIP or encroachment of species such as *Dichrostachys cinerea* (Sickle bush). The implementation of a veld management plan will remedy this potential problem.	Life of operation	Environmental Officer & Contractor	AIP proliferation and Encroachment	Ongoing
Management outcome: Alien Vegetation				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency

Compilation of an Alien Invasive Plant management plan.	Life of operation	Project manager, Environmental Officer & Contractor	Assess presence and encroachment of alien vegetation	Quarterly monitoring
Waste management must be a priority and all waste must be collected and stored adequately. It is recommended that all waste be removed from site on a weekly basis to prevent rodents and pests entering the site	Life of operation	Environmental Officer & Health and Safety Officer	Presence of waste	Life of operation
Management outcome: Dust				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Dust-reducing mitigation measures must be put in place and must be strictly adhered to, for all roads. This includes wetting of exposed soft soil surfaces and not conducting activities on windy days which will increase the likelihood of dust being generated.	Construction phase	Contractor	Dustfall	As per the air quality report and the dust monitoring program.
Management outcome: Waste management				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
Waste management must be a priority and all waste must be collected and stored effectively.	Life of operation	Environmental Officer & Contractor	Waste Removal	Weekly
Monitoring of litter, spills, fuels, chemicals and human waste in and around the project area.	Construction/Closure Phase	Environmental Officer & Health and Safety Officer	Presence of Waste	Daily
A minimum of one toilet must be provided per 10 persons. Portable toilets must be pumped dry to ensure the system does not degrade over time and spill into the surrounding area.	Construction	Environmental Officer & Health and Safety Officer	Number of toilets per staff member. Waste levels	Daily
The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected shall be disposed of at a licensed disposal facility	Construction	Environmental Officer & Health and Safety Officer	Availability of bins and the collection of the waste.	Ongoing
Where a registered disposal facility is not available close to the project area, the Contractor/ECO shall provide a method statement with regard to waste management. Under no circumstances may domestic waste be burned on site	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Collection/handling of the waste.	Ongoing
Refuse bins will be emptied and secured Temporary storage of domestic waste shall be in covered waste skips. Maximum domestic waste storage period will be 10 days.	Life of operation	Environmental Officer, Contractor & Health and Safety Officer	Management of bins and collection of waste	Ongoing
Management outcome: Environmental Awareness Training				
Impact Management Actions	Implementation		Monitoring	
	Phase	Responsible Party	Aspect	Frequency
All personnel and contractors to undergo Environmental Awareness Training. A signed register of attendance must be kept for proof. Discussions are required on sensitive environmental receptors within the project area to inform contractors and site staff of the presence of protected species, their identification, conservation status and importance, biology, habitat	Life of operation	Health and Safety Officer	Compliance to the training.	Ongoing

requirements and management requirements the Environmental Authorisation and within the EMPr.	

9 Recommendations, Conclusion, and Impact Statement

9.1 Recommendations

The following are recommendations made in support of the vegetation assessment.

- A competent Environmental Control Officer (ECO) must oversee the construction and rehabilitation phase of the project, with the protected plant species condition, protection and demarcation as a priority; and
- Protected and Threatened Trees: The removal of large trees should be avoided as much as possible. In the event avoidance is not feasible, a permit will be required for the relocation or destruction of trees.

9.2 Conclusion

The areas within the survey corridor have been altered both currently and historically. The local community in the area has had an impact the flora and vegetation communities, which is especially evident in the disturbed and transformed habitats. From an ecological perspective the development is situated primarily in an area which has been impacted due to the rural anthropogenic environment and associated disturbances, with some semi-natural vegetation remaining in the degraded Bushveld habitats. The active channel, riparian areas and wetland areas are considered to be the most environmentally sensitive.

The impact to the NT *Dalbergia melanoxylon* and protected tree species that occurred throughout the survey corridor are one of the major considerations regarding the proposed development. It is thus imperative that all avenues, especially avoidance be considered. If avoidance is not possible, relocation needs to be considered. If avoidance or relation is not possible, a permit for destruction then needs to be applied for at the local authority.

Overall the impacts of the proposed development were rated as moderate prior to the implementation of mitigation measures. Post-mitigation the majority of anticipated impacts were regarded as low for the majority of the impacts.

9.3 Impact Statement

Considering the above-mentioned information, a number of sensitive features were identified for the project. It is the opinion of the specialist that the project may be cautiously considered for approval, but all prescribed mitigation measures and recommendations must be considered by the issuing authority.

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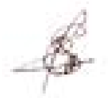
11 Appendix Items

11.1 Appendix A - Declaration

I, Martinus Erasmus, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.



Martinus Erasmus

Biodiversity Specialist

The Biodiversity Company

February 2020

11.2 Appendix B – Floral species expected to occur within the project area.

Family	Taxon	IUCN	Ecology	Protected Tree	LEMA
Euphorbiaceae	*Acalypha glabrata var. pilosa*	LC	Indigenous		
Euphorbiaceae	*Acalypha villicaulis*	LC	Indigenous		
Passifloraceae	*Adenia digitata*	LC	Indigenous		
Fabaceae	*Albizia amara subsp. sericocephala*	LC	Indigenous		X
Hyacinthaceae	*Albuca seineri*	LC	Indigenous		
Hyacinthaceae	*Albuca virens subsp. virens*	LC	Indigenous		
Acanthaceae	*Blepharis diversispina*	LC	Indigenous		
Poaceae	*Brachiaria deflexa*	LC	Indigenous		
Colchicaceae	*Camptorrhiza strumosa*	LC	Indigenous		
Apocynaceae	*Carissa spinarum*		Indigenous		
Agavaceae	*Chlorophytum galpinii var. galpinii*	LC	Indigenous		
Agavaceae	*Chlorophytum macrosporum*	LC	Indigenous		
Menispermaceae	*Cissampelos mucronata*	LC	Indigenous		
Vitaceae	*Cissus sp.*				
Cucurbitaceae	*Coccinia adoensis*	LC	Indigenous		
Fabaceae	*Colophospermum mopane*	LC	Indigenous		
Combretaceae	*Combretum hereroense*		Indigenous		
Commelinaceae	*Commelina modesta*	LC	Indigenous		
Commelinaceae	*Commelina subulata*	LC	Indigenous		
Malvaceae	*Corchorus asplenifolius*	LC	Indigenous		
Caryophyllaceae	*Corrigiola litoralis subsp. litoralis*	NE	Indigenous		
Amaryllidaceae	*Crinum macowanii*	LC	Indigenous		
Fabaceae	*Crotalaria sphaerocarpa subsp. sphaerocarpa*	LC	Indigenous		
Euphorbiaceae	*Croton megalobotrys*	LC	Indigenous		
Euphorbiaceae	*Croton pseudopulchellus*	LC	Indigenous		
Cucurbitaceae	*Cucumis hirsutus*	LC	Indigenous		
Cucurbitaceae	*Cucumis zeyheri*	LC	Indigenous		
Cyperaceae	*Cyperus obtusiflorus var. obtusiflorus*	LC	Indigenous		
Cyperaceae	*Cyperus rupestris var. rupestris*	LC	Indigenous		
Fabaceae	*Dalbergia nitidula*	LC	Indigenous		
Fabaceae	*Decorsea schlechteri*	LC	Indigenous		
Fabaceae	*Desmodium gangeticum*	LC	Indigenous		
Fabaceae	*Dichrostachys cinerea subsp. nyassana*	LC	Indigenous		
Hyacinthaceae	*Dipcadi glaucum*	LC	Indigenous		
Hyacinthaceae	*Dipcadi gracillimum*	LC	Indigenous		
Apocynaceae	*Diplorhynchus condylocarpon*	LC	Indigenous		
Sapindaceae	*Dodonaea viscosa var. angustifolia*	LC	Indigenous		
Acanthaceae	*Dyschoriste rogersii*	LC	Indigenous		
Boraginaceae	*Ehretia amoena*	LC	Indigenous		
Boraginaceae	*Ehretia obtusifolia*	LC	Indigenous		
Meliaceae	*Ekebergia capensis*	LC	Indigenous		
Fabaceae	*Elephantorrhiza goetzei subsp. goetzei*	LC	Indigenous		
Poaceae	*Eleusine coracana subsp. africana*	LC	Indigenous		
Acanthaceae	*Elytraria acaulis*		Indigenous		
Musaceae	*Ensete ventricosum*	LC	Indigenous		
Equisetaceae	*Equisetum ramosissimum subsp. ramosissimum*	LC	Indigenous		

Ruscaceae	*Eriospermum mackenii subsp. mackenii*	NE	Indigenous		
Asteraceae	*Erlangea misera*	LC	Indigenous		
Fabaceae	*Erythrina lysistemon*	LC	Indigenous		
Ebenaceae	*Euclea crispa subsp. crispa*	LC	Indigenous		
Orchidaceae	*Eulophia schweinfurthii*	LC	Indigenous		
Euphorbiaceae	*Euphorbia lugardiae*	LC	Indigenous		
Euphorbiaceae	*Euphorbia trichadenia*		Indigenous		
Convolvulaceae	*Evolvulus alsinoides*	LC	Indigenous		
Asteraceae	*Felicia mossamedensis*	LC	Indigenous		
Apocynaceae	*Gomphocarpus fruticosus subsp. fruticosus*	LC	Indigenous		
Asteraceae	*Helichrysum sp.*				
Boraginaceae	*Heliotropium ovalifolium*	LC	Indigenous		
Malvaceae	*Hermannia glanduligera*	LC	Indigenous		
Apocynaceae	*Holarrhena pubescens*	LC	Indigenous		
Phyllanthaceae	*Hymenocardia ulmoides*	LC	Indigenous		
Fabaceae	*Indigastrum costatum subsp. macrum*	LC	Indigenous		
Fabaceae	*Indigofera heterotricha*	LC	Indigenous		
Convolvulaceae	*Ipomoea crassipes var. crassipes*	LC	Indigenous		
Oleaceae	*Jasminum stenolobum*	LC	Indigenous		
Juncaceae	*Juncus lomatophyllus*	LC	Indigenous		
Cyperaceae	*Kyllinga alba*	LC	Indigenous		
Hyacinthaceae	*Ledebouria revoluta*	LC	Indigenous		
Poaceae	*Leptocarydion vulpiastrum*	LC	Indigenous		
Asteraceae	*Linzia glabra*	LC	Indigenous		
Verbenaceae	*Lippia wilmsii*	LC	Indigenous		
Celastraceae	*Maytenus peduncularis*	LC	Indigenous		
Cucurbitaceae	*Momordica cardiospermoides*	LC	Indigenous		
Geraniaceae	*Monsonia glauca*	LC	Indigenous		
Polygonaceae	*Oxygonum dregeanum subsp. canescens*	NE	Indigenous		
Poaceae	*Oxytenanthera abyssinica*	DD	Indigenous		
Apocynaceae	*Pachycarpus concolor subsp. concolor*	LC	Indigenous		
Molluginaceae	*Paramollugo nudicaulis*		Indigenous		
Fabaceae	*Philenoptera violacea*	LC	Indigenous	X	
Asteraceae	*Polydora angustifolia*	LC	Indigenous		
Polygalaceae	*Polygala senensis var. senensis*	LC	Indigenous		
Polygalaceae	*Polygala serpentaria*	LC	Indigenous		
Polygonaceae	*Polygonum plebeium*	LC	Indigenous		
Portulacaceae	*Portulaca kermesina*	LC	Indigenous		
Apocynaceae	*Rauvolfia caffra*	LC	Indigenous		
Celastraceae	*Reissantia indica*		Indigenous		
Acanthaceae	*Rhinacanthus xerophilus*	LC	Indigenous		
Ruscaceae	*Sansevieria aethiopica*	LC	Indigenous		
Apocynaceae	*Schizoglossum garcianum*	LC	Indigenous		
Oleaceae	*Schrebera alata*	LC	Indigenous		
Anacardiaceae	*Sclerocarya birrea subsp. caffra*	LC	Indigenous	X	
Fabaceae	*Senna italica subsp. arachoides*	LC	Indigenous		
Amaranthaceae	*Sericorema remotiflora*	LC	Indigenous		
Malvaceae	*Sida chrysantha*	LC	Indigenous		
Asteraceae	*Sigesbeckia orientalis*		Not indigenous; Naturalised		
Malvaceae	*Sterculia rogersii*	LC	Indigenous		

Lamiaceae	*Syncolostemon canescens*	LC	Indigenous		
Lamiaceae	*Syncolostemon elliottii*	LC	Indigenous		
Talinaceae	*Talinum tenuissimum*	LC	Indigenous		
Santalaceae	*Thesium gracile*	LC	Indigenous		
Euphorbiaceae	*Tragia rupestris*	LC	Indigenous		
Vahliaceae	*Vahlia capensis subsp. capensis*	LC	Indigenous		
Lamiaceae	*Vitex ferruginea*	LC	Indigenous		
Campanulaceae	*Wahlenbergia sp.*				
Rhamnaceae	*Ziziphus rivularis*	LC	Indigenous		
Poaceae	*Phragmites mauritianus*	LC	Indigenous		

FLOODLINE DELINEATION FOR THE WATERCOURSES ASSOCIATED WITH THE MHINGA POWERLINE DEVIATIONS

Mhinga, Limpopo, South Africa

February 2021

CLIENT

Prepared by:

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Report Name	**Floodline Delineation for the Watercourse Associated with the Mhinga Powerline Deviations**
Submitted to	K&T
Report Writer	Michael Ryan (Cand. Sci. Nat. 125128)
Report Reviewer	Andrew Husted (Pr. Sci. Nat. 400213/11)
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.

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DECLARATION

I, Michael Ryan, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

MRyan

Michael Ryan

Riverine Ecologist and Hydrologist (Cand. Sci. Nat. 125128)

The Biodiversity Company

February 2021

DISCLAIMER

Findings, recommendations and conclusions provided in this report are based on the best available scientific methods and the author's professional knowledge/information at the time of compilation. The Biodiversity Company employees involved in the compilation of this report, however, accepts no liability for any actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with services rendered, and by the use of the information contained in this document.

The modelled floodlines presented in this study are for indicative purposes only for the delineation of sensitive habitats, and not meant for any engineering designs. No form of this report may be amended or extended without the prior written consent of the author and/or a relevant reference to the report by the inclusion of an appropriately detailed citation.

1 Introduction

The Biodiversity Company was commissioned to conduct an floodline delineation for the proposed deviations of 8 km (3 areas proposed for deviations from original authorised route) of 132 kV powerlines stretching between Phugwane and Mhinga Substation within the Limpopo province. The original line was approved under authorisation number 12/12/20/1667. Eskom proposes to deviate the authorised Kingbird 132kV powerlines in three sections due to streams being located on the authorised route as well as houses being constructed since the authorisation was received in 2010. The deviations total distance is approximately 8 km whilst the actual line is 25 kms in length (Kantey and Templer, 2021). Deviation 1 is said to be 4.421 km long, following the R524 and stretching into a portion of Nkavele Village. Deviation 2 is 1.224 km long and deviates just after the Nkavele road just after the town of Saselemane. Deviation 3 is 1.834 km moving east from the Xaswita village (Figure 1-1).

The centre points of the deviations are:

- Deviation 1, centre point: 22° 55’ 43.01”S and 30° 51’ 08.41” E
- Deviation 2, centre point: 22° 51’ 58.73”S and 30° 52’ 10.13” E
- Deviation 3, centre point: 22° 49’ 11.77”S and 30° 52’ 46.61”E

The deviations fall on the following properties:

Deviation 1:

- Remaining Extent of the farm Mhinga's Location 258 MT
- Remaining Extent of the farm Mhinga's Location Extension 259 MT
- Remaining Extent of the farm Tshikundu Location Extension 260 MT
- Remaining Extent of the farm Tshikundu Location 262 MT.

Deviation 2 and Deviation 3

- Remaining Extent of the farm Nthlaveni 2 MU (Kantey and Templer, 2021).

This report, after taking into consideration the findings and recommendations provided by the specialist herein, should inform and guide the Environmental Assessment Practitioner (EAP), enabling informed decision making as to the ecological viability of the proposed development and to provide an opinion on whether any Environmental Authorisation (EA) process or licensing is required for the proposed activities.

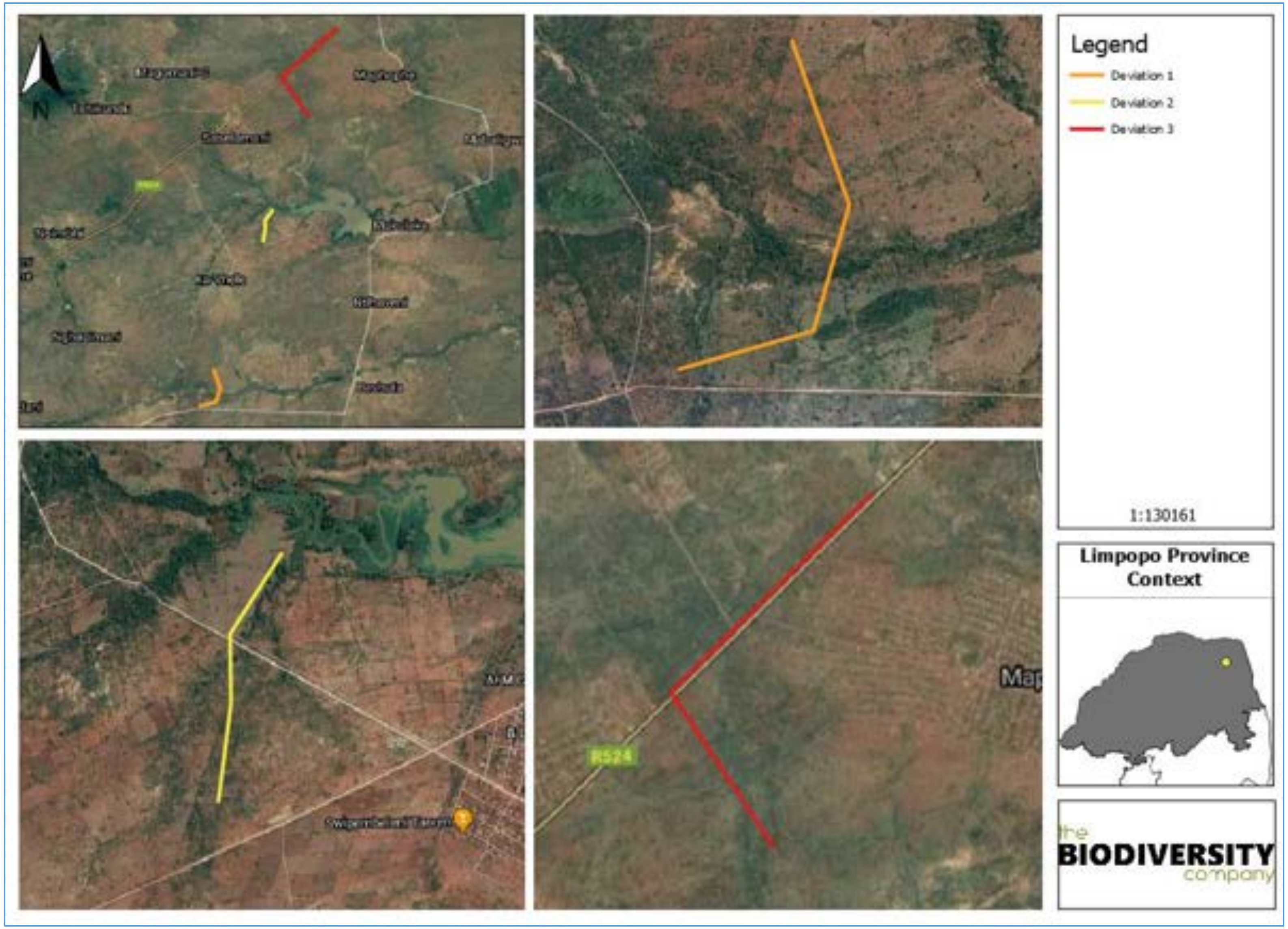

Figure 1-1: The deviations for the Mhinga Powerline

2 Project Area

The proposed powerline route extends from Gijamandzini to Mhingaville, Thohoyandou, Limpopo, South Africa the co-ordinates of the start and end of the powerline are 22°59'51.09"S 30°49'19.90"E and 22°48'2.30"S 30°53'33.14"E respectively. Due to the extent of the powerline the focus of the study was the three diversion sections as the existing route has prior authorisation.

The hydrological setting of the project area is within the Olifants Water Management Area (WMA 2) within the B90B quaternary catchments. Each diversion crosses a watercourse which is considered for the delineations, as they are potentially susceptible to modification from the proposed project. These watercourses include an un-named river in the south (Figure 2-1) along with 2 tributaries of the Mphongolo River - a northern tributary and southern tributary (Figure 2-2). All the watercourses were dry during the time of the survey. A map illustrating the locality setting of the proposed project is presented in Figure 2-3.

Figure 2-1: The dry watercourse of the un-named river (December 2020)

Figure 2-2: The dry southern (left) and northern (right) tributary of the Mphongolo River() (December 2020)

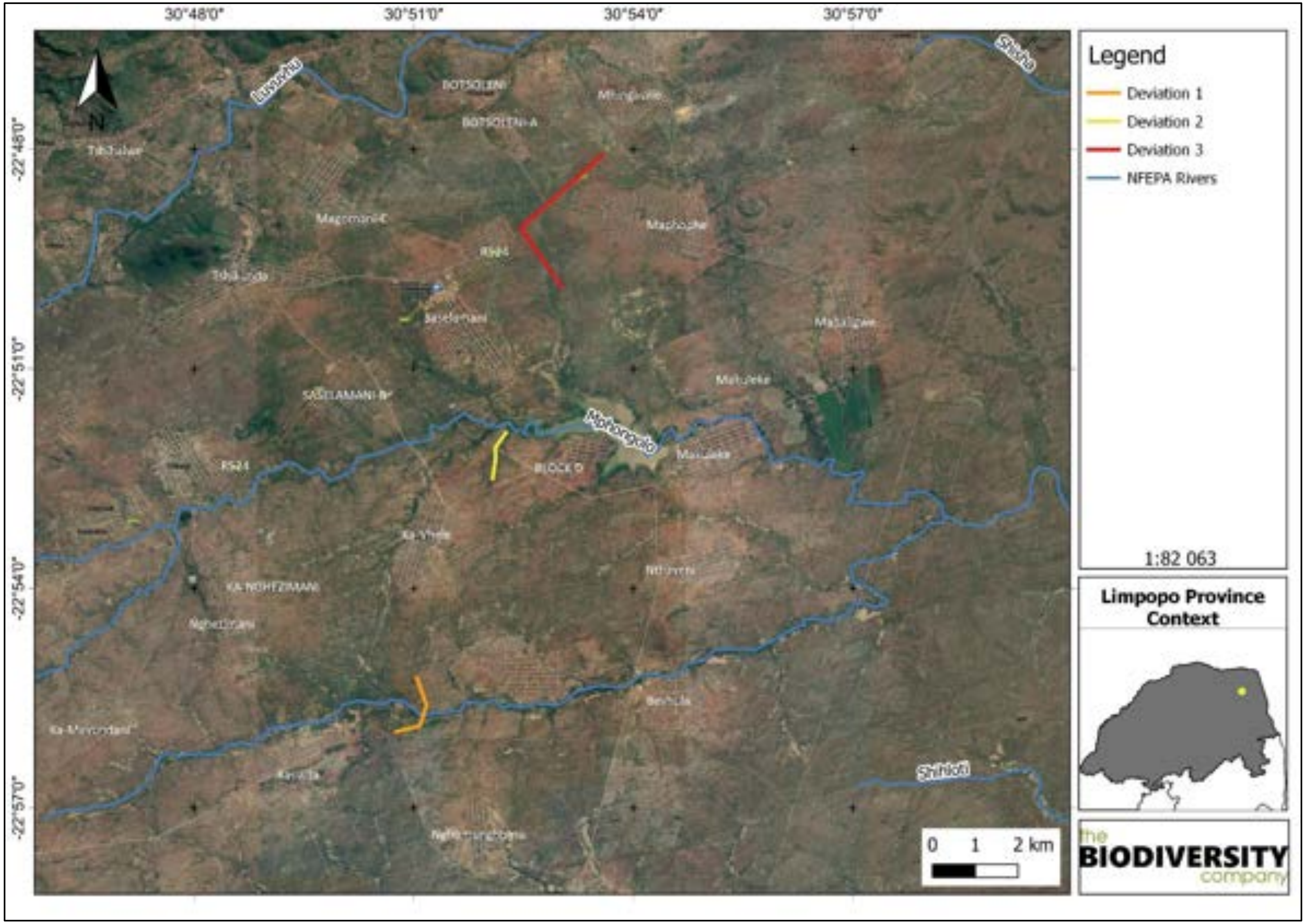

Figure 2-3: Locality map illustrating the project area (February 2021)

3 Methodology

3.1 Survey

A single survey was completed for this study. The survey was completed on the 7th to 11th of December 2020 which represented a wet season survey.

3.2 Flood Hydrology

The hydrological assessment completed in this determination was set out in line with the standards and methods stipulated in the SANRAL drainage manual (SANRAL, 2013). Based on the practical guidelines for the relevant catchment areas the following inputs were required for the peak flood calculations:

- Catchment area;
- Slope (catchment/watercourse);
- Run-off characteristics;
- Land use, land type and underlying lithology;
- Mean annual precipitation;
- Mean annual evaporation;
- Longest flow paths;
- Catchment centroids; and
- Local hydraulic structures.

The supporting software Utility Programs for Drainage was utilised for the calculations of the various flood peaks for the appropriate 1:50 and 1:100 return periods.

3.2.1 Storm Rainfall Depths

Through the available software, Design Rainfall Estimation in South Africa (version 3), the storm rainfall depths were derived from data presented in Smithers and Schulze (2002). The method utilised makes use of the rainfall stations near the project area. The storm rainfall depths for various return periods and time of concentration were then calculated for the project area using the abovementioned software.

3.2.2 Elevation Data and Catchment Area

Topographic factors such as catchment size, slope, stream patterns and shape are known to have an impact on the nature of flood events. Steeper catchments have higher flood peaks over a shorter critical duration, whereas a gentle catchment topography produces longer duration flood peaks (SANRAL, 2013).

Relief data was obtained for the 2230 DD Quarter Degree Square's from the Department of Rural Development and Land Reform. The contour interval for this data was presented at 10 m. The clipped contour data was used to create a Triangular Irregular Network (TIN) which was converted to create a Digital Elevation Model (DEM).

In addition to this topographic elevation data, the Advanced Land Observing Satellite (ALOS) elevation profiles were obtained. Elevation data created from the 10 m contours and ALOS elevation profiles was interrogated to form an assessment on which data source would provide comprehensive elevation profiles for the required terrain models.

Standard ARCGIS 10.5 hydrology tools were then used to generate the watersheds for the specific watercourses considered in this determination.

The catchment characteristics were defined based on the ARCGIS methods stipulated in Gericke and du Plessis (2012 & 2013). These characteristics included catchment slope, watercourse length and slope, longest flow path and catchment centroid.

3.2.3 Land Cover and Soils

Land cover types and lithology affects the rates of infiltration and runoff within a catchment. Land cover and soil coverages were used during the peak flow calculations. The land cover of the immediate catchment area upstream of the lowest point in the modelled river was assessed during the determination. In addition, land cover classes from the 2013 – 2014 South African National Land-Cover dataset (Land Type Survey Staff. 1972 – 2006 & Geoterraimage, 2015) and Google Earth imagery was also utilised to calculate the overall catchment land use coverages. Generalised soil coverages for the catchment area were derived based on the Land Type and Capability dataset from the Agricultural Resource Council – Institute for Soil, Climate and Water (ARC-ISCW). The derived landcover was utilised to assign respective manning’s n values for the 2 dimensional model.

3.2.4 Manning’s n Roughness Coefficients

The mannings n roughness was estimated based on Chow (1959) and supplemented with data presented in Arcement and Schneider (1989).

3.2.5 Hydraulic Structures

No hydraulic structures or storage was considered in this floodline assessment.

3.2.6 Peak Flow Calculations

Peak flow calculations were completed with the Utility Drainage Programme software. Rational Method, Rational Method (alternative), Unit Hydrograph, Standard Design Flood (SDF) and Empirical methods were used to derive the peak discharge for the 1:100 and 1:50 flood periods (SANRAL, 2013).

3.2.7 Software Used

- ARCGIS 10.5 is a Geographical Information System (GIS) software programme used to view, edit, create and analyse geospatial data. ARCGIS was used to view spatial data and to create maps. Its extension 3D Analyst was used for terrain modelling purposes, for converting the elevation data into Digital Elevation Model (DEM) grid format;
- Hydrologic Engineering Centre (HEC) GEORAS utilises the ARCGIS environment and was used for the preparation of geometric data (cross-sections, river profile, banks and flow paths) for input into the HEC-RAS hydraulic model. It is further used in post

processing to import HEC-RAS results back into ARCGIS, to perform flood inundation mapping;

- Design Rainfall Estimation in South Africa (version 3);
- Utility Programme for Drainage (Van Vuuren and Van Dijk) Version 1.1.0; and
- HEC-RAS 5.0.7 (Brunner, 2010) was used to perform hydraulic modelling. HEC-RAS is a programme used to perform one/two-dimensional calculations for a range of applications.

3.2.8 Hydraulic Model Setup

The hydraulic model considered in this study was completed using the standard procedures stipulated in the HEC-RAS 2D Modelling User's Manual (US Army Corps of Engineers, 2016). The HEC-RAS 5.0.7 application was updated with functions in the RAS-Mapper which allows for the comprehensive construction of 2 and 1 dimension models. Considering that floodplain modelling and not specific 1 dimensional elevation was required for this study, the 2 dimensional model was used. Development of the hydraulic model included the following steps:

- Derivation of the 2 dimensional perimeter and refinement area (Figure 3-1);
- Establishment and enforcement of break-lines;
- Generation of 2 dimensional grids ($50m^2$);
- Construction of internal and external boundary conditions;
- Construction of a 1 dimensional cross sectional area for hydrograph generation at a location 500m upstream of the proposed crossing structure (Figure 3-2).

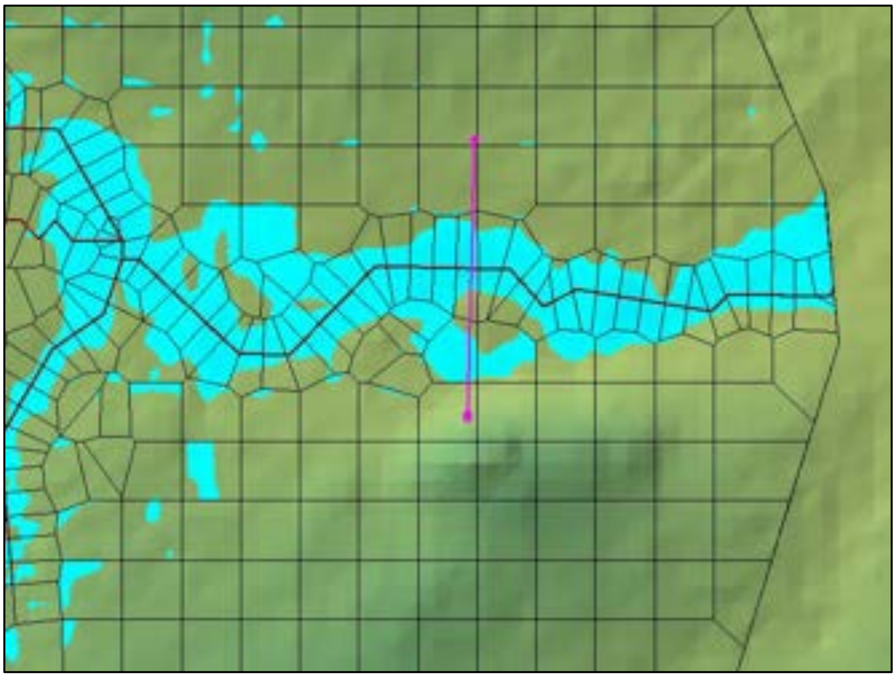

Figure 3-1: Extract of the typical 2 dimensional model completed in this study for watershed 1

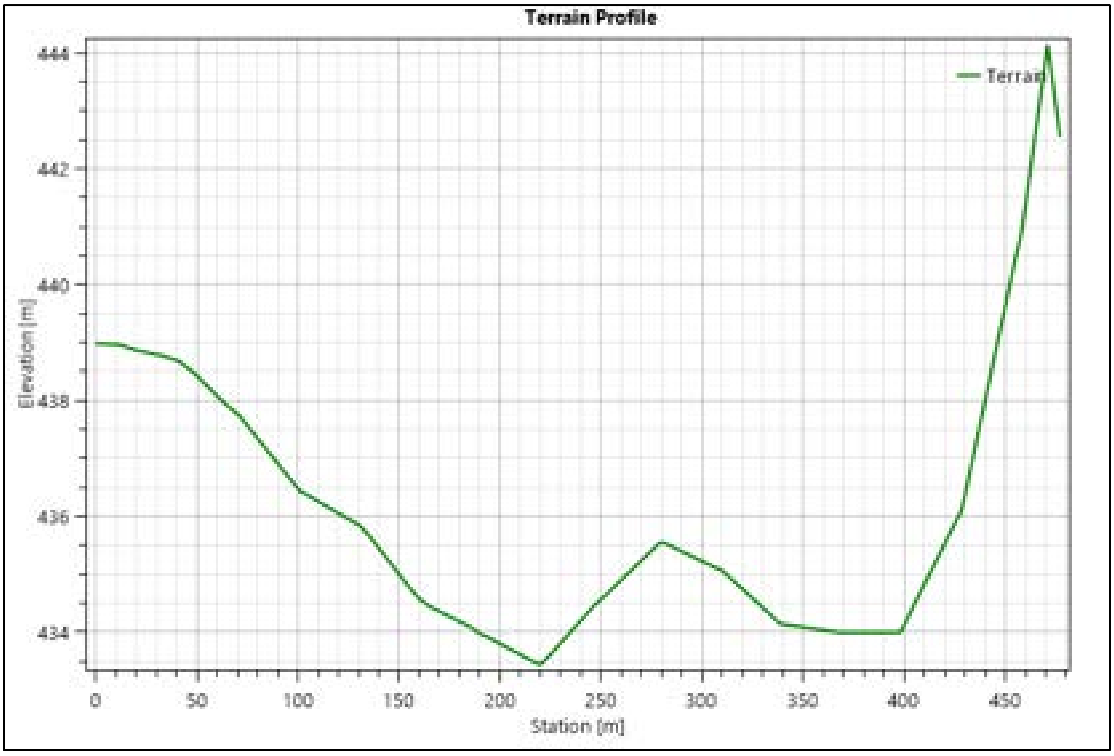

Figure 3-2: Established 1 dimensional cross section exert across the watercourse for watershed 1

A flood hydrograph 2 dimensional unsteady flow simulation was completed for the floodline delineation. Peak flow volumes were integrated from the outputs received from the Utility Programme for Drainage (Van Vuuren & Van Dijk, 2009). Based on the relevant time of concentration values derived for the watercourse considered in this study, design storm events were calculated and simulated.

Following the completion of the simulation, discharge volumes at the prescribed 500 m cross section upstream were utilised to calibrate the model to be in line with the calculated peak flows as per Section 3.2.6 of this report. For watershed 1 and 2 the calculated peak flows were inserted into the watercourse in order to model the inundation boundary. For watershed 3 a rain on grid model was then used where rainfall was modelled over the whole catchment and concentrated at the project area, revealing the flood extent. An example of the discharge rates and specified design flood hydrograph at the point in the watercourse the powerline crosses are presented in Figure 3-3. Following the completion of the simulation and calibration of the model, flood inundation extents were calculated and exported as presented in the results section of this study.

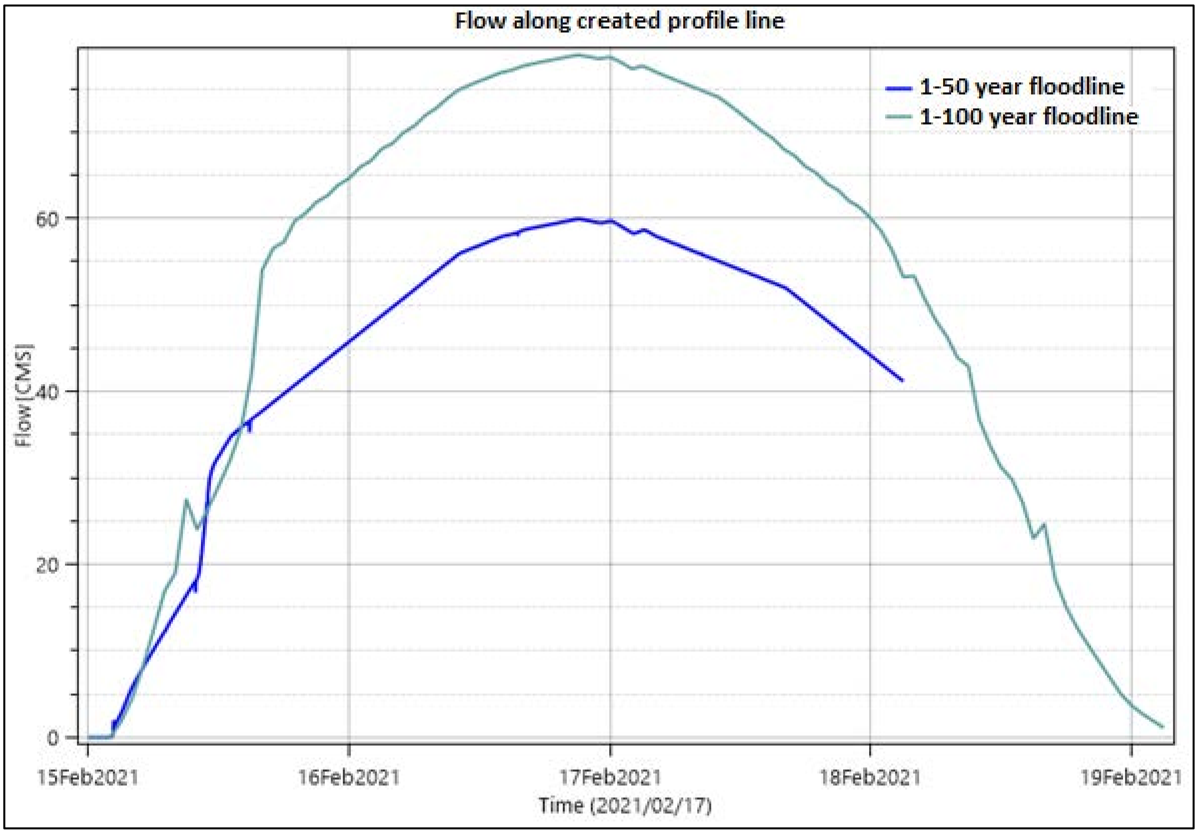

Figure 3-3: Design flood hydrograph across watercourse for the 1-50 and 1-100 year floodline for watershed 1 (February 2021)

4 Limitations and Assumptions

The following limitations are applicable:

- It is assumed that all information received from the client and associated specialists is relevant and correct;
- No riparian areas were available for the master layout/sensitivity map for defining watercourse extent which is then inferred from the delineated floodline. It is however not known if the riparian extent would be more extensive;
- No storage facilities (dams) or other hydraulic structures (bridges culverts, etc) were modelled upstream or downstream of the project area, due to restricted access which is required to gather the necessary data;
- No flood protection infrastructure were modelled;
- The floodline presented should only be used for indicative and environmental planning purposes, and not for detailed engineering designs, unless signed off by a suitably qualified and registered engineer;
- The floodline presented must only be considered within the 500m regulated area up and downstream of the three rearing facility as this is the location where the flow hydrographs were calibrated and therefore represents the most accurate flood extent;
- No detailed contour data (<1m) was available for the modelling of the catchment areas and watercourse channels considered in this study; and

- The floodline areas modelled in this assessment should be interpreted with caution given the overall low resolution elevation data utilised.

5 Catchment Description

5.1 Hydrological Setting

The project area is situated within the Olifants Water Management Area (WMA 2) within the B90B quaternary catchments. The quaternary catchments have been further divided into three by DHSWS (Figure 5-1). The proposed powerline crosses from B90B1 catchment in the south into the B90B2 catchment in the north.

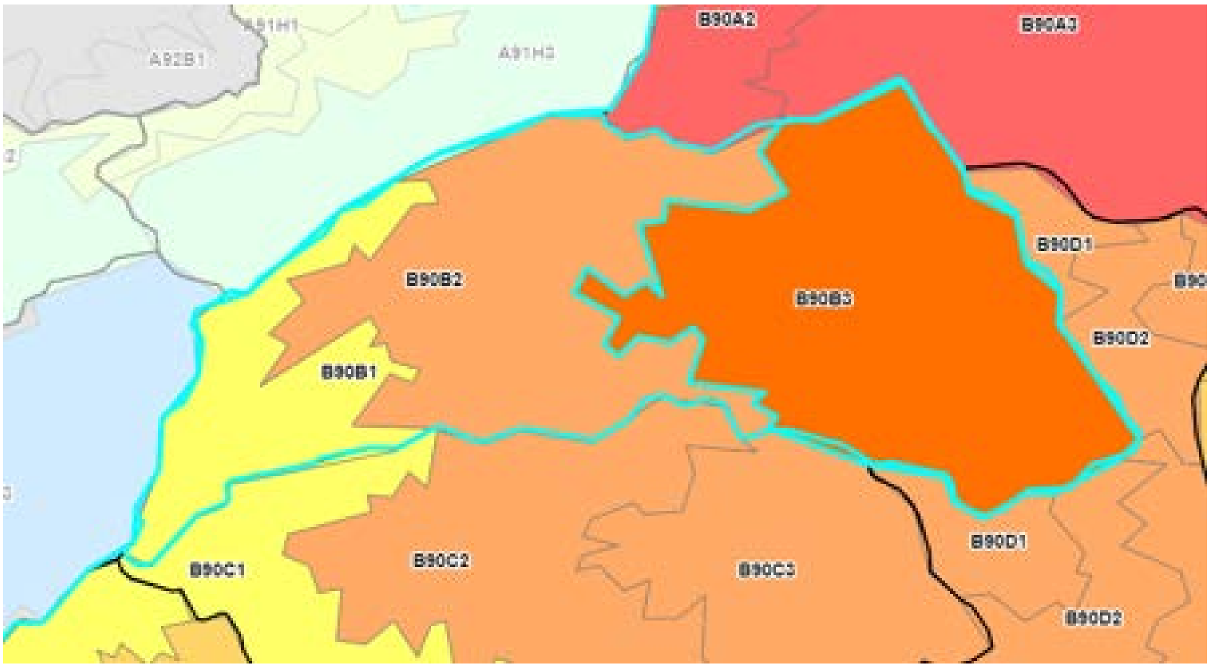

Figure 5-1: Division of quaternary catchments by DHSWS (2021)

The old WMA's were combined however for a more comprehensive understanding of the hydrological setting, the old WMA should be considered, with the project situated within the old Luvuvhu and Letaba WMA. According to StatsSA (2010), the Luvuvhu and Letaba WMA lies entirely within the Limpopo Province which borders on Botswana, Zimbabwe, and Mozambique. Economic activity is predominantly irrigation, afforestation, tourism and informal farming, with over 90% of the area's population live in rural communities. Surface water predominantly originates in the mountainous areas and is regulated by dams in the upper and middle reaches of the rivers. Water transfers take place from Letaba to neighbouring WMAs, including some inter-catchment transfer schemes. Population growth is expected to be moderate, however less than 1% per annum. Activities such as mining are expected around Tzaneen and Gravelotte, however no dramatic increase in water use requirements are expected in other areas of development. According to StatsSA (2010), the predicted water balance for the WMA in 2020 in -26 million m^3/annum. Potential for development is estimated at 42 million m^3/annum, which the raising of the Tzaneen Dam wall, and the construction of the Nwamitwa Dam.

At a localized scale the delineated catchment was defined around the watercourses of concern for the proposed powerline. The powerline diversion sections cross an un-named river in the south along with 2 tributaries of the Mphongolo River. The sections/ reaches of these rivers which are of concern is the B90B-00082 Sub Quaternary Reach (SQR) of the Mphongelo River and the B90B-00099 SQR of the un-named river.

Desktop information for the listed SQR's was obtained from DHSWS (2021). The B90B-00082 SQR spans 25.51 km of the Mphongelo River with a Present Ecological State (PES) category classed as largely modified (class D) with a moderate ecological importance and sensitivity (Table 5-1). The moderately modified state of the reach was due to impacts to instream habitat, wetland and riparian zone continuity, flow modifications and moderate potential impacts on physio-chemical conditions (water quality). The sources of modification in the reach are grazing / trampling and vegetation removal on a large scale. The reach experiences further modification from abstraction, runoff/effluent from agricultural lands and urban areas and roads causing algal growth, erosion and sedimentation, inundation, large dams on a moderate scale. Small scale modification results from low water crossings, nature reserves and small farm dams.

The B90B-00099 SQR spans 27.04 km of the un-named river with a PES category classed as moderately modified (class C) with a moderate ecological importance and sensitivity (Table 5-1). The moderately modified state of the reach was due to impacts to instream habitat, wetland and riparian zone continuity, flow modifications and moderate potential impacts on physio-chemical conditions (water quality). The sources of modification in the reach are predominantly erosion which is caused by changes in flow from abstraction and runoff/effluent from urban areas, roads and agricultural lands. Other sources of modification include sedimentation, grazing / trampling and vegetation removal.

Table 5-1: Summary of the Present Ecological State of the SQRs associated with the Mphongolo and un-named river reaches (DHSWS, 2021)

B90B-00082	
River Name	Mphongelo River
Reach length	25.51
Stream Order	2
Present Ecological Status	Largely Modified (class D)
Ecological Importance	Moderately
Ecological Sensitivity	Moderately
Default Ecological Category	C
B90B-00099	
River Name	Un-named
Reach length	27.04
Stream Order	1
Present Ecological Status	Moderately Modified (class C)
Ecological Importance	Moderate
Ecological Sensitivity	Moderate
Default Ecological Category	C

5.2 Topography and Drainage

The topography of the three watersheds vary greatly with the topography of watershed 1 varying from 538 metres above mean sea level (mamsl) in the south west to 434 mamsl at the powerline diversion; watershed 2 varying from 461 metres above mean sea level (mamsl) in the south to 419 mamsl at the powerline diversion; watershed 3 varying from 497 metres above mean sea level (mamsl) in the west to 426 mamsl at the southern end of the powerline diversion. All three catchments upstream of the powerline diversions are considered to have a gentle gradient with an average catchment slope of approximately 1.0%, 2.2%, 1.3% respectively, indicating a flat topography in the majority of the catchment area (Figure 5-5, Figure 5-6, Figure 5-7). The river profile indicates a gentle slope of the watercourse with the scale perceptive when the diagrams are considered (Figure 5-2, Figure 5-3, Figure 5-4). The small inconsistencies in the profile indicate either pooling areas or discrepancies in the river path. All details pertaining to river gradient and relevant stream lengths are provided in Table 5-6.

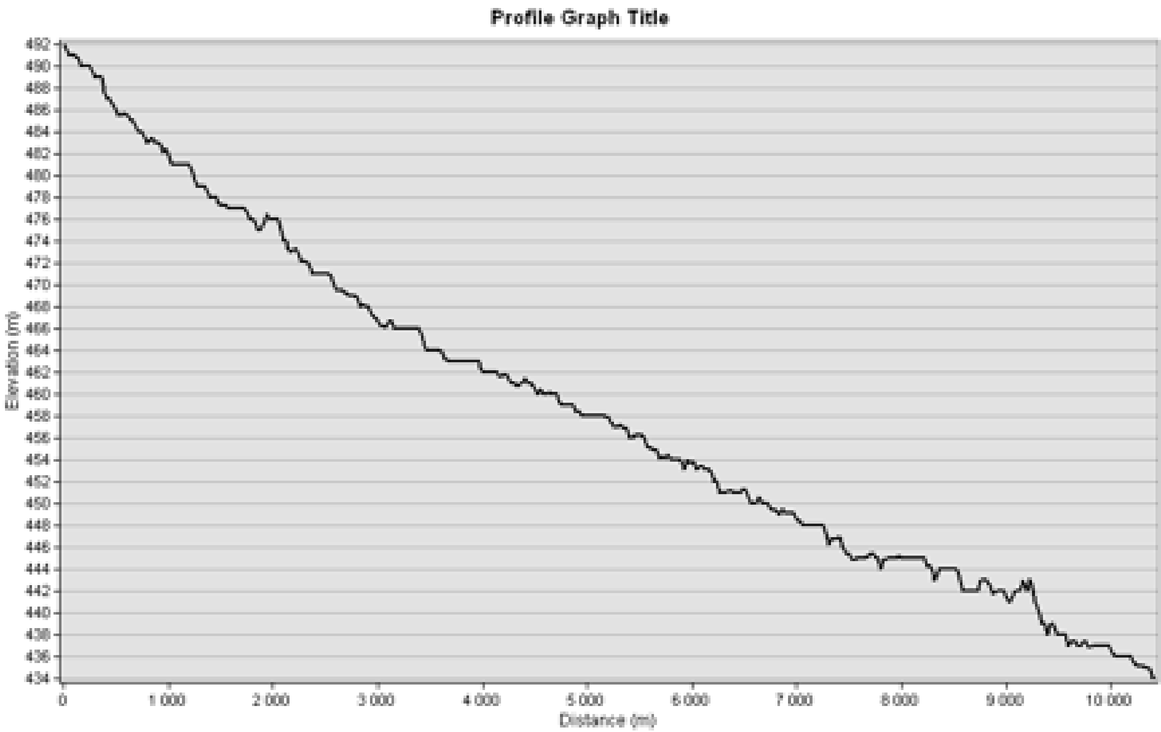

Figure 5-2: River profiles upstream of the modelled watercourse at Deviation 1 (February 2021)

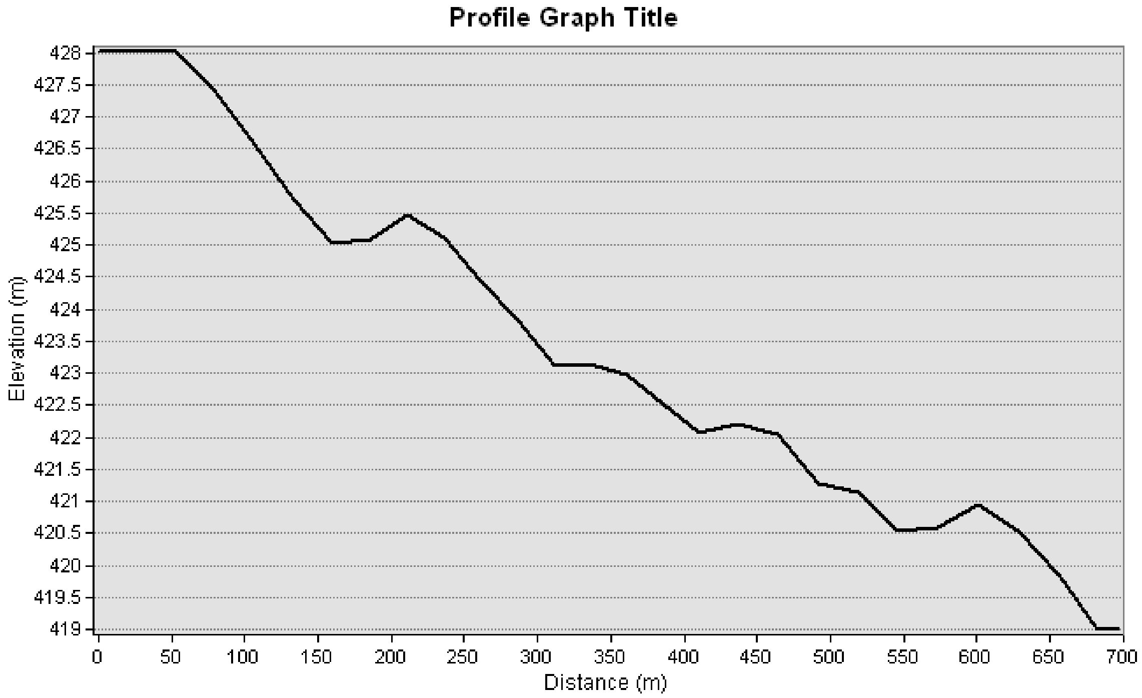

Figure 5-3: River profiles upstream of the modelled watercourse for Deviation 2 (February 2021)

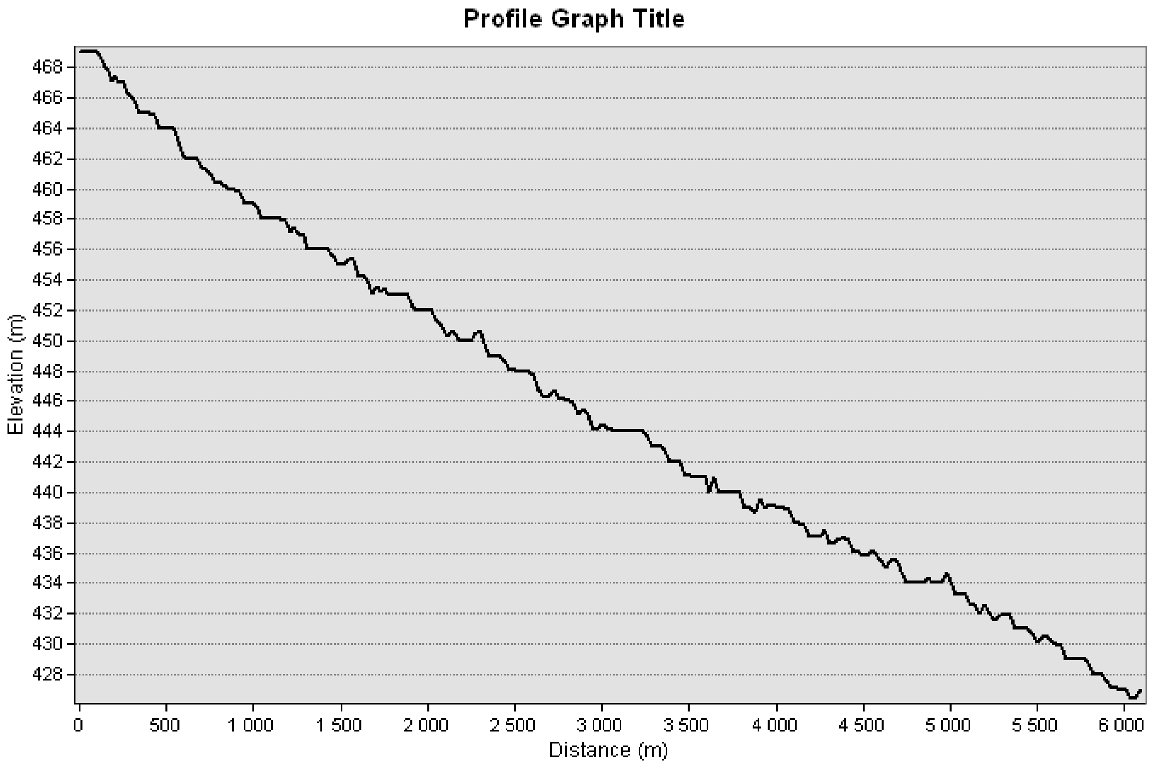

Figure 5-4: River profiles upstream of the modelled watercourse for deviation 3 (February 2021)

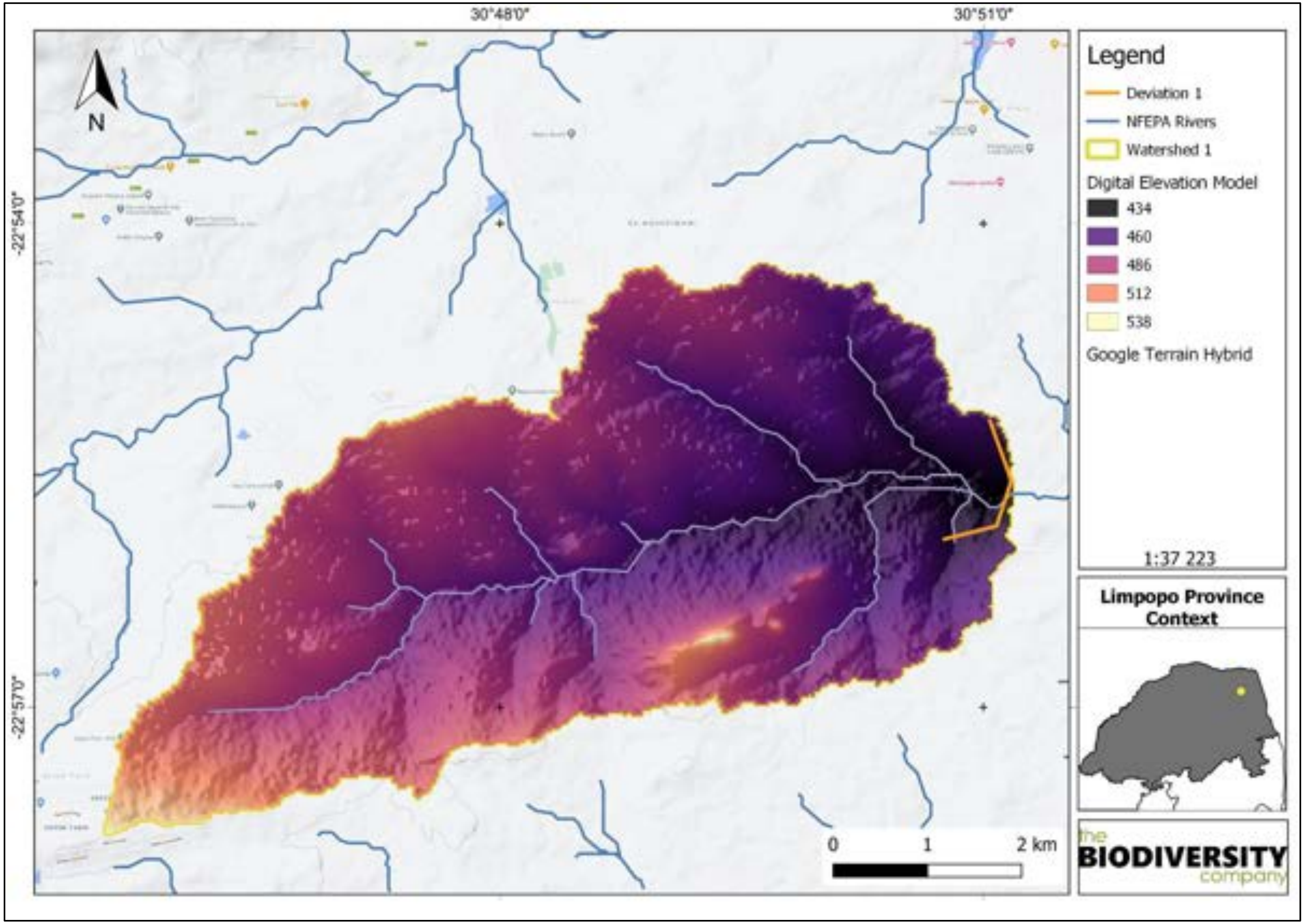

Figure 5-5: Digital Elevation Model for the modelled watercourse for deviation 1 (February 2021)

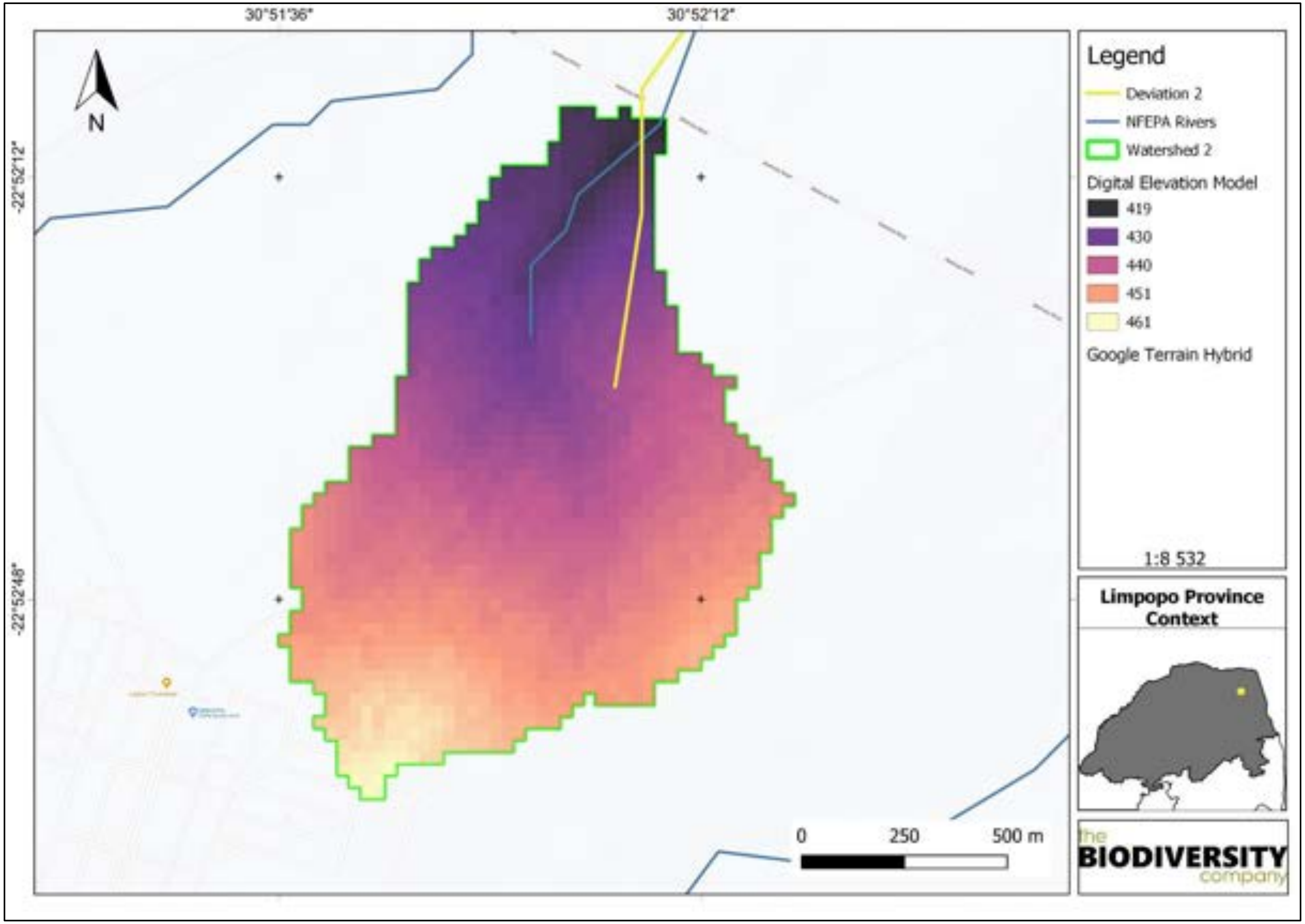

Figure 5-6: Digital Elevation Model for the modelled watercourse for deviation 2 (February 2021)

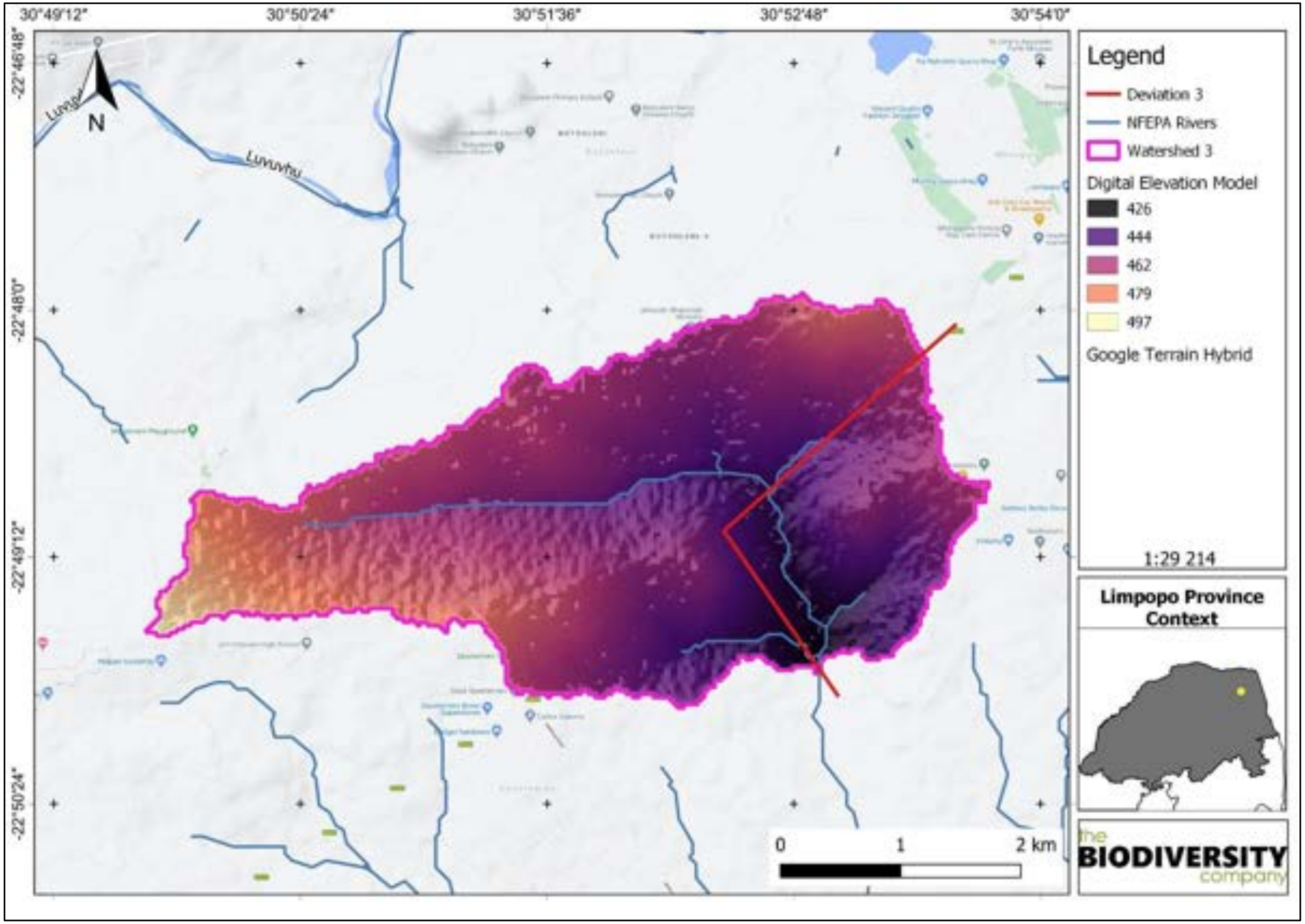

Figure 5-7: Digital Elevation Model for the modelled watercourse for deviation 3 (February 2021)

5.3 Rainfall

The selected weather station for the project area is the Nandoni Dam Evaporation (A9E004) station located 29 km west of the project area in the adjacent catchment (A91F) to the west, which has data from 2006 to present. This data was considered to have an applicable temporal and spatial scale for the project area. This data was then compared to the established rainfall data provided in the Water Resources of South Africa, 2012 study (Water Resources of RSA, 2012).

The nearest town of the project area is the Louis Trichardt which is 100km west. Louis Trichardt which is 990 m above sea level experiences a warm temperate climate. The area receives summer rainfall with limited winter rainfall. The climate of Louis Trichardt can be classified as Cwb by the Köppen-Geiger climate classification. The average temperature is 18.7 °C with a Mean Annual Precipitation of 793 mm. The mean monthly rainfall is indicated in Figure 5-8. The wettest month occurs in January during the height of the summer whilst July is the driest month in winter with 2.5 mm. The rainfall for the specific catchment the project falls in the B90B1 and B90B2 catchments which is represented in (Figure 5-9). This diagram indicates the average rainfall attained from historic data for the period of 1975 to 2006 which shows an MAP (Mean Annual Precipitation) of 614.12 mm and 541.03 mm with a projected 4.6% and 5.3% decrease by 2045 for the B90B1 and B90B2 catchments respectively.

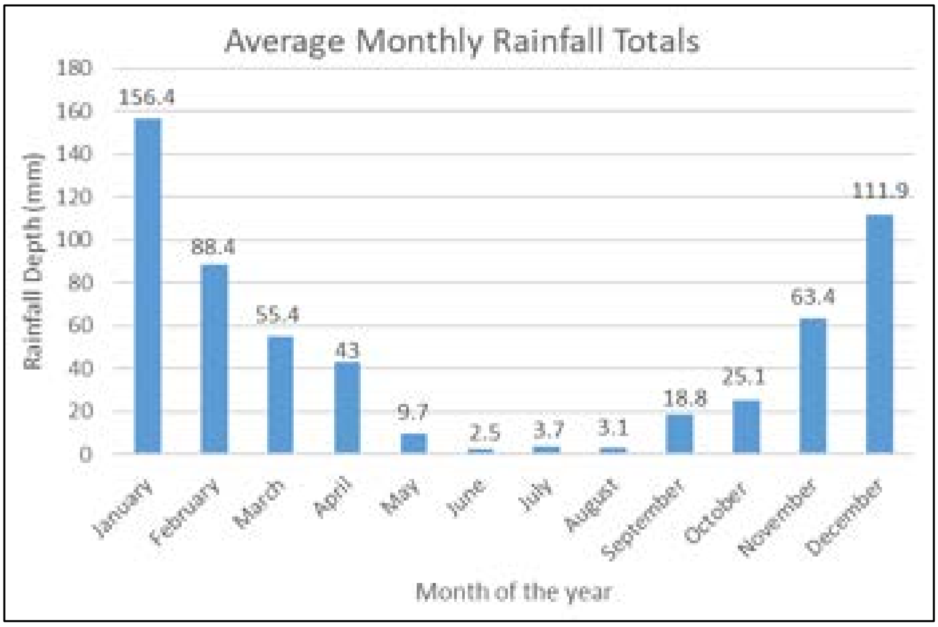

Figure 5-8: Total annual rainfall per month for the project area (DHSWS, 2021)

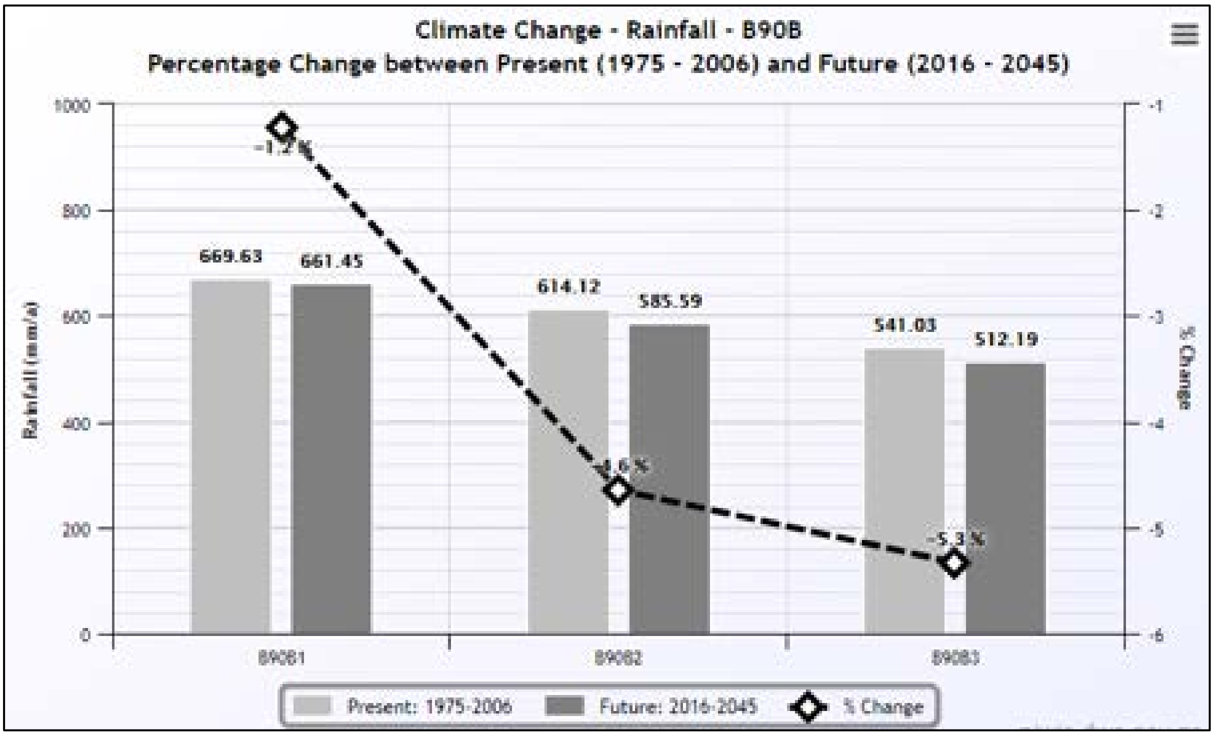

Figure 5-9: Rainfall change for the B90B catchment (DHSWS, 2021)

5.4 Storm Rainfall Depths

The storm rainfall depths for the centre position of the project area were extracted from the Design Rainfall Estimation in South Africa software programme (Smithers and Schulze, 2002). The programme uses the six closest rainfall stations for the specified project area. The rainfall stations used for this project area are indicated in Table 5-2. The gridded storm rainfall depths for the contributing catchment at the various return periods and storm durations are indicated in Table 5-3.

Table 5-2: Six closest rainfall stations to the project area (Design Rainfall Estimation in South Africa (version 3), 2021)

Station Name	Station No.	Distance (Km)	Record (Years)	Latitude	Longitude	Map (Mm)	Altitude (Mamsl)
BOLTMAN	0724361_W	21.7	49	23°01'S	30°43'E	595	571
PUNDA MILIA	0768011_W	28.5	70	22°41S	31°01'E	589	540
GOOLDVILLE HOSPITAAL	0766863_A	34.6	37	22°53S	30°29'E	1077	710
SIBASA	0766837_W	37.6	87	22°56S	30°28'E	928	705
SHANGONI	0724790_W	38.8	41	23°10S	30°56'E	539	420
RAMBUDA	0766827_W	43.5	45	22°47S	30°24'E	1034	720

Table 5-3: Storm Rainfall Depths for the Catchment(Design Rainfall Estimation in South Africa (version 3), 2021)

Storm Duration	Return Period / Storm Rainfall Depth (mm)						
min / hr / day	1:2 yr	1:5 yr	1:10 yr	1:20 yr	1:50 yr	1:100 yr	1:200 yr
5 min	8.2	11.6	14	16.3	19.5	22	24.6
10 min	13.5	19.1	23	26.9	32.1	36.3	40.5

Storm Duration	Return Period / Storm Rainfall Depth (mm)						
15 min	18.1	25.6	30.8	36	43	48.6	54.3
30 min	25.3	35.7	43	50.2	60	67.8	75.7
45 min	30.7	43.4	52.2	61	73	82.3	92
1 hr	35.2	49.8	59.9	70.1	83.8	94.5	105.7
1.5 hr	42.8	60.5	72.8	85.1	101.8	114.9	128.4
2 hr	49.2	69.5	83.6	97.7	116.8	131.9	147.4
4 hr	56.8	80.3	96.6	112.9	135	152.4	170.3
6 hr	61.8	87.4	105.2	122.9	147	165.9	185.4
8 hr	65.7	92.8	111.7	130.5	156.1	176.1	196.8
10 hr	68.8	97.2	117	136.8	163.5	184.5	206.2
12 hr	71.5	100.9	121.5	142.1	169.8	191.7	214.2
16 hr	75.9	107.2	129.1	150.9	180.3	203.5	227.5
20 hr	79.5	112.3	135.2	158	188.9	213.2	238.3
24 hr	82.6	116.7	140.5	164.2	196.3	221.5	247.6
1 day	70.5	99.6	119.9	140.2	167.6	189.1	211.4
2 day	88.5	125	150.5	175.9	210.3	237.3	265.2
3 day	101	142.7	171.8	200.8	240.1	271	302.8
4 day	110.6	156.2	188.1	219.8	262.8	296.6	331.5
5 day	118.6	167.5	201.7	235.8	281.9	318.1	355.5
6 day	125.6	177.4	213.6	249.7	298.5	336.8	376.5
7 day	131.8	186.2	224.2	262	313.3	353.5	395.1

5.5 Evaporation

The DHSWS (2021) hydrological database was consulted for the S Class Pan evaporation rates which revealed a Mean Annual Evaporation (MAE) of 1458 mm for the project area, with monthly evaporations represented in Figure 5-10. This was then compared to the DHSWS (2021) National Integrated Water Information System was consulted for potential evaporation rates. The watercourses considered for the assessment falls with the B90B quaternary catchment which have average potential evaporation as well as modelled future changes as represented in Figure 5-11. This indicated a 2163.23 mm/a and 2186.70 mm/a evaporation rate for the B90B1 and B90B2 catchments along with a projected 8.8% and 8.7% future increase by 2045, respectively. This data was also compared to that of the Water Resources of South Africa, (2012) study.

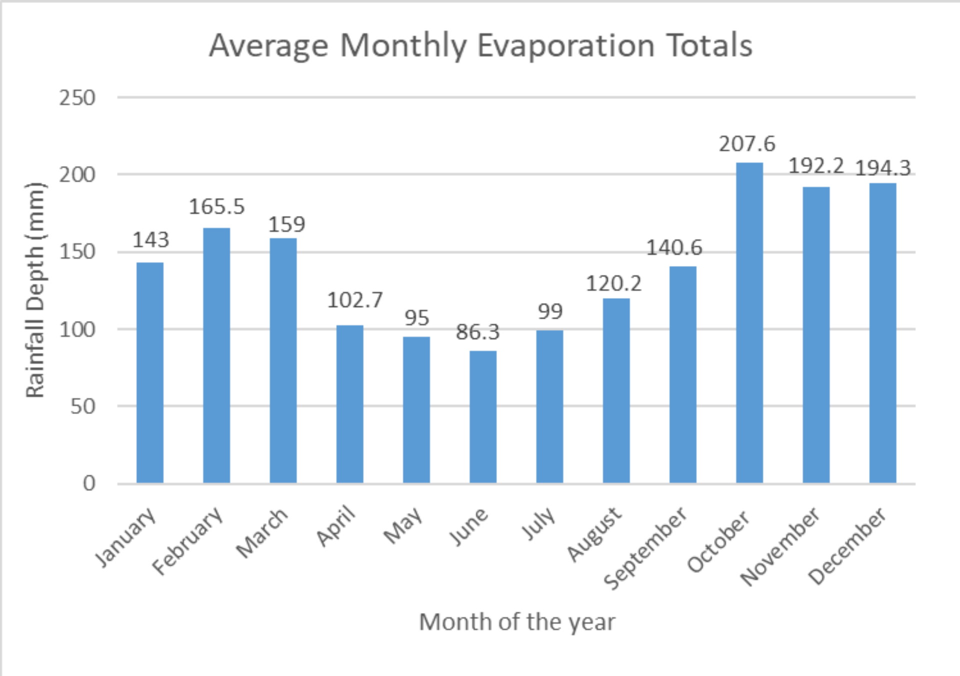

Figure 5-10: Total annual evaporation per month for the project area (DHSWS, 2021)

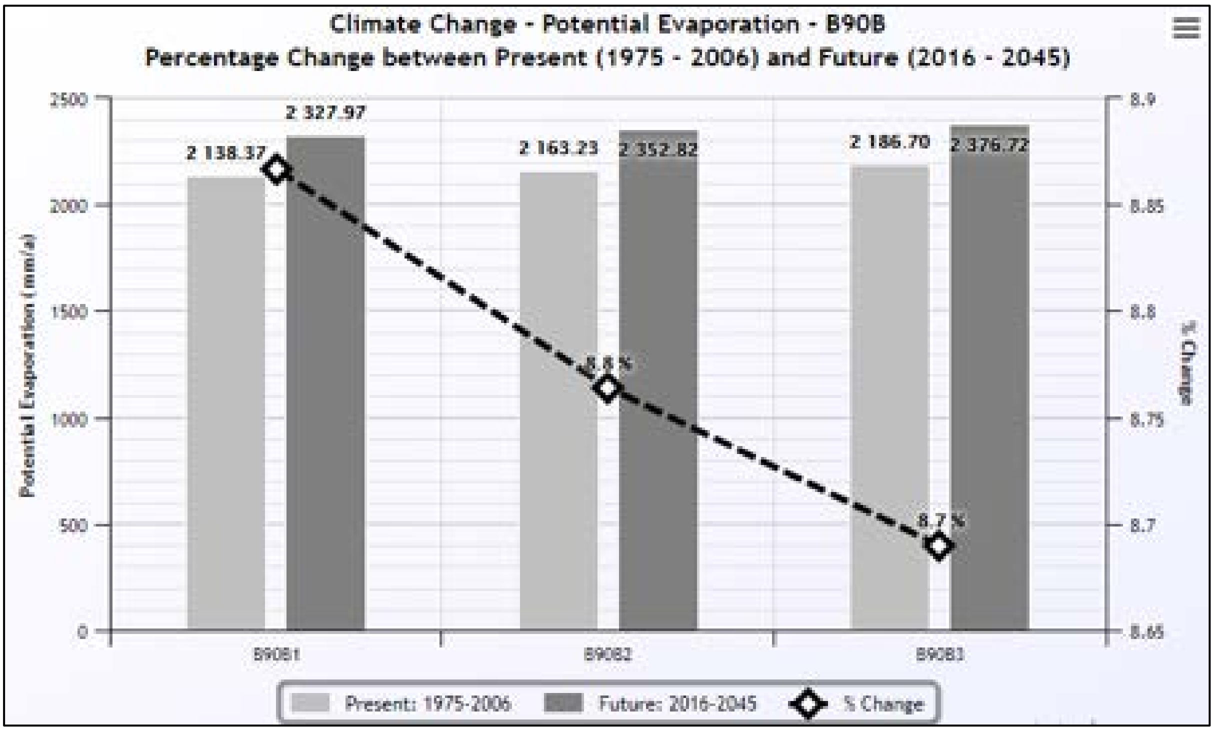

Figure 5-11: Potential Evaporation change for the B90B catchment (DHSWS, 2021)

5.6 Mean Annual Runoff

Mean Annual Runoff (MAR) was considered for the watercourses associated within the B90B quaternary catchment. This data represents an average for a 31 year recorded period from 1975 to 2006 and while it won't provide a peak flow for any particular system it will contextualise calculated peak flows. The streamflow and predicted change for these catchments are represented below in Figure 5-12. The proposed powerline crosses the B90B1 and B90B2 catchments. The northern tributary of the Mphongolo River at deviation 1 forms part of the B90B2 catchment, while the southern tributary of the Mphongolo River and the un-named river form part of the B90B1 catchment. Catchment B90B1 has an average streamflow of 152.16 m^3/s for the 31-year period with a projected 30.6 % decrease by 2045. Catchment B90B2 has an average streamflow of 142.83 m^3/s for the 31-year period with a projected 29.9 % decrease by 2045. The MAR data was compared to that provided in the Water Resources of South Africa, (2012) study and deemed relevant.

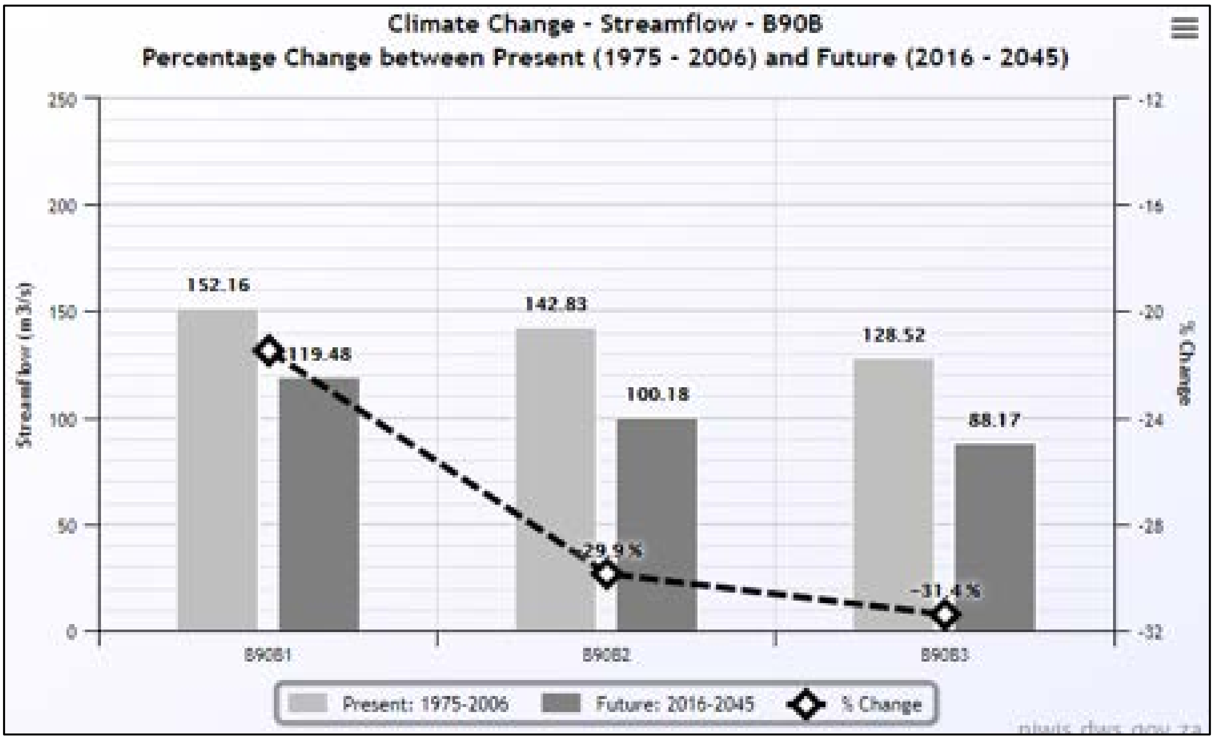

Figure 5-12: Current Streamflow and predicted change for the B90B catchment (DHSWS, 2021)

5.7 Land Cover Soil and Geology

The proposed powerline diversion areas have been grouped into the Area of Interest (AOI). A total of 37 of the 73 land cover macro classes are located in the AOI (Thompson, 2019). These were then grouped into appropriate classes for simplification as well as according to landuse types required by the Drainage utility program for calculation peak flows.

The dominant land cover type in each catchment varied. In watershed 1 it was derived to be Forestry, Woodlands and Thickets (65.72%) followed by Cultivation and Livestock (16.77%). In watershed 2 it was derived to be Cultivation and Livestock (63.84%) followed by Forestry, Woodlands and Thickets (20.99%). In watershed 3 it was derived to be Forestry, Woodlands and Thickets (55.98%) followed by Cultivation and Livestock (28.46%). Considering the findings of the land cover assessment, the majority of the landcover in all three catchments has been modified by primary activity however much of the landuse is still considered to be natural. The remaining landuse types and percent coverage is represented in Table 5-4 and Figure 5-13.

Table 5-4: Catchment land-use by area and percentage

Land Cover Class	Km²	Percentage Cover (%)	Km²	Percentage Cover (%)	Km²	Percentage Cover (%)
	Watershed 1		Watershed 2		Watershed 3	
Forestry, Woodlands and Thickets	23.27	65.72	0.27	20.99	8.32	55.98
Cultivation and Livestock	5.94	16.77	0.83	63.84	4.23	28.46
Grassland and Shrubland	0.78	2.21	0.15	11.45	0.20	1.34
Urban/Built up	4.40	12.42	0.0007	0.06	1.91	12.84
Watercourses	0.49	1.39	0.01	1.08	0.17	1.16
Bare	0.53	1.51	0.03	2.59	0.03	0.21
Total	35.40	100	1.30	100	14.87	100

Soils are a key natural regulator of catchment hydrological response due the capacity that soils have for absorbing, retaining, and releasing water (Schulze, 1989). The Soil Conservation Services (SCS) hydrological soil classes of the catchment are presented in Figure 5-14. The SCS hydrological soil classes represented are uniform across the area of interest (AOI) with class C soils dominant across all three catchments (Table 5-5). Therefore, the soils in the AOI are a sandy clay loam with moderately fine to fine structures causing low infiltration rates when wet.

Table 5-5: Soil Conservation Services Hydrologic Soil Class Interpretation (SANRAL, 2013 & Bosznay 1989)

Class	Description
Class A	Sand, loamy sand or sandy loam types of soils. It has low runoff potential and high infiltration rates even when thoroughly wetted. They consist chiefly of deep, well to excessively drained sands or gravels and have a high rate of water transmission.
Class B	Silt loam or loam. It has a moderate infiltration rate when thoroughly wetted and consists chiefly or moderately deep to deep, moderately well to well drained soils with moderately fine to moderately coarse textures.
Class C	Soils are sandy clay loam. They have low infiltration rates when thoroughly wetted and consist chiefly of soils with a layer that impedes downward movement of water and soils with moderately fine to fine structure.
Class D	Soils are clay loam, silty clay loam, sandy clay, silty clay or clay. This HSG has the highest runoff potential. They have very low infiltration rates when thoroughly wetted and consist chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a claypan or clay layer at or near the surface and shallow soils over nearly impervious material.

The soils of the AOI are comprised of Ae328, Fb496 and Bd56 landtype (Figure 5-16). Watershed 1 is composed of Ae328 (98.34%) and Fb496 (1.66%), Watershed 2 is composed of Ae328 and Watershed 3 is composed of Bd56. Ae328 soils are comprised of Mispah (Ms10) in the A horizon and Shorrocks (Hu36) in the B horizon. Fb496 soils are comprised of Glenrosa (Gs15), Robmore (Gs18), Mispah (Ms10) and Shorrocks (Hu36) in the A horizon and Lindley (Va41) and Shorrocks (Hu36) in the B horizon. Bd56 soils are comprised of Wasbank (Wa21), Devon (We22), Klipfontein (Ms11), Glendale (Sd21), Makatini (Hu37) and Sibasa (We13) in the B horizon (Geoterraimage. 2015).

These above soil types belong to S2, S8 and S13 soil classes (Figure 5-15). Watershed 1 is composed of S2 (98.34%) and S13 (1.66%), Watershed 2 is composed of S2 and Watershed 3 is composed of S8. S2 soils are freely drained, structureless soils with favourable physical properties. These soils may have restricted soil depth, excessive drainage, high erodibility and low natural fertility. S8 soils are imperfectly drained soils, often shallow and often with a plinthic horizon which remain with relative wetness favourable in dry areas. S13 soils are lithosols (shallow soils on hard or weathering rock) with favourable physical properties but may have restricted soil depth, excessive drainage, high erodibility and low natural fertility.

The soil patterns of the AOI fall within three types namely LP2, CM and PT2 (Figure 5-17). Watershed 1 is composed of CM (98.34%) and LP2 (1.66%) patterns, Watershed 2 is composed of the CM pattern and Watershed 3 is composed of the PT2 patterns. CM soils are red-yellow in colour, well drained, massive or weakly structured soils with high base status. LP2 soils have limited pedological development, are usually shallow as they form on hard or weathering rock forming intermittent with lime in the landscape. PT2 soils are red, yellow and /or greyish soils with high base status and a plinthic horizon (Land Type Survey Staff. 1972 – 2006).

The geological units of the three catchments are outlined in Figure 5-18. The oldest rocks of the region are found in the south of the AOI in watershed 1 and 2 which are the Goudplaats-hout gneiss. The Goudplaats-hout gneiss forms the basement metamorphosed granites (granitoid gneisses). They range in age from 3600 to 3200 Ma with a structure which range from massive to layered, leucocratic to dark grey and vary in grain size from fine grained to pegamatoidal (Dippenaar & van Rooy., 2014).

Watershed 1 also contains 2% of Giyani greenstone belt. The Giyani greenstone belt is situated in the granite-gneiss terrane of the Kaapvaal Craton located south of the high-grade Southern Marginal Zone (SMZ) of the Limpopo Belt. The Giyani belt is completely enveloped by granite gneiss, which is largely migmatitic, and by the granites the latter clearly postdating the greenstones. The relationship between the belt and the surrounding gneiss is not clear, although it is suspected the Giyani belt has been transported northward onto the adjacent migmatitic gneisses (Kleywegt *et al*.,1987).

Watershed 1 is made up from the Soutpansberg Group. The Soutpansberg Group represents a volcano-sedimentary succession which is subdivided into five formations. The basal discontinuous formation is only a few metres thick, comprised of epidotised clastic sediments, including shale, greywacke and conglomerate (Brandl, 1999). The north of the catchment is comprised specifically of the Fundudzi Formation of the Soutpansberg Group. It consists of reddish, arenaceous and minor argillaceous deposits. These are essentially sandstone and quartzitic in places, locally gritty or a conglomerate with interbedded basaltic lava, tuff, shale, agglomerate and siltstone with preserved bedding. They formed from a massive rockslide event that occurred in the Soutpansberg Mountains approximately 20000 years ago, blocking the course of the eastern flowing Mutale River forming Lake Fundudzi (Chiliza & Hingston., 2019).

The exposed rock types at surface are Leucocratic biotite gneiss, granite, pegmatite and migmatite of the Swazian Erathem with diabase dykes and sills common. Sandstone, conglomerate and shale of the Fundudzi Formation, Soutpansberg Group are found in watershed 1 (Land Type Survey Staff. 1972 – 2006).

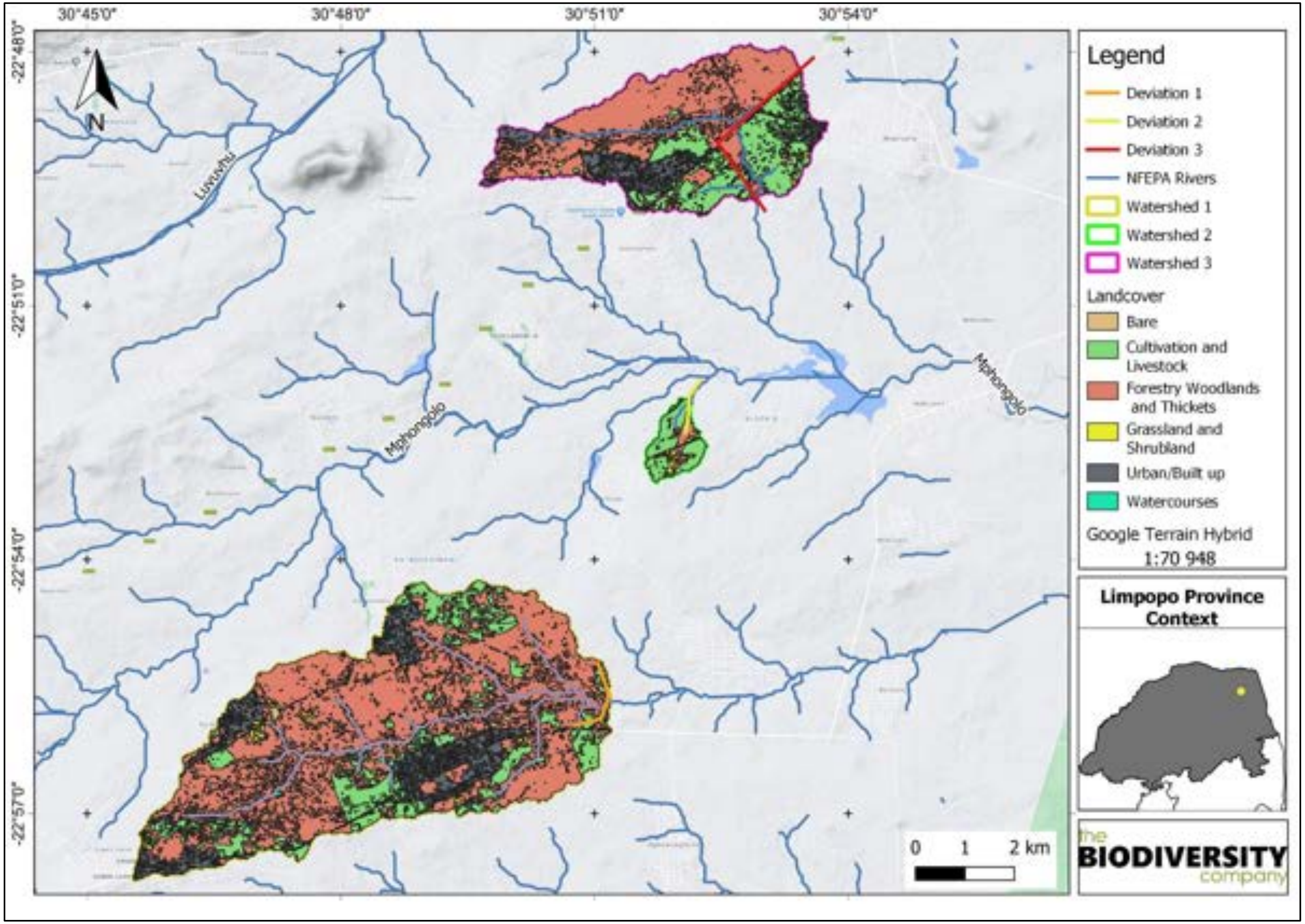

Figure 5-13: Landcover Map for the respective catchments considered in this determination (February 2021)

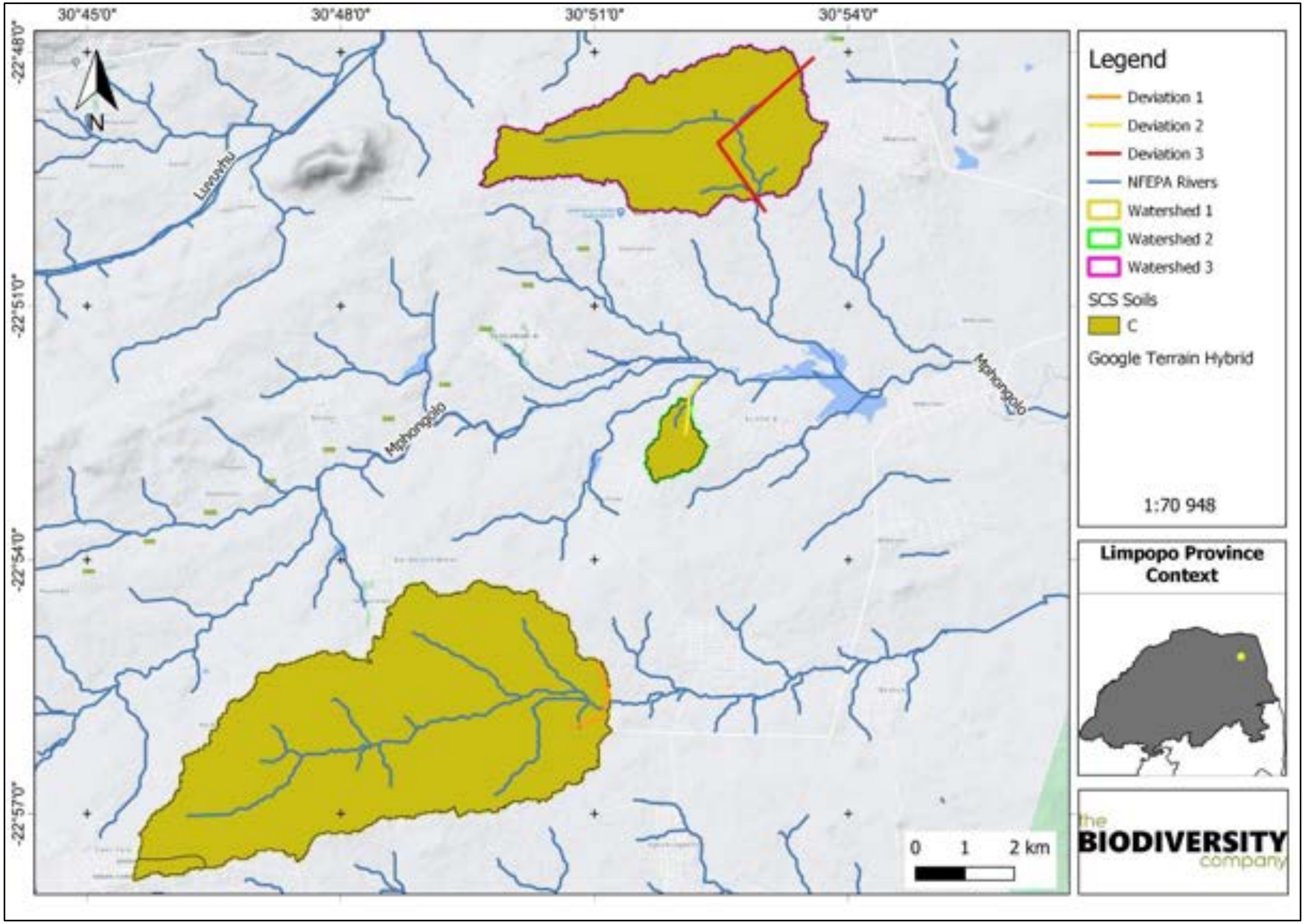

Figure 5-14: SCS hydrological soils classes for the respective watersheds considered in this determination (February 2021)

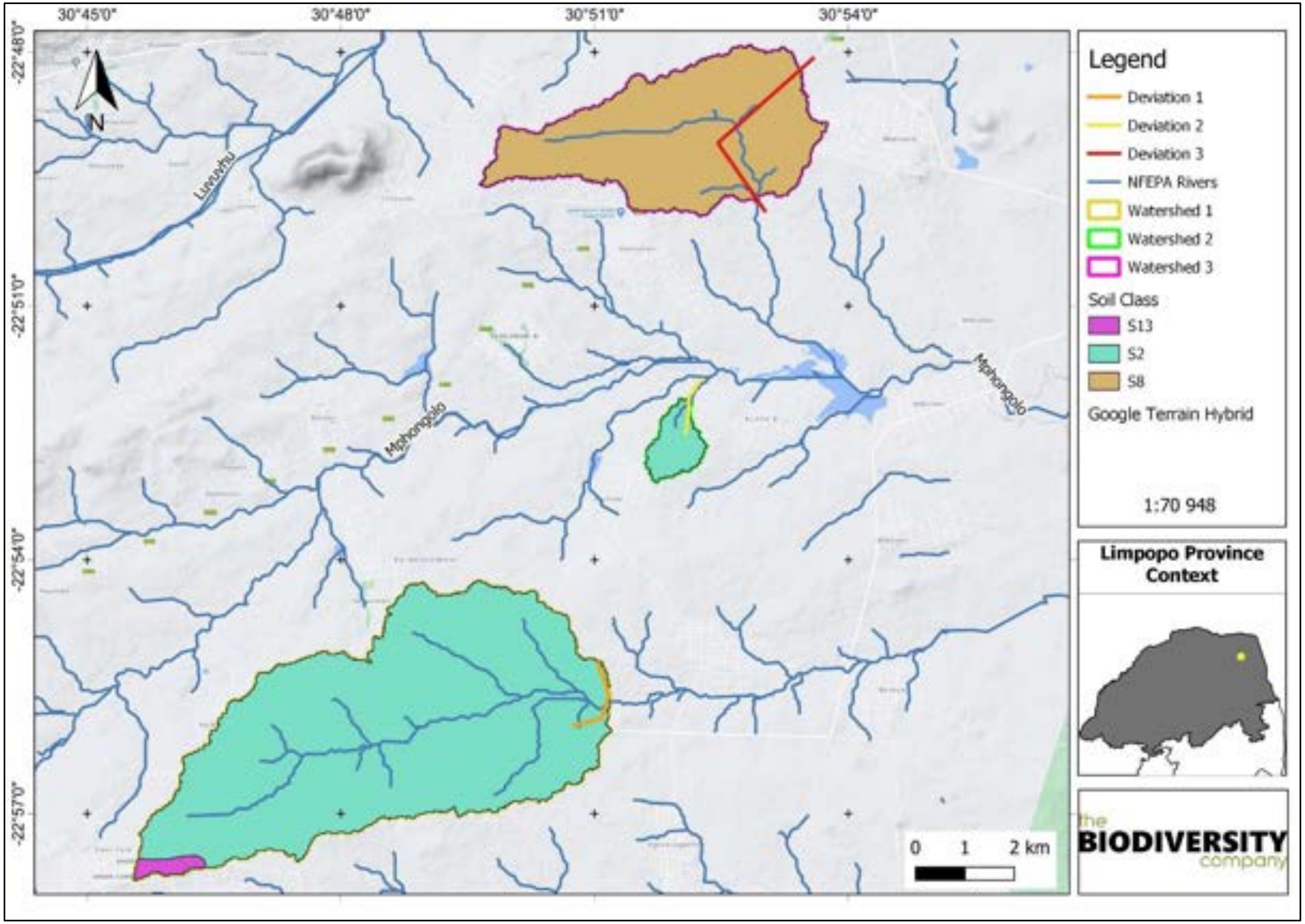

Figure 5-15: Soil classes map for the watersheds considered in this determination (February 2021)

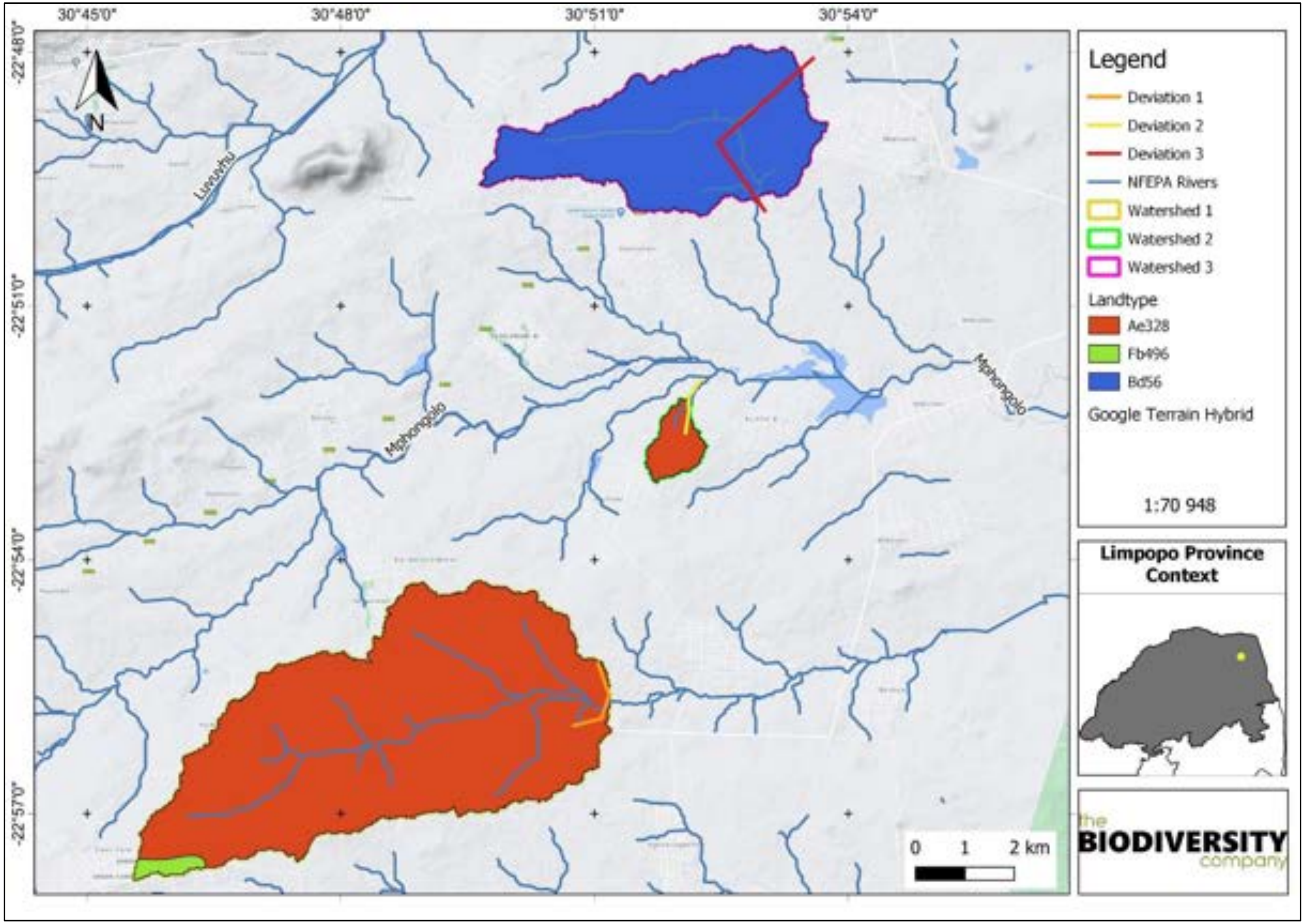

Figure 5-16: Soil type map for the watersheds considered in this determination (February 2021)

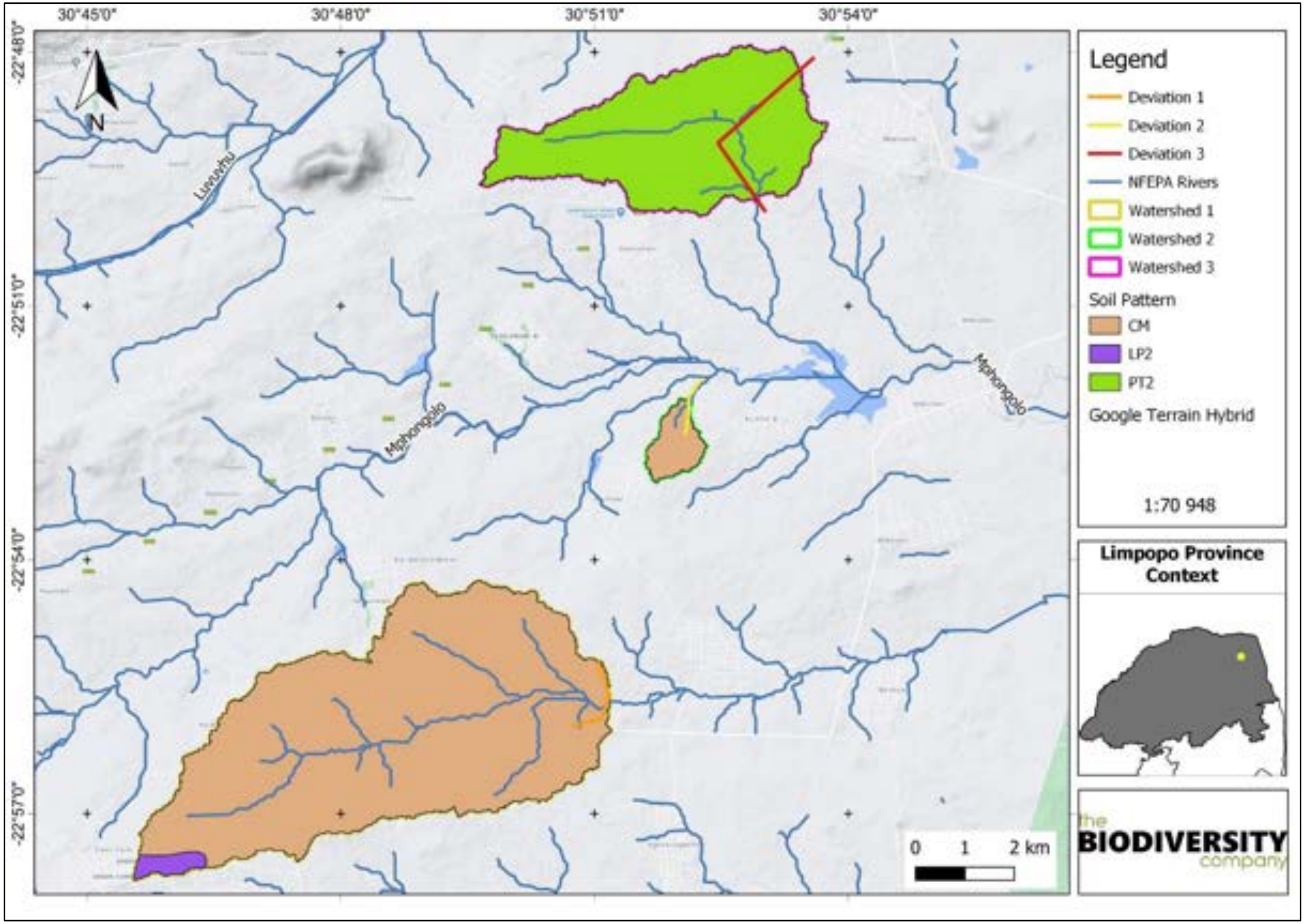

Figure 5-17: Soil patterns map for the watersheds considered in this determination (February 2021)

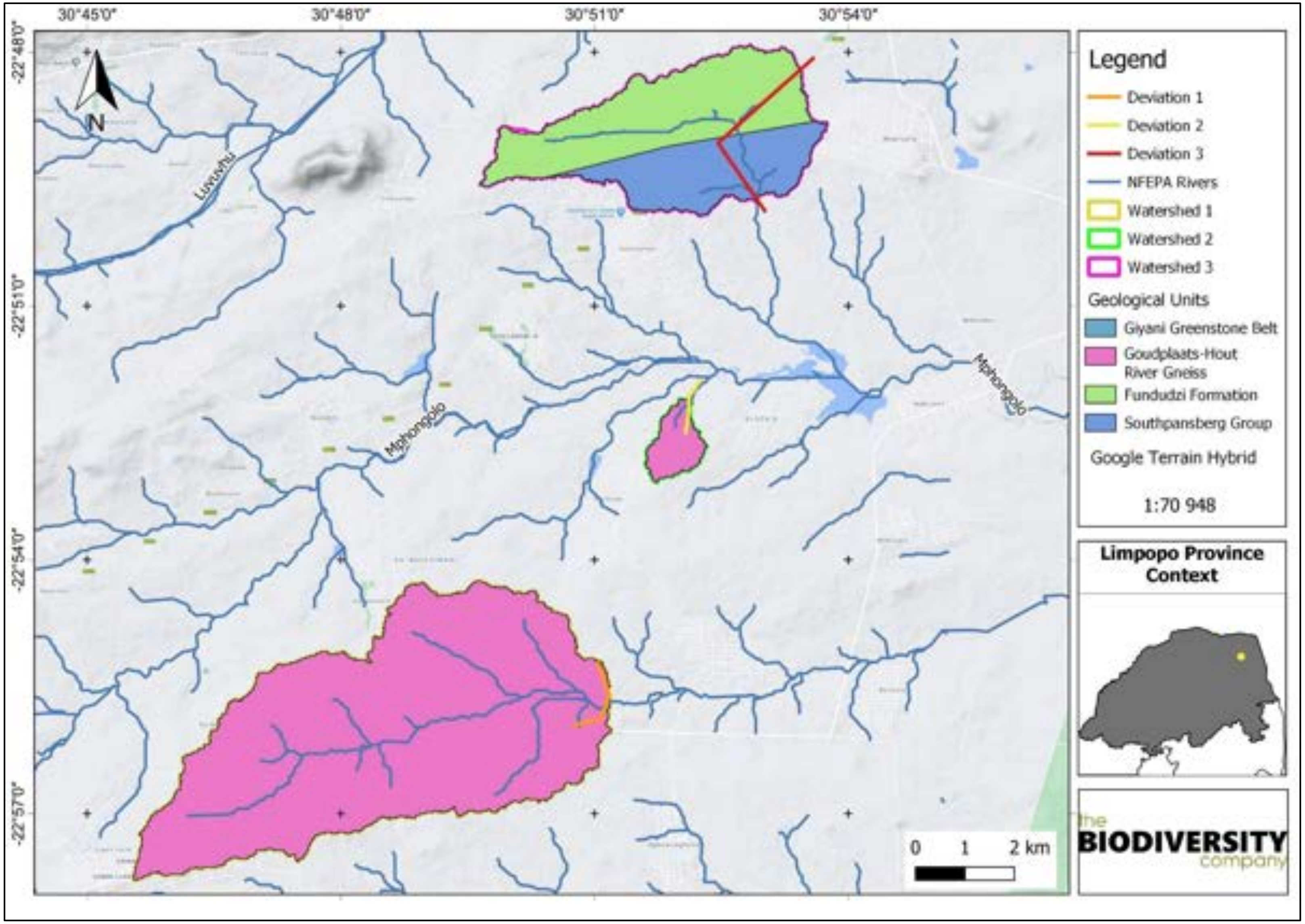

Figure 5-18: Geological map for the watersheds considered in this determination (February 2021)

5.8 River Gauging Stations

An effective method for modelling peak flows is the consideration of all available river gauging stations for observed and verified flows within the watercourse. An assessment of the available data for verified flows in the considered river systems was completed. All three watercourses are considered un-gauged systems with 2 gauging stations on alternative tributaries downstream. These stations are situated along the Shisha River (B9H001) and Shingwidzi River (B9H002). The data does not have a spatial scale which will be applicable to the project area and therefore considered irrelevant. For this reason, design flood peaks for the proposed activities were estimated using relevant regional and deterministic methods.

5.9 Manning's Roughness

The mannings roughness for natural streams with widths less than 30 m were used for the smaller watercourses instream roughness ratings (Chow, 1959). All three systems considered for the delineation are large ephemeral rivers which were dry at the time of the survey. The observed channels all have similar geomorphology with wide channels and poorly developed banks. The bed is comprised of predominately sand with some sections of cobbles. Detritus is found in the watercourse and riparian area with vegetation growing in the channel indicating intermittent flow (Figure 5-19, Figure 5-20 and Figure 5-21). Intermittent flow and riparian vegetation encroachment into the channel has occurred on a small scale. The watercourses will flow with high velocity laminar flow as a result with no pools forming. A manning's n roughness rating of 0.03 was applied to all three systems. The riparian areas were dominated by large trees and small shrubs with flood water levels deposited detritus and therefore a manning's roughness of 0.120 was used for the riparian areas. Due to the use of the Rain of Grid Model for watershed 3, the landuse layer was added to the HECRAS model with mannings roughness attributed to each individual landuse to effectively model the runoff of rain into channels which eventually reaches the project area. The assigned mannings roughness were sourced from Papaioannou *et al*., (2018).

Figure 5-19: Representation of the geomorphology of northern tributary of the Mphongelo River (December 2020)

Figure 5-20: Representation of the geomorphology of northern tributary of the Mphongelo River (December 2020).

Figure 5-21:Representation of the geomorphology of the watercourse of the un-named river (December 2020)

5.10 Peak Flow

The parameters and calculated peak flows using the peak discharge methods are summarised in Table 5-6, Table 5-7, Table 5-8 and Table 5-9 respectively, with the most appropriate peak flow for the study site presented in blue. When determining peak flow, it is pertinent that multiple methods are considered, and the hydrologists discretion is used to consider which is most appropriate. The SDF method was considered first and compared with the other methods due to its versatility as a model (SANRAL, 2013). The Standard Design Flood (SDF) model was run first as the model can achieve effective results over variable project settings, allowing for models to be simulated for any catchment size. The SDF method has modelled peak flows which occur at the upper range for the five methods (Table 5-7) used with the highest calculated peak flow, therefore considered to have overestimated the peak flow. The empirical method is used for large catchments and therefore considered inappropriate for the assessment – resulting in lowest calculated peak flow of the five methods. The unit hydrograph method is designed for catchments which range in size from 15 – 5000 km^2 and was therefore considered the most appropriate for watershed 1. The rational and alternative rational models are typically applied to catchments below 15 km^2 and therefore were considered appropriate for watershed 2 and 3 (SANRAL, 2013. The peak flows calculated by the alternative rational model was used in a conservative approach as the values were higher than the rational method and used to delineate the 1 - 50 and 1 - 100 year floodlines for the two watersheds.

Table 5-6: Parameters used to calculate Peak Flow

Method	Watershed 1	Watershed 2	Watershed 3
MAP (mm)		467	
Catchment Area (km²)	35.40	1.30	14.87
Longest Watercourse (km)	10.8	0.7	7
H0.10L (mAMSL)	444	427	462
H0.85L (mAMSL)	484	420	439
Height Difference Along 10-85 slope (m)	40	7	21
Height difference along equal area slope (m)	50	8	38
Average Slope of Longest Watercourse (m/m)	0.002		
Distance to catchment centroid (km)	6.2	0.9	4.2
Time of concentration (h)	3.2		2.49
Number of days per year thunder is heard		30	
Veld type region		8	
SDF Basin number		3	
Kovacs K-region		K5	

Table 5-7: Calculated Peak flows for the watershed 1 using the different available methods (m^3/s)

Period/Method	Rational	Rational (alternative)	Unit Hydrograph (m^3/s)	SDF	Empirical
1:2 year	23.82	28.57	12.82	5.181	-
1:5 year	33.69	50.27	20.9	30.8	-
1:10 year	44.22	68.47	29.9	55.4	32.32
1:20 year	56.49	87.94	40.79	83.72	43.87
1:50 year	75.7	114.29	59.21	126.6	60.8
1:100 year	95.89	136.52	78.51	163.01	76.96

Table 5-8: Calculated Peak flows for the watershed 2 using the different available methods (m^3/s)

Period/Method	Rational	Rational (alternative)	Unit Hydrograph (m^3/s)	SDF	Empirical
1:2 year	5.102	6.65	1.958	1.135	-
1:5 year	7.251	11.72	3.269	6.744	-
1:10 year	9.561	15.98	4.793	12.13	4.349
1:20 year	12.28	20.54	6.725	18.33	5.902
1:50 year	16.56	26.73	10.22	27.72	8.18
1:100 year	21.13	31.96	14.22	35.7	10.35

Table 5-9: Calculated Peak flows for the watershed 3 using the different available methods (m^3/s)

Period/Method	Rational	Rational (alternative)	Unit Hydrograph (m^3/s)	SDF	Empirical
1:2 year	12.47	15.04	6.005	2.699	-
1:5 year	17.68	26.47	9.921	16.05	-
1:10 year	23.25	36.06	14.4	28.86	17.89
1:20 year	29.77	46.32	19.96	43.62	24.29
1:50 year	40.02	60.21	29.76	65.96	33.66
1:100 year	50.87	71.93	40.6	84.94	42.61

5.11 Floodlines and Watercourse Extents

The modelled floodlines for watershed 1 to 3 is presented in Figure 5-22, Figure 5-23 and Figure 5-24.

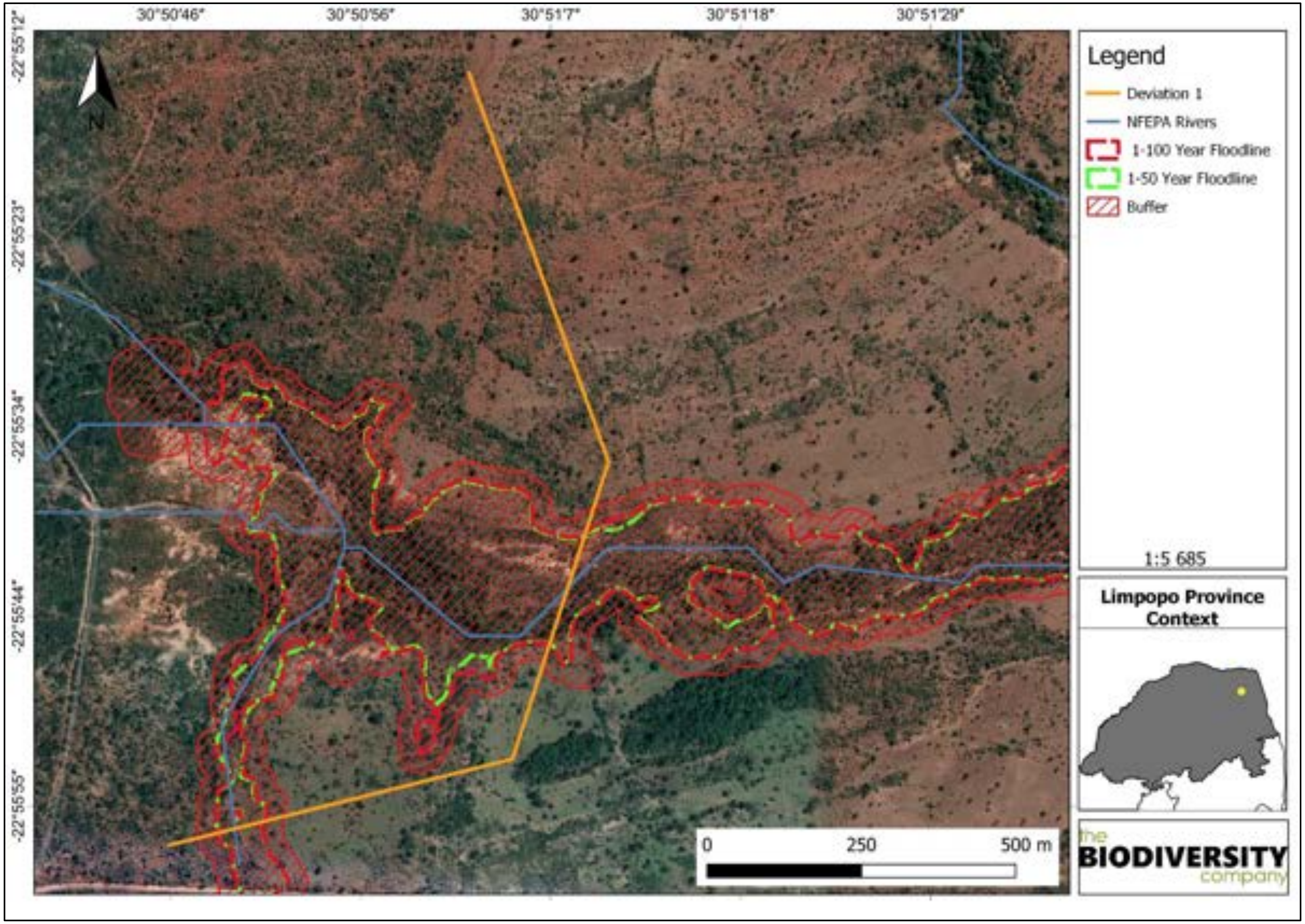

Figure 5-22: Modelled 1-50 and 1-100 year floodlines for the northern tributary of the Mphongolo River (February 2021)

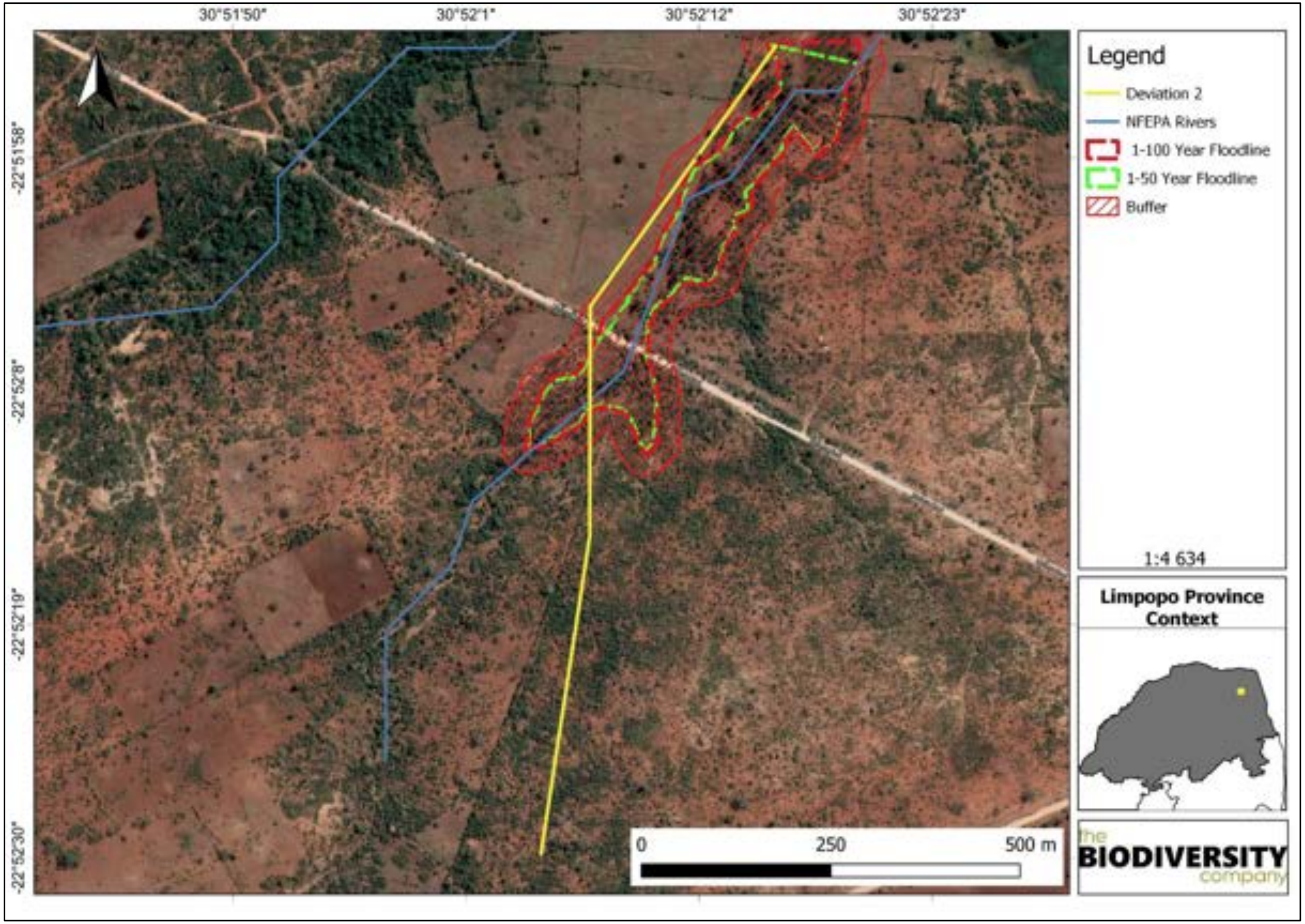

Figure 5-23: Modelled 1-50 and 1-100 year floodlines for the southern tributary of the Mphongolo River (February 2021)

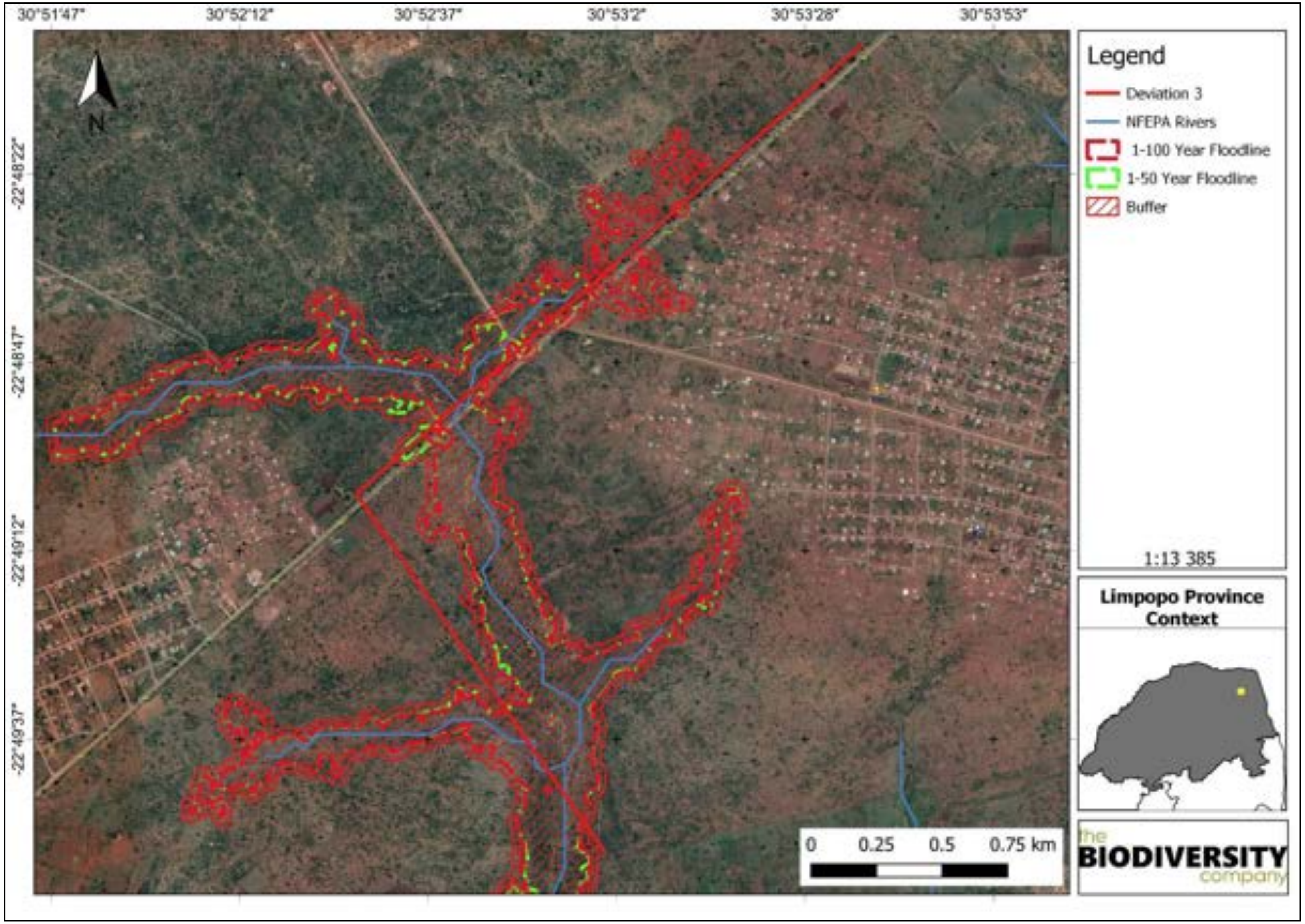

Figure 5-24: Modelled 1-50 and 1-100 year floodlines for the un-named river (February 2021)

5.12 Sensitivity Maps

The legal definition of the extent of a watercourse is defined in the amendment of the General Authorisation for section 21 (c) and (i) water uses. The extent of the watercourse is defined as:

- A river, spring or natural channel in which water flows regularly or intermittently "within the outer edge of the 1 in 100 year floodline or riparian habitat measured from the middle of the watercourse from both banks"; and

- Wetlands and pans "within 500 m radius from the boundary (temporary zone) of any wetland or pan".

An example of the watercourse extent is provided in Figure 5-25. As a result, all available aspects of a watercourse described should be merged and 30 m buffer delineated around it (Macfarlane *et al*, 2015) to indicate the "No go" area which is to be protected to ensure future health of the watercourses. The riparian delineations were however not available and therefore the comprehensive sensitivity map or master layout was defined by the edge of the 1 in 100 year floodline merged with the delineated wetlands (Clark, 2021). The modelled sensitivity layouts are therefore represented in Figure 5-26, Figure 5-27 and Figure 5-28 for the southern and northern tributaries of the Mphongolo River and the unnamed river respectively.

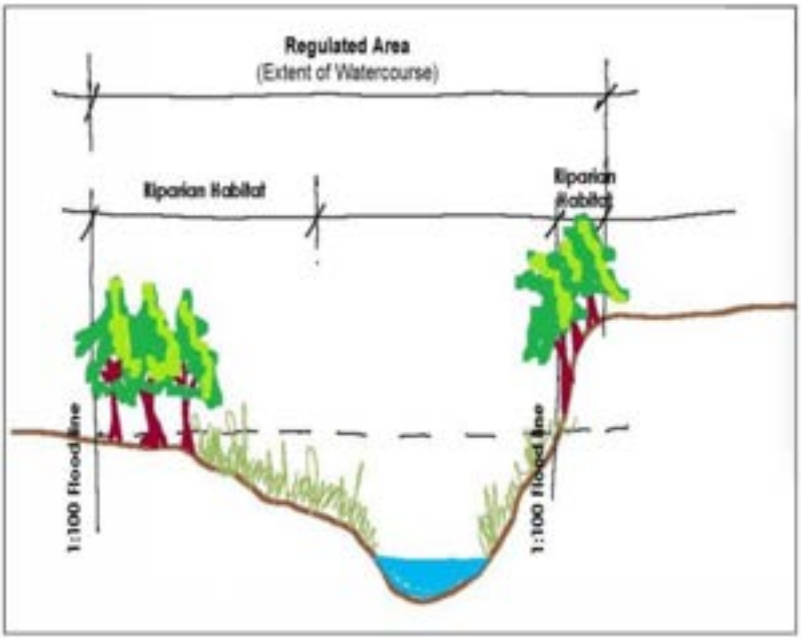

Figure 5-25: The extent of a watercourse (DWA, 2012)

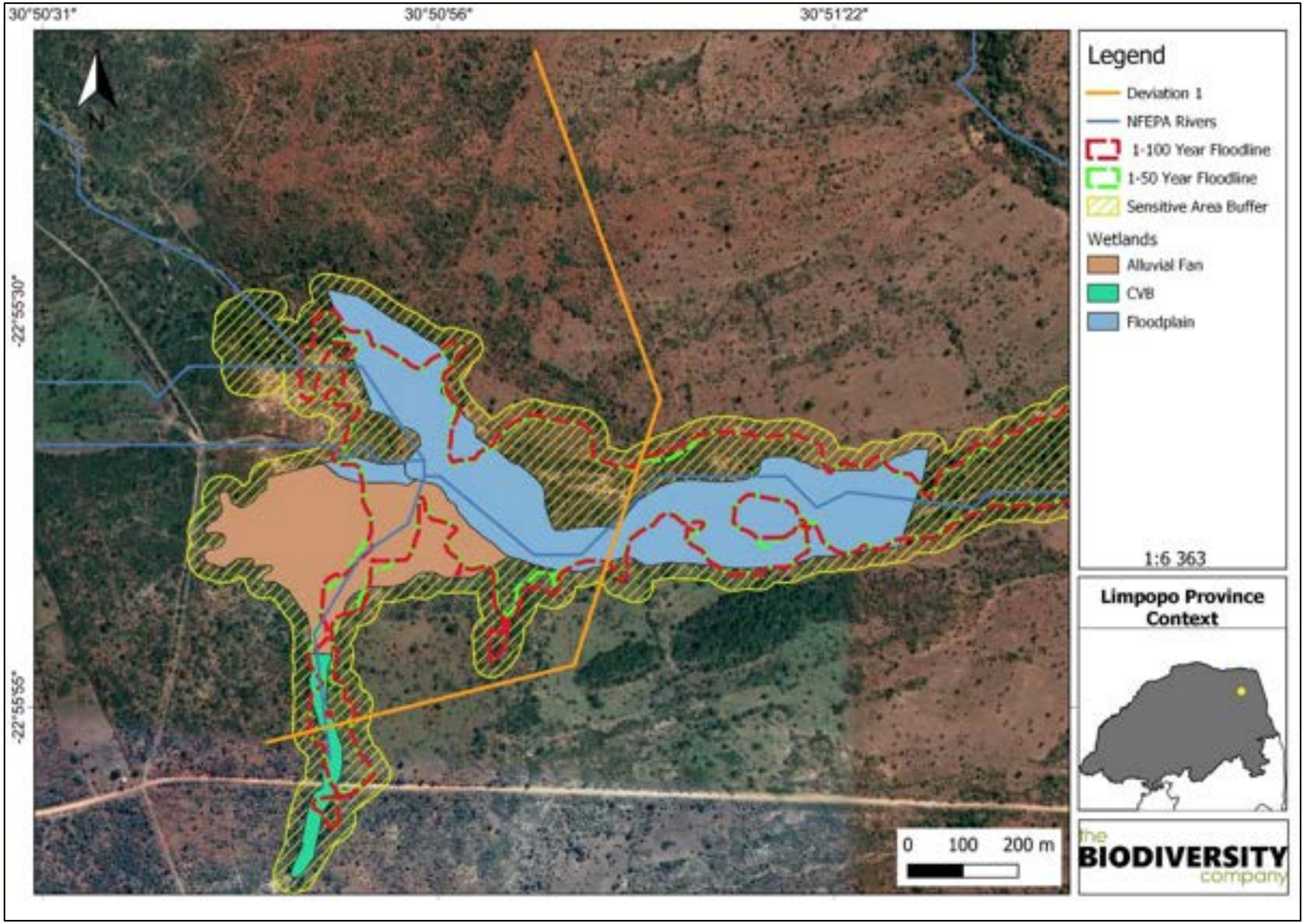

Figure 5-26: Sensitivity map for the for the northern tributary of the Mphongolo River (February 2020)

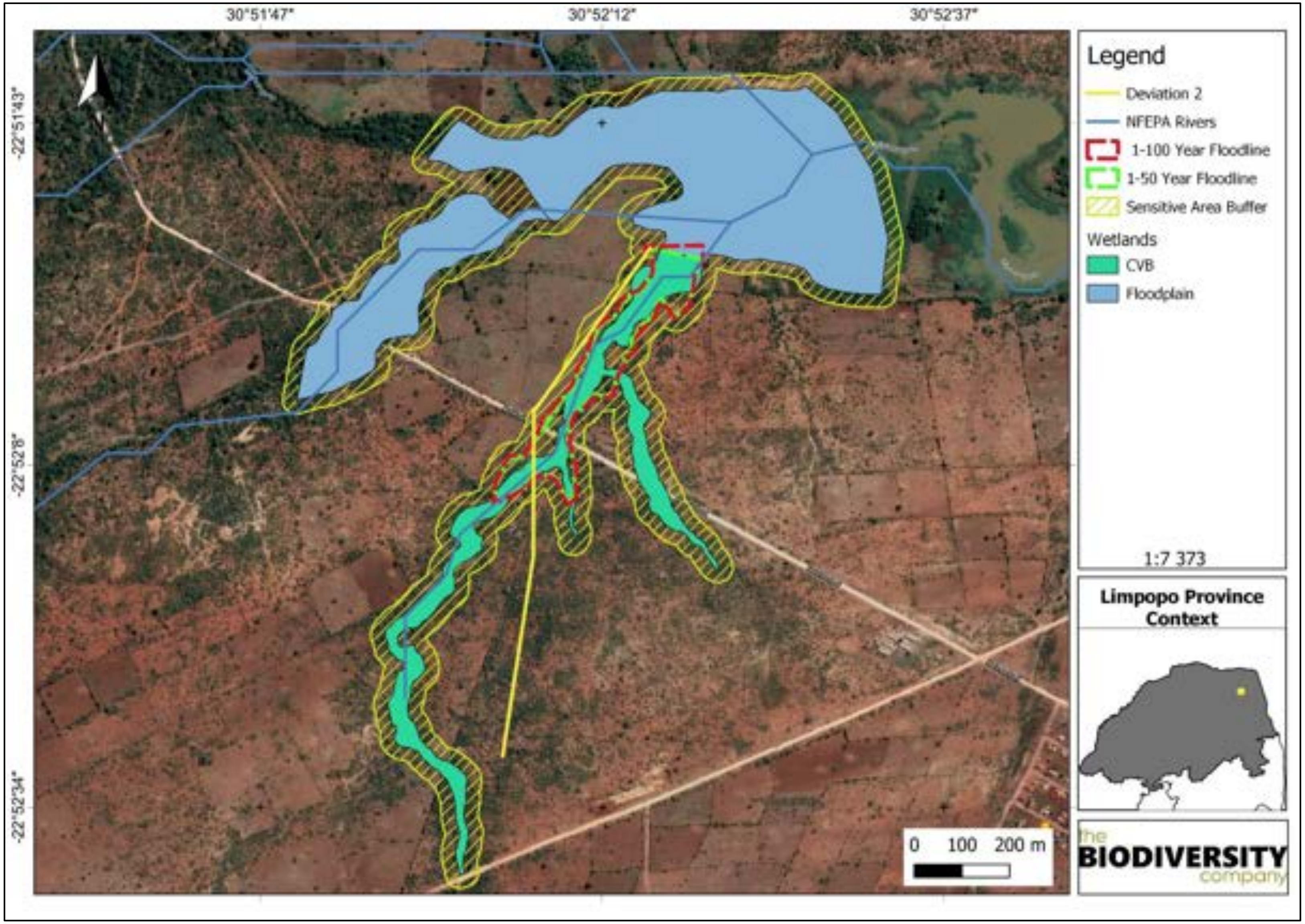

Figure 5-27: Sensitivity map for the for the southern tributary of the Mphongolo River (February 2020)

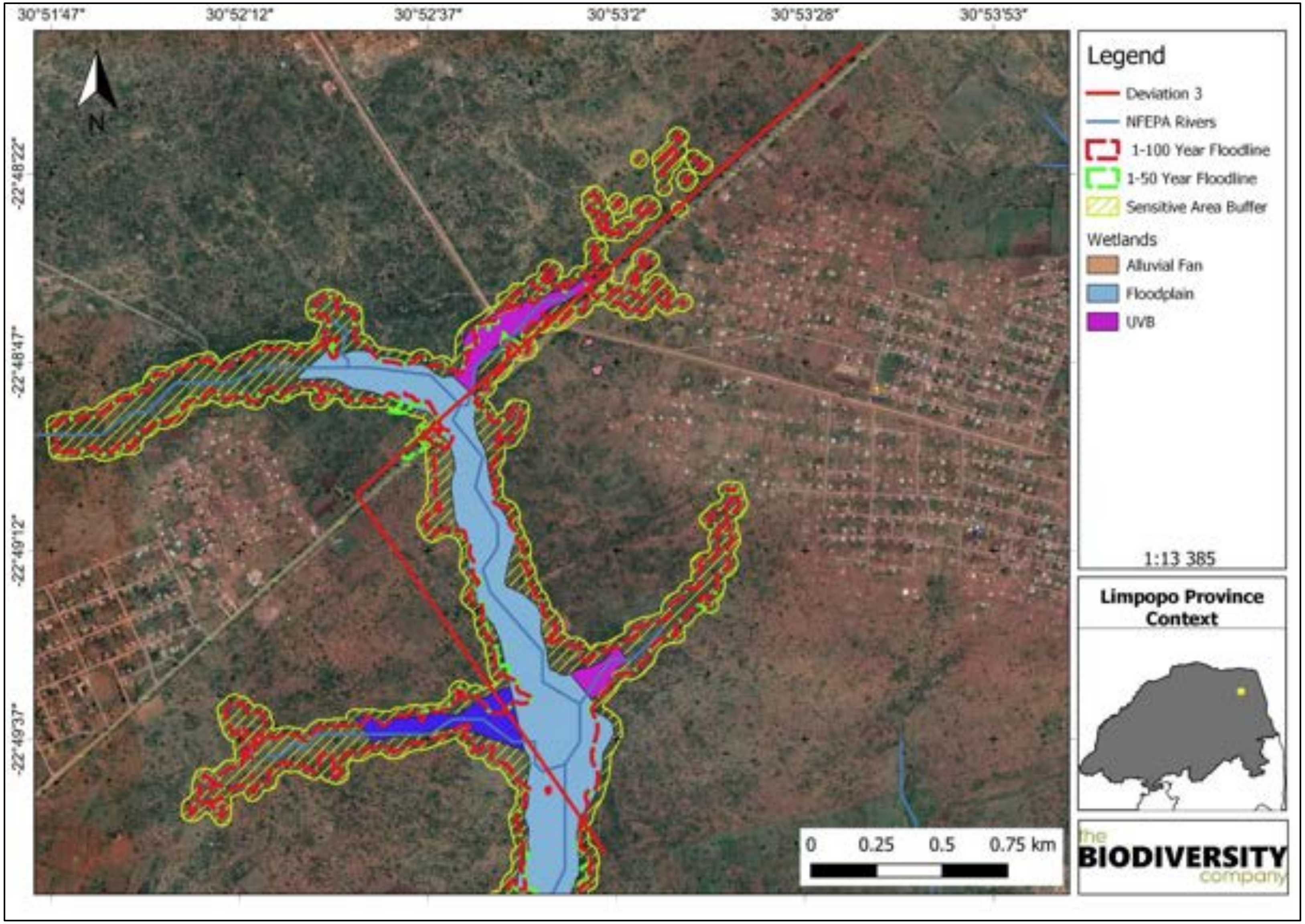

Figure 5-28: Sensitivity map for the un-named river (February 2021)

6 Conclusion

The aim of the project was to define the extent and hydrology of the watercourse associated with the Mhinga powerline deviations project. This aim was effectively completed using standard methods. Floodline extents for the watercourse were effectively modelled. The 1:100 year floodline extent along with delineated wetlands were then provided a 30 m buffer which was delineated as sensitive areas. These areas should be avoided for habitat protection with no associated infrastructure or building facilities within the delineated areas.

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WETLAND BASELINE AND RISK ASSESSMENT FOR THE MHINGA POWERLINE DEVIATIONS

Mhinga, Limpopo

February 2021

CLIENT

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1 Introduction

The Biodiversity Company was commissioned to conduct a wetland baseline and risk assessment for the establishment of three 132 kV powerline deviation routes (Deviations 1-3) to avoid recently established settlements. The deviations stretch over 8 km between Phugwane and Mhinga Substation within the Limpopo Province. The original line was approved under authorisation number 12/12/20/1667. Eskom proposes to deviate the authorised Kingbird 132kV powerlines in three sections due to streams being located on the authorised route as well as houses being constructed since the authorisation was received in 2010. The deviations total distance is approximately 8 km whilst the actual line is 25 kms in length (Kantey and Templer, 2021). Deviation 1 is said to be 4.421 km long, following the R524 and stretching into a portion of Nkavele Village. Deviation 2 is 1.224 km long and deviates just after the Nkavele road just after the town of Saselemane. Deviation 3 is 1.834 km moving east from the Xaswita village (Figure 3-1).

A wet season site visit was conducted from 7-10 December 2020. The survey primarily focussed on delineating and assessing impacts to wetlands within along the 3 km powerline deviation but also included ground truthing of systems within the 500 m regulated area around the proposed route. Additionally, the field investigations took cognisance of sensitive biotic receptors within the project area

This assessment was conducted in accordance with the 2014 EIA Regulations (No. R. 982-985, Department of Environmental Affairs, 4 December 2014) emanating from Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998). The findings and information herein is in terms of Appendix 6 of the 2014 NEMA EIA Regulations (amended in 2017). Further to this a risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998 (NWA) (Act No 36 of 1998).

.

2 Terms of Reference

The Terms of Reference (ToR) included the following:

- A desktop assessment of all available datasets;
- Delineation of wetland areas in accordance with the DWAF (2005) guidelines, whereby the outer edges of the wetland areas were identified;
- Determination of the Present Ecological State (PES) or health for the wetland as a whole was calculated, whereby the hydrology, geomorphology and vegetation scores are aggregated to obtain an overall PES health score (Macfarlane et al., 2009);
- An assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines as described in WET-EcoServices (Kotze et al., 2009);
- An assessment of the Ecological Importance and Sensitivity (EIS) tool was derived to assess the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred (Rountree et al., 2013);
- Use of the "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane and Bredin, 2017) was used to determine the appropriate buffer zone for the proposed activity; and
- Compilation of a risk assessment completed in accordance with the requirements of the DWS General Authorisation (GA) in terms of Section 39 of the NWA for water uses as defined in Section 21(c) or Section 21(i) (GN 509 of 2016).

3 Project Area

The Mhinga powerline project area is situated between the Phugwane and Mhinga Substation within the Limpopo Province. The predominant land uses surrounding the project area includes formal and informal housing, open spaces and protected areas (Figure 4 1). A locality map of the project area is shown in Figure 4 1.

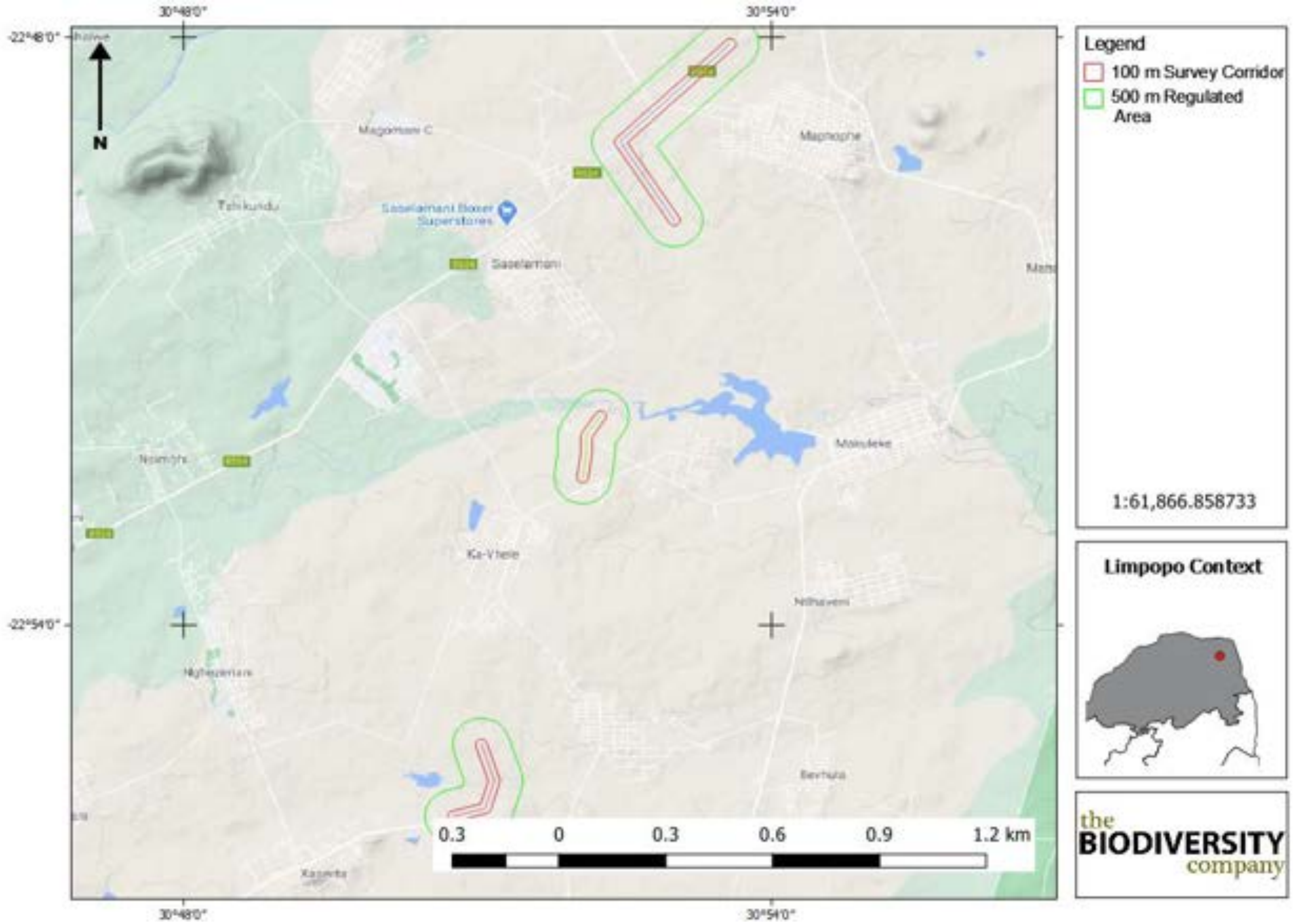

Figure 3-1 **Locality of the project area**

4 Key Legislative Requirements

4.1 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries, or aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource.

A watercourse means;

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

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

4.2 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

5 Receiving Environment

5.1 Limpopo Conservation Plan, Version 2 (LCPv2)

The Limpopo Conservation Plan, Version 2 (LCPv2), was completed in 2013 for the Limpopo Department of Economic Development, Environment & Tourism (LEDET) (Desmet *et al.,* 2013). The purpose of the LCPv2 was to develop the spatial component of a bioregional plan (i.e. map of Critical Biodiversity Areas and associated land-use guidelines). The previous Limpopo Conservation Plan (LCPv1) was completely revised and updated (Desmet *et al.,* 2013). A Limpopo Conservation Plan map was produced as part of this plan and sites were assigned to the following CBA categories based on their biodiversity characteristics, spatial configuration and requirement for meeting targets for both biodiversity pattern and ecological processes: Critical Biodiversity Area 1 (CBA1), Critical Biodiversity Area 2 (CBA2), Ecological Support Area 1 (ESA1), Ecological Support Area 2 (ESA2), Other Natural Area (ONA), Protected Area (PA), and No Natural Remaining (NNR).

CBAs are terrestrial and aquatic areas of the landscape that need to be maintained in a natural or near-natural state to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. Thus, if these areas are not maintained in a natural or near natural state then biodiversity targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity compatible land uses and resource uses (Desmet *et al.,* 2013).

ESA's are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services (SANBI, 2017). Critical Biodiversity Areas and Ecological Support Areas may be terrestrial or aquatic.

ONAs consist of all those areas in good or fair ecological condition that fall outside the protected area network and have not been identified as CBAs or ESAs. A biodiversity sector plan or bioregional plan must not specify the desired state/management objectives for ONAs or provide land-use guidelines for ONAs (Driver *et al.,* 2017).

NNR are areas in poor ecological condition that have not been identified as CBAs or ESAs. They include all irreversibly modified areas (such as urban or industrial areas and mines), and most severely modified areas (such as cultivated fields and forestry plantations). A biodiversity sector plan or bioregional plan must not specify the desired state/management objective or provide land-use guidelines for NNR areas (Driver *et al.,* 2017).

The Mhinga project area falls in two different classifications most of the project area falls within the ESA1 classification, while a portion of Deviation 2 falls within an ESA2 area (**Figure 5-1**).

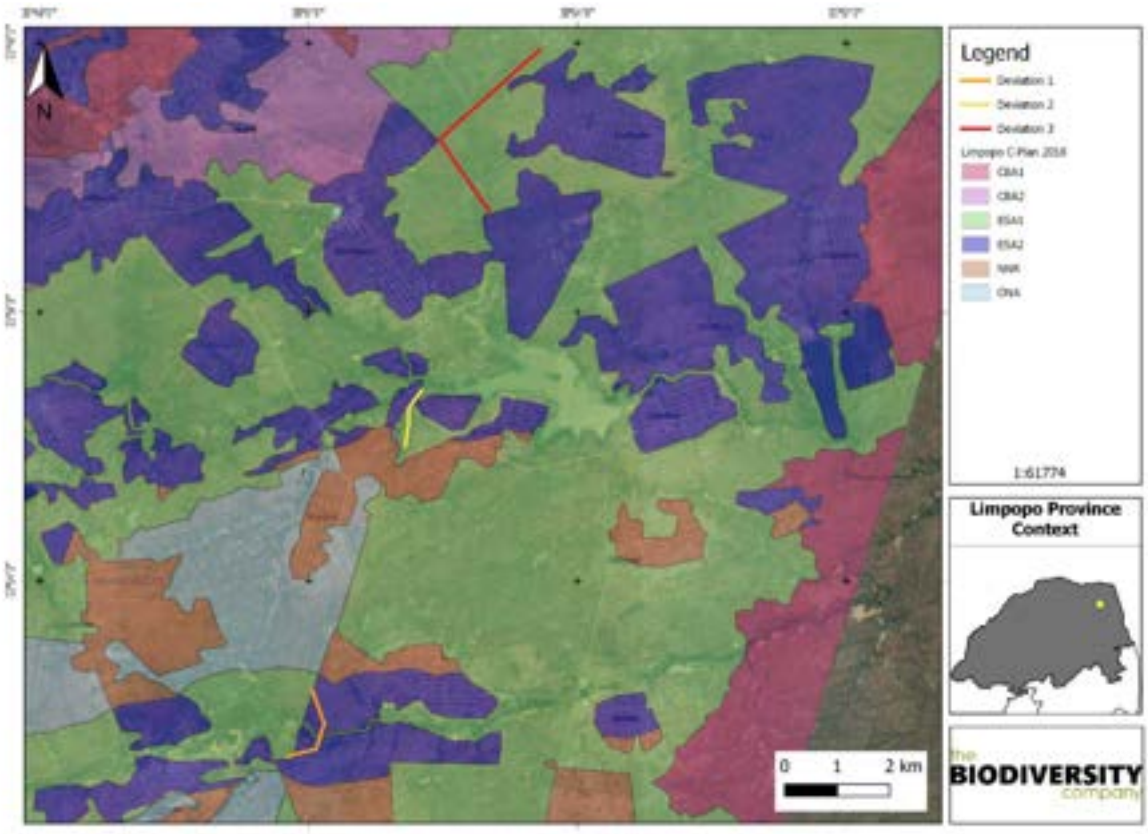

Figure 5-1 Limpopo Conservation Plan V2.

5.2 National Freshwater Ecosystem Priority Areas Status

In an attempt to better conserve aquatic ecosystems, South Africa has recently categorised its river systems according to set ecological criteria (i.e. ecosystem representation, water yield, connectivity, unique features, and threatened taxa) to identify Freshwater Ecosystem Priority Areas (FEPAs) (Driver *et al*., 2011). The FEPAs are intended to be conservation support tools and envisioned to guide the effective implementation of measures to achieve the National Environment Management Biodiversity Act (NEM:BA) biodiversity goals (Nel *et al.,* 2011).

In the project area the three floodplains associated with the Mphongolo River are classified as Upstream Management Areas. The project area runs across a FEPA river (fish support area and fish corridor) but does not fall close to or cross a FEPA wetland (***Figure 5-2***).

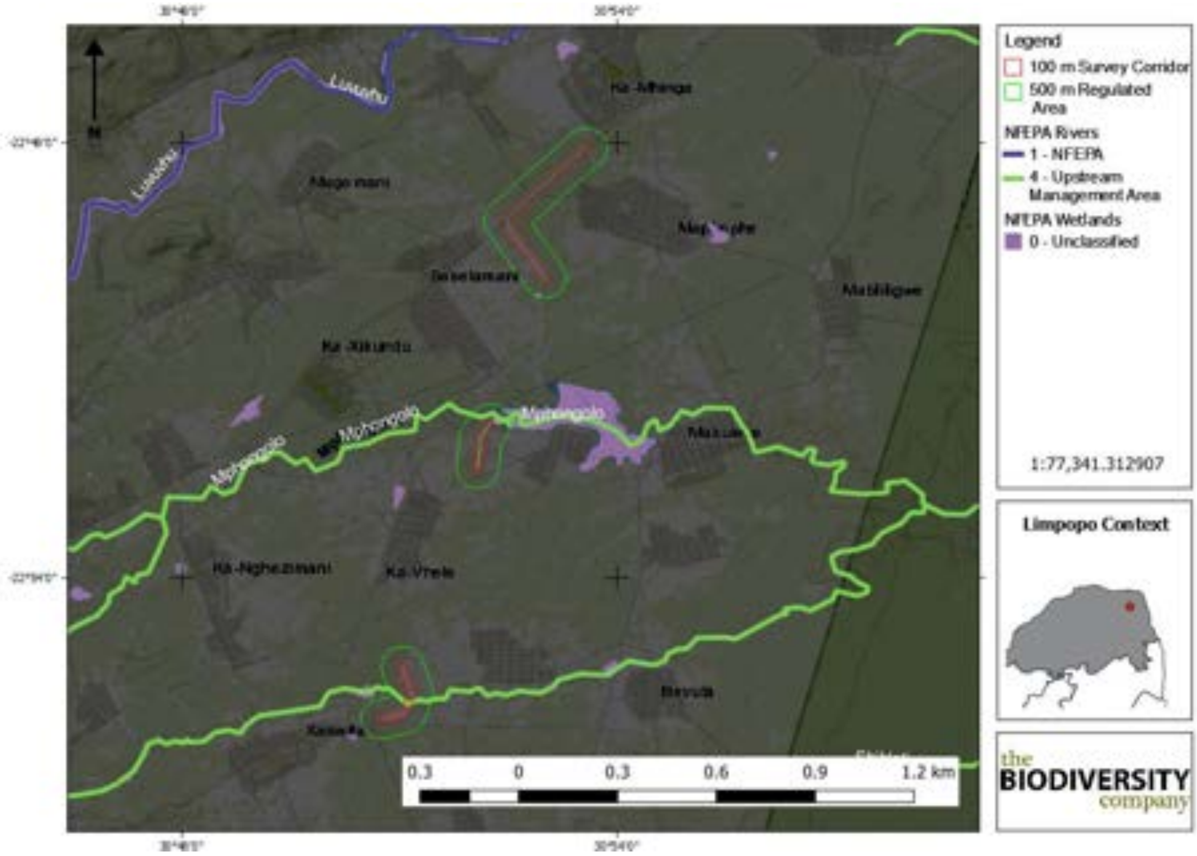

Figure 5-2 **NFEPA wetlands and rivers within the project area.**

5.3 National Wetland Map 5

The National Wetland Map 5 spatial data was published in October 2019 (Deventer *et al*. 2019) in collaboration with SANBI with the specific aim of spatially representing the location, type and extent of wetlands in South Africa. The data represents a synthesis of a wide number of official watercourse data including rivers, inland wetlands and estuaries.

The dataset recognises the presence of floodplain, valley-bottom, seep and depression wetlands within the project area. Except for seeps which are considerably under-represented (which is to be expected at a national scale), the dataset provides a good regional scale indication of wetland extent (***Figure 5-3***).

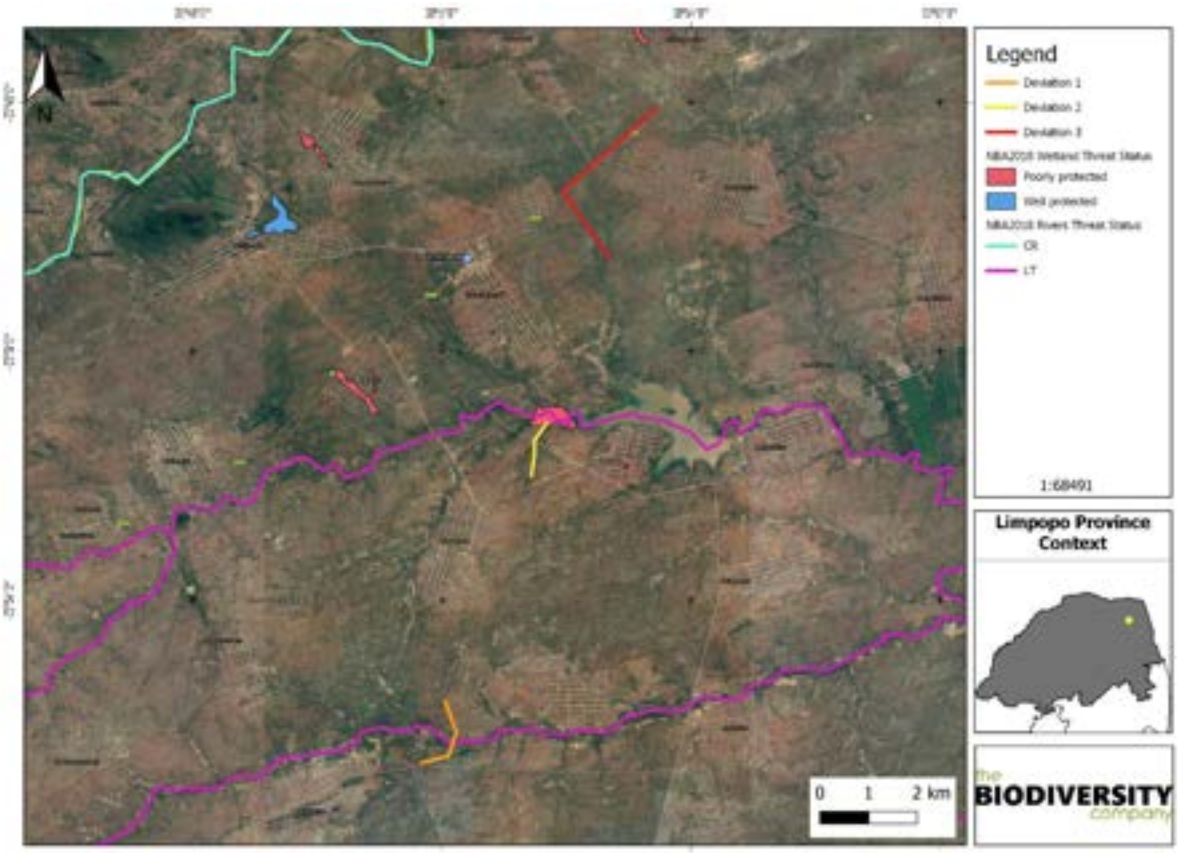

Figure 5-3 National Wetland Map 5

5.4 Regional Drainage

A digital elevation model (DEM) was generated for the project area using NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data. This data together with the 1:50 000 topographical river lines data (Surveyor General) is provided in **Error! Reference source not found.** below. This map shows the project area is drained by network of mostly non-perennial watercourses. The Mphongolo Floodplain is the only system that is classified as perennial (however even this system is mostly ephemeral). The elevation is low ranging from 400 to 500 masl. The prevailing drainage direction from all wetlands within the project area is in an easterly direction into the Mphongolo River.

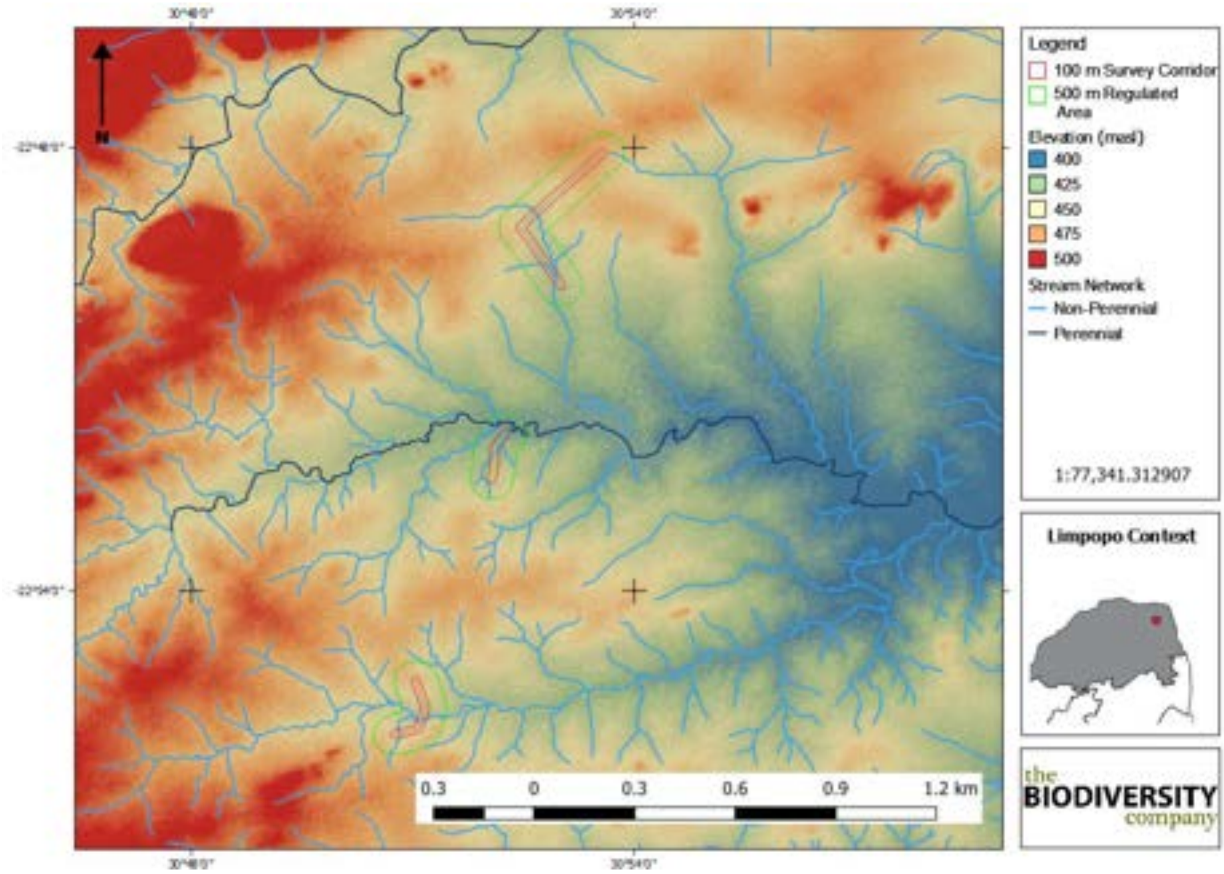

Figure 5-4 Digital elevation model and stream network.

6 Methodologies

6.1 Desktop Research

The following spatial datasets were utilised:

- Aerial imagery (Google Earth Pro);
- Land Type Data (Land Type Survey Staff, 1972 - 2006);
- South African Inventory of Inland Aquatic Ecosystems (Van Deventer *et al*., 2019);
- The National Freshwater Ecosystem Priority Areas (Nel *et al*., 2011);
- Contour data (5m);
- NASA Shuttle Radar Topography Mission Global 1 arc second digital elevation data; and
- South African Inventory of Inland Aquatic Ecosystems (SAIIAE) (Van Deventer, H., et al., 2018).

6.2 Wetland Identification and Mapping

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) was considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels. In addition, the method also includes the assessment of structural features at the lower levels of classification (Ollis *et al.,* 2013).

The wetland areas are delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 6-1. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The soil forms (types of soil) found in the landscape were identified using the South African soil classification system namely; Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practise the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

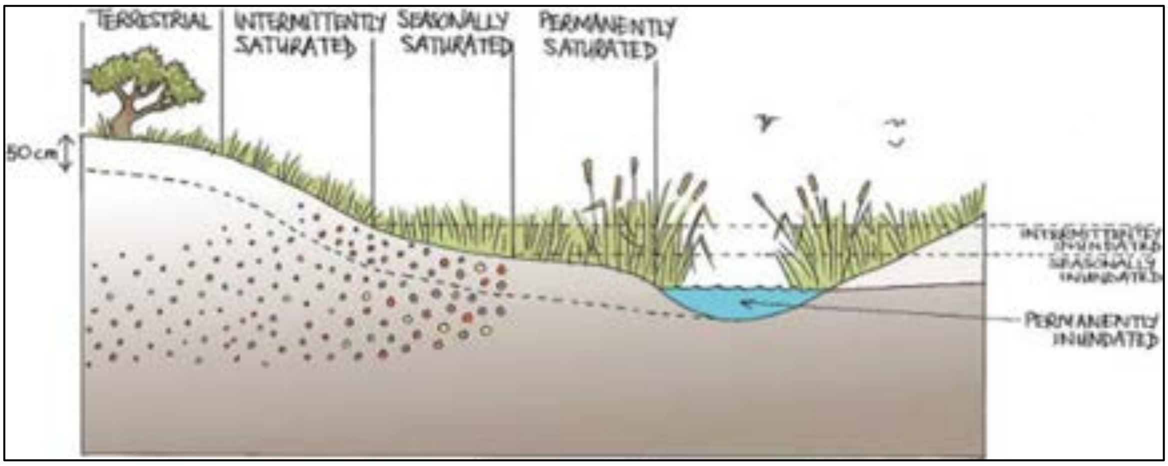

Figure 6-1 Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al., 2013).

6.3 Present Ecological Status (PES)

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological Status (PES) score. This takes the form of assessing the spatial extent of impact of individual activities/occurrences and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 6-1.

Table 6-1 The Present Ecological Status categories (Macfarlane et al., 2009)

Impact Category	Description	Impact Score Range	PES
None	**Unmodified, natural**	**0 to 0.9**	**A**
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

6.4 Ecological Importance and Sensitivity (EIS)

The method used for the EIS determination was adapted from the method as provided by DWS (1999) for floodplains. The method takes into consideration PES scores obtained for WET-Health as well as function and service provision to enable the assessor to determine the most representative EIS category for the wetland feature or group being assessed. A series of determinants for EIS are assessed on a scale of 0 to 4, where 0 indicates no importance and 4 indicates very high importance. The mean of the determinants is used to assign the EIS category as listed in Table 6-2 (Rountree and Kotze, 2013).

Table 6-2 Description of Ecological Importance and Sensitivity categories

EIS Category	Range of Mean	Recommended Ecological Management Class
Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

6.5 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this assessment. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and also then includes structural features at the lower levels of classification (Ollis *et al*., 2013).

6.6 Determining Buffer Requirements

The “Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries” (Macfarlane and Bredin, 2017) was used to determine the appropriate buffer zone for the proposed activity.

6.7 Limitations

The following aspects were considered as limitations:

- The semi-arid setting and intermittent nature of the wetlands presented challenges regarding the delineation and classification of the systems. Nevertheless, soil indicators were sufficient for the purposes of delineation;
- Due to the very large scale of the project area in field delineations were restricted to within a 100 m corridor on either side of the proposed powerline route. Wetlands within the 500 m regulated were largely based on desktop delineation with limited ground truthing; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at least five meters to either side

7 Results and discussion

7.1 Wetland Classification and Extent

Three HGM types of namely floodplain, channelled valley-bottom and unchanneled valley-bottoms) were identified and delineated within the 500 m regulated area surrounding the project area. These three main HGM types were further divided according to the three powerline deviations (Deviations 1-3) which are each associated with a different sub-catchment of the Mphongolo River (**Figure 7-1**). The Deviation 1 project area hosts one moderately sized and largely natural floodplain (HGM1) representing a tributary of the Mphongolo River, a small highly ephemeral channelled valley-bottom (HGM2) and a large alluvial fan (HGM9). The Deviation 2 project area supports the large Mphongolo River floodplain (HGM3) as well as two large, channelled valley bottoms (HGM4). The Deviation 3 project area hosts a long narrow floodplain (HGM5), one channelled valley-bottom (HGM6) and two unchanneled valley-bottom wetlands (HGM7).

All these wetlands are ephemeral, only being intermittently inundated with overland flows for a short period following significant rainfall or flood events. However, there is still variation with regards to hydroperiod with the wetlands associated with the Mphongolo proper (Deviation 2) showing the highest saturation levels. Although the reach of the Mphongolo River bisected by Deviation 2 is classified as perennial according to the 1:50 000 topographical river lines (Surveyor General) it is only the lower reaches associated with the dam inlet that are likely to maintain surface water year-round.

The active channel of the two northern floodplains (HGM 2 and 3) is clearly discernible and was delineated. As per Ollis *et al.,* (2013) the active channel was classified as riverine and therefore excluded from this wetland assessment. Additionally, a large alluvial fan was identified in the western portion of Deviation 1. Again, this type of system is not catered for within the current wetland assessment toolset and was therefore excluded. Likewise, all borrow pits and manmade water accumulations were classified as artificial and excluded from this assessment.

The level 1-4 classification for these HGM units as per the national wetland classification system (Ollis *et al.,* 2013) is presented in (Table 7-1). A map showing the extent of these wetlands is shown in Figure 7-1.

Table 7-1 Wetland classification as per SANBI guideline (Ollis et al. 2013). Green indicates HGMs included in assessment, red indicates HGM excluded from assessment

Wetland System	Level 1	Level 2		Level 3	Level 4		
	System	DWS Ecoregion/s	NFEPA Wet Veg Group/s	Landscape Unit	4A (HGM)	4B	4C
HGM 1	Inland	Lowveld	Lowveld Group 3	Plain	Floodplain	Upland Floodplain	N/A
HGM 2	Inland	Lowveld	Lowveld Group 3	Valley Floor	Channelled valley-bottom	N/A	N/A
HGM 3	Inland	Lowveld	Lowveld Group 3	Slope	Floodplain	Upland Floodplain	N/A
HGM 4	Inland	Lowveld	Lowveld Group 3	Valley Floor	Depression	N/A	N/A
HGM 5	Inland	Lowveld	Lowveld Group 1	Plain	Floodplain	Upland Floodplain	N/A
HGM 6	Inland	Lowveld	Lowveld Group 1	Valley Floor	Channelled valley-bottom	N/A	N/A
HGM 7	Inland	Lowveld	Lowveld Group 1	Valley Floor	Unchanneled valley-bottom	N/A	N/A

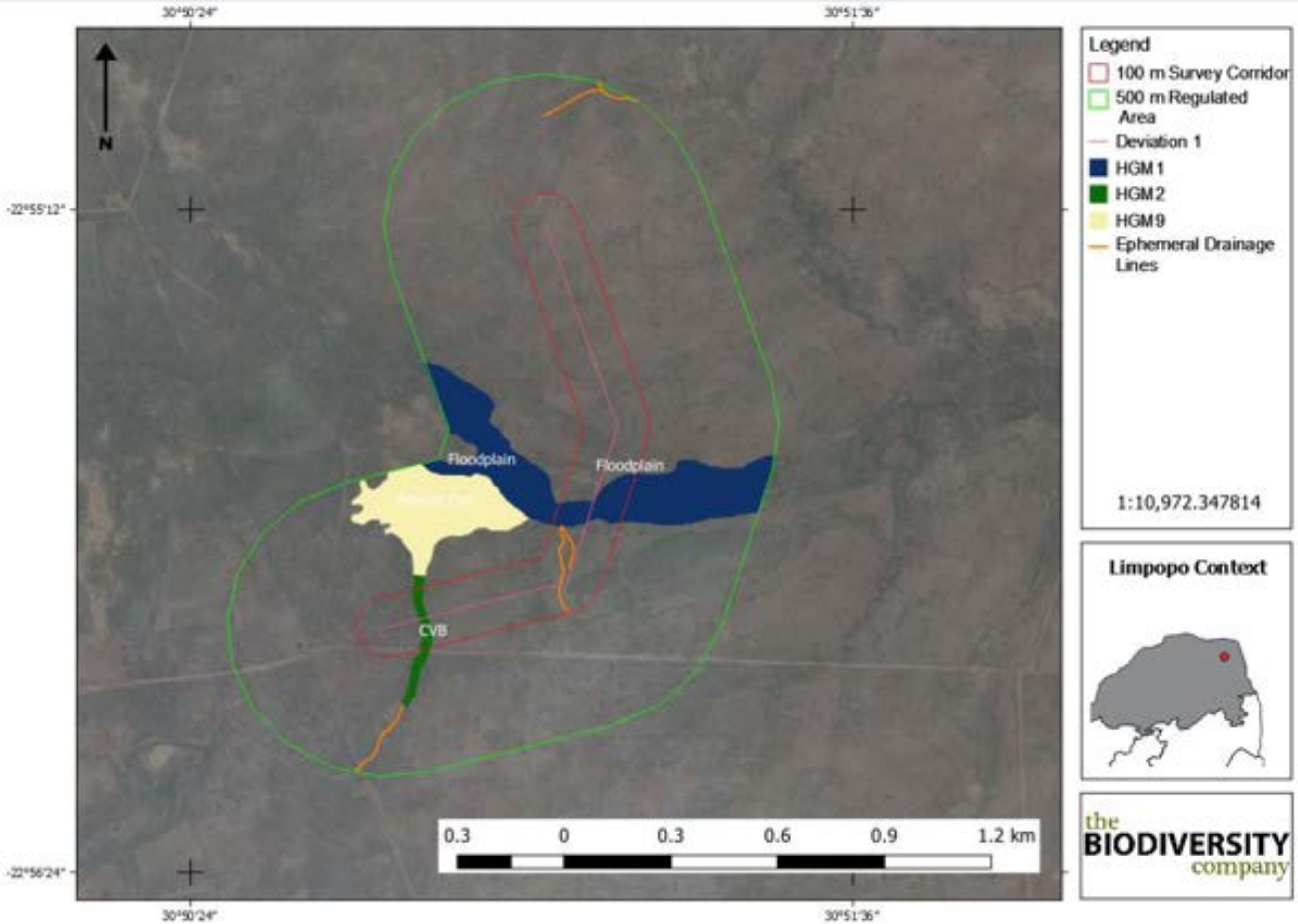

Figure 7-1 ***Wetlands delineated within the 500 m regulation area of Deviation 1 superimposed on a digital elevation model***

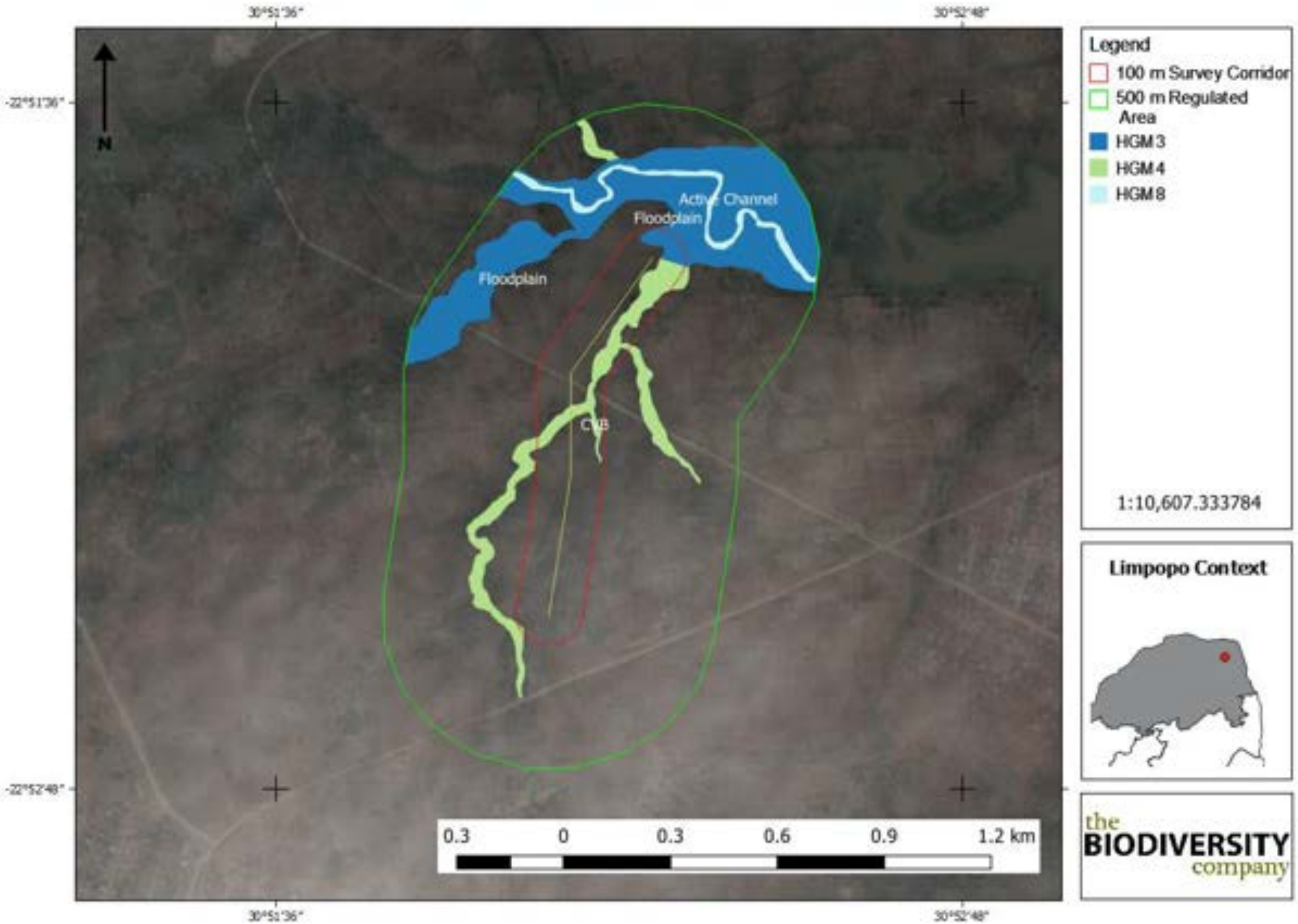

Figure 7-2 ***Wetlands delineated within the 500 m regulation area of Deviation 2 superimposed on a digital elevation model***

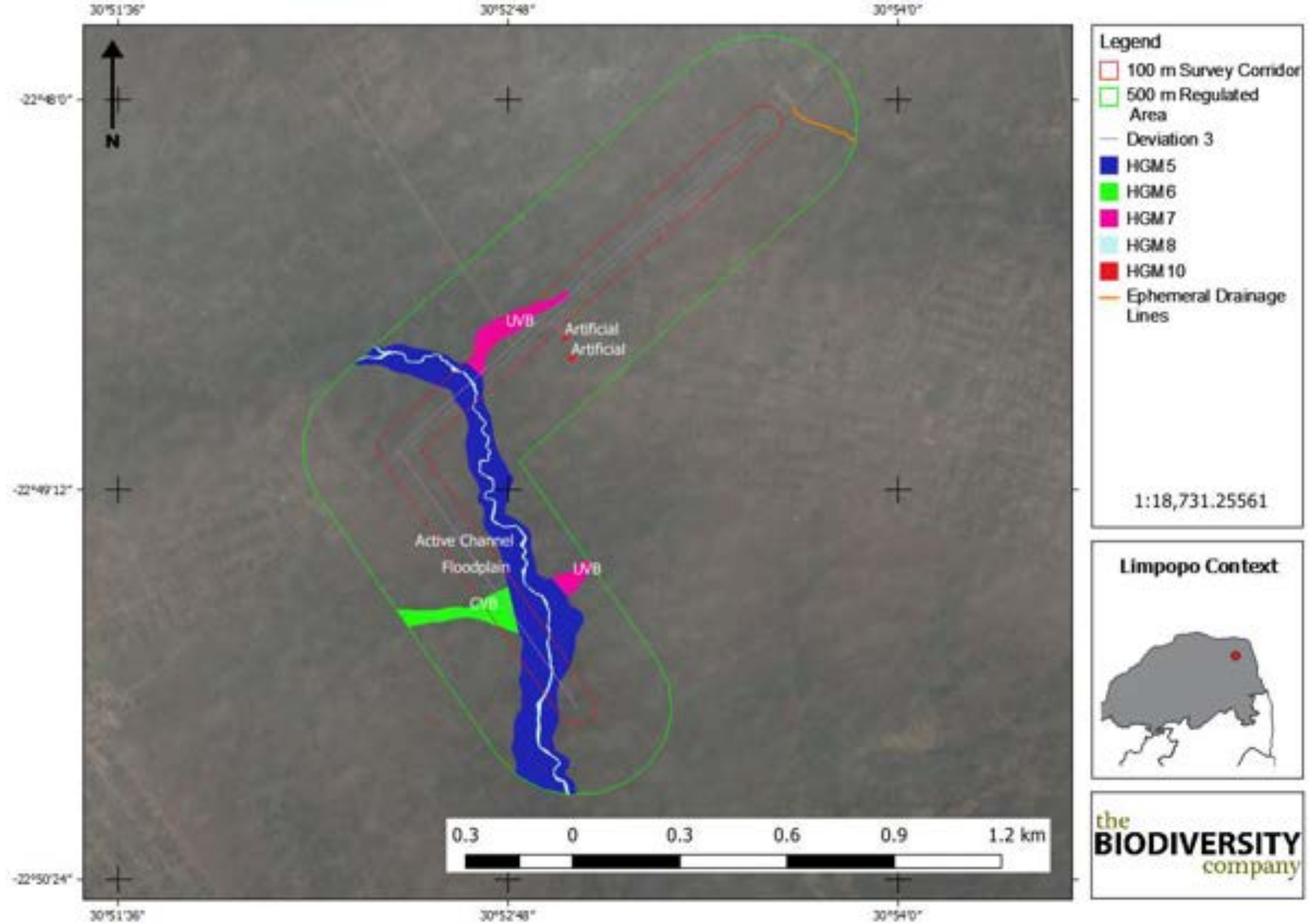

Figure 7-3 ***Wetlands delineated within the 500 m regulation area of Deviation 3 superimposed on a digital elevation model***

7.2 Wetland Description

7.2.1 Hydrogeomorphology

The main wetlands on site are the three floodplain wetlands (one in each deviation area). The largest and most saturated is the Mphongolo River floodplain (HGM1) followed by HGM2 and then HGM3. All are ephemeral and characterised by a deep mostly dry alluvial flow path. They all show high channel sinuosity and are mostly flanked by a distinct broad-leafed riparian zone. These wetlands display most of the typical floodplain characteristics such as meander cuttoffs, backwater depressions, levees and terraces. According to Ollis *et al*. (2013) floodplains are typically located on plains or wide valley floors. They are river features typically characterised by the presence of meander cut-offs, depressions and backwaters. They are, by definition, depositional environments formed by the accumulation of alluvial deposits carried downstream by rivers. Another characteristic of floodplains is that they are typically inundated on average, several times per year, during high flows.

Several channelled valley-bottom wetlands drain into these floodplains. All are highly ephemeral (particularly HGM 2). They too are flanked by a distinct riparian zone. They are distinguished from the floodplains in having a steeper flow path gradient (ca. 2%) a narrower cross-sectional profile and lack meander cuttoffs. According to Ollis *et al*. (2013) channelled valley-bottom wetlands show a clearly defined, finite stream channel and typically lack floodplain features such as meander cut-offs and depressions. These wetlands are known to undergo a loss of sediment in cases where the wetlands slope is high and the deposition thereof in cases of low relief or as in this instance where large dams and other impeding features concentrate flows and deprive the system of sediment.

Unchanneled valley-bottom wetlands occur within the Deviation 3 project area. These wetlands have a very shallow cross-sectional profile. These wetlands are typically found on valley-floors where the landscape does not allow high energy flows. Unchanneled valley-bottoms are characterised by sediment deposition, a gentle gradient with streamflow generally being spread diffusely across the wetland, ultimately ensuring prolonged saturation levels and high levels of organic matter. The assimilation of toxicants, nitrates and phosphates are usually high for unchanneled valley-bottom wetlands, especially in cases where the valley is fed by sub-surface interflow from slopes.

Figure 7-4 Examples of the three main types of wetlands within the project area A), floodplain, B) unchanneled valley-bottom, C) channelled valley-bottom

7.2.2 Soils

The project area straddles two Land Types. The southern half (Deviation 1 and half of Deviation 2) is zoned under Landtype AE328 while the northern half (Deviation 3 and the northern half of Deviation 2) is zoned under Bd56. The former has a lithology characterised by leucocratic biotite gneiss, granite, pegmatite and migmatite of the Swazian Erathem while the latter is characterised by sandstone, conglomerate and shale of the Fundudzi Formation, Soutpansberg Group (Land Type Survey Staff, 1972 - 2006).

In these Land Types, areas lower down on the catena (associated with the watercourses) are said to be characterised by Oakleaf, Glenrosa, Westleigh and Shortlands soil forms. More terrestrial midslope areas are dominated by Hutton soils while crests are characterised by the Mispah soil form.

At a site scale, the majority of the flow paths of the floodplains and larger channelled valley-bottom wetlands are underlain by deep stratified alluviums known as the Dundee soil form. The unchanneled valley bottom wetlands and the remaining wetland areas outside of theflow path are typically underlain by Oakleaf soil form which as characterised by a red sandy clay with feint mottling to around 30 cm followed by a neocutanic horizon overlying a saprolitic horizon. Oxbows within the central portion of the northern floodplain along Deviation 3 (HGM 5) was found to support Willowbrook soils characterised by a melanic topsoil. The confluence of HGM 4 with HGM 3 supports a vlei area characterised by Katspruit soils which was distinguished by heavy mottling within an orthic topsoil underlain by a G horizon. Examples of these soil form are shown in Figure 7-5.

Figure 7-5 Wetland soils observed on site A) Katspruit, B) Dundee, C) Oakleaf, D) Willowbrook

7.2.3 Vegetation

The wetland and riparian vegetation is characteristically bushveld with most of the floodplains and larger valley-bottom wetlands being easily identified in the field by their prominent riparian zones. The riparian zones are characterised by a noticeably taller, denser and often greener woody component. Although most of the larger trees within the riparian zone have been felled, some large trees do persist especially along HGM 1 and HGM 4. Overall, the vegetation remains in a largely natural state. Grazing pressure is moderate to high. Some of these plants are shown in Figure 7-6.

Figure 7-6 Wetland associated vegetation observed on site A) Ziziphus rivularis, B) Diospyros mespiliformis, C) Schoenoplectus spp., D) Crinum macowanii

7.3 Wetland Ecosystem Services

The ecosystem services provided by the wetlands identified within the project area were assessed and rated using the WET-EcoServices method (Kotze *et al*. 2008) (**Table 7-2**). The seven wetland HGM units differed in terms of the level and type of ecosystem services provision. Overall, the wetlands provide an even mix of important indirect supporting, as well direct provisional services (given their rural setting).

The three floodplains (one crossed in each deviation), particularly HGM 1, are considered the hardest working in terms of ecosystem services provision. These floodplains are distinct from the other wetlands in that they provide highly important (scores of High and Moderate-High) services relating to flood attenuation, streamflow regulation sediment trapping, nutrient assimilation, erosion control, carbon storage and provision of water and harvestable resources. Large areas of bare, hardened soil surfaces in their catchments due to settlements and overgrazing afford them a high opportunity to receive stormflows. However, their low flow path gradient (ca. 1%), high channel sinuosity and abundance of backwater depressions and meander cut-offs makes them particularly affective at attenuating the stormflows received from the catchment. These wetlands are upper catchment systems considered important to streamflow regulation in the Mphongolo into which they drain. The same attributes which make these wetlands effective at attenuating floods also makes them effective at trapping sediment (noticeable accumulation of alluvium) which together with the dense marginal riparian vegetation allows them to effectively assimilate nutrients and control the erosive forces of the stormflows. Due to their greater hydroperiod, these systems are considered more important than the others from a carbon storage perspective. The wide buffers, largely natural state and, importantly, the higher saturation levels and more frequent presence of open water makes these wetlands important from a biodiversity perspective. These wetlands are also considered important in terms of the direct provision of water and harvestable resources. Their larger size, scenic beauty and abundance of fauna make them potentially important from a recreation and tourism perspective.

Aside rom HGM 2 which is too small and ephemerally inundated to provide appreciable ecosystem services, the remaining valley-bottom wetlands were all assigned an overall rating of Moderately-High. This is mainly on account of their importance in flood attenuation, sediment trapping, biodiversity maintenance, provision of harvestable resources and cultivated foods.

Table 7-2 Summary of the ecosystem services scores

			Wetland Unit	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7
Ecosystem Services Supplied by Wetlands	Indirect Benefits	Regulating and supporting benefits	Flood attenuation	3.0	1.9	2.7	2.2	2.4	2.2	2.2
			Streamflow regulation	2.2	1.2	2.2	1.8	2.0	1.8	1.8
		Water Quality enhancement	Sediment trapping	3.7	2.5	3.3	2.8	3.2	2.8	2.8
			Phosphate assimilation	3.2	2.3	2.9	2.3	2.8	2.3	2.6
			Nitrate assimilation	2.7	1.9	2.7	2.0	2.5	2.0	2.2
			Toxicant assimilation	3.1	2.1	2.9	2.2	2.7	2.2	2.4
			Erosion control	2.8	2.0	2.7	1.8	2.1	2.0	1.9
			Carbon storage	2.3	1.3	2.3	1.7	2.0	1.7	1.7
	Direct Benefits		Biodiversity maintenance	3.3	3.0	3.3	3.0	3.0	3.0	3.0
		Provisioning	Provisioning of water for human use	2.7	0.4	2.7	1.5	2.5	1.5	1.5
			Provisioning of harvestable resources	3.6	1.4	2.8	2.6	2.8	2.6	2.6
			Provisioning of cultivated foods	3.8	1.4	3.2	3.2	3.2	3.2	3.2
		Cultural benefits	Cultural heritage	2.5	2.0	2.5	2.0	2.5	2.0	2.0
			Tourism and recreation	3.0	1.4	2.9	1.9	2.4	1.9	1.9
			Education and research	2.8	2.0	2.0	2.0	2.0	2.0	2.0
Overall				44.4	26.7	41.0	32.9	38.1	33.2	33.7
Average				3.0	1.8	2.7	2.2	2.5	2.2	2.2

7.4 Wetland Health

The present ecological state (PES) of the wetlands identified within the 500 m regulated area is provided in Table 7-3. Overall, HGMS 1, 2, 4 and 5 remain in a Largely natural state while HGMs 3, 6 and 7 are considered Moderately Modified.

From a hydrological perspective, the most pressing threat relates to the presence of high intensity rural settlement in the catchments of most of these wetlands. This coupled with overgrazing has significantly increased the extent of bare and hardened surfaces in the catchment which has the effect of increasing floodpeak intensity with potentially erosive consequences. Otherwise, the hydrological regime remains largely intact with no significant artificial inputs from water treatment works or industry nor are there any impacts causing artificially increased losses (e.g. commercial crop irrigation, plantations or alien bushclumps). HGMs 5 and 7 (along Deviation 3) are however, bisected by R524 which serves to impede flows to a small degree, with minor downstream erosion.

From a geomorphological perspective, the decreased vegetation cover, steeper catchment slope and increased floodpeak intensity has resulted in an erosive sediment environment in the upper catchment reaches of the larger wetlands (gulley erosion visible on Google Earth). Conversely, the low flow path gradients of the wetlands themselves (particularly the floodplains), has created a depositional environment. Considerable sediment deposition in the form of alluvium is evident within the flow paths of the floodplains. This accumulation is being exploited by artisanal sand miners in HGM 1 (low intensity).

The wetland and riparian vegetation within the project area remains largely intact, natural and devoid of alien and invasive species. The low intensity impacts that do exist centre on crop cultivation, erosion, livestock grazing and infrastructure (settlement and roads). These impacts have undoubtedly decreased cover and species richness within the wetlands. HGMs 1, 4 and 5 support the most intact and mature riparian vegetation, comprised of a number of large trees surrounded by dense, and lower, broadleaf species extending some distance from the system.

Table 7-3 Summary of the scores for the wetland PES

Wetland	Hydrology	Geomorphology	Vegetation	Overall
Eastern System				
HGM 1	C: Moderately Modified (2)	C: Moderately Modified (2.2)	B: Largely Natural (1)	B: Largely Natural (18)
HGM 2	B: Largely Natural (1.5)	B: Largely Natural (1)	B: Largely Natural (0.8)	B: Largely Natural (1.2)
HGM 3	C: Moderately Modified (3.5)	C: Moderately Modified (3.2)	C: Moderately Modified ()	C: Moderately Modified (3.3)
HGM 4	B: Largely Natural (1.5)	C: Moderately Modified (2)	B: Largely Natural (1.5)	B: Largely Natural (1.6)
HGM 5	B: Largely Natural (1)	B: Largely Natural (1.1)	B: Largely Natural (0.9)	B: Largely Natural (1)
HGM 6	C: Moderately Modified (2)	C: Moderately Modified (2.1)	C: Moderately Modified (2)	C: Moderately Modified (2)
HGM 7	C: Moderately Modified (2.5)	B: Largely Natural (1.8)	C: Moderately Modified (2.3)	C: Moderately Modified (2.2)

Figure 7-7 Examples impacts influencing the PES ratings; A) sand mining, B) culvert, C) headcut erosion, D) dumping, E) livestock

7.5 The Ecological Importance and Sensitivity

The results of the ecological and importance (EIS) assessment are shown in

Table **7-4**. From a regional perspective all of the floodplains are associated with the upper catchment of the Mphongolo River and are classified as Upstream Management Areas on the NFEPA Rivers database. The NFEPA Wetveg database recognises floodplains and valley-bottom wetlands within the Lowveld Groups 1 and 3 as Critically Endangered and Not Protected (Nel and Driver, 2012).

At a more local scale, HGMs 1, 3 and 5 are the most functionally intact wetlands and are considered to have a Very High EIS. These wetlands provide important foraging habitat, shelter and movement corridors for high diversity of unique and conservation important wetland associated species. HGM 3 was found to be frequently used by Hippopotamus closer to the dam inlet. It is likely that these wetlands support Cape Clawless Otter (*Aonyx capensis*), Brown Hyaena (*Hyaena brunnea*), Serval (*Leptailurus serval*). The catchment remains relatively free of toxicant producing activities and these systems are considered to be sensitive to changes in water quality. Except for HGM 2, due to their rural setting all of the systems are considered important from a direct human benefits perspective.

Table 7-4 The Ecological Importance and Sensitivity results for the wetland area

Aspect	HGM 1	HGM 2	HGM 3	HGM 4	HGM 5	HGM 6	HGM 7
Ecological Importance & Sensitivity	3.7	1.7	3.3	2.7	3.3	3.0	3.0
Hydrological/Functional Importance	2.9	1.9	2.7	2.1	2.5	2.1	2.2
Direct Human Benefits	3.1	1.4	2.7	2.2	2.6	2.1	2.1

8 Sensitivity Analysis

The "*Buffer zone guidelines for wetlands, rivers and estuaries*" (Macfarlane and Bredin 2017) was used to determine the appropriate wetland buffer zone for the proposed activity, in this case mining. Buffers were generated for the two main wetland types namely valley bottom and seep wetlands.

The main impacts to these wetlands as consider in the buffer determination tool include increase in sediment inputs & turbidity, Alteration to flow volumes, inputs of contaminants. Considering this, the size of the pre-mitigation buffer zones for the wetlands delineated within the project area is 32 m and 15 m for the construction and operational phase respectively. These buffer requirements are, however, expected to decrease given the successful application of recommended mitigation measures. The post-mitigation buffer requirements are 16 m and 15 m for the construction and operational phases respectively. Overall, it is recommended that a buffer of 32 m be applied to the wetlands within the project area.

A map was produced to visually represent the sensitivity of the wetlands to the proposed development based on the findings of the wetland assessment (**Figure 8-1**). All identified HGM units were classified as having a High sensitivity while their associated buffers were assigned a Moderate-High sensitivity. All other non-wetland areas within the 500 m regulated area were assigned a Low sensitivity from a wetland perspective

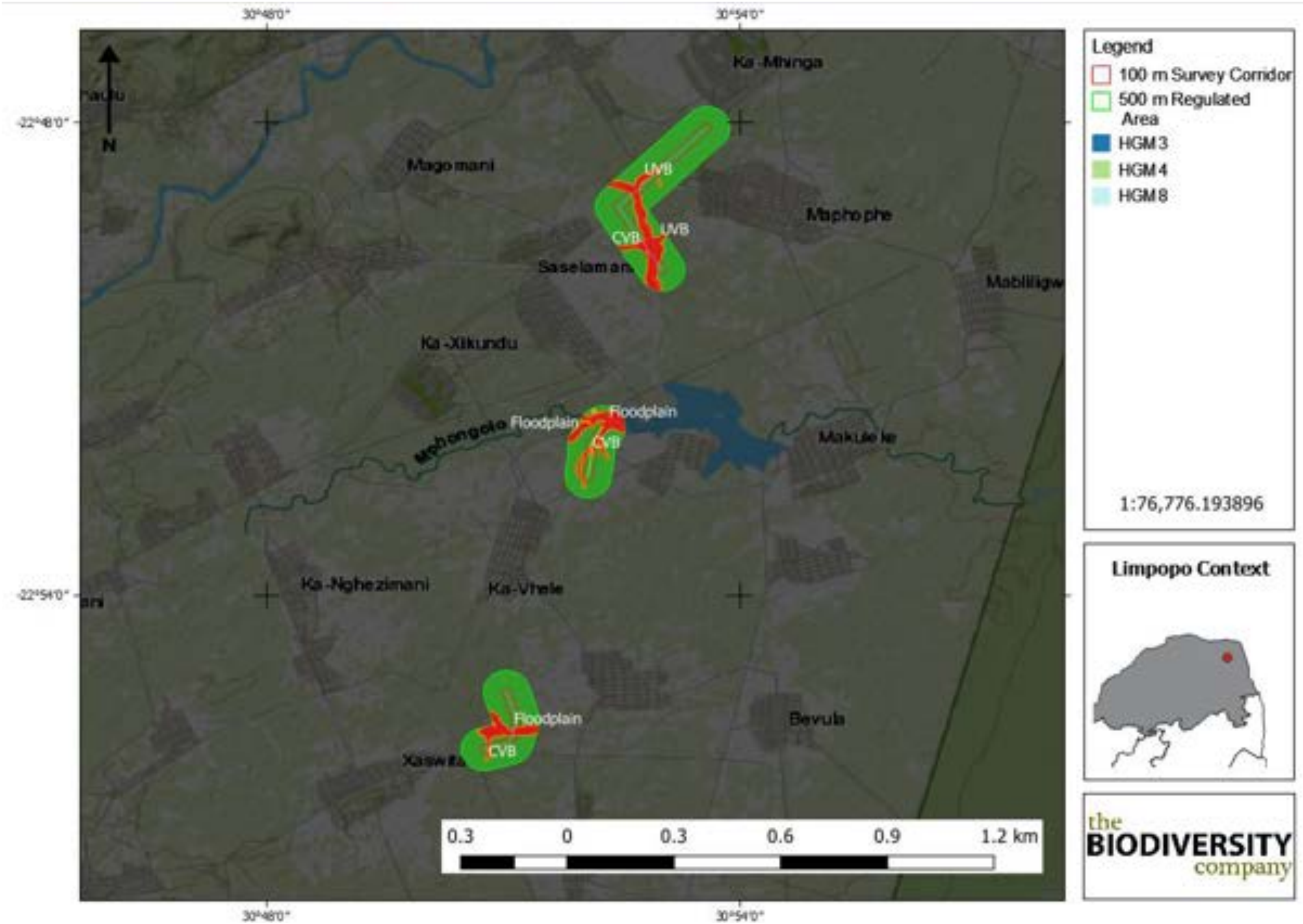

Figure 8-1 *Wetland sensitivity map*

9 Wetland Risk Assessment

A risk assessment was conducted in line with Section 21 (c) and (i) of the National Water Act, 1998, (Act 36 of 1998) to investigate the level of risk posed by proposed project and inform the level of water use licencing required. The project entails the establishment of three 132 kV powerline deviation routes (Deviations 1-3) to avoid recently established settlements. The deviations stretch over 8 km between Phugwane and Mhinga Substation within the Limpopo Province. The risks posed by the proposed development to wetlands within the project area (the transmission line deviation route and the 500 m regulated area surrounding it), together with their associated post-mitigation significance ratings and accompanying mitigation measures are provided in **Table 5**.

The most significant risk associated with the project is that each of the powerline deviation routes crosses at least one wetland and, in some instances, (i.e. Deviation 3) multiple wetlands. Consequently, the most potentially adverse risk is considered to be the disturbance and degradation of wetland and riparian vegetation at these crossing points. This impact is assigned a residual (with mitigation rating) of Moderate, on account of the activity occurring directly within the wetland and having a direct impact on the wetlands riparian integrity. As such a severity rating for this risk is set at the mandatory maximum of 5 as per the DWS Risk Assessment protocol. Unless the powerlines are re-routed outside of the wetlands and their associated buffer, this risk is unavoidable and permanent. Clearing of riparian vegetation and any other activities within the delineated boundary of the wetland will require a full water use licence.

Other potential risks include storage of equipment, increased bare surfaces, runoff and potential for erosion. Additionally, the excavation, levelling and installation of transmission towers may lead to increased sediment loads and contamination of wetlands with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles as well as Contamination and eutrophication of wetland systems with human sewerage and litter. Once constructed the routine operation and maintenance of powerline route will invariably result in the degradation of wetland vegetation wetland vegetation due to mandatory and routine clearing of vegetation within the powerline servitude. This together with any residual disturbances from construction may facilitate proliferation of alien and invasive species, if not managed appropriately. Risks associated with decommissioning the powerline infrastructure centre on vegetation degradation from vehicle access and increased bare surfaces, runoff and potential for erosion from the removal of the tower infrastructure. A number of mitigation measures are provided in **Table 5** which would, if implemented effectively, reduce the significance of these impacts to Low. Of these the perhaps the most significant mitigation measures are as follows:

- If feasible, consider the re-alignment of the powerline deviations so as to remain outside of the delineated wetlands and their 32 m buffers. If not feasible then it is positive to note that Deviation 1 crosses the floodplain at its narrowest point. However, consider the slight realignment of Deviation 2 to remain outside of the buffer of HGM 4 (this would require only a small westerly shift of 27 m from the point where it is closest to the wetland;

- When crossing the wetland and riparian areas restrict the disturbance and clearance footprint to within 15 m on either side of the proposed powerline route during construction (30 m disturbance corridor). During operation clear only as necessary directly underneath the line;

- Although the Deviation 1 line crosses at the narrowest part of the riparian zone it is important to note that there is a very large Jackalberry tree along the footpath crossing the floodplain. It is outmost importance that this old and large riparian tree is not cut down, if needed keep the powerline crossing slightly west of this tree to prevent it being felled. The location of the tree is 22°55'44.16"S; 30°51'8.16"E;
- Request the wetland spatial data from TBC, load it onto a GPS and use it to mark out the positions where the transmission lines will enter and exit the buffer on the southern side of the wetland;
- Avoid placing pylon infrastructure within the demarcated wetlands or their associated 32 m buffer;
- Try to reduce the 30 m disturbance corridor and the unnecessary clearing of vegetation when traversing these wetlands;
- Demarcate construction area, with high visibility plastic fencing;
- Signpost these wetland areas as an environmentally sensitive area and keep all excavation, soil stockpiling, general access and construction activities out of this area;
- Construct the transmission lines during winter when flow volumes are lowest. This will reduce impacts to wetlands due to soil poaching and vegetation trampling under peak saturation levels;
- Make use of existing access routes as much as possible before new routes are considered. Any selected “new” route must not encroach into the wetland areas;
- All non-essential activities must adhere to the 32 m buffer area; and
- In line with the 2010 Eskom Environmental Procedure Document entitled "Procedure for vegetation clearance and maintenance within overhead powerline servitudes," all alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. This involves the control of category 1, 2 and 3 plants to the extent necessary to prevent or to contain the occurrence, establishment, growth, multiplication, propagation, regeneration and spreading such plants within servitude areas.

Table 5 ***DWS Risk Impact Matrix for the proposed development***

Activity	Aspect	Impact	Wetland Type	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
Construction																			
Clearing and preparation of powerline route including storage of equipment	Wetland vegetation loss and soil exposure.	Disturbance and degradation of wetland vegetation	F	1	1	5	3	5	1	3	9	2	2	5	2	11	99	**M**	• If feasible consider the re-alignment of the powerline deviations so as to remain outside of the delineated wetlands and their 32 m buffers. If not feasible then it is positive to note that Deviation 1 crosses the floodplain at its narrowest point. However, consider the slight realignment of Deviation 2 to remain outside of the buffer of HGM 4 (this would require only a small westerly shift of 27 m from the point where it is closest to the wetland. • When crossing the wetland and riparian areas restrict the disturbance and clearance footprint to within 15 m on either side of the proposed powerline route during construction (30 m disturbance corridor). During operation clear only as necessary directly underneath the line. • Although the Deviation 1 line crosses at the narrowest part of the riparian zone it is important to note that there is a very large Jackalberry tree along the footpath crossing the floodplain. It is outmost importance that this old and large riparian tree is not cut down, if needed keep the powerline crossing slightly west of this tree to prevent it being felled. The location of the tree is 22°55'44.16"S; 30°51'8.16"E. • Request the wetland spatial data from TBC, load it onto a GPS and use it to mark out the positions where the transmission lines will enter and exit the buffer on the southern side of the wetland. • Avoid placing pylon infrastructure within the demarcated wetlands or their
			CVB	1	1	2	4	5	1	3	9	2	2	5	1	10	90	**M**	
			UVB	1	1	2	3	5	1	3	9	2	1	5	1	9	81	**M**	

Activity	Aspect	Impact	Wetland Type	Severity: Flow Regime	Severity: Water Quality	Severity: Habitat	Severity: Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
																			associated 32 m buffer. • Try to reduce the 30 m disturbance corridor and the unnecessary clearing of vegetation when traversing these wetlands. • Demarcate construction area, with high visibility plastic fencing. • Signpost these wetland areas as an environmentally sensitive area and keep all excavation, soil stockpiling, general access and construction activities out of this area. • Construct the transmission lines during winter when flow volumes are lowest. This will reduce impacts to wetlands due to soil poaching and vegetation trampling under peak saturation levels. •Additionally the risk of vehicles getting stuck and further degrading the vegetation integrity is lowest during this time. • Make use of existing access routes as much as possible before new routes are considered. Any selected "new" route must not encroach into the wetland areas;
		Increased bare surfaces, runoff and potential for erosion	F	2	2	2	2	2	2	2	6	3	3	1	1	8	48	L	• Keep pylon hole excavation and soil heaps neat and tidy. •Limit construction activities to the dry season when storms are least likely to wash concrete and sand into wetlands. • Ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash. • Mixing of concrete must under no circumstances take place in any wetland or their buffers. Scrape the area where mixing and storage of sand and concrete occurred to clean once finished. • Do not position any of the pylons within any of the delineated wetland areas. • Do not situate any of the construction
			CVB	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	
			UVB	1	1	1	1	1	2	2	5	2	1	1	1	5	25	L	

Activity	Aspect	Impact	Wetland Type	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
			Severity																
																			material laydown areas within any wetland. • No machinery should be allowed to parked in any wetlands.
		Introduction and spread of alien and invasive vegetation	F	1	1	3	1	1.5	1	2	4.5	3	3	5	1	12	54	L	• The site is relatively free of aliens it is important to keep it this way. Promptly remove all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed. • Limit soil disturbance • The use of herbicides is not recommended in or near wetlands (opt for mechanical removal). • Appropriately stockpile topsoil cleared from the transmission line footprint. • Clearly demarcate transmission line construction footprint, and limit all activities to within this area. • Minimize unnecessary clearing of vegetation beyond the tower footprints and transmission line corridors. • Lightly till any disturbed soil around the tower footprint to avoid compaction.
			CVB	1	1	2	1	1.25	1	2	4.25	3	1	5	1	10	43	L	
			UVB	1	1	2	1	1.25	1	2	4.25	3	1	5	1	10	43	L	
Excavation, levelling and installation of transmission towers	Soil disturbance, sedimentation (excavated soil) and contamination potential (cement and human waste)	Increased sediment loads to downstream reaches	F	2	2	2	2	2	2	2	6	3	3	1	1	8	48	L	• See mitigation for increased bare surfaces, runoff and potential for erosion • Re-instate topsoil and lightly till pylon disturbance footprint.
			CVB	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	
			UVB	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	
		Contamination of wetlands with hydrocarbons due to leaks and spillages from machinery, equipment & vehicles as well	F	2	3	2	2	2.25	2	2	6.25	3	3	1	1	8	50	L	• Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility. • Appropriately contain any generator diesel storage tanks, machinery spills (e.g. accidental spills of hydrocarbons oils, diesel etc.) or construction materials on site
			CVB	1	3	1	1	1.5	2	2	5.5	3	1	1	1	6	33	L	

Activity	Aspect	Impact		Severity															Control Measures
			Wetland Type	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	
		as Contamination and eutrophication of wetland systems with human sewerage and litter.	UVB	1	2	1	1	1.25	2	2	5.25	3	1	1	1	6	32	L	(e.g. concrete) in such a way as to prevent them leaking and entering the north-western seep. • Mixing of concrete must under no circumstances take place within the permanent or seasonal zones of the wetland. Check for oil leaks, keep a tidy operation, and promptly clean up any spills or litter. • Provide appropriate sanitation facilities for workers during construction and service them regularly. • The Contractor should supply sealable and properly marked domestic waste collection bins and all solid waste collected must be disposed of at a licensed disposal facility; • The Contractor must be in possession of an emergency spill kit that must be complete and available at all times on site; • Any possible contamination of topsoil by hydrocarbons must be avoided. Any contaminated soil must be treated in situ or be placed in containers and removed from the site for disposal in a licensed facility;
Operation																			
Routine operation and maintenance of powerline route	Clearing of wetland vegetation beneath powerline	Degradation of wetland vegetation wetland vegetation.	F	1	1	5	3	5	1	3	9	2	2	5	2	11	99	M	• Clear vegetation in line with the 2010 Eskom Environmental Procedure Document entitled "Procedure for vegetation clearance and maintenance within overhead powerline servitudes". • Avoid the use of herbicides and diesel to treat stumps within the wetland areas. • Make use of existing access routes as much as possible, before new routes are considered. Any selected "new" route must not encroach into the wetland areas.
			CVB	1	1	2	4	5	1	3	9	2	2	5	1	10	90	M	
			UVB	1	1	2	3	5	1	3	9	2	1	5	1	9	81	M	

Activity	Aspect	Impact	Severity: Wetland Type	Flow Regime	Water Quality	Habitat	Biota	Severity	Spatial scale	Duration	Consequence	Frequency of activity	Frequency of impact	Legal Issues	Detection	Likelihood	Significance	Risk Rating	Control Measures
	Alien and Invasive species	Proliferation of alien and invasive species	F	1	1	1	4	1.75	2	1	4.75	3	1	5	1	10	48	L	• In line with the 2010 Eskom Environmental Procedure Document entitled "*Procedure for vegetation clearance and maintenance within overhead powerline servitudes*" all alien vegetation along the transmission servitude should be managed in terms of the Regulation GNR.1048 of 25 May 1984 (as amended) issued in terms of the Conservation of Agricultural Resources Act, Act 43 of 1983. By this Eskom is obliged to control category 1, 2 and 3 plants to the extent necessary to prevent or to contain the occurrence, establishment, growth, multiplication, propagation, regeneration and spreading such plants within servitude areas.
			CVB	1	1	1	4	1.75	2	1	4.75	3	1	5	1	10	48	L	
			UVB	1	1	1	4	1.75	2	1	4.75	3	1	5	1	10	48	L	
Decommissioning																			
Removal of transmission towers and lines	Vehicle access	Degradation of wetland vegetation and proliferation of alien and invasive species	F	2	2	2	3	2.25	1	2	5.25	3	1	5	1	10	53	L	• See mitigation for the impacts on direct loss, disturbance and degradation of wetlands and spread of alien and • Invasive plants. • Control should continue for a minimum of three years following decommissioning.
			CVB	2	2	2	3	2.25	1	2	5.25	3	1	5	1	10	53	L	
			UVB	2	2	2	2	2	1	2	5	3	1	5	1	10	50	L	
	Re-excavation of Transmission Towers	Increased bare surfaces, runoff and potential for erosion	F	2	2	2	2	2	2	2	6	3	3	1	1	8	48	L	• See mitigation for increased bare surfaces, runoff and potential for erosion and increased sediment loads during construction
			CVB	1	1	1	1	1	2	2	5	3	1	1	1	6	30	L	
			UVB	1	1	1	1	1	2	2	5	2	1	1	1	5	25	L	

10 Conclusion

A total of seven wetland HGM units belonging to three HGM types namely floodplains (HGMs 1, 3, and 5), channelled valley-bottom (HGMs 2, 4 and 6) and unchanneled valley-bottom (HGMs 7) were identified and delineated within the three deviation areas (Deviations 1-3). Overall, HGMS 1, 2, 4 and 5 remain in a Largely natural state while HGMs 3, 6 and 7 are considered Moderately Modified.

The wetlands provide an even mix of important indirect supporting, as well direct provisional services (given their rural setting). The three floodplains (one crossed in each deviation), particularly HGM 1, are considered the hardest working in terms of ecosystem services provision. These floodplains are distinct from the other wetlands in that they provide highly important (scores of High and Moderate-High) services relating to flood attenuation, streamflow regulation sediment trapping, nutrient assimilation, erosion control, carbon storage and provision of water and harvestable resources. In terms of EIS, HGMs 1, 3 and 5 are the most functionally intact wetlands and are considered to have a Very High EIS. These wetlands provide important foraging habitat, shelter and movement corridors for high diversity of unique and conservation important wetland associated species.

In terms of risks, each deviation crosses at least one wetland. The most potentially adverse risk the disturbance and degradation of wetland and riparian vegetation at these crossing points. This impact is assigned a residual (with mitigation rating) of Moderate, on account of the activity occurring directly within the wetland and having a direct impact on the wetlands riparian integrity. As such a severity rating for this risk is set at the mandatory maximum of 5 as per the DWS Risk Assessment protocol. Unless the powerlines are re-routed outside of the wetlands and their associated 32 m buffer, this risk is unavoidable and permanent. Clearing of riparian vegetation and any other activities within the delineated boundary of the wetland will require a full water use licence.

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12 Appendices

DECLARATION

I, Tyron Clark, declare that:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing any decision to be taken with respect to the application by the competent authority; and the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of Section 24F of the Act.

Tyron Clark

Tyron Clark (Pr. Sci. Nat. 121338)

Wetland Ecologist

The Biodiversity Company

February 2021

Appendix E: Comments and responses report

Designation of Party	Contact person	Response by Seoras Graham the EAP. Environmental Assessment Practitioner.
In establishing the various relevant authorities to contact for the application:		
	EAP: Seoras Graham	1 April 2021 Hi Bathandwa, Thank you for your response. • We have completed a draft BAR Report, • Please find attached the Public Participation Plan, • We will submit the application form during the course of the next week, we have held back on submitting as we aware of Condition 19 of the NEMA regulations: -*"basic assessment timeframes whereby:, the applicant must, within 90 days of receipt of the application by the competent authority, submit to the competent authority"* • Lets do the meeting on the 08/04/2021 from 10h00. Feel free to contact me should you have any queries.
	Ms Bathandwa Ncube Department of Environment, Forestry and Fisheries Regulatory, Compliance and Sector Performance	1 April 2021 Goodday Seoras

	Integrated Environmental Authorisations:	Please send a MS Teams invitation for the meeting, as your team will have to record the meeting and draft the meeting minutes. Kind regards Bathandwa
	EAP: Seoras Graham	28th of April 2021, Hi Bathandwa, I hope this email finds you well. Please see the minutes from the meeting. We will be sending the application as a new application, this is as the specialist studies particularly for Deviation 3 was not within the current proposed deviation area. Feel free to contact me should you have any queries. Regards, Seoras Graham
	Ms Bathandwa Ncube	28th of April 2021, Goodday Seoras The minutes of the pre-application meeting refer.

		It is understood that the public participation process was conducted prior to approval of the Public Participation Plan by the Department therefore please note that upon submission of the application and draft BAR, the Department requires a 30 day commenting period on the draft BAR and may request additional information to be submitted with the final BAR or request that additional organs of state be given an opportunity to comment on the draft report. Regarding the Public Participation Plan (dated April 2021) that you have submitted to the Department (attached): 1. Please amend the PPPlan where it refers to an amendment application. 2. Site notices must be placed at strategic points along the powerline route deviations. 3. Should there be I&APs without internet resources, please cater for them in terms of telephone calls and sms notification. 4. If electronic copies of the report will be sent to stakeholders via electronic methods of sharing large files (links-WeTransfer etc.), the EAP/applicant is requested to follow up on receipt of these documents, as there are instances where these emails do not reach their required destination or get sent to junk mail. 5. When the PPPlan has been amended, please submit to me via email for approval, so you can submit the application and report on the EIA portal. Regarding the application itself:

		1. Please ensure that all the relevant listed activities have been applied for. Should the site fall within a CBA/protected area, please refer to activities in Listing Notice 3. Should any of the pylons fall within a watercourse and require excavation/infilling, the relevant activity must be applied for. 2. Start, middle and end coordinates must be provided for each deviation. 3. The stakeholders identified in the PPPlan refer. Please submit the draft report to the following additional stakeholders for comments: SAHRA (via the SAHRIS portal), BirdLife, Limpopo Department of Agriculture and Rural Development, Department of Water and Sanitation; and the Department's Biodiversity Conservation Directorate at BCadmin@environment.gov.za, Attention: Mr Seoka Lekota. 4. Regarding Specialist studies, please include a Visual Impact Assessment. 5. Additional comments will be provided after review of the draft BAR. Kind regards Bathandwa Ncube

Appendix F: Environmental Management Programme (EMPr)

Environmental Management Programme

For

ESKOM MHINGA PROPOSED POWERLINE DEVIATIONS, MALAMULELE, LIMPOPO

MARCH 2021

Department of Agriculture and Rural Development Land & Environmental Affairs (DARDLEA)REFERENCE: 12/12/20/1667

K&T PROJECT REFERENCE: 7047I

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Details of this report

Client Name:	Eskom Holdings SOC LTD
Client Contact:	Phuliso Masiagwala/Tshifiwa Matamela
Document Title:	Eskom Mhinga proposed deviation
K&T Project Reference:	7047I
File Name:	7047C_Eskom Mhinga Proposed Powerlines_EMPr_March 2021_Rev 1

Report Revision Record

Revision	*Date*	*Description*
A – D	March 2021	Draft Environmental Management Programme
0	June 2021	Final Environmental Management Programme

This report has been prepared by Kantey & Templer (Pty) Ltd (hereafter referred to as K&T), with all reasonable skill, care and diligence within the terms of the Contract with the client, incorporating our General Terms and Conditions of Business and taking account of the resources devoted to it by agreement with the client.

We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies on the report at their own risk.

ENVIRONMENTAL MANAGEMENT PROGRAMME

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ENVIRONMENTAL MANAGEMENT PROGRAMME

1. ENVIRONMENTAL IMPLEMENTATION PROCEDURES

The environmental procedures specify roles, responsibilities and procedures for the implementation of the Environmental Management Programme (EMPr) as well as training requirements.

1.1 The Scope of this EMPr

The general principles contained within this section shall apply to all activities associated with the construction, operation and decommissioning of deviated Mhinga 132Kv powerlines

Eskom proposes to deviate the authorised Kingbird 132kV powerlines in three sections between Phugwane and Mhinga Substation due to streams being located on the authorised route as well as houses being constructed since the authorisation was received on the 19th of November 2010. The deviations total distance is 8km whilst the actual line is 25kms in length.

1.2 Purpose and Structure of the EMPr

The purpose of this EMPr is to govern the Installation and operational activities to ensure that potential impacts on the surrounding environment are minimized. The objectives of this EMPr are to manage the identified impacts by:

- Specifying environmental management measures to be implemented on site by the Contractor;
- Assigning responsibilities for aspects of environmental management to relevant parties; and
- Detailing a system for addressing non-compliance which ensures accountability, reporting and resolution of any non-compliance.

Implementation of the conditions contained in this EMPr is ultimately the responsibility of Eskom trading as Holding SOC Ltd, although the relevant Contractor will be bound to complying with these through the inclusion of the environmental management specification in relevant Contractual Documentation.

This EMPr comprises of three sections, namely:

- **Environmental Implementation Procedures:**
  Provide a description of the roles and responsibilities of the Contractor as well as the Environmental Control Officer (ECO). It also contains the procedure for implementing the EMPr and details community liaison as well as monitoring of the EMPr. A brief description of the legislation which is potentially applicable to the proposal is also provided.

- **Project Background:**

  Provide an overview of the project details as well as the purpose and objectives of the EMPr. A description of the site and the proposal are provided in this section.

- **Potential Impacts and Environmental Specifications:**

  Lists the potential impacts the project may have on the environment and lists the management procedures which need to be adhered to by the Contractor and ECO. It provides details on the management of materials on site including waste management, water management, dust management and noise management. Fire control and the management of installation and operational activities are also discussed.

1.3 Roles and Responsibilities

The roles and responsibilities of various parties associated with environmental management during the project are outlined below. The channels of communication between the role players are indicated in Figure 1.

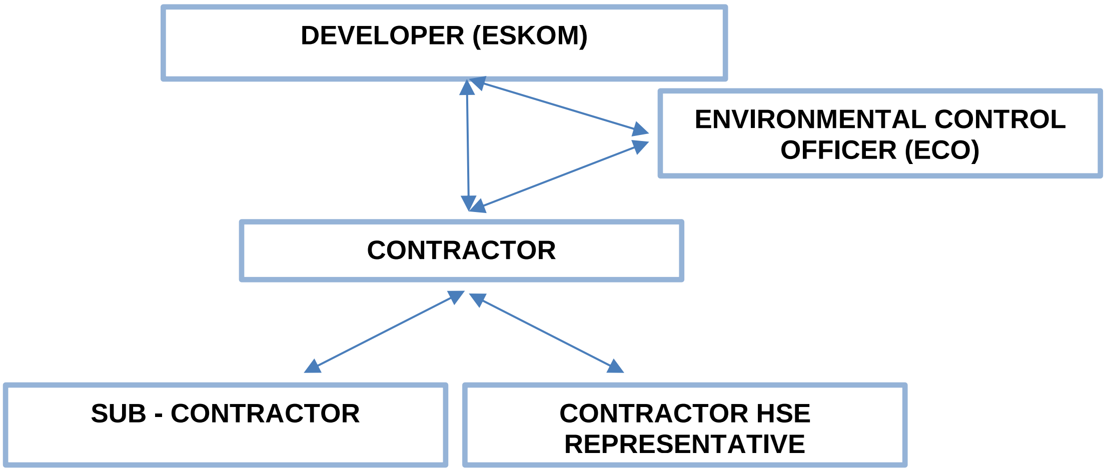

Figure 1: Channel of communication between role players

The Developer / Eskom

Eskom is ultimately responsible for ensuring the implementation of the EMPr. Eskom shall:

i. Ensure that the Contractor is duly informed of the EMPr and associated responsibilities and implications of this EMPr prior to commencement of the activity;
ii. Ensure that the Contractor is aware of and adheres to the provisions of this EMPr;
iii. Monitor the Contractor’s activities (together with the ECO) with regard to the requirements outlined in the EMPr;
iv. Ensure that the Contractor remedies problems timeously and to the satisfaction of the authorities;
v. Appoint an independent and suitably qualified ECO; and
vi. Notify the authorities and the ECO should problems not be remedied timeously.

The Contractor

The Contractor will be appointed by Eskom to undertake the required works on site. The Contractor will be responsible for:

i. Ensuring that all activities on site are undertaken in accordance with the EMPr;
ii. Informing all employees and sub-contractors of their roles and responsibilities in terms of the EMPr;
iii. Ensuring that all employees and sub-contractors comply with this EMPr;
iv. Consulting with the ECO in the case of any uncertainty regarding environmental management requirements, or any activities not covered in the EMPr which may have a detrimental effect on the environment;
v. Reporting any problems to the ECO; and
vi. Demonstrating respect and duty of care for the environment in which he/she is operating.

The Contractor will be responsible for the cost of rehabilitation of any environmental damage that may result from non-compliance with the EMPr, environmental regulations and relevant legislation.

The Contractor's Health, Safety and Environmental Representative

The Contractor will appoint/select a suitable representative who will be responsible for the environmental, health and safety management on site. The Contractor's Health, Safety and Environmental (HSE) Representative will be responsible for:

i. Ensuring that all activities on site are undertaken in accordance with the EMPr.

The Environmental Control Officer (ECO)

The ECO shall be a qualified environmental professional or professional firm with the relevant environmental expertise and shall be responsible for:

i. Informing key, on-site staff of their roles and responsibilities in terms of the EMPr;
ii. Undertaking site inspections once a month during the construction to determine compliance with the EMPr;
iii. Identifying areas of non-compliance, and recommending measures to rectify them in consultation with Eskom and the relevant Contractor;
iv. Compiling a checklist of areas of non-compliance;
v. Ensuring a follow-up and resolution of all non-compliance; and
vi. Undertaking a post construction inspection, this may result in recommendations for additional clean-up and rehabilitation measures if necessary.

EMPr Implementation Procedure

The EMPr implementation procedure is outlined below:

i. The ECO shall undertake an initial site visit in conjunction with Eskom and the relevant Contractor;
ii. Eskom will undertake to ensure that the EMPr is implemented, and ensure that copies of the EMPr are available at the offices of the Contractor on site;
iii. The Contractor's Environmental Representative is to undertake a weekly site inspection;
iv. The ECO will visit the site once a month to check on the progress of the implementation of the EMPr during the activity; and
v. The ECO will prepare reports at appropriate intervals, detailing any environmental issues, non-compliance and actions to be implemented.

1.4 Legal Requirements

In all instances, Eskom, their respective employees and contractors should remain in compliance with relevant local and national legislation. The Contractor's Environmental Representative should be familiar with all legislated requirements as well as permit conditions and agreements. Additionally, the Environmental Representative should be able to communicate these to the relevant persons and to monitor compliance. Particular attention should be paid to the following:

- Constitution of the Republic of South Africa Act (No 108 of 1996)
- National Environmental Management Act (No. 107 of 1998);
- National Water Act (No. 36 of 1998);
- National Heritage Resources Act (No. 25 of 1999);
- National Environmental Management: Air Quality Act (No. 39 of 2004);
- Occupational Health and Safety Act (No. 85 of 1993) and Construction Regulations (2014);
- Compensation for Occupational Injuries Act (No. 130 of 1993);
- Hazardous Substances Act (No. 15 of 1973);
- SANS 10400 relating to building regulations must be adhered to;

Note that other legislative requirements may pertain to the project, and the above list is not intended to be definitive or exhausted.

2. PROJECT BACKGROUND

2.1 Introduction

The planned development by Eskom is for a deviation in three sections of the authorized Kingbird powerline between the proposed Phugwane substation and the proposed Mhinga substation. The location of the proposed project is between Penninggotcha and Mhingaville within the Limpopo province. Deviation 1 is located on the following farm holdings: Remaining Extent of the farm Mhinga's Location 258 MT, Remaining Extent of the farm Mhinga's Location Extension 259 MT, Remaining Extent of the farm Tshikundu Location’s Extension 260 MT and Remaining Extent of the farm Tshikundu Location’s 262 MT. Deviation 2 and 3 are located on the Remaining Extent of the farm Nthlaveni 2 MU.

The approximate size for the three deviations total 8000m or 8km in length, whilst the entire proposed Kingbird powerline measures some 25km in length.

The deviation is necessary due to the presence of streams on the authorized route, as well as the construction of houses in the development path which has occurred since the authorization was received on the 19th of November 2010. Deviation 1 and Deviation 2 are due to the presence of rivers or wetlands and Deviation 3 is due to the presence of houses.

2.2 Site Description

The table below provides an overview of key characteristics of the site.

Table 1: Table 1: Site Description

Name of Site	Eskom Mhinga Proposed Powerline Deviation
Location of site	The approximate length of the three deviation sections is 8kms. The length of the entire authorized Kingbird powerline is 25kms.
Site co-ordinates	***Deviation 1 centre point:*** Latitude: 22° 55’ 43.01”S Longitude: 30° 51’ 08.41” E ***Deviation 2 centre point:*** Latitude: 22° 51’ 58.73”S Longitude: 30° 52’ 10.13” E ***Deviation 3 centre point :*** Latitude : 22° 49’ 11.77”S Longitude: 30° 52’ 46.61”E
Extent of Site	8km linear
Surrounding Land Uses (within 500 m)	**North:** Undeveloped land tribal land **East:** Undeveloped land tribal land **South:** Undeveloped tribal land **West:** Undeveloped tribal land

Figure 2: Aerial image showing the location of the site in relation to its surrounds (©Google Afr 2021)

3. DEFINITIONS

For the purposes of this EMPr, the following definitions and abbreviations shall apply:

The Site	
Community	Those people who may be impacted upon by the activity. This includes neighbouring landowners, the local authority and other occasional users of the area.
EMPr	The Environmental Management Programme, applicable to the project.
Hazardous Material	A substance that can have a harmful effect on the environment and those substances declared hazardous substances in terms of the Hazardous Substances Act (Act 15 of 1973).
Solid Waste	All solid waste including construction debris, chemical waste, broken redundant equipment, oil filters, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).
Environment	The surroundings within which humans exist, comprising of the following components: i. The land, water and atmosphere of the earth; ii. Micro-organisms, plant and animal life; iii. Any part or combination of points i and ii and the interrelationships among and between them; and iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and wellbeing.
Contaminated Water	Water contaminated by the Contractor's activities, e.g. water and runoff from plant/personnel wash areas.
Plant	All site equipment and machinery.
Potentially Hazardous Substance	A substance which, in the reasonable opinion of the Engineer/ECO/EO, can have an adverse effect on human health or the environment.
Reasonable	Unless the context indicates otherwise, reasonable in the opinion of the ECO after he/she has consulted with an employee of the Developer, suitably experienced in "environmental implementation plans" and "environmental management programmes" (both as defined in the National Environmental Management Act, No. 107 of 1998).

4. VARIOUS POTENTIAL IMPACTS ARE ASSOCIATED WITH THE CONSTRUCTION PHASE

Various potential impacts associated with the erection and operation Phase have been identified. The following table provides mitigation measures which should be implemented to mitigate these factors.

Table 2: Potential impacts associated with the construction of the power lines.

Potential Impact	Mitigation Measure
Impact*:* Clearing the site **Description:** The clearing of vegetation and in order to not destroy the environmentally valuable topsoil which is fertile and contains organic material is removed.	i. The first 300 mm of soil must be stockpiled separate from the soil excavated deeper than 300 mm; and

	ii. All excess soil resources must be conserved and used for topsoil in areas where erosion has occurred or for agricultural use.
Impact*:* Stormwater management **Description:** Stormwater will need to be managed such that erosion features do not form and siltation of the stormwater does not occur.	i. Stormwater is managed where water is dispersed and not concentrated. ii. Clearing of vegetation and topsoil should be limited as far as possible to areas which are to be earmarked for development. The topsoil shall be cleared and used in areas to rehabilitate where temporary areas are to be located such as the site camp. iii. Measures such as hale bails and silt fences should be employed to reduce the silt load of the water which discharges to drainage lines. iv. Should erosion features form these erosion features should be rehabilitated and the stormwater dispersed such that they don't occur again. v. Mulch should be used to cover exposed soil and prevent the onset of erosion.
Impact*:* Water Conservation **Description:** Protecting sensitive environmental features.	i. Any alien invasive species must be removed from the servitude.
Impact*:* Environment **Description:** Protecting sensitive environmental features.	i. No poisoning or trapping of any fauna should be permitted, all staff must adhere to this; ii. It is deemed important that the wetlands drainage lines and buffer are demarcated ideally with wooden stakes as sensitive areas, and no construction activity, laydown yards, camps or dumping of construction material are to be permitted within the sensitive zones (where possible);
From the specialist studies conducted.	
Environmental: Botanical	i. A competent Environmental Control Officer (ECO) must oversee the construction and rehabilitation phase of the project, with the protected plant species condition, protection and demarcation as a priority; and ii. Protected and Threatened Trees: The removal of large trees should be avoided as much as

	possible. In the event avoidance is not feasible, a permit will be required for the relocation or destruction of trees. The impact to the NT *Dalbergia melanoxylon* (zebra wood) and protected tree species that occurred throughout the survey corridor are one of the major considerations regarding the proposed development. It is thus imperative that all avenues, especially avoidance be considered. If avoidance is not possible, relocation needs to be considered. If avoidance or relation is not possible, a permit for destruction then needs to be applied for at the local authority.
Environmental: Avifauna	i. Mitigation measures as described in the specialist study can be implemented to reduce the significance of the risk but there is still a possibility of collision by large non-passerine avifauna species. ii. Based on the number and status (e.g. CR) of the large SCCs recorded, the area is seen as very highly sensitive. Considering the project was previously approved the impact compared to the benefit was considered sufficient to warrant the project to be authorized. iii. This decision should include whether a long term monitoring study should be conducted prior to the approval of this project.
Environmenta : Wetland Assessment	i. The 1:100 year floodline extent along with delineated wetlands are provided and a 30 m buffer was delineated as sensitive areas. These areas should be avoided for habitat protection with no associated infrastructure or building facilities within the delineated areas. ii. To do this the powerline towers should be designed such that the towers are outside the 1:100 year floodline and 30m buffer. If this is not possible then the impact will be greater and additional measures should be considered such as drafting method statements approved by the ECO and wetland specialist.
Heritage Impacts	i. The burial heritage sites identified by the heritage specialist are the following: (Exigo-MHI-BP01 - Site Exigo-MHI-BP03). ii. It is primarily recommended that the burial be conserved in situ and that a conservation buffer of at least 50m, as required by SAHRA Burial Ground and Graves (BGG) Unit.

	iii. A fence and access gate should be erected around each burial site. A distance of at least 2m should be maintained between the graves and the fence which should be at least 1,8m high. Clear signboard should be erected indicating the heritage sensitivity of the sites and contact details for visitation of the graves.
Visual Impacts	• With the preparation of the portions of land onto which activities will take place the minimum amount of existing vegetation and topsoil should be removed. • Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation. • All topsoil that occurs within the proposed footprint of an activity must be removed and stockpiled for later use. • Adopt responsible construction practices aimed at containing the establishment activities to specifically demarcated areas.
Fire and Explosions	i. Hot works are only permitted where it is suitable and in a distal location of any grass. ii. Fire extinguishers and water should be available should a fire occur. **An emergency fire plan must be available onsite should a fire occur.**
Impact*:* Soil and groundwater contamination from surface spillages. **Description:** The storage and handling of hydrocarbon fuels or lubricants and/or leaking equipment may result in accidental spillages. Accidental spillages can potentially contaminate soil, surface water and groundwater. **NB:** No batching of concrete will occur onsite.	**Soil Management** i. Construction vehicles to be maintained in good working order to reduce the probability of leakage of fuels and lubricant. ii. Fuel and other chemicals are to be stored correctly on site. iii. Correct measures need to be taken to ensure that no contaminants seep into the soil. iv. SANS 10 400 relating to building regulations must be adhered to. v. Emergency procedures and clean-up operations must be in place prior to commencement of Installation. vi. All suspected contaminated soil is to be removed and stored on tarpaulin prior to disposal to a licensed hazardous waste facility. Waste manifest/waste disposal certificate documents must be retained. **Surface and Groundwater Management** i. Vehicles transporting concrete and other chemicals are not permitted to be washed on site. ii. Vehicle maintenance is not permitted on site, unless in a designated area which is to be bunded or have spill trays and spill kits available. iii. Mixing/decanting of chemicals and dangerous goods must take place on a drip tray / shutter boards / impermeable surface.

	iv. The materials storage area must be located in a defined area away from the onsite drainage system to prevent contamination of stormwater. v. Fuel and other chemicals are to be stored correctly on site. vi. Measures need to be taken to ensure that no contaminants seep into the soil or groundwater. vii. Emergency procedures and cleaning up operations must be in place prior to installation commencement. **Stormwater management** i. The Contractor must prevent discharge of any pollutants, such as lime, chemicals and fuels into any watercourses and/or the stormwater system. This is an offence in terms of the National Water Act (Act 36 of 1998). **ii.** Stockpiled material must be situated on higher lying areas of the site and not in any stormwater run-off channels or any other areas where it is likely to cause erosion or where water would naturally accumulate.
Impact: Traffic Increase Description: An occasional disturbance in traffic may be experienced during the refuelling of the tank.	i. Vehicles accessing the site are required to be roadworthy and fitted with safety lights to increase visibility. ii. Appropriate road signage is to be used. iii. The speed of truck(s) and other vehicles must be strictly controlled to avoid dangerous conditions. Site speed limits must be adhered to.
Impact: Noise Pollution **Description:** Construction activities will result in a temporary increase in noise levels due to delivery vehicles/trucks moving to and from the site.	i. The activity will only occur from Mondays to Fridays, between the hours of 7am and 6pm, Saturdays between the hours of 7am and 1pm. No work is to occur on Sundays and / or public holidays unless approved by the Engineer and ECO. ii. Employees are to wear appropriate PPE to limit hearing damage. iii. Vehicles are to be maintained to limit noise levels.
Impact: Waste **Description:** Inappropriate disposal of such waste will pollute the receiving environment (soil/ storm water) and adjacent properties. **NB:** No batching of concrete will occur onsite. Waste generated during construction may consist of the following : • Building rubble. • General waste. **Metal waste.**	Bins shall be emptied regularly and the contents disposed of at a licensed waste disposal facility. • All waste is to be disposed of at a licensed and correctly designated waste disposal facility. • All waste storage areas onsite must be kept tidy. • Separate bins with closed lids shall be provided for hazardous and general waste and shall be clearly demarcated. • Recyclable waste shall be separated for recycling. • All waste stored onsite must be secured so that it is not blown offsite by wind. **Building Rubble** i. During construction activities, all rubble generated must be removed from the site; **Fuel Spillages**

	ii. The contractors used for the construction should have spill kits available prior to construction to ensure that any fuel, oil or hazardous substance spills are cleaned-up and discarded correctly; iii. Adequate firefighting equipment must be provided at strategic points on site. a. Rehabilitate the area if required. iv. Contaminated soil/fuel that cannot be removed needs to be treated *in situ* with an appropriate remedial agent. **Hazardous Waste** v. Hazardous wastes, including all items deemed to be contaminated, must be separated from general waste, stored separately in appropriate containers and disposed of at a licensed hazardous waste disposal facility or certified recycling facility. vi. Separate bins with closed lids must be provided for hazardous and general waste and must be clearly marked. vii. Bins shall be emptied on a weekly basis and the contents disposed of at a licensed waste disposal facility. viii. The Contractor will be responsible for the remediation of water and/or soil, if these are found to be contaminated as a result of the activities of the Contractor. **General Waste** ix. No waste is to be buried on the site. x. Waste may not be burned onsite. xi. All waste is to be disposed of at a licensed waste disposal facility. xii. All waste storage areas onsite must be kept tidy. Separate bins with closed lids shall be provided for hazardous and general waste and shall be clearly marked. xiii. All waste stored onsite must be secured so that it is not blown offsite by wind. xiv. Sufficient weather-proof and vermin-proof bins must be provided for the disposal of solid waste. xv. Bins shall be emptied regularly and the contents disposed of at a licensed waste disposal facility. xvi. Proof of disposal (certificate) must be retained for auditing purposes. xvii. The Contractor is to separate all rubble from “soft” waste.

	xviii. The Contractor must set up a solid waste control and removal system. The system shall comply with the following detailed requirements: a. Wherever possible, materials used or generated shall be sorted for recycling purposes. Recycling protocols shall sort materials into the following categories: xix. Paper/cardboard xx. Aluminium xxi. Metals (other than aluminium) xxii. Organic waste xxiii. Glass
Impact: Health and Safety Issues **Description:** Due to the nature of activities associated with the construction of the powerlines and towers. Due to construction activities, together with negligence and inadequate staff training, the safety of workers, the public, property and/or equipment may be compromised. Injury from moving **construction and delivery vehicles**	**General Health and Safety** i. The contractor appointed for construction is to comply with Occupational Health and Safety Act (OSHA) 85 of 1993 in its entirety. ii. All personnel are to abide by Gormet Guru specific and general site safety, health and environmental rules. iii. A file should be kept on site containing documents and checklists relevant to HSE. These include daily checklists for Personal Protective Equipment (PPE), site layout and compliance etc. In addition to this, a record of daily “toolbox talks” should be documented and filed. iv. No person should work onsite without being formally inducted into Health, Safety and Environmental issues. v. All plant, machinery tools and equipment brought onto site are to be fit for the purpose and the required legal documents indicating compliance, testing, calibration and inspection available. vi. No hot works may commence onsite without the appropriate approval and permit. vii. No work is to commence without the fire team and/or first aider being present, together with their fire or first aid equipment. viii. All personnel are to wear the prescribed PPE. ix. No person in an intoxicated state i.e. under the influence of drugs or alcohol will be permitted to enter, work or remain onsite. x. Only authorised and trained operators may operate machinery. xi. Telephone numbers of emergency services, including the local fire department, shall be posted conspicuously in the Contractor’s/s office near the telephone. In the event of an emergency, the Contractor shall contact the emergency service in the area.

	xii. The Contractor shall allocate "designated smoking areas" for employees onsite. These areas must be equipped with the necessary fire-fighting measures to prevent fires. xiii. In order to respond to emergency conditions that may arise onsite due to leakages, contamination and accidents, comprehensive and effective evacuation plans and emergency must be in place and implemented, as required. xiv. Access to the construction area is to be restricted and only the site personnel are to be permitted access to this area. xv. The contractor will provide workers with adequate Personal Protective Equipment (PPE). xvi. Ensure that the handling of equipment and materials is supervised and adequately instructed. xvii. Ensure adequate training of staff. xviii. **Ensure that construction vehicles and equipment are under the control of competent personnel.**
Socio-economic impacts	Positive socio-economic impacts through job creation, sustainable farming training, food produced and awareness. No mitigation measures are required as the he impacts are positive in terms of job creation.

5. POTENTIAL IMPACTS ASSOCIATED WITH THE OPERATIONAL ACTIVITIES

Various potential impacts related to the operational phase have been identified and appropriate measures are proposed in order to mitigate these impacts. The following table summarises such mitigation measures:

Potential Impact	Mitigation Measures
Impact protecting the wetland and associated buffer **Description:** The wetland integrity must be maintained as it is an important and legislated water resource.	The wetland's buffer zone must be clearly demarcated by means of barricading. The following activities should not be permitted in the demarcated area: i. Harvesting plants; ii. Ablutionary activities; and iii. No trapping or killing of fauna.
Environmental	• There are not expected to be any further impacts but as suggested by the Avifauna specialist a monitoring plan should be implemented to establish what the impacts on the birds species are.
Water management: **Description:** The sensitive water resource features should be adhered to.	i. The conditions of the water authorization shall be adhered to ensure mitigation of the sensitive wetlands are implemented.

Noise Impact: **Description:** As the natural surrounds are relatively quiet important to mitigate noise impacts of noisey machinery.	i. Aethetics/Noise: ii. Construction should only take pace between: 08H00 to 17H00
Impact: Traffic	iii. All vehicles will follow the traffic management legislation and on- site rules.
Fire and Explosions	• Hot works are only permitted where it is suitable and in a distal location of any grass. • Fire extinguishers and water should be available should a fire occur. An emergency fire plan must be available onsite should a fire occur.
Impact: Waste Generation **Description:** waste generated during the operational phase.	**Hazardous Waste** i. Hazardous wastes, including all items deemed to be contaminated, must be separated from general waste, stored separately in appropriate containers and disposed of at a licensed hazardous waste disposal facility or certified recycling facility. ii. Separate bins with closed lids must be provided for hazardous and general waste and must be clearly marked. iii. Certificates of hazardous waste disposal must be kept for auditing purposes. iv. Bins shall be emptied on a daily/weekly basis and the contents disposed of at a licensed waste disposal facility. v. The Contractor will be responsible for the remediation of water and/or soil, if these are found to be contaminated as a result of the activities of the Contractor. **General Waste** i. No waste is to be buried on the site. ii. Waste may not be burned onsite. iii. All waste is to be disposed of at a licensed waste disposal facility. iv. All waste storage areas onsite must be kept tidy. Separate bins with closed lids shall be provided for hazardous and general waste and shall be clearly marked. v. All waste stored onsite must be secured so that it is not blown offsite by wind. vi. Sufficient weather-proof and vermin-proof bins must be provided for the disposal of solid waste. vii. Bins shall be emptied regularly and the contents disposed of at a licensed waste disposal facility.

	viii. Proof of disposal (certificate) must be retained for auditing purposes. ix. No dumping is permitted onsite. x. The responsible site personnel is to remove refuse collected from working areas at least once a week. xi. Wherever possible, materials used or generated during operation shall be sorted for recycling purposes. Recycling protocols shall sort materials into the following categories: • Paper/cardboard • Aluminium • Metals (other than aluminium) • Organic waste • Glass
Socio-Economic Impacts	Positive socio-economic impacts through job creation and access to power to the local community
Visual Impacts	• Ensure, wherever possible, natural indigenous vegetation is retained and incorporated into the site rehabilitation.

In light of the above, it is imperative that Eskom maintain specific operating procedures as well as routine equipment integrity checks to minimise the abovementioned risks associated with the operation of the site.

No-go option				
CONSTRUCTION PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**
The no go option there would not be the benefits of construction activities in a severely depressed economy.				
OPERATIONAL PHASE				
Potential impacts	**Significance rating of impacts (positive or negative)**	**Proposed mitigation**	**Significance rating of impacts after mitigation**	**Risk of the impact mitigation not being implemented**

6. GENERAL MANAGEMENT

6.1 Storage Area

i. Storage areas are to be roofed with impervious material.

ii. Stockpile areas shall be approved by the ECO before any stockpiling commences.

iii. The area allocated to store fuel / chemicals (if required) must have clear sign posts (no flames, no smoking etc.).

iv. If a chemical storage area is required onsite the bund walls needs to be high enough to contain one and a half times the volume of product to be stored.

6.2 Materials Delivery and Offloading

i. Sub-contractors and delivery drivers shall be informed of procedures and restrictions in terms of this EMPr.

ii. All loads will be secured to prevent spillage during transport.

iii. The Contractor shall be responsible for clean-up resulting from failure of Sub-contractors to properly secure materials.

6.3 Hazardous Substances

i. The contractor/site operator must keep Material Safety Data Sheets (MSDS) on site for all potentially hazardous substances/materials used (as defined in the regulations for Hazardous Chemical Substances). Suitably trained personnel are to be available onsite during working hours so that in the event of human exposure to any hazardous materials the correct first aid actions can be implemented.

ii. All hazardous substances e.g. oils, bitumen, hydraulic fluids are to be stored within secondary containment (e.g. using a drip tray) in a suitable storage facility. Major stocks of hazardous materials other than fuel should preferably be stored offsite.

iii. No hazardous substance may be disposed of onsite. All hazardous wastes are to be disposed of at a licensed waste disposal facility.

6.4 Maintenance of Equipment and Machinery

i. The Contractor shall designate an area for the servicing of equipment and vehicles if this is to be undertaken onsite.

ii. All equipment/vehicles will be serviced in this area unless it is physically impossible to move a machine.

iii. All reasonable measures must be taken to ensure waste oils and lubricants are contained e.g. drip trays may be used.

iv. A demarcated area shall be provided for the parking of Contractor's vehicles / equipment not in use.

v. All equipment / vehicles are to be regularly serviced and maintained in good working order. All leaks are to be repaired as soon as possible.

vi. Vehicles dripping oil / grease are not to be permitted on public roads or onsite.

vii. Refuelling of equipment (if required) must occur within a designated refuelling area with adequate pollution prevention measures in place.

6.5 Management of Power Tools

i. Any welding, cutting and other hot work activities may not commence until the site has been inspected. All flammable or explosive substances should be isolated and the area where used not to a risk of causing a veld fire.

6.6 Management of Site

6.6.1 Site Boundaries and "No Go" Areas

i. Privately owned areas beyond the boundary of the site are to be designated as "no go" areas by the Contractor, these includes the wetland, the wetland buffer and the drainage line.
ii. Any sensitive areas will be demarcated as "no go" or "restricted access" areas.
iii. Should additional work space be required, this must be agreed upon between the Engineer, Contractor/s, and ECO.
iv. Site boundaries within which the Contractor may operate must be agreed to prior to the start of site operations. The Contractor must fence off or demarcate these areas at the beginning of the project. These fences must be maintained.

6.6.2 Concrete and Cement Batching

i. All bulk concrete batches (exceeding 6m^3) should be imported to the site.
ii. Small scale cement batching will be allowed in areas designated by the ECO.
iii. Runoff from operations must be contained and sediments allowed must be allowed to settle. Following the "settling out" of sediments, runoff may be disposed of at the nearest waste water treatment works. Contaminated runoff may not be disposed of in the stormwater system as it will result in the contamination of nearby water bodies. **This is an offence in terms of the National Water Act (No. 36 of 1998).**
iv. Cement bags must be placed in bins and not left to blow around the site. They must be disposed of as waste at a licensed waste disposal facility.

6.6.3 Site Layout and Construction Camp

i. The Contractor, in consultation with the Engineer and the ECO shall designate an area for the erection of the construction camp, should this be required.
ii. The area chosen for these purposes shall be the minimum reasonably required and which will involve the least disturbance.
iii. Specific areas onsite will be set aside for various project activities. The location of the construction camp, ablution facilities and storage areas will be agreed upon prior to the commencement of work at the site, and should be agreed in conjunction with the ECO, Engineer, and Contractor.
iv. These areas must be maintained in good condition throughout the project, as to prevent environmental degradation.

6.6.4 Ablution Facilities

i. Ablution facilities are to be provided for all onsite staff.
ii. Toilet facilities supplied by the Contractor for the workers should occur at a minimum ratio of 1 toilet per 25 workers (preferred 1:15).
iii. Excretion and urination are strictly prohibited other than at the designated ablution facilities.
iv. All temporary / portable toilets are to be secured to the ground to the satisfaction of the ECO to prevent them from toppling over due to wind or any other cause.

v. Toilets shall be maintained in a hygienic state and serviced regularly or as required by a reputable contractor, and the contents are to be removed to a licensed disposal facility.

vi. The Contractor shall ensure that no spillage occurs when the toilets are cleaned or emptied.

vii. The Contractor shall ensure that toilets are removed offsite following completion of the project.

6.6.5 Eating / Break Areas

i. The Contractor shall designate an area for staff to eat during breaks.

ii. The Contractor must ensure that no fires, for cooking or other purposes, are lit onsite.

iii. Sufficient weather- and vermin-proof bins are to be provided for the collection of domestic waste.

6.6.6 Security

i. The storage area will be securely fenced by means of portable fences.

ii. All construction material and equipment must be stored in locked containers within the storage area.

iii. The storage area shall be well lit at night and the emergency contact numbers of the Contractor/s shall be posted conspicuously in case of an emergency.

6.7 Control of Fire Risks

i. The Contractor(s) shall take all reasonable and active steps to avoid increasing the risk of fire through their activities onsite.

ii. No fires are permitted onsite.

iii. Workers shall not be permitted to smoke onsite.

iv. The Contractor's HSE Representative shall ensure that the basic firefighting equipment is available onsite and is to the satisfaction of the local emergency services.

v. Sufficient firefighting equipment, which is in good order shall be maintained onsite at all times.

vi. Local emergency services should be notified of intended construction activities.

7. ENVIRONMENTAL AWARENESS PROGRAMME FOR EMPLOYEES AND CONTRACTORS

The training should provide a guide or reference for the Contractor to enforce environmental awareness, as it is the Contractor's responsibility to ensure compliance with the EMPr. Environmental training should be conducted on an ongoing basis. Therefore, even if the formal "classroom" training is not possible, training should be conducted in the form of toolbox talks or via other information-sharing platforms. It is fairly easy to determine whether training has been provided by conducting personal interviews and checking the general conditions of the site. For instance, oil spillages, poor soil management, damage to vegetation outside the construction area, poor waste management, inadequate toilet facilities etc. indicate that environmental awareness onsite has not been discussed or practiced in an appropriate manner.

7.1 Objective

The objective of this procedure is to intensify environmental awareness as well as to ensure compliance with the EMPr by the Contractor to ensure that his/her employees, whose work impacts on the environment, receive environmental awareness training relevant to their level of responsibility.

7.2 Scope

The scope of the Environmental Awareness procedure is to increase environmental awareness as well as to ensure compliance with the conditions of the EMPr, as well as to explain how work can be performed in an environmentally responsible manner.

7.3 General Environmental Awareness Training

The purpose of general environmental awareness training is to ensure that the contractor's employees at each relevant function and level receive environmental training and are made aware of:

i. The importance of conformance with the environmental procedures and with the requirements of the EMPr.
ii. The significance of environmental impacts, actual or potential, of their work activities and environmental benefits of improved personal performance.
iii. Their roles and responsibilities in achieving conformance with the environmental procedures and with the requirements of the EMPr, including emergency preparedness and response requirements.

7.3.1 Environmental Awareness Training – Operator & Management Levels

The environmental awareness training works on the concept of making a connection between an activity/aspect and an impact on the environment. By identifying the relevant impact, the potential negative impacts on the environment are identified and staff is made aware of the environmental impacts of their activity, products and services, as well as of how to mitigate such impacts.

Awareness training for management level includes taking cognisance of the project's EMPr and an overview of general environmental awareness principles.

New employees and Contractors should receive induction training prior to commencing with their tasks.

7.3.2 Programme for Basic Environmental Awareness

All employees onsite should receive basic environmental training. The reasons for specific actions, methodology and processes must be explained. Training should be given to the workers onsite with regard to environmental awareness. Basic environmental awareness will address the following:

i. Training of staff to ensure that solid waste or building waste dumping is prevented. Transferring knowledge to the drivers and visitors regarding use of waste bins, the consequences of dumping, and the importance of using a chemical toilet.

ii. Preventing toxic waste dumping by using plastic lining when mixing concrete, drip trays and oil-collecting containers.
iii. Treatment of hydrocarbon waste spills.
iv. Health and safety issues are to be addressed by conveying the importance of personal hygiene.
v. Training in topsoil management when subsoil is to be removed.
vi. Training in topsoil treatment during rehabilitation.
vii. Training on the management of overburden removal, stockpiling and replacement.
viii. Training on the maintenance and repair of access roads.
ix. Checking vehicles for oil leaks, noise levels and exhaust emissions;
x. Removal and treatment of contaminated soil.

8. MONITORING AND PERFORMANCE ASSESSMENT

i. Regular monitoring of all the environmental management measures and components shall be carried out by Eskom in order to ensure that the conditions contained in this EMPr are adhered to.
ii. Ongoing and regular reporting of the progress of implementation of this EMPr will be undertaken.
iii. Various points of compliance will be identified with regard to the various impacts that the operations will have on the environment.
iv. Inspections and monitoring shall be carried out on both the implementation of the plan and the impact on plant and animal life.
v. Visual inspections on erosion and pollution shall be carried out on a regular basis.

9. EMERGENCY RESPONSE PLAN

Procedure

i. An Emergency Response will be initiated in the following situations:
   a) In the event of a fire;
   b) In the event of an explosion;

The following procedure is to be followed in the event of an emergency:

i. The area is to be evacuated and cordoned off;
ii. The Fire Department and all relevant Emergency Services are to be contacted;
iii. The Local Municipality is to be notified;
iv. The Department of Water Affairs and Sanitation is to be contacted;
   b.

10. REHABILITIATION AND AFTERCARE

The aim of rehabilitation is to:

i. Manage the site and conduct orderly housekeeping in such a way as to not unnecessarily disturb the surrounding areas and / or other sensitive environments.
ii. Conduct the final rehabilitation of the site so that visual scarring is minimised.

iii. The use of topsoil to reinstate the natural the natural.

iv. Ensure that the environment affected by the activity is adequately rehabilitated, as far as practical, to a pre-determined standard which conforms to the concept of sustainable development. The affected environment shall be maintained in a stable condition that will not be detrimental to the health and safety of humans and animals, and that will not pollute the environment or lead to the degradation thereof.

v. It is the responsibility of Eskom to ensure that the Contractor and their employees' onsite are capable of complying with all the statutory requirements, which includes the implementation of this EMPr.

vi. Any gate or fence erected by the Contractor which is not required by the landowner shall be removed.

vii. All infrastructure and equipment used during the construction period must be removed from the site following completion of the project and these areas rehabilitated.

viii. Waste material of any description, including receptacles, scrap and rubble must be removed from the site and disposed of at a licensed waste disposal facility. Waste may not be buried or burned onsite.

ix. Final rehabilitation shall be completed within a period specified by the ECO.

11. TOLERANCES

Non-compliance with the conditions of this EMPr will constitute a breach of contract. The Contractor shall be held liable should his / her activities inflict damage to the environment. The Contractor shall mitigate any damage sustained and any consequences resulting from such damage, at his / her expense.

12. GENERAL

If modifications to this document are required, these should be agreed to by all parties concerned.

Appendix G: Other information

Appendix H: Public Participation

-Photographs of Site Notices

Photo 1: Substation site notice posted in the proposed servitude of the Deviation 3 powerline route along R524 Punda Maria road (Mhingaville and Pennigotcha Substaion).

Photo 2: Xitsonga and English public participation notice posted on the intesection road of Saselemane(R524) and Xikundu village(unamed road)

Photo 3: Public participation notices in both Xitsonga and English posted on the intesection between R524 (Punda Maria road) at Mhingaville and D3862 at Maphophe Village

K&T KANTEY & TEMPLER CONSULTING ENGINEERS	Eskom	PUBLIC PARTICIPATION	DECEMBER 2020
		ESKOM MHINGA	7047I