May 2018

MDARDLEA REF:
1/3/1/16/1E - 149

BASIC ASSESSMENT REPORT

CROCODILE RIVER SUBSTATION AND POWERLINE

SUBMISSION

ENPACT ENVIRONMENTAL CONSULTANTS CC
REG. 2004/051532/23

I. PROJECT INFORMATION

PROJECT DETAILS						
TITLE:	Crocodile River Substation and Powerline					
REPORT STATUS:	Basic Impact Assessment Report – submission					
LOCATION:	The Remaining Extent of Portion 14 of the farm Boschrand 283 JT, The Remaining Extent of farm Riverside 308 JT, Portion 1 of the farm Riverside 308 JT and Erven 7, 8, 10, 11, and 29 of Mataffin, Mpumalanga. The secondary substations will be located on Riverside Park Ext 27&29.					
COORDINATES:	**Latitude (S):**			**Longitude (E):**		
Start	25˚	28’	02.60”	30˚	55’	48.97”
End	25˚	26’	30.41”	30˚	56’	59.43”
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REVIEWED BY:	Heinrich Kammeyer Enpact Environmental Consultants CC E-mail: heinrich@enpact.co.za					
APPLICANT:	**City of Mbombela local municipality**					
REPORT PREPARED FOR SUBMISSION TO:	**Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs: DARDLEA**					
DATE OF COMPILATION:	**May 2018**					
ACTIVITIES APPLIED FOR:	Notice no. R 983, 2014: Activity 11, 12 Notice no. R 985, 2014: Activity 14					
MDARDLEA REFERENCE NUMBER:	1/3/1/16/1E - 149					

EAP Declaration

I hereby affirm/confirm:

- The correctness of the information provided in the report;
- I will ensure compliance with the EIA Regulations 2014 (as amended);
- 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 application;
- I will take into account, to the extent possible, the matters listed in regulation **18** of the regulations when preparing the application and any report, plan or document relating to the application;
- I will disclose to the proponent or applicant, registered interested and affected parties 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 or the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority (unless access to that information is protected by law, in which case I will indicate that such protected information exists and is only provided to the competent authority);
- I 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;
- I am aware that it is an offence in terms of Regulation 48 to provide incorrect or misleading information and that a person convicted of such an offence is liable to the penalties as contemplated in section 49B(2) of the National Environmental Management Act, 1998 (Act 107 of 1998).

Signature of the environmental assessment practitioner

09/05/2018

Executive Summary

Submitted to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) in terms of the requirements of Government Notices no. R982 and R983 for the Basic Environmental Impact Assessment (BA) process in terms of the 2014 EIA Regulations as amended, National Environmental Management Act, 1998 (Act No. 107 of 1998).

Application Summary

Project: Crocodile River Substation and Powerline

Location: The project is of a linear nature and traverses and includes The Remaining Extent of Portion 14 of the farm Boschrand 283 JT, The Remaining Extent of farm Riverside 308 JT, Portion 1 of the farm Riverside 308 JT and Erven 7, 8, 10, 11, and 29 of Mataffin, City of Mbombela local municipality, Mpumalanga. The secondary substations will be located on Riverside Park Ext 27&29.

The line will start at the existing Mataffin Substation and mostly follow existing road alignments and end at the proposed substation further north from where it will feed into two smaller substation units.

Activities:
Activities published in the EIA regulations (amended) in the Government Notice No. R983 and R985 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) requires environmental authorisation:

R.983, 2014: Activity 11 – The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.	▪ The construction of an electrical substation and a 132kV powerline between the following points: • 25˚28'02.60"S 30˚55'48.97"E • 25˚26'30.41"S 30˚56'59.43"E
R.983, 2014: Activity 12 - The development of—(ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs—(a) within a watercourse; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — excluding — (dd) where such development occurs within an urban area; (ee) where such development occurs within	▪ The construction of a 132kV powerline where pylon/pole footprints will be 15 x 15m within or close to identified water resources where the alignment falls outside an urban area and outside the road reserve.

existing roads, road reserves or railway line reserves.	
R.985, 2014: Activity 14 – The development of — (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs — (a) within a watercourse; (c) if no Development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse f. Mpumalanga - i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.	▪ The construction of a 132kV powerline where the alignment will entail pylon/pole footprints of 15 x 15m within or close to identified water resources and where it falls within areas classified as Ecosystem Support Areas under the MBSP 2014 that can fall under ecosystem services areas.

Project description:

It is proposed to construct a 132kV powerline from the Matsafeni substation to a new a substation that will accommodate 4 x 20 MVA transformers in order to provide electricity to the Fresh Produce Market and other Riverside Townships such as Ext. 27 & 29 west of the existing Riverside Industrial Park.

The new powerline will follow the existing tar roads as far as possible until it deviates from the roads to the proposed substation. An existing dirt road to the Croc River substation will be upgraded and paved as access.

The line will mostly be fixed to round self-supporting steel poles but where height or distance requires it, lattice type structures will be used for example at the crossing of the Crocodile River. Both of these structures will be bolted to concrete foundations. Footprints will not be more than 15m x 15m.

The new substation site is located on an old sport field and is transformed.

The line will be approximately 4,5 km in length. The construction period is expected to be 12 months.

Two alternative alignments as well as two alternative substation sites were considered in this report.

Refer to the attached locality map and the rest of the report for more detail.

Process followed:

An application with relevant documentation was submitted to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (MDARDLEA) on 22 March 2018.

A notice in the prescribed format was placed in The Lowvelder of 16 February 2018. Site notices was placed at the sites and along the route on 19 February 2018. The notices informed the public and potentially affected parties of the project, EIA process and opportunity to partake as well as the availability of the report for comment. The affected landowner gave consent to the EIA process that is underway.

A Background Information Document was also sent to identified potentially affected parties which included authorities, the ward councillor and others.

The irrigation board registered in response to the notices.

The Basic Assessment Report was available for a commenting period of 30 days plus extra days to provide for the holidays. The list of Interested and Affected Parties includes State departments as well as the competent authority and identified parties.

Comments were received from the MDARDLEA and the MTPA. No further comments were received from the irrigation board. Refer to appendix 7D for the proof of communication with all parties.

Direct consultation will take place with commenting parties. Any comments received were included in the final submission to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs with responses to commenting parties. No substantial changes were made to the content of the BAR that required it to be made available for comment again before submission.

Key findings and recommendations:

Alternatives:
Alternative routes and substation sites have been considered in the assessment.
Preferred powerline route:
The proposed 132kV overhead line will start at the existing Matsafeni substation east of the Mbombela Stadium, heading north-east along Matsafeni Road. It will cross Samora Machel Drive, the railway line and Crocodile River west of the P166 road. The 132kV line will be aligned west of the P166 on the boundary of the road servitude up to the proposed preferred substation site. There are existing 11kV power lines along the alignment which will become redundant in future and some of the new pylons could be placed in the same positions as some of the old poles, therefore reducing the cumulative impact.

Powerline route alternative:
An alternative route for the 132kV overhead line which would cross over Hall's farmland was also investigated. It can be referred to as the western route. This alignment stays mostly west of the river past the Hall's Dairy and crosses the river much closer to the proposed substation. Refer to the attached layout and alternative discussion.

Substation alternatives:

Substation site (preferred):
This site is located 160 m from the Crocodile River at its nearest point and was formerly a soccer field. There was an informal residential area adjacent east and north of the site. The houses were demolished after the residents were relocated and the field was left to return to a more natural state. It is however still only a grassed area as can be seen on aerial imagery.

Substation site (alternative):
This site is located closer to the P166 and Riverside Park. Utilising this site will allow a shorter 132 kV line as well as shorter underground cables to Riverside Park Ext 27&29. This site is however untransformed, not level and close to the valley bottom wetland. The environmental impact of this site is rated much higher than the preferred site and there not recommended as a viable alternative.

Key potential impacts:
Most of the impacts can be expected during the construction phase but these can be mitigated to acceptable levels. The design already mitigates for some impacts. There are also some aspects that may result in significant impacts during the operational phase and these were assessed.

In assessing the impacts, in particular for the terrestrial and aquatic ecosystems, the following facts are important to keep in mind:

- Some of the new poles will be erected on the same footprints as that of existing 11 kV lines located in the same area.
- The footprints for the steel poles are very small – at most 15 x 15m impacted during construction.
- The powerline poles will look similar to those located adjacent Enos Mabuza Drive:

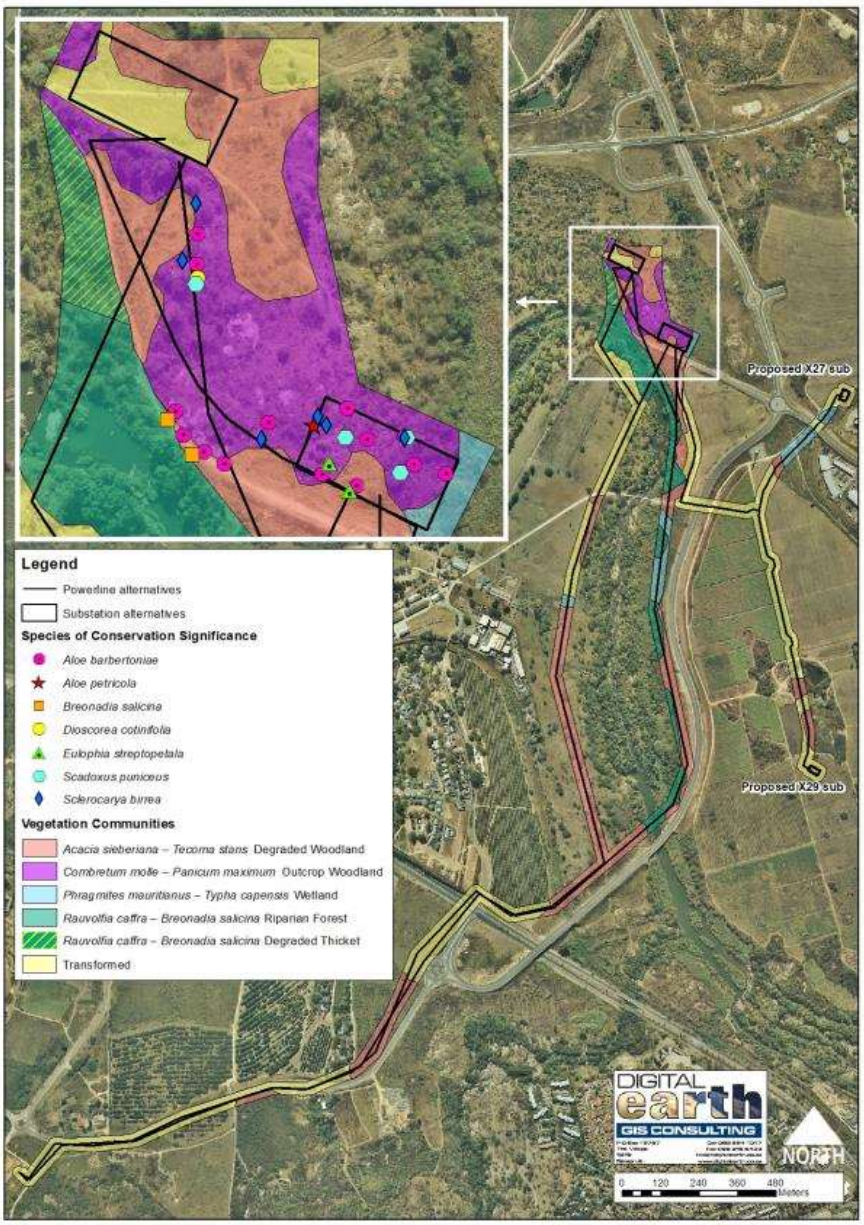
- The powerline will be located on the edge of the P166 servitude or just within the servitude. When the bypass road was constructed, SANRAL cleared the servitude and it is mostly grassed areas. Few to no trees will need to be removed for the power line support structures.
- No riparian trees will need to be removed for the two lattice structure pylons which will allow the 132 kV line to span the almost 300m of the Crocodile River.
- Once the poles are up, the powerline will be attached to the poles across the river with the help of a helicopter. The clearing of additional areas apart from the footprint of the poles will not be required.
- The substation site was an old soccer field and is level and transformed.
- The specialist reports described the alignment and surrounds in detail as required. The impact assessment however will take into account the actual impact footprint. Refer to the impact assessment.

The following are the key impacts that were identified:

- **Terrestrial ecology:** Most of the proposed powerline routes transect transformed or degraded habitat and the only natural habitat remaining is at the two proposed Crocodile River crossings, on the western side of the P166.

  The study area includes two vegetation types which are Legogote Sour Bushveld (Endangered and Threatened Ecosystem) and Lowveld Riverine Forest (Critically Endangered and Threatened Ecosystem). Most of the study area is classified as Heavily

Modified, Moderately Modified Areas (Old lands) or Other Natural Areas by the Mpumalanga Biodiversity Sector Plan (MBSP) (Lötter *et al*., 2014).



Four untransformed vegetation communities were identified within the proposed area and the biodiversity values of each are as follows:

Vegetation Communities	Conservation Importance	Functional Importance	Biodiversity Value	Biodiversity / Development conflict	Recommendations
Outcrop Woodland	High	Moderate	High	High	Limited development with mitigation
Riparian Forest	High	High	High	High	Limited development with mitigation
Degraded Woodland	Low	Low	Low	Low	Develop with mitigation
Degraded Wetland	Moderate	High	High	High	Limited development with mitigation
Transformed	Very Low	Very Low	Very Low	Very Low	Develop with no specific mitigations

The specialist report also considered the fauna of the study area. Refer to the report for more detail on this. Impacts include the potential:

- Degradation of a Critically Endangered vegetation type, Degradation of vegetation communities with High Biodiversity Value,
- Loss or damage of plant species of conservation importance,
- Degradation of watercourses,
- Invasion of natural habitat by alien plants,
- Loss of habitat for conservation-important fauna and
- Increase in poaching activities.

The footprints will be relatively small. Mostly alien vegetation will need to be cleared for erecting the necessary pylons. The preferred substation site is on a site that is completely transformed. Impacts are mostly of a low to very low concern after mitigation. With the alternative alignment and substation the impact could however be of a higher significance as it will result in the removal of riparian trees and plants of conservation concern.

During operation the powerline could cause collisions and electrocutions – a number of larger birds, such as cormorants, geese, herons, egrets, birds of prey and ibises, utilise the Crocodile River as a roosting, breeding or foraging area and regularly fly along its length. The erection of powerlines across the river may prove detrimental to these species as many larger birds are prone to collisions, or may be electrocuted when attempting to perch or roost on the pylons and come into contact with two live components or a live and earthed component concurrently (Van Rooyen 1998). Even though few of the potentially impacted species are threatened, a significant number of larger birds utilise the Crocodile River and associated habitats and the impact is considered to be significant.

The impact is rated to be of a high significance and could be of a cumulative nature as it results in the death of the birds that fly into the line. It will impact directly on the population dynamics of these species in the greater area and on the function of these species in the ecosystem. Flappers will be put on the powerline as per the ecologist's recommendations to lower the impact.

- **Aquatic ecosystems:**

The proposed study area is located within the North Eastern Highlands Level I Aquatic Ecoregion, on the lower boundary of Quaternary Catchment X22C, near the confluence of the Gladdespruit and Crocodile Rivers, in the Nkomati Water Management Area.

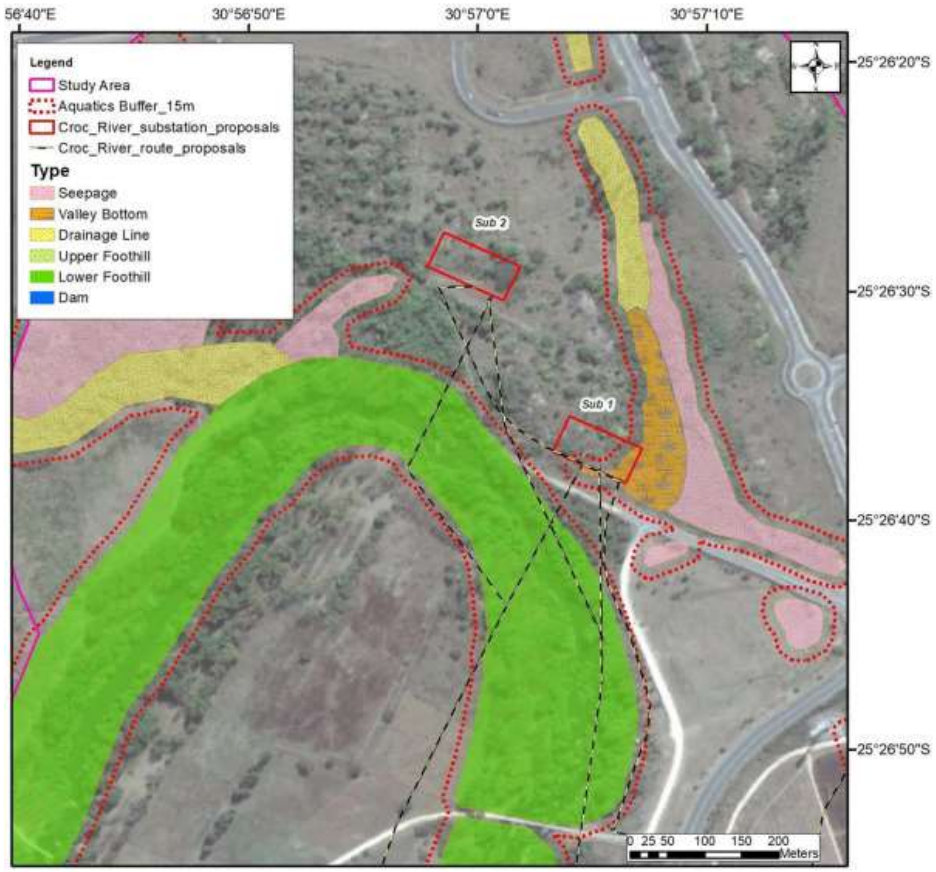
Six hydro-geomorphic aquatic ecosystem types were identified within the Study Area, of which three could be affected by the proposed development, namely the:

- Seepage Wetland;
- Valley Bottom Wetland (No Channel); and
- Lower Foothill (Crocodile River).

The Study Area also contained these ecosystem types are unlikely to be impacted by the proposed development, either directly or indirectly, and so these systems were not considered in detail in this report:

- an Upper Foothill River (lower Gladdespruit),

- a number of drainage lines and
- dams



The Ecological Importance of the three aquatic ecosystem types assessed ranged between Very Low, for the Seepage Wetland, to Very High for the Lower Foothill (Crocodile River).

The Functional Importance of the three aquatic ecosystem types assessed ranged between Low for the Seepage Wetland to High for the Crocodile River. The following section explains the ratings that were given.

The direct human benefits provided by the two wetlands assessed were rated as Very Low, while direct human benefits provided by the Crocodile River were rated as close to High.

The Present Ecological State of the Crocodile River adjacent to the P166 road bridge was rated in January 2018 as Moderately Modified (Category C: 68%). The Present Ecological State of riparian vegetation in the Crocodile River at the P166 road bridge was rated as borderline between *Largely and Seriously Modified* (Category D/E: 40%).

The impacts were identified, discussed and rated as follows after mitigation:
Construction:

- *Surface water pollution – Low*

Impacts on surface water and downstream resources could occur during the construction phase which would entail potential vegetation removal from water resources, limited groundworks and cement and concrete mixing operations in or close to resources.

Potential oil/fuel spillages from construction operations may also result in surface water pollution. An increase in hardened surfaces close to and around resources may result in an increased storm water run-off which may result in erosion, loss of top soil and sedimentation.

- *Disturbance of seepage wetlands - Very Low*
- *Disturbance of valley bottom wetland (alternative sub site) – Medium*
- *Disturbance of Croc River riparian zone (preferred alignment) - Low*
- *Disturbance of Croc River riparian zone (alternative route) – High*

The powerline will cross the Crocodile River were the riparian zone is already degraded, mainly by backup from a diversion weir. This route crosses an episodic to seasonal Seepage Wetland, but this wetland is largely terrestrialised, and the Ecological Importance and Sensitivity of this wetland is rated as Very Low.

Clearing of riparian and wetland vegetation for the proposed servitudes and bulk earthworks for the proposed pylons is expected to impact directly on the two Seepage Wetlands near the P166 (Seep 1 and Seep 2) and the Crocodile River riparian zone. The 132 kV line will span the Crocodile River a height that will not require the removal of riparian trees. This specific two anchor pylons will also be placed outside the riparian edge and the impact after these design mitigation measures will reduce the impact to Low. The footprint of the pylons will be very small and the indirect impacts can be mitigated to be of a very low significance.

The alternative substation site which is not the preferred alternative will impact directly on the associated wetland.

If impacts are not mitigated it could be of a cumulative and medium significance. Should the alternative alignment and alternative substation sites be considered, the impacts would be of a medium significance regardless of mitigation as it would entail riparian removal and direct impacts on wetlands as a result of the substation site.

Operation:
If the footprints and surrounds are sufficiently stabilised and rehabilitated, there should be no impact on the surface water resources identified within the study area.

The transformers contain oil and any uncontrolled spillage (during filling) or oil leakage from the transformers will contaminate soil and cause water pollution. The design already mitigates for the risk of oil spillage.

Should the alternative substation site however be considered, the site will directly impact on the flow and likely the function of the small valley bottom wetland adjacent east of the proposed site. The impact is of a high significance.

- **Geology and soil conditions:** Limited vegetation removal is expected and the footprints of the poles will be very small. But some poles will be in or close to wetlands and soil disturbances increase the risk for erosion. Hardening of soil surfaces may also increase stormwater flow which may cause erosion. Erosion, if any, could impact on the aquatic ecosystems that will be passed or traversed.

  The cumulative nature of the impact is of low significance as the footprints will be small and there is no evidence of erosion at the existing poles. The impact is of low significance before mitigation.

  Operation:
  The transformers contain oil and any uncontrolled spillage (during filling) or oil leakage from the transformers will contaminate soil and cause water pollution. The design already mitigates for the risk of oil spillage. The transformers are placed on plinths in a leak proofed bunded area which can contain the total volume of oil held inside the transformer. The oil then drains to a tank from where it can be recovered and recycled.

  The activities will not change the soil conditions of the site or surrounding area.

- Socio-economic impact: There is a need for the proposed infrastructure and without it the approved townships that it will service cannot operate. It will thus contribute to a positive social impact. The overall impact was rated to be positive and of medium significance and a cumulative nature.

  Other potentially negative impacts that can indirectly result in negative social impacts are of a low significance before mitigation.

- **Heritage resources:** The graveyard that was identified is not located within the proposed substation site but there may be unintentional impact during the construction activities. The cemetery site is approximately 150m from the nearest boundary of the proposed substation site.

  Before construction of the substation starts a temporary fence must be erected around the graveyard to prevent construction workers from entering this area. The construction camp must not be located near the graveyard but rather west of the substation area

Other impacts include:
- Air quality;
- Aesthetic impact;
- Noise and vibration;
- Traffic impact;
- Health, safety and security.

Project Team

Environmental Assessment Practitioner:
Enpact Environmental Consultants CC
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Expertise:
Heinrich Kammeyer is the owner of Enpact Environmental Consultants CC. Qualifications include a degree in Chemical Engineering, MBL and a Masters Environmental Engineering (Cum laude). The Environmental Consulting Business which was started in 2004 has completed more than 150 Environmental Impact Assessment Applications to date. Experience in Environmental Impact Assessments, over the past 13 years, spans a wide range including residential and business developments, tourism developments, roads, water and sewer, renewable power generation, concentrate farming and waste management facilities. In addition he also has extensive experience in waste management licences as well as water use licence applications.

Maryke André has 10 years' experience in the EIA consulting business with this company. Qualifications include a Btech Nature Conservation degree. Experience in Environmental Impact Assessments spans a wide range of projects including residential and business developments, tourism developments, infrastructure projects (roads, water, sewer and renewable power generation), concentrate farming and waste management facilities. She also deals extensively with the compilation of waste management and water use licence applications.

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***** For the Terms of References and methodologies please refer to the attached Specialist reports**

Crocodile River Substation

1. Introduction and Motivation

1.1 Background

Developments including the Mpumalanga Fresh Produce Market and some Riverside Extensions have been approved and some of the development already commenced. These projects are in need of electricity and the required distribution infrastructure needs to be constructed.

The existing Riverside and Matsafeni substations cannot service all the townships that require electrical connections. The distribution capacity triggers an activity listed under the EIA Regulations 2014, as amended.

This Basic Assessment Report was compiled in terms of the National Environmental Act, 1998 and Environmental Impact Assessment Regulations, 2014 (amended). The environmental impact assessment evaluates the aspects and potential impacts of the proposed activity on the natural and social environment. Information for the evaluation was obtained from the applicant, professional team, environmental specialists and the interested and affected parties.

The Basic Assessment Report contains the following information:

- Detail description of the proposed activity;
- Description of the property on which the activity is to be undertaken;
- Description of the environment that may be affected by the activity;
- Details of the public participation process;
- The need and desirability of the proposed activity;
- Evaluation of alternatives;
- Specialist reports and findings;
- Description of environmental issues that were identified;
- Assessment of environmental issues;
- Environmental impact statement with key findings of the environmental impact assessment;
- Environmental Management Programme.

The Basic Assessment Report is made available for comment to Interested and Affected Parties which includes State Departments and relevant authorities. Any comments received will be included in the report before it is submitted to the Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) for consideration and decision making.

1.2 Description of activity

It is proposed to construct a 132 kV powerline and a substation with two secondary substations located on the approved Riverside Park Ext 27&29 townships. This infrastructure will serve the Fresh Produce Market and other Riverside Townships such as Extensions 27 and 29 located west of the existing Riverside Industrial Park.

The 132 kV line will start at the following coordinates: S25°28'02.60" E30°55'48.97" and end at S25°26'30.41" E30°56'59.43". The proposed 132kV overhead line will start at the existing Matsafeni substation east of the Mbombela Stadium, heading north-east along Matsafeni Road. It will cross Samora Machel Drive, the railway line and Crocodile River west of the P166 road. The 132kV line will then be aligned west of the P166 on the boundary of the road reserve up to the proposed preferred substation site west of the P166 road and south of the Lydenburg road. From the proposed Croc Substation 11 kV underground cables will link to

the secondary low voltage substations located on Riverside Park Ext 27&29. Refer to the layout map under Appendix 1.

The electrical engineer, Integra Electrical Solutions, provided a basic description of what the associated infrastructure will entail. Following is a description of the activities and infrastructure that can be expected:

Croc River Substation
This will be a 132kV to an 11 kV firm 40 MVA substation with the following design parameters:

a) Overhead 132 kV Powerline
The 132kV powerline from Matsafeni substation will follow the existing tar roads as far as possible until it deviates from the roads to the proposed substation.

The 132 kV line will be approximately 4,5 km in length.

The line will mostly be fixed to round self-supporting steel poles but where height or distance requires it, lattice type structures will be used for example at the crossing of the Crocodile River. Both of these structures types will be bolted to concrete foundations. Footprints will be a maximum of 15m x 15m.

The conductors will be mounted in a staggered configuration to the inline poles and directly to strain or turn poles. Jumpers from the one side of the pole to the other side with supporting insulators will complete the installation.

b) Substation 132 kV yard
The substation yard will be approximately 100m x 50m - the size of the disturbed area / old soccer field. The yard will be able to accommodate 4 x 20 MVA transformers. At first there will be two transformers to start off with and the other two will be installed as the load growth necessitate.

In future there will be two incomer lines from the Eskom Marathon substation and two feeder lines. There will be one line from Matsafeni Substation (located close to Mbombela Stadium) and a future line from Nels River Substation positioned at the intersection of the University Road with the R40. The Matsafeni Line will be the main supply line until the other lines are constructed in the future.

The substation will all be open bus bar and conductor configuration with equipment mounted on steel structures so that the required safety clearances are complied with.

The main 11 kV cables and the control cables from the outside equipment to the building will be in built trenches. The trenches will be covered with concrete slabs to minimise cable theft. The yard will be fenced in by palisade fencing. The yard inside the palisade will be covered with plastic and a layer of concrete stones. The yard base will, as far as possible, be on a flat plane with minimum civil ground cut and fill work.

The transformers will be placed inside leak-proof bunded areas to contain the accidental spillage or leakage of transformer oil.

The existing gravel path to the Croc River substation site will be upgraded and paved to provide good access for heavy vehicles. The road will be approximately 2,2m wide and does not trigger listed activities.

c) Substation Building

The building will be constructed with a semi face brick outside and plaster and paint on the inside. The roof will be pitched with grey Chroma deck sheeting. The building will be positioned in the yard for easy access from the road.

The building will house the 132 kV control equipment and the 11 kV switchgear. The building size will be approximately 20 x 30 m. No potable water is in close proximity thus no facilities will be provided.

d) Area Lighting

Area lighting will be provided on a mast which will be positioned to place direct lightning onto the open 132 kV equipment. Further perimeter lighting at the fence will also be provided on 10m poles.

e) Feeder 11 kV Cables

High Voltage 11 kV cables will be laid from the new substation building (switchgear) to the proposed developments it will serve. It will follow the access road and other existing roads from where it will be aligned with the internal roads of the developments.

The cables will be laid at a depth of 1,2 meters and covered in trenches with bedding before it is closed with excavated material.

Construction Period:

The construction period will be over a year as the lead times of the 132 kV equipment and transformers are close to 12 months. All work, concrete bases / building etc. will be completed ready for installation of the equipment when it arrives on site.

2. Need and desirability of the activity

2.1 Need and Desirability

The proposed Croc River Substation is necessary for the development growth in Riverside area especially for the Fresh Produce Market and Riverside Park Extensions.

The substation is centrally placed to accommodate both the Extension 27 and 29 as some of the mentioned developments and with possible other supply areas in close proximity.

The project area has been impacted by earlier activities and the construction of road infrastructure.

The potential impact of the 132 kV line is rated as low and the site for the Croc Substation is transformed and not in further than 100m from the Crocodile River and wetland area.

Please refer to Sections 3, 4, 8 and 9 of the report where more aspects pertaining to the need and desirability is further discussed. Specifically refer to the impact assessment.

2.2 Benefit to society

Power supply will be provided for the Riverside Park developments and the construction and operation of these business complexes will provide several job opportunities.

Job opportunities will also be provided during the construction of the 132 kV line and Croc Substation.

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3. Consideration of alternatives

Alternatives should include a consideration of the 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 reasonable and feasible alternatives that may be considered during the process are location alternatives, layout alternatives and the No-go alternative.

3.1 Locality alternatives

The proposed locality or area that the powerline and substations are proposed in is dependent on the existing infrastructure locality in relation to the new townships that will require electricity. A feasible locality alternative has not been identified.

3.2 Layout or activity alternatives

Layout alternatives were considered for the 132 kV powerline as well as the substation.

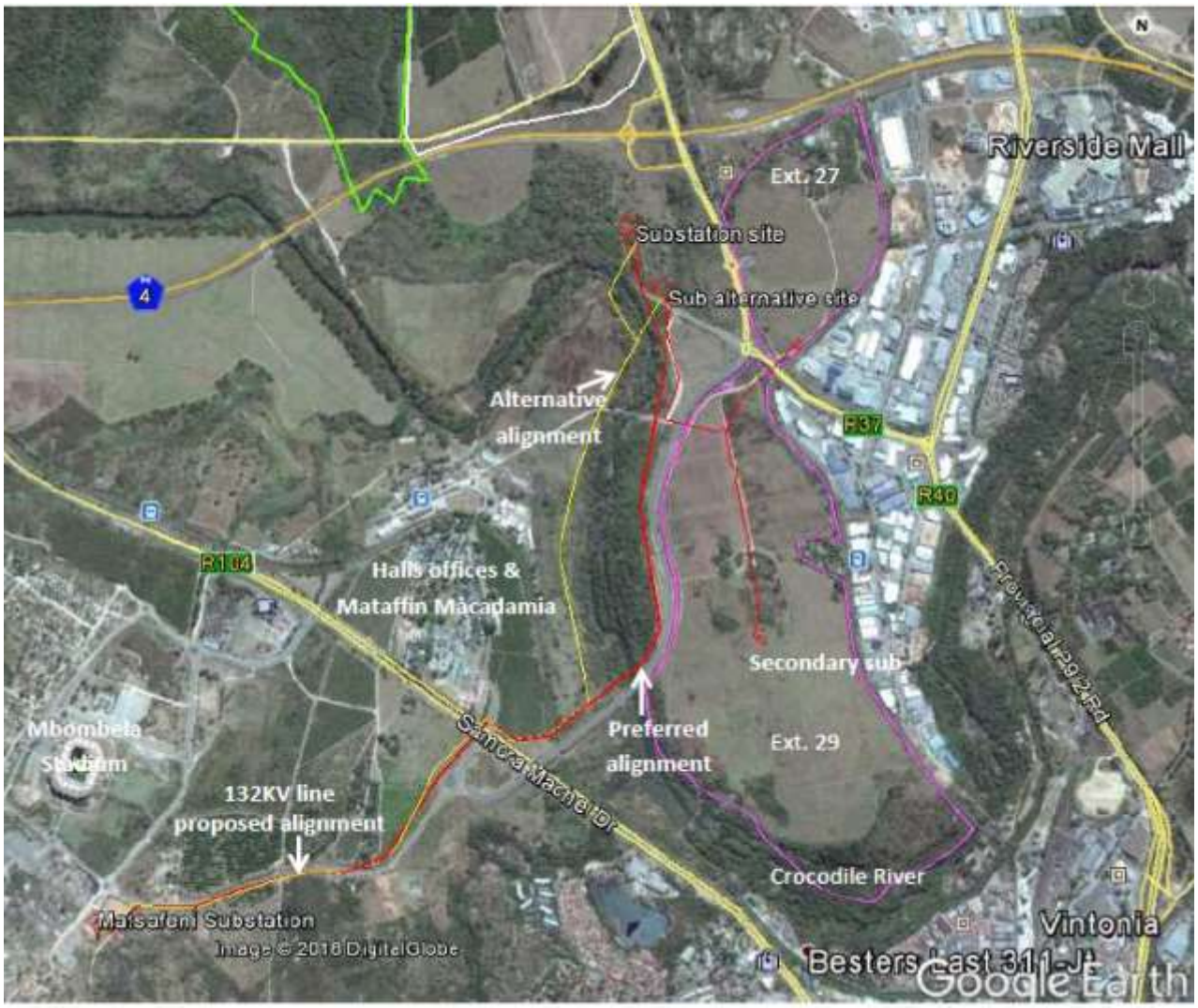


Figure 1: Powerline and substation alternative layout

Most of the proposed powerline routes transect transformed or degraded habitat and the only natural habitat remaining is at the two proposed Crocodile River crossings, on the western side of the P166. The following descriptions must be read with the map in figure 1 above.

Preferred powerline route:
The proposed 132kV overhead line will start at the existing Matsafeni substation east of the Mbombela Stadium, heading north-east along Matsafeni Road. It will cross Samora Machel Drive, the railway line and Crocodile River west of the P166 road. The 132kV line will be aligned west of the P166 on the boundary of the road servitude up to the proposed preferred substation. There are existing 11kV power lines along the alignment which will become redundant in future and some of the new pylons could be placed in the same positions as some of the old poles.

Powerline route alternative:
An alternative route for the 132kV overhead line which would cross over Hall's farmland was also investigated. It can be referred to as the western route. This alignment stays mostly west of the river past the Hall's Dairy and crosses the river much closer to the proposed substation. Refer to the attached layout and alternative discussion.

Substation alternatives:

Substation preferred site: This site is located 160 m from the Crocodile River at its nearest point and was formerly a soccer field. There was a residential area for farm workers adjacent east and north of the site. The houses were demolished after the residents were relocated and the field was left to return to a more natural state. It is however still only a grassed area as can be seen on aerial imagery. This image is from 2004 Google imagery and clearly shows the site as transformed:

Substation alternative site: The site is located closer to Riverside and a shorter 132 kV line and distribution cable will be required. But this site is located 80m from the Crocodile River at its nearest point and is immediately west of a small valley-bottom wetland. The site is not level and more groundwork would be required. It is not the preferred site from an ecological or engineering point of view.

3.3 No-go alternative

The "no-go" alternative would entail that the proposed powerline and substation is not constructed and the proposed and approved developments not serviced.

This is not a feasible or preferred alternative.

4. Site Specifications

4.1 Locality of proposed activity

The activities are proposed on The Remaining Extent of Portion 14 of the farm Boschrand 283 JT, The Remaining Extent of farm Riverside 308 JT, Portion 1 of the farm Riverside 308 JT and Erven 7, 8, 10, 11 and 29 of Mataffin, Mpumalanga. The secondary substations will be located on Riverside Park Ext 27&29, City of Mbombela local municipality, Mpumalanga.

The proposed 132kV overhead line will start at the existing Matsafeni substation east of the Mbombela Stadium, heading north-east along Matsafeni Road. It will cross Samora Machel Drive, the railway line and Crocodile River west of the P166 road. The 132kV line will then be aligned west of the P166 on the boundary of the road reserve up to the proposed preferred substation site west of the P166 road and south of the Lydenburg road. From the Croc Substation 11 kV underground cables will link to the secondary low voltage substations located on Riverside Park Ext 27&29.

4.2 Local authority

The area falls under the jurisdiction of the City of Mbombela local municipality whom is also the applicant.

4.3 Existing and surrounding land use

The proposed project area starts in Mataffin on the outskirts of Nelspruit. It includes the Matsafeni residential area with high density formal and informal structures and will pass the Matsafeni offices. The Mbombela Stadium is a well-known landmark that is north of the existing Matsafeni substation.

The line will cross the R104 or also known as Samora Machel road, cross the railway line and the Crocodile River and be aligned west of the P166 bypass road. These roads are regionally important but the activities will not impact on these roads.

The Crocodile River that will be traversed by the powerline is an important river. The 132 kV line will span the river at a height which would not affect riparian trees.

The area to the immediate east the line is still undeveloped but has been approved for further township development. The Riverside Commercial and Industrial extensions are just east of the powerline alignment and proposed substation.

The prominent land uses within 500m from the site:

Natural area	Low density residential	Medium density residential	High density residential	Informal residential
Retail	Commercial & warehousing	Light industrial	Medium industrial	Heavy industrial
Power station	Office/consulting room	Military or police base/station/compound	Casino/entertainment complex	Hospitality facilities
Open cast mine	Underground mine	Spoil heap or slimes dam	Quarry, sand or borrow pit	Dam or reservoir
Hospital/medical center	School	Tertiary education facility	Church	Old age home
Sewage treatment plant	Train station or shunting yard	Railway line	Major road (4 lanes or more)	Airport

Harbour	Sport facilities	Golf course	Polo fields	Filling station
Landfill or waste treatment site	Plantation	Agriculture	River, ~~stream or wetland~~	Nature conservation area
Mountain, koppie or ridge	Museum	Historical building	Graveyard	Archaeological site
Other land uses (describe):				

5. Site Assessment – Physical Characteristics

5.1 Climate

The site is located in the summer rainfall zone with a mean annual precipitation of 850 mm for the vegetation type as classified by (Mucina & Rutherford, 2006).

The tropical climate is characteristic of the Mpumalanga Lowveld area with dry, cold winters and the highest rainfall and daily temperatures in summer between October and March.

5.2 Topography

The proposed powerline route follows an undulating topography which starts at a higher altitude at the existing substation and falls all the way down to the Crocodile River Valley from where it only slightly climbs to a higher elevation ending at the proposed substation site that is located in the valley.

5.3 Geology and soil condition

The general geology of the area consists of granite and gneiss and derived soils from the Nelspruit Suite of Rocks.

Geotechnical investigations that were undertaken in the area and surrounds described the geology to consist of transported soils of variable thickness, reworked residual granite and outcrops with thin surficial regolith.

5.4 Terrestrial ecology

Ecorex Consulting Ecologists CC was appointed to perform an ecology survey for terrestrial ecosystems (flora, mammals, birds, reptiles and frogs) for a proposed substation and powerline construction project in the Mataffin / Riverside areas, Mbombela. The study provides a basis for assessing potential impacts of the proposed project on terrestrial ecology and guides the design and location of planned infrastructure. The study comprised flora and key vertebrate fauna (mammals, birds, reptiles, frogs). The two key deliverables for this study were a baseline terrestrial ecology survey and an integrated Biodiversity Value Assessment.

The Crocodile River Substation & Powerlines Baseline Terrestrial Ecology Study & Biodiversity Value Assessment (December 2017) gives report on the findings of this study. Following is an abstract of the most relevant information from the report. Refer to Appendix 4 for the full report, the terms of reference and a complete list of the works as referenced in the sections to follow. Both alternatives have been assessed in the study. Following is an abstract of sections of the report:

Most of the proposed powerline routes transect transformed or degraded habitat and the only natural habitat remaining lies at the two proposed Crocodile River crossings, on the

western edge of the P166 road as well as on the proposed Croc River substation site. The study area is situated within the quarter-degree grid 2530 BD at an altitude of between 645 and 715 mamsl. The total length of the powerline routes surveyed is approximately 11 km, and the area surveyed around the proposed powerline routes (20m buffer surveyed on either side of the proposed powerline routes) and substation sites measures approximately 42 ha.

According to Mucina & Rutherford (2006), two vegetation types are situated within the study area. These include Legogote Sour Bushveld, which they classify as Endangered and has been listed as a Threatened Ecosystem (Notice 1002 of Government Gazette 34809, 9 December 2011), and Lowveld Riverine Forest, which they classify as Critically Endangered and has also been listed as a Threatened Ecosystem. Legogote Sour Bushveld is virtually endemic to Mpumalanga Province, marginally extending into the Limpopo Province.

It occurs on the granite and quartzite foothills of Mpumalanga and Limpopo Provinces below the escarpment west of the Kruger National Park, extending from Mariepskop in the north through Mbombela to Barberton in the south. Legogote Sour Bushveld originally covered about 352 314 ha, of which 57.5 % has been transformed, mostly through cultivation and urbanisation[1]. Lowveld Riverine Forest occurs along recent alluvial deposits at low altitudes from Maputaland in the south and northwards through the Lowveld region of Mpumalanga and Limpopo Provinces[2].

Typical Legogote Sour Bushveld is characterised by open to dense woodland on gently to moderately undulating terrain with a high diversity of trees and shrubs. Lowveld Riverine Forest is characterised by tall riparian trees that fringe larger streams and rivers.

Most of the study area is classified as Heavily Modified, Moderately Modified Areas (Old lands) or Other Natural Areas by the Mpumalanga Biodiversity Sector Plan (MBSP) (Lötter *et al*., 2014). The study area is not situated in any of southern Africa's floristic centres of endemism, which are areas that have an unusually high number of plants unique to that area (Van Wyk & Smith, 2001).

5.4.1 Local vegetation communities

Four untransformed vegetation communities were identified within the proposed development site on the basis of distinctive vegetation structure, floristic composition and position in the landscape.

[1] Lötter *et al*., 2014
[2] Mucina & Rutherford, 2006

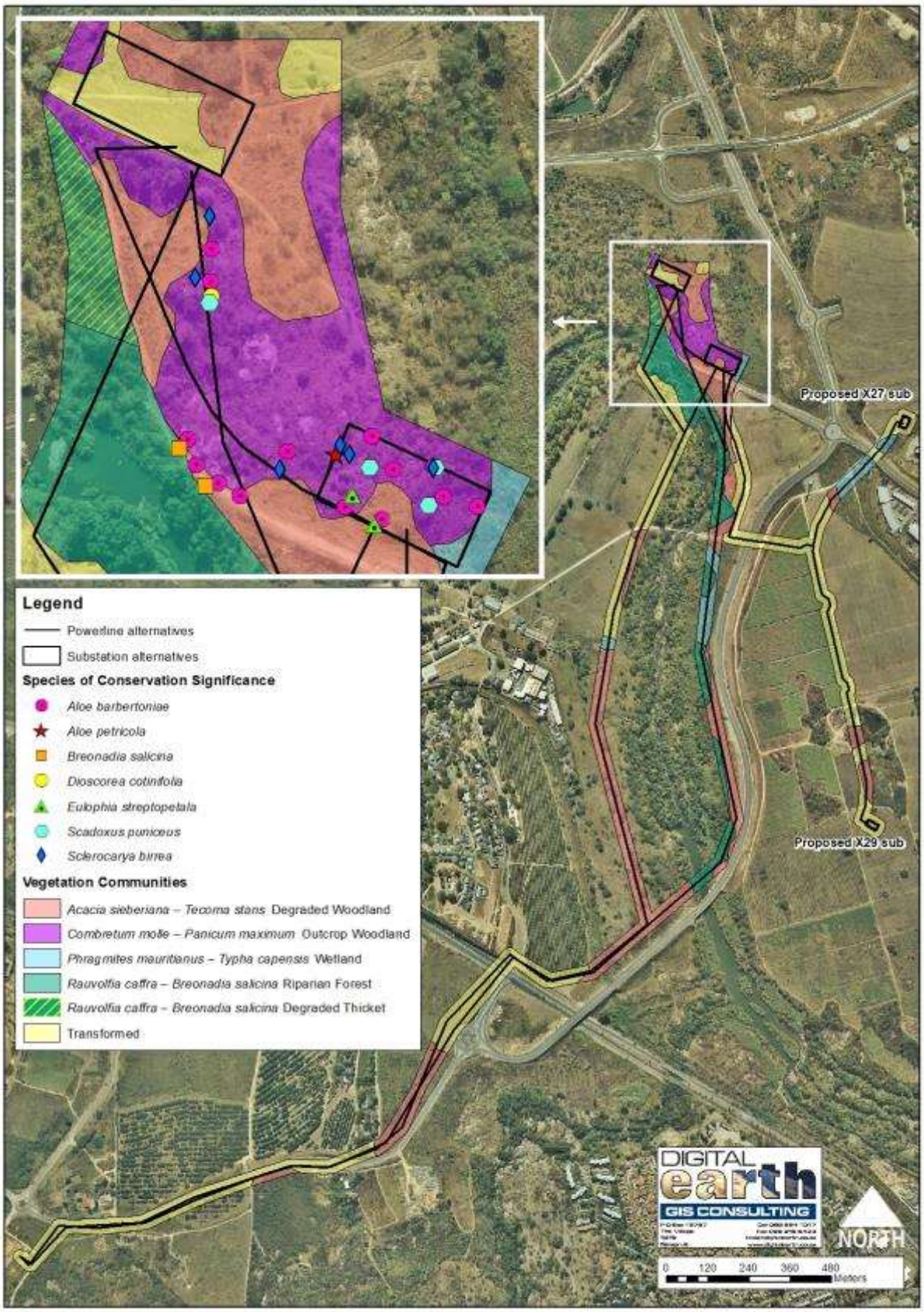


Figure 2: Vegetation communities identified within the study area

5.4.1.1 Combretum molle – Panicum maximum Outcrop Woodland

This vegetation community is restricted to the far northern portion of the study area, in the vicinity of the proposed Croc River substation site. Here, scattered granite outcrops support a diverse assemblage of typical Legogote Sour Bushveld plant species. Outcrop Woodland covers 2.6 ha which equates to just over 6 % of the area surveyed.

Vegetation structure is Low Open to Closed Woodland (*sensu* Edwards, 1983) with dominant trees including *Combretum molle, Ficus ingens, Erythrina lysistemon, Gymnosporia buxifolia, Peltophorum africanum, Sclerocarya birrea* subsp*. caffra* and *Searsia pentheri.* Shrubs and dwarf shrubs are prolific and include *Jasminum multipartitum, Asparagus buchananii, Lantana camara, Eriosema psoraleoides, Triumfetta pilosa* var*. tomentosa* and *Diospyros lycioides* subsp*. sericea.* The succulent *Aloe barbertoniae* occurs in large numbers on most outcrops with lower numbers of other succulents such as *Aloe petricola, Kalanchoe rotundifolia* and *Euphorbia ingens.* Herbaceous plants and geophytes include a number of habitat specialists such as *Tulbaghia ludwigiana, Aeollanthus rehmannii, Eriospermum porphyrovalve* and *Sansevieria hyacinthoides.*

The large, deciduous bulb *Ledebouria zebrina* grows in monospecific colonies below the outcrops. The sedge *Cyperus rupestris* var*. rupestris* and the fern *Selaginella dregei* dominate the ground layer on the outcrops while the grass *Panicum maximum* dominates the areas with deeper soils. Other common grasses found include *Eragrostis superba* and *Urochloa mosambicensis*.

Photographs of Outcrop Woodland

A total of 100 species (51% of the entire list) was recorded from Outcrop Woodland during fieldwork, by far the highest of the four communities.

Species fidelity, which is closely linked to community uniqueness, is very high, with 65 species (65% of the community list) occurring nowhere else in the study area.

Several additional species are likely to be found later in the wet season as many plants desiccate rapidly at the onset of the dry season due to the very shallow soils present within parts of this community.

Six conservation-important species were recorded although none are considered to be of conservation concern as defined by Raimondo *et al*. (2009). Refer to the section on these plants discussed after the description of the four vegetation communities.

5.4.1.2 Rauvolfia caffra – Breonadia salicina Riparian Forest

This vegetation community occurs along the banks of the Crocodile River. It covers approximately 5.8 ha which equates to just under 14 % of the area surveyed.
Vegetation structure is Tall Forest as defined by Edwards (1983).

The trees *Rauvolfia caffra* and *Breonadia salicina* are dominant canopy trees while other common trees recorded are *Ficus sycomorus, Combretum erythrophyllum, Syzygium cordatum, Celtis africana, Bridelia micrantha, Trichilia emetica, Antidesma venosum* and the exotic species *Grevillea robusta, Morus alba, Melia azedarach, Carya illinoinensis* and *Jacaranda mimosifolia*. Smaller trees and woody shrubs that are commonly encountered in the understory include *Phyllanthus reticulatus, Tecoma stans, Lantana camara, Gymnosporia senegalensis* and *Diospyros lycioides* subsp. *sericea*.

Photographs of Riparian Forest

The understory is sparse in places due to the dense vegetation but the shade-loving grasses such as *Panicum maximum* and *Setaria megaphylla* favour forest edges. This vegetation community has been invaded by many exotic climbers such as *Aristolochia elegans, Caesalpinia decapetala, Passiflora subpeltata, Cardiospermum grandiflorum* and *Solanum seaforthianum*. Plants recorded at the water's edge include *Ludwigia octovalvus* and *Phragmites mauritianus.*

A small section of this vegetation community in the far northern portion of the study area contains a floristically similar composition to Riparian Forest but is not riparian in nature. This area has been hatched on the vegetation community map and is included in this description based on the plant species located within that narrow belt.

A total of 68 species (34% of the entire list) was recorded from *Rauvolfia caffra – Breonadia salicina* Riparian Forest. Species fidelity is high with 36 species (53% of the community list) occurring nowhere else in the study area. However, a significant proportion of these are invasive alien species.

Two conservation-important species were recorded, although none are considered to be of conservation concern as defined by Raimondo *et al*. (2009). Refer to the section on these plants discussed after the description of the four vegetation communities.

5.4.1.3 Acacia sieberiana – Tecoma stans Degraded Woodland

This vegetation community occurs in widely scattered portions and covers 13.6 ha or just over 32 % of the study area. Vegetation structure varies from Open to Closed Woodland and in places Shrubland (*sensu* Edwards, 1983).

The dominant canopy species is *Acacia sieberiana* var. *woodii* while other frequently found trees include *Jacaranda mimosifolia*, *Combretum molle, Sclerocarya birrea* subsp*. caffra* and *Dichrostachys cinerea* subsp*. nyassana.* The alien shrub *Tecoma stans* is the dominant shrub found in this community while *Diospyros lycioides* subsp*. sericea, Baccharoides adoensis* var*. kotschyana* and *Lantana camara* are also regularly recorded*.* Herbs are dominated by pioneer species such as *Ceratotheca triloba, Waltheria indica, Ocimum americanum* var*. americanum, Senecio madagascariensis* and *Bidens pilosa.* Grasses include *Heteropogon contortus*, *Cynodon dactylon, Eragrostis curvula, Hyperthelia dissoluta* and *Sporobolus africanus.*

Photos of the Degraded woodland

A total of 62 species (31% of the entire list) was recorded from Degraded Woodland, the second lowest species richness for any vegetation community in the study area. Species fidelity is high, with 27 species (44% of the community list) occurring nowhere else in the study area, although most of these include alien and indigenous pioneer species.

Only one conservation-important species was recorded in this vegetation community namely the tree *Sclerocarya birrea* subsp. *caffra* (uncommon) which is protected under the National Forests Act (No. 30 of 1998).

5.4.1.4 Phragmites mauritianus – Typha capensis Degraded Wetland

This vegetation community occurs in small pockets along the Crocodile River, on the eastern edge of the proposed substation Site B and east the P166 in the area where the two proposed smaller substations (X27 and X29) are to be built.

An additional wetland section occurs on the proposed Route 2 of the powerline alignment, but this is most likely an artificial wetland as it has formed below the wastewater outlet of the Hall's Dairy. Small portions are also embedded within the Riparian Forest, but these are too small to be mapped.

Wetland occupies 1.9 ha (4.5 %) of the study area. Vegetation structure is mostly Tall to High Closed Grassland becoming Short to Tall Sparse Woodland in places where alien trees have established (*sensu* Edwards, 1983).

The reed *Phragmites mauritianus* strongly dominates this community, mostly growing in large, continuous colonies, as well as the rush *Typha capensis*. Other common hydrophytes include the grasses *Ischaemum fasciculatum, Paspalum urvillei* and *Leersia hexandra,* the sedges *Cyperus esculentus* and *C. dives*, the herbs *Nidorella auriculata, Persicaria decipiens* and *Ageratum conyzoides,* and the ferns *Thelypteris confluens* and *Pteridium aquilinum* subsp*. capense*. Trees and shrubs are frequently found within this vegetation community, especially in the portions east of the P166 and along the Crocodile River, and

include *Tecoma stans*, *Melia azedarach, Acacia sieberiana* var. *woodii*, *Morus alba, Lantana camara, Syzygium cordatum, Phyllanthus reticulatus* and *Flueggea virosa*.

Photographs of Wetland

A total of 57 species (29% of the entire list) was recorded from *Phragmites mauritianus – Typha capensis* Wetland, the lowest species richness for any vegetation community in the study. Species fidelity is predictably very high given the specialised nature of the habitat, with 21 species (37% of the community list) occurring nowhere else in the study area.

No conservation-important plant species were recorded in this vegetation community.

5.4.1.5 Transformed communities

The remainder of the study area can be classed as Transformed and covers an area of 18.3 ha (just over 43 %) of the study area. These areas include orchards and road verges. Transformed areas were assessed as having Very Low Biodiversity Value.

5.4.2 Conservation-important Flora

A total of 198 plant species in 70 families was recorded during fieldwork. None of these are regarded as threatened (i.e. Vulnerable, Endangered or Critically Endangered) or as additional species of conservation concern (i.e. Near Threatened, Critically Rare, Rare, Declining or Data Deficient).

Two plants are protected under the National Forests Act (No. 30 of 1998) namely *Sclerocarya birrea* subsp*. caffra* and *Breonadia salicina,* and five are protected under the Mpumalanga Nature Conservation Act (No.10 of 1998), namely *Aloe petricola, A. barbertoniae, Dioscorea cotinifolia, Scadoxus puniceus* and *Eulophia speciosa*. Although not considered to be of conservation-importance but rather regional importance, two species are endemic to Mpumalanga, namely *Aloe petricola* and *A. barbertoniae* (see table for confirmed sightings).

Eight plant species of conservation concern potentially occur within the study area. These plants have either been recorded from similar habitat within the quarter-degree grid 2530 BD and surrounding grids or are widespread in Legogote Sour Bushveld and are likely to occur within the study area. All of these have a low or very low likelihood of occurring within the study area due to unsuitable habitat or altitude present, regional rarity or adequate coverage during fieldwork.

Table 1: Conservation-Important Flora Species confirmed on site

Taxa	Growth form	Red Data	Protected	MPU Endemic	Outcrop Woodland	Riparian Forest	Degraded Woodland	Wetland
Family Amaryllidaceae *Scadoxus puniceus* (L.) Friis & Nordal	geophyte		MNCA		r			
Family Anacardiaceae *Sclerocarya birrea* (A.Rich.) Hochst. subsp. *caffra* (Sond.) Kokwaro	tree		NFA		u	r	u	
Family Asphodelaceae *Aloe barbertoniae* Pole-Evans *Aloe petricola* Pole-Evans	succulent succulent		MNCA MNCA	E E	f r			
Family Dioscoreaceae *Dioscorea cotinifolia* Kunth	climber		MNCA		r			
Family Orchidaceae *Eulophia streptopetala* Lindl.	herb		MNCA		r			
Family Rubiaceae *Breonadia salicina* (Vahl) Hepper & J.R.I.Wood	tree		NFA			d		
TOTAL	**7**	**0**	**7**	**2**	**6**	**2**	**1**	**0**
NFA = National Forests Act	d = dominant							
MNCA = Mpumalanga Nature Conservation Act	f = frequent							
	u = uncommon							
	r = rare							

The conservation-important plant localities represent the larger and main clusters of plants and should not be seen as a complete inventory of all species present as some may have been missed during fieldwork and for others a general point was placed at the centre of a large copse or grove of plants. These localities are meant to guide the developers during the planning and construction phases. These points are spatially presented in Figure 2.

5.4.3 Mammals

Most of the surrounding areas are developed and include orchards, roads, a dairy and associated pastures and fallow agricultural lands. In addition, the large settlement of Matsafeni lies adjacent to the existing substation at the southern end of the study area where the proposed powerlines begin and two busy arterial roads (the P166 by-pass road and the R104) also bisect the proposed routes. Most of the study area is owned by either the Matsafeni Trust or HL Hall's & Son and these areas have been farmed for many decades. Due to these developments and disturbance, almost all the larger mammals have disappeared from the Mataffin area through persecution and habitat destruction.

Although 133 mammal species have been recorded from the degree grid 2530 to date as reflected in the Animal Demography Unit's Virtual Museum's database, only 14 species have been recorded for the grid 2530 BD1. This is more a reflection of poor observer coverage than true diversity present within the area as most mammals remaining are either small, cryptic or nocturnal in habit and therefore difficult to photograph.

An estimated 12 conservation-important mammals potentially occur within the project area. Several cave-roosting bat species of conservation concern such as the Short-eared Trident Bat (*Cloeotis percivali* – Endangered) could potentially occur overhead but these species are

only likely to feed over the site because of the shortage of suitable roosting sites and have been excluded from this assessment.

Of the 12 potentially occurring species, nine are considered to be of conservation concern with only one considered threatened. Hippopotamus (*Hippopotamus amphibius*) is listed as Vulnerable by the International Union for Conservation of Nature (IUCN) and was confirmed to occur within the study area.

Refer to the following table:

Table 2: List of mammals recorded in the study area

Species	Family	Red Data	Protected	Endemic	Assemblages			
					Woodland	Forest	Wetland	Grassland
Mammals								
ORDER: PRIMATES **Family Cercopithecidae (Old World monkeys)** Vervet Monkey	*Chlorocebus pygerythrus*					x		
ORDER: LAGOMORPHA **Family Leporidae (rabbits and hares)** Scrub Hare	*Lepus saxatilis*			E	x			
ORDER: CARNIVORA **Family Herpestidae (mongooses)** Slender Mongoose Meller's Mongoose	*Herpestes sanguineus* *Rhynchogale melleri*				x x			
ORDER: CETARTIODACTYLA **Family Hippopotamidae (hippopotamus)** Hippopotamus **Family Bovidae (cattle & antilopes)** Grey Duiker	*Hippopotamus amphibius* *Sylvicapra grimmea*	VU‡	MNCA		x x	x	x	x
Subtotal	6	2	1	0	5	2	1	1

Provincial assessment
‡ IUCN assessment
VU = Vulnerable
E = Endemic

5.4.4 Birds

Although no formal publications regarding avifauna have been published for the Mbombela area, the quarter degree square (QDS) 2530 BD, within which the study area is situated, is well birded by citizen scientists who have collectively recorded 344 species since 2007 as part of the second Southern African Bird Atlas Project (SABAP2), which is currently still in progress. This includes input from numerous ECOREX surveys. At a finer scale, data from SABAP2 indicate that 312 bird species from 552 full protocol lists have already been recorded from the pentad (mapping units) in which the study area is situated (2520_3055). A pentad covers an area of approximately 77 km^2, which is considerably smaller than a quarter-degree grid (approximately 694 km^2) and thus a better indication of which species occur in the study area. This figure compares well with other areas of high avian diversity,

including many pentads in the Kruger National Park (source from http://sabap2.adu.org.za/pentad, 26/11/2017).

The study area does not fall within or close to any Important Bird Areas (IBA's) (Taylor *et. al*., 2015).

Fifteen conservation-important birds potentially occur within the general vicinity of the study area. Twelve of these are considered threatened, two of which were confirmed to occur during fieldwork and are briefly discussed below.

African Finfoot (*Podica senegalensis*)
This secretive habitat specialist is listed as Vulnerable. A single bird was observed in the Crocodile River from the low-level bridge in the northern part of the study area and this species is resident along the river (*pers. obs*.).

Southern Bald Ibis (*Geronticus calvus*)
This ibis is listed as Vulnerable. It is a recent colonist of the Mbombela area and is usually found on the grassy escarpment to the west of the city. It was first recorded from farmland adjacent to Mataffin in 2011 and then within Mbombela itself in 2015 (SABAP2). A pair was then recorded breeding on the cliffs at the cascades in the Lowveld National Botanical Gardens for the first time in August 2017 (*pers. obs.).* Four birds were observed over the northern dryland pastures along Powerline Route 2 and they *probably regularly utilise this grassland habitat to forage in*.

Two additional Threatened species have a **Moderate likelihood** of occurring within the study area:
Bat Hawk (*Macheiramphus alcinus*)
This crepuscular raptor is listed as Endangered by Taylor *et. al*. (2015) due to a low regional total population, destruction of forest habitat, direct persecution and potentially by insecticides (which kill insects and the bats that feed on them). Only one pair is known to reside in the Mbombela area (*pers. obs*.) and, although the nest site is approximately 10 km east of the study area, *these birds probably regularly forage for bats over the Crocodile River on Mataffin*.

Lanner Falcon (*Falco biarmicus*)
This is the largest falcon in South Africa and is assessed as Vulnerable due to loss of habitat, urbanisation, agricultural transformation and reduction of prey. It is infrequently recorded from the Mbombela area (SABAP2 reporting rate 0.73%) but forages widely and may occasionally utilise the open areas within the study area. No breeding habitat (cliff ledges) is present.

Three potentially occurring bird species are classified as Near Threatened. One of these was confirmed during previous ECOREX surveys in the Mataffin area and is the Half-collared Kingfisher (*Alcedo semitorquata*). It was recorded from Riparian Forest on Mataffin during a previous ECOREX survey and is resident along the Crocodile River (*pers. obs*.). The other two species have a low likelihood of occurring.

** Refer to the ecology study for a list of species that was confirmed during fieldwork.

Local avifauna assemblages
The Mataffin area was classed as having a high avian diversity.
Four broad assemblages or species-habitat associations were identified, each of which is briefly described below.

I. Woodland Assemblage
Natural and secondary woodlands occur in the northern portion of the study area as well as on Powerline Route 2. Fifty species (42 % of the entire species list) were recorded from the Woodland assemblage, the highest of the four assemblages.

II. Forest Assemblage
This assemblage is restricted to the strip of Riparian Forest lining the Crocodile River in the northern part of the study area. Forty-one species (34 %) were recorded from the Forest assemblage, the second-highest of the four assemblages.

III. Wetland Assemblage
This assemblage is confined to the wet grassland and reedbeds of the few small wetlands in the study area. Twenty-nine species (24 % of the entire species list) were recorded from the Wetland assemblage, the lowest of the four assemblages.

IV. Grassland Assemblage
The dryland pastures and grassy road verges provided habitat for a number of generalist grassland birds. Thirty-four species (28 % of the entire species list) were recorded from the Grassland assemblage, the second-lowest of the four assemblages.

5.4.5 Reptiles

The Lowveld and Foothills of eastern Mpumalanga supports a very high diversity of reptile species, with diversity levels ranking in the top 10% of all areas in South Africa. The two reptile groups showing the highest diversity include the lizards (20-41 species recorded) and snakes (20-44 species recorded) (Bates *et. al*, 2014).

Reptile endemicity, however, is low which is to be expected as the area lies in close proximity to Mozambique within the widespread savannah biome (Bates *et. al,* 2014).

55 species have been recorded from the QDS 2530 BD, in which the study area is situated, as listed on the Reptile Atlas of Southern Africa website (http://vmus.adu.org.za/) and in Bates *et al*. (2014).

One reptile has been nationally assessed as Vulnerable, namely the Nile Crocodile (*Crocodylus niloticus*), which is also protected under NEMBA ToPS. This species has a low likelihood of occurring within the Crocodile River as it is very rare in Mbombela (*pers. obs.)* and only one record exists in the Reptile Atlas database for 2530 BD. Three species have been assessed as provincially threatened in the MTPA threatened species database, one of which is considered to be provincially Endangered (Haacke's Flat Gecko *Afroedura multiporus haackei*), and two of which are assessed as Vulnerable (Wilhelm's Flat Lizard *Platysaurus intermedius wilhelmi* and Barberton Girdled Lizard *Smaug warreni barbertonensis*).

Both have a moderate likelihood of occurrence because of the presence of suitable habitat, while Wilhelm's Flat Lizard was **confirmed** to occur on a large granite outcrop in the northern portion of the study area during fieldwork, and is likely to be resident. Two additional species are classified as Near Threatened but both have a low likelihood of occurring within the study area due to local rarity or incorrect habitat and altitude present. Southern African Python (*Python natalensis*) is protected under the National Environmental Management: Biodiversity Act (No.10 of 2004) and is likely to be resident within the study area.

Table 3: List of reptiles recorded in the study area

Species	Family	Red Data	Protected	Endemic	Assemblages			
					Woodland	Forest	Wetland	Grassland
Reptiles								
ORDER: SQUAMATA								
Family Gekkonidae (geckos)								
Common Dwarf Gecko	*Lygodactylus capensis capensis*				x			x
Family Cordylidae (girdled lizards)								
Wilhelm's Flat Lizard	*Platysaurus intermedius wilhelmi*	VU#)		E	x			
Family Gerrhosauridae (plated lizards)								
Common Giant Plated Lizard	*Matobosaurus validus*				x			
Family Scincidae (skinks)								
Striped Skink	*Trachylepis striata*				x			
Rainbow Skink	*Trachylepis margaritifer*				x			
Variable Skink	*Trachylepis varia*				x			
Family Agamidae (agamas)								
Southern Tree Agama	*Acanthocercus atricollis*				x			
Subtotal	7	1	0	1	7	0	0	1

Provincial assessment
‡ IUCN assessment
VU = Vulnerable
E = Endemic

Seven reptiles were recorded during fieldwork. All seven were located within the Woodland habitat which supports a few rocky outcrops in the northern part of the study area. One species was recorded from Grassland habitat. Dedicated reptile surveys, including trapping, would have produced additional species but are unlikely to have produced data that would change the recommendations in this report.

5.4.6 Frogs

The Mbombela are supports a moderately high diversity of frog species, with levels of 11-20 species per QDS in the foothill areas. Frog endemicity, however, is very low with no potentially occurring endemic species present in the Mbombela area (Minter *et. al,* 2004).

Table 4: List of frogs recorded in the study area

Species	Family	Red Data	Protected	Endemic	Assemblages			
					Woodland	Forest	Wetland	Grassland
Frogs								
ORDER: ANURA								
Family Brevicepitidae (rain frogs)								
Bushveld Rain Frog	*Breviceps adspersus*				x			

Species	Family	Red Data	Protected	Endemic	Assemblages			
					Woodland	Forest	Wetland	Grassland
Family Phrynobatrachidae (puddle frogs) Snoring Puddle Frog	*Phrynobatrachus natalensis*						x	
Subtotal	2	0	0	0	1	0	1	0
TOTAL	**135**	**5**	**2**	**2**	**63**	**43**	**31**	**36**

Provincial assessment
‡ IUCN assessment
VU = Vulnerable
E = Endemic

Thirty-nine frog species have been recorded from the degree grid 2530 and, on a finer scale, 20 have been recorded from the QDS 2530 BD, within which the study area is situated.

None of the twenty species of frogs that have been recorded in 2530 have Red Data or protected status. Two frog species were recorded during fieldwork (refer to table above) although dedicated trapping and nocturnal surveys would result in confirmation of at least a few additional species.

5.4.7 Biodiversity Value

A qualitative integration of conservation importance and functional importance values for the four vegetation communities represented in the study area provides an indication of the biodiversity values of these communities.

Vegetation Communities	Conservation Importance	Functional Importance	Biodiversity Value
Outcrop Woodland	High	Moderate	High
Riparian Forest	High	High	High
Degraded Woodland	Low	Low	Low
Degraded Wetland	Moderate	High	High
Transformed	Very Low	Very Low	Very Low

The Outcrop Woodland vegetation community has **High** Biodiversity Value due to a combination of High Conservation Importance and Moderate Functional Value scores. It attained a High rating for Conservation Importance due to the following components:

- Protection Status – a High score was allocated because of provincial policy to avoid developing rocky outcrops;
- Size – granite outcrops are mostly small and fragmented and are embedded in a Vulnerable vegetation type;
- Unique Habitat or Taxa – numerous plant and animal species are restricted to these outcrops, some of which are locally endemic, e.g. *Aloe petricola*, or threatened, e.g. Wilhelm's Flat Lizard;
- Present Ecological State – granite outcrops in the study area are largely undisturbed.

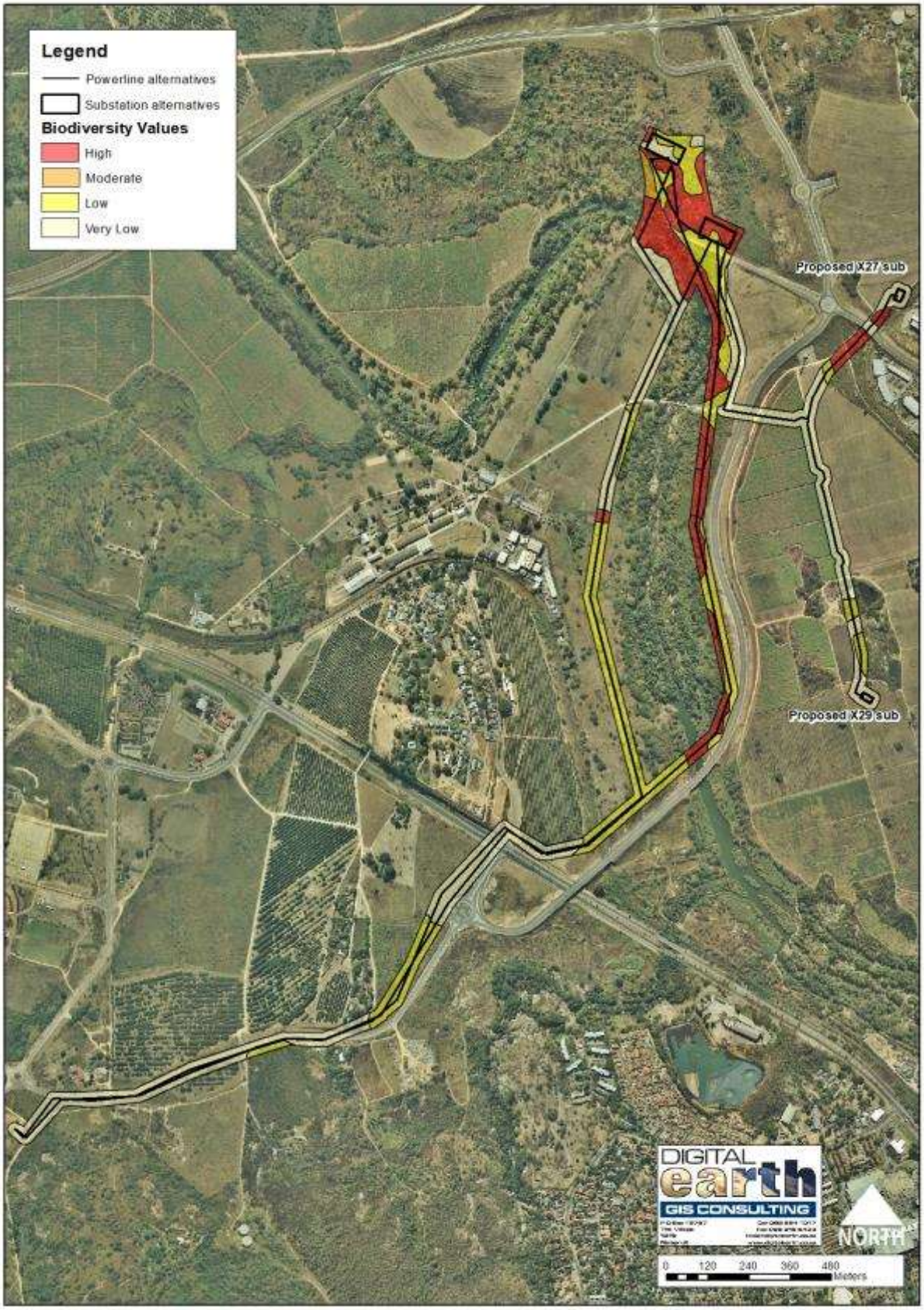


Figure 3: Biodiversity values of the vegetation communities

The Riparian Forest vegetation community has **High** Biodiversity Value due to a combination of High Conservation Importance and High Functional Value scores. Riparian Forest was

rated as having High Functional Importance because of a high rating in the following components:

- Provisioning Services – fibres, medicinal plants;
- Regulating Services - flood attenuation;
- Supporting Services – nutrient cycling, migration corridors.

The Wetland was assessed as having **High** Biodiversity Value through integration of Moderate Conservation Importance and High Functional Importance scores.

Wetlands were allocated a High Functional Importance rating because of high scores in the following components:

- Provisioning Services – fibres, medicinal plants;
- Regulating Services - flood attenuation, water purification;
- Supporting Services – nutrient cycling, migration corridors.

Transformed areas are assessed as having **Very Low** Biodiversity Value resulting from Very Low Conservation Value and Very Low Functional Value scores. As these areas are already developed no additional comment is necessary.

Refer to the ecology report for more detail.

5.5 Surface Water Resources

There are a number of drainage lines, wetlands and of course the main resource being the Crocodile River located in the project area. The proposed powerline will traverse a few water resources and traverse the Crocodile River just north of its confluence with the Gladdespruit which is a major tributary to the river.

Nepid Consultants CC compiled the Crocodile River Substations and Powerlines EIA Specialist Report: Aquatic Ecosystems, 4th February 2018.

Refer to Appendix 5 for the full report, terms of reference, detailed classification and a complete list of the works as referenced in the sections to follow. Both alternatives have been assessed in the study. Following is an abstract from the report:

This report considered all aquatic ecosystems within 500 m of the proposed routes and substations, but focussed on aquatic ecosystems within the immediate footprint of the proposed developments.

5.5.1 Aquatic ecoregion and drainage

The Study Area is located within the North Eastern Highlands Level I Aquatic Ecoregion (*sensu* Kleynhans *et al.* 2005). This ecoregion is described as a hot and dry region characterised by plains with a low to moderate relief, and vegetation consisting mostly of Lowveld Bushveld types.

The proposed development is located on the lower boundary of Quaternary Catchment X22C, near the confluence of the Gladdespruit and Crocodile Rivers, in the Nkomati Water Management Area.

5.5.2 Freshwater priority areas

There are no National Freshwater Priority Wetlands or Fish Support Areas within or near the Study Area. The national wetland database classified the Crocodile and lower Gladdespruit as “Channelled Valley Bottom Wetlands”. A large area near the Mbombela Soccer Stadium,

in the western portion of the Study Area, is classified as “Unchanneled Valley Bottom Wetland”.

5.5.3 Classification and delineation

Six hydro-geomorphic aquatic ecosystem types were identified within the Study Area, of which three could be affected by the proposed development, namely the:

- Seepage Wetland;
- Valley Bottom Wetland (No Channel); and
- Lower Foothill (Crocodile River).

The Study Area also contained these ecosystem types are unlikely to be impacted by the proposed development, either directly or indirectly, and so these systems were not considered in detail in this report:

- an Upper Foothill River (lower Gladdespruit),
- a number of drainage lines and
- dams

The following two figures show the classification and delineation of the aquatic ecosystems in the area and around the proposed substation.

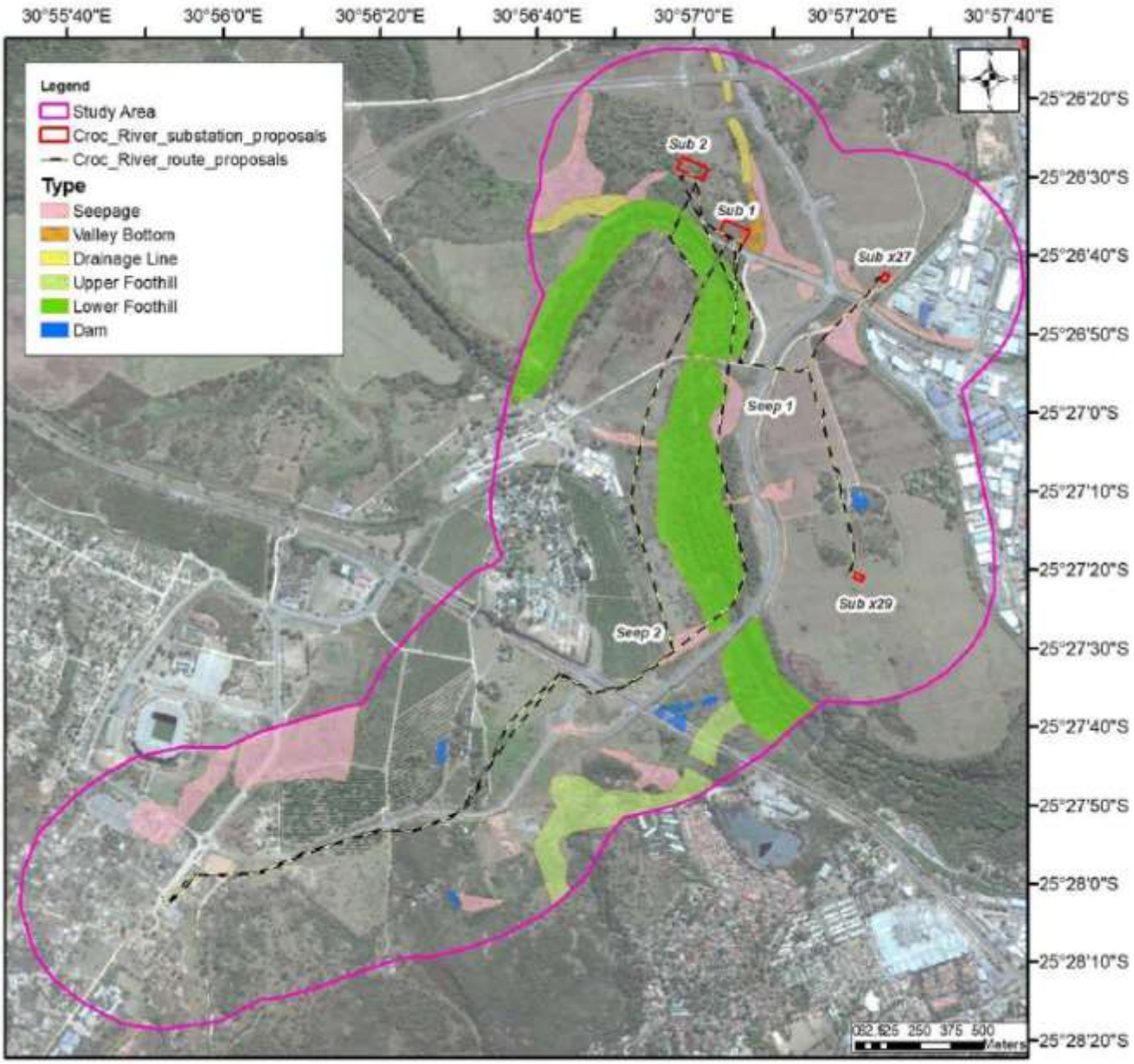


Figure 4: Aquatic ecosystem classification and delineation

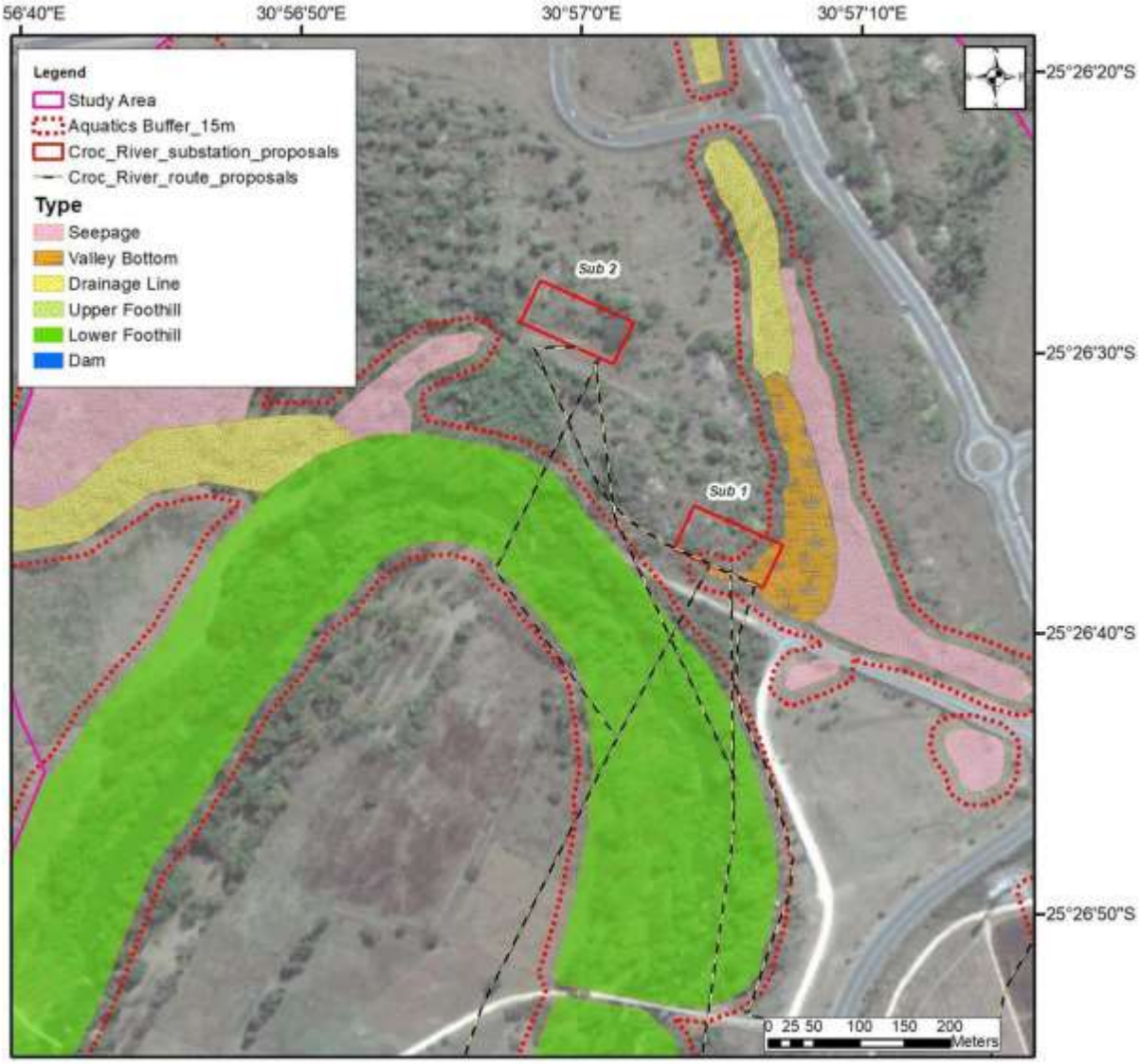


Figure 5: Classification and delineation of aquatic ecosystems at the proposed substation footprints

The following section summarises the key features of each aquatic ecosystem type:
*Note that alien invasive vegetation in the tables below are marked with a *.*

a) Seepage Wetlands

Distribution: Seepage wetlands were common and widely distributed in the Study Area in 2018. However, comparison of aerial imagery from 1936 with Google Earth imagery from 2017 shows that many of these wetlands have been modified significantly. For example, there used to be an extensive seepage wetland immediately south of the proposed Substation x27, but this area has since been transformed by roads and industrial development, and much of this wetland no longer exists, although there are a few remnants of this wetland that remain. Two Seepage Wetlands could be impacted directly by the proposed development as follows:

• **Seep 1:** left bank of the Crocodile River, and west of the P166 road. This is a lateral seepage wetland which appears to be driven by seepage from irrigated sugar upslope of the wetland. The wetland is dominated by *Phragmites mauritianus,* and to a less extent *Typha capensis.*

• **Seep 2:** on the right bank of the Crocodile River, adjacent to the P166 road bridge that crosses the Crocodile River. This wetland is characterised by intermittent saturation.

Size:	0.3 to 13.5 ha.
Flow type:	Seasonal to intermittent saturation, never inundated.
Soils:	Course sand with scattered iron concretions (mottling), and grey matrix.
Flora:	Plant species diversity was high, with a total of 154 species recorded
Hydrophytes:	*Cyclosaurus interruptus*
Grasses:	*Andropogon eucomus, Arundinella nepalensis, Cynodon nlemfuens*, Imperata cylindrica, Ischaemum polystachyum, Paspalum distichum*, Setaria megaphylla, Setaria sphacelata, Sporobolous africanus, Sporobolus pyramidalis*
Reeds:	*Arundo donax*, Phragmites mauritianus*
Sedges:	*Bulbostylis hispidula, Cyperus esculentus*, Kyllinga melanosperma*
Herbs:	*Ageratum conyzoides*, Canna indica*, Centella asciatica*, Commelina benghalis*, Commelina erecta, Heterotis canescens, Nidorella auriculata, Oenathera rosea*, Persicaria decipiens, Ranunculus multifidis*, Utricularia scandens, Verbena bonariensis**
Geophytes:	*Calocasia esculenta**, Eulophia angolensis*
Climbers:	*Cardiospermum grandiflorum*, Ipomoea cairica, Ipomoea purpurea*, Passiflora foetida*, Rubus sp.*, Tacazzea apiculate,*
Shrubs:	*Tecoma stans*, Sesbania bispinosa*, Solanum maurtianum*, Lantana*

	*camara**
Trees:	*Schinus terebinthifolius*, Diospyros lycioides subsp. sericea, Senegalia ataxacantha, Eucalyptus grandis*, Psidium guajava*.*

b) Valley Bottom Wetlands (no channel)

Distribution: The Study Area contained one Valley Bottom Wetland (no channel), located immediately east of the proposed Substation 1. Comparison of aerial imagery from 1936, with Google Earth imagery from 2017 shows that the size of this wetland has remained largely unchanged over the years. Refer to report attached for images.

Size:	Small (1.2 ha)
Flow type:	Permanent saturation, seasonal inundation
Soils:	Unconsolidated course sands mixed with black, anoxic clays and organics
Flora:	Plant species diversity was low, with a total of 49 species recorded.
Hydrophytes:	*Cyclosaurus interruptus, Thelypteris confluens, Typha capensis, Ludwigia octovalvis*
Grasses:	*Cynodon nlemfuens*, Leersia hexandra, Paspalum distichum*, Paspalum urvillei**
Reeds	*Arundo donax*, Phragmites mauritianus*
Sedges:	*Cyperus dives, Cyperus esculentus*, Cyperus fastigiatus, Kyllinga melanosperma*
Herbs:	*Nidorella auriculata, Pulicaria scabra, Ecliptera prostrata*, Persicaria decipiens, Persicaria senegalensis, Ranunculus multifidis*, Verbena bonariensis**
Geophytes:	*Calocasia esculenta***
Climbers:	*Cissampelos mucronata*
Shrubs:	*Tecoma stans**
Trees:	*Morus alba**

c) Lower Foothill – River zone

Lower Foothill Marginal Zone, near the P166 road bridge [2018-01-15].

Lower Foothill Upper Zones (Non-Marginal), near the P166 road bridge [2018-01-15].

Distribution: The Crocodile River passes through the Study Area over a distance of 3.1 km, and the river here is classified as a Lower Foothill. Photographs of the marginal and upper (non-marginal) zones near the PO166 road bridge are shown in photos above. The proposed powerline will cross the Crocodile River at one of three alternative locations:

- adjacent to Sub 2;
- adjacent to Sub 1; and
- adjacent to the P166 road bridge.

Size:	The Crocodile River and its riparian zone within the Study Area is 120 to 260 m wide (Figure 5-8).
Flow Type:	Perennial.
Substrate:	Mostly clay, fine and course sands, with large boulders and bedrock outcrops.
Flora:	Plant species diversity was high, with 159 species recorded, but 51 of these were alien species (i.e. 32%), shown in red (Appendix G). Key taxa

	in the marginal and non-marginal zones were as follows:
Marginal Zone:	
Hydrophytes:	*Salvinia molesta*, Cyclosaurus interruptus, Eichhornia crassipes*, Thelypteris confluens, Typha capensis, Ludwigia octovalvis*
Grasses:	*Arundinella nepalensis, Cynodon dactylon, Cynodon nlemfuens*, Leersia hexandra, Pennisetum purpureum*, Saccharum officinarum***
Reeds	*Arundo donax*, Phragmites mauritianus, Phragmites australis*
Sedges:	*Cyperus dives, Schoenoplectus brachyceras*
Herbs:	*Persicaria decipiens, Tagetes minuta**
Geophytes:	*Calocasia esculenta**, Dioscorea cotinifolia, Dietes iridioides*
Climbers:	*Cissampelos mucronata, Dalbergia armata,*
Shrubs:	*Chromolaena odorata*, Caesalpinia decapetala*, Sesbania bispinosa, Tecoma stans*, Lantana camara*, Ricinis communis**
Trees:	*Breonadia salicina, Combretum erythrophyllum, Ficus sycomorus, Maesa lanceolata, Morus alba*, Melia azedarach*, Rauvolfia caffra, Syzygium cordatum, Trichelia emetica.*

Non-Marginal Zone: notice high levels of alien invasive vegetation (marked with *)	
hydrophytes:	*None.*
grasses:	*Arundinella nepalensis, Cynodon nlemfuens*, Pennisetum purpureum*, Saccharum officinarum**, Setaria sphacelata,*
reeds	*Arundo donax*, Bambusa glaucescens*, Phragmites mauritianus*
sedges:	*Cyperus esculentus*, Cyperus distans,*
herbs:	*Achyranthes aspera*, Ageratum conyzoides*, Bidens pilosa*, Carharanthus roseus*, Desmodium uncinatum*, Erigeron sumatrensis, Salvia tiliifolia*, Schkuhria pinnata*, Tithonia diversifolia*, Tridax procumbens*
geophytes:	*Dioscorea cotinifolia, Dietes iridioides*
climbers:	*Abrus precatorius, Aristolochia elegans*, Cardiospoermum grandiflorum*, Cissampelos mucronata, Dalbergia armata, Dolichandra unguis-cat*, Ipopoea purpurea*, Passiflora subpetela*, Rhoicissus tridentate, Smilax anceps, Solanum seaforthianum**
shrubs:	*Chromolaena odorata*, Caesalpinia decapetala*, Sesbania bispinosa*, Tecoma stans*, Lantana camara*, Annona senegalensis, Solanum mauritianum**
trees:	*Bridelia micrantha, Combretum erythrophyllum, Jacaranda mimosifolia*, Grevillia robusta*, Maesa lanceolata, Morus alba*, Melia azedarach*, Magnifera indica**, Carya illinoinensis**, Psidium guajava*, Rauvolfia caffra, Sclerocarya birrea, Syzygium cordatum, Trichelia emetica, Vachellia sieberiana.*

d) Drainage Lines

Photo of a drainage line in the project area

The Study Area contained a few episodic to seasonally active drainage lines, one feeding the Valley Bottom wetland near the proposed Substation 1. Here, bed substrates were characterised by highly mobile course sands with no evidence of mottling. These systems are unlikely to be affected by the proposed development and were therefore not considered in detail in this report.

e) Upper Foothill – River zone

Upper Foothill (lower Gladdespruit)

The Study Area included the lower reaches of the Gladdespruit, at its confluence with the Crocodile River. The river here is characterised by granite bedrock with a waterfall, cascades and isolated pools, and a well-wooded riparian zone. This system was unlikely to be affected by the proposed development and was therefore not considered in detail in this report.

f) Dams

Abandoned settling pond, dominated by bulrush *Typha capensis*

The Study Area contained a number of farm dams used for irrigation, some of which were no longer is use, as well as a series of dysfunctional settling ponds near the confluence of the Gladdespruit and Crocodile River. These systems are unlikely to be affected by the proposed development and were therefore not considered in detail in this report.

5.5.4 Ecological and Functional Importance

Ecological Importance

The Ecological Importance of the three aquatic ecosystem types assessed ranged between Very Low, for the Seepage Wetland, to Very High for the Lower Foothill (Crocodile River).

Table 5: Ecological Importance ratings of the aquatic systems

Parameter	Seepage Wetland (P166)	Valley Bottom (Sub 1)	Lower Foothill (P166)
Biodiversity support	**0.0**	**0.3**	**3.7**
Red Data species	0.0	0.0	4.0
Unique species	0.0	0.0	3.0
Migration/breeding/feeding	0.0	1.0	4.0
Landscape scale	**0.5**	**1.0**	**2.0**
Protection status of wetland	0.0	0.0	0.0
Protection status of vegetation type	2.0	2.0	4.0
Regional context	0.0	2.0	2.0
Size and rareity	0.0	0.0	2.0
Diversity of habitats	0.5	1.0	2.0
Sensitivity of the wetland	**0.3**	**1.8**	**3.0**
Sensitivity to floods	0.0	2.0	2.0
Sensitivity to low flows	0.5	3.0	4.0
Sensitivity to water quality	0.5	0.5	3.0
	0.5	1.8	3.7

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Red Data Species
The Seepage Wetland and Valley Bottom Wetland were rated as zero in terms of Red Data species, but the Lower Foothill (Crocodile River) was rated *Very High* in terms of Red Data species: Half-coloured Kingfisher was confirmed in the area by Duncan McKenzie (pers comm.), and the Critically Endangered Inkomati Suckermoth *Chiloglanis bifurcus* has been recorded in the Crocodile River at Sterkspruit, some 6 km upstream of the proposed development (SAIAB database).

Unique Species
There were no unique species or uncommonly large populations of species in the two wetlands, but the Crocodile River support unusual taxa, including the burrowing mayfly *Ephoron savignyi,* and taxa sensitive to water quality deterioration, including *Athericidae*, *Psephenidae*, *Prosopistomatidae* and *Heptageniidae*.

Migration/breeding/feeding sites
The Seepage wetland is unlikely to provide a migration corridor for any species, whereas the Valley-Bottom Wetland links the Crocodile River to a small drainage line and was rated as having low importance as a migration corridor. The Crocodile River, on the other hand, provides an important migration corridor for fish species, such as *Labeobarbus marequensis.*

Protection status of the wetland
Aquatic ecosystems in the Study Area have no formal protection status, so protection status of the wetland was rated as *Zero.*

Protection status of the vegetation type
Most of the Study Area is located within Legogote Sour Bushveld (SVI 9), which had a conservation status of **Endangered** (Mucina and Rutherfoord 2006), but this was later changed to **Vulnerable** (Notice 1002 of Government Gazette 34809, 9 December 2011).

The two wetlands were therefore rated as having *Moderate* importance in terms of vegetation protection status. By contrast, riparian zones within the Study Area represent azonal (unmapped) portions of Lowveld Riverine Forest (FOa 1), and this vegetation type has a conservation status of **Critically Endangered** (Mucina and Rutherford 2006). The protection status of the Crocodile River vegetation type was therefore rated as *Very High.*

Plant species that are protected under the Mpumalanga Nature Conservation Act (Act No 10 of 1998), and/or the National Forestry Act (No 84 of 1998), that were confirmed during this and/or previous surveys were:

- *Breonadia salicina* Least Concern
- *Dietes iridioides* Least Concern
- *Dioscorea cotinifolia* Least Concern
- *Eulophia angolensis* Least Concern
- *Eulophia horsfallii* Least Concern
- *Freesia laxa* Least Concern
- *Gloriosa superba* Least Concern
- *Scadoxus puniceus* Least Concern
- *Sclerocarya birrea* Least Concern

Regional context of ecological integrity
Regional context of ecological integrity of the Seepage Wetland was rated as *Zero* because the Mpumalanga Biodiversity Sector Plan classifies the area as "*Modified – Old Lands*" (MTPA 2013). By contrast, the Valley Bottom Wetland and Lower Foothill were rated as *Moderate*, as these are both classified as "*Natural – Other*" (MTPA 2013).

Size and rarity of the wetland type/s present
The size and rarity of the two wetlands were rated as Zero, as both are common and very small. By contrast, the size and rarity of the Crocodile River was rated as *Moderate*.

Diversity of habitat
Diversity of aquatic habitats in the Seepage wetland was rated as *Very low*, while Diversity of Habitats in the Valley Bottom Wetland was rated as *Low.* By contrast, diversity of habitats in the Crocodile River was rated as *Moderate*.

Sensitivity to changes in floods
The sensitivity to changes in floods in the Seepage Wetland was rated as *Zero,* whereas the sensitivity to floods in the Valley Bottom wetland was rated as *Moderate.* Likewise, the sensitivity of the Crocodile River to changes in floods was rated as *Moderate*, as risks of erosion are low because of abundance of stable bedrock.

Sensitivity to changes in low flows/dry season
Sensitivity to changes in low flow in the Seepage Wetland was rated as *Very Low,* as this is a naturally seasonal to episodic system. Sensitivity to low flows in the Valley Bottom wetland was rated as *High*, as this is a permanently saturated system. Sensitivity to low flow in the Crocodile River was rated as *Very High*, as this is a naturally perennial system that supports a high diversity of flow-dependent taxa.

Sensitivity to changes in water quality
Sensitivity to changes in water quality were rated as *Very Low* for the two wetlands. Sensitivity to changes in water quality were rated as *High* for the Crocodile River.

Functional Importance
The Functional Importance of the three aquatic ecosystem types assessed ranged between Low for the Seepage Wetland to High for the Crocodile River. The following section explains the ratings that were given.

Table 6: Functional Importance ratings for the aquatic ecosystems

Parameter	Seepage Wetland (P166)	Valley Bottom (Sub 1)	Lower Foothill (P166)
Flood attenuation	0.0	3.0	3.0
Streamflow regulation	0.0	0.5	4.0
Sediment trapping	1.0	3.0	-
Phosphate assimilation	2.0	2.0	2.0
Nitrate assimilation	2.0	3.0	2.0
Toxicant assimilation	2.0	3.0	2.0
Erosion control	1.0	3.0	3.0
Carbon storage	0.5	1.0	4.0
	1.1	2.3	2.9

Scoring: 0=None; 1=Low; 2=Moderate; 3=High; 4 = Very High

Flood attenuation
The Seepage Wetland has an insignificant role in terms of flood attenuation because of its small size and structure, whereas the Valley Bottom Wetland, despite its small size, is likely to be relatively important in terms of flood attenuation because of its structure and dense

vegetation. Similarly, the Crocodile River is likely to have high importance in terms of flood attenuation because of its wide, anastomosed and unconfined structure, and dense woody vegetation.

Streamflow regulation
The Seepage Wetland contributes close to *Zero* in terms of streamflow regulation, whereas the contribution of the Valley Bottom Wetland to streamflow regulation is rated as *Very Low.* The Crocodile River, on the other hand, is important in maintaining streamflow during low flow periods.

Sediment trapping
The Seepage Wetland is unlikely to contribute much to sediment trapping because of its slope, whereas the Valley Bottom Wetland is likely to contribute significantly to sediment trapping. Sediment trapping was not rated for the river as this attribute applies to wetlands rather than streams or rivers.

Phosphate, nitrate and toxicant assimilation
The Seepage Wetland and Valley Bottom Wetland were rated as having *Moderate* importance in terms of phosphate assimilation because both are likely to receive inputs of phosphate from livestock that use these areas for grazing. The Valley Bottom Wetland is likely to provide *High* assimilation of nitrate and toxins because of the abundance of vegetation and low gradient that provides opportunity for plant uptake and large surface area for bacterial colonisation, particularly during the wet season. The potential for nutrient assimilation by the Crocodile River was rated as *Moderate* on account of the moderate gradient and abundance of marginal and emergent vegetation.

Erosion control
Erosion control in the Seepage Wetland was rated as very low because of the low gradient. By contrast, vegetation within and alongside the Valley Bottom Wetland and Crocodile River is essential for minimising the risks of erosion, and their role in erosion control was rated as *High.*

Carbon storage
Carbon storage within the two wetlands was *Low to Very low* because of the limited woody vegetation, whereas carbon storage along the Crocodile River was rated as a *Very High* because of the abundance of woody vegetation in the riparian zone Ds.

5.5.5 Direct Human Benefits

The direct human benefits provided by the two wetlands assessed were rated as Very Low, while direct human benefits provided by the Crocodile River were rated as close to High (refer to report for the table). The following section explains the ratings that were given:

Water for human use
The two wetland types assessed do not appear to be used for any direct human uses. By contrast, the importance of the Crocodile River for domestic, agriculture and other direct human uses was rated as *Very High.*

Harvestable resources
The Seepage Wetland provides grazing for livestock and its role in terms of harvestable resources was rated as *Moderate*. The Valley Bottom Wetland, on the other hand, does not appear to provide useful harvestable resources, other than reeds, and its role was rated as *Low.* The Crocodile River, on the other hand, provides a number of harvestable resources, particularly timber and livestock grazing, and was rated as having *High* importance in terms of harvestable resources.

Cultivated foods
There was no evidence of subsistence cultivation within the Seepage Wetland. The Valley Bottom Wetland contained a few madumbi plants, but these appeared to be feral plants that were not harvested. The Crocodile River riparian zone, on the other hand, is used extensively for cultivation of pecan nuts. The riparian zone also contained a number of food plants, including tomatoes, bananas and mangoes, although these appeared to be feral plants that were not actively harvested.

Cultural heritage
The importance of aquatic ecosystems to cultural heritage is unknown, but most likely *Zero* for the two wetlands, and *Moderate* for the Crocodile River.
Tourism and recreation
The importance of the three aquatic ecosystems assessed to tourism and recreation is unknown for certain, but most likely *Zero*.

Education and research
The importance of the two wetlands to education and research is likely *Zero,* whereas the Crocodile River was rated as having *Moderate* importance for education and research.

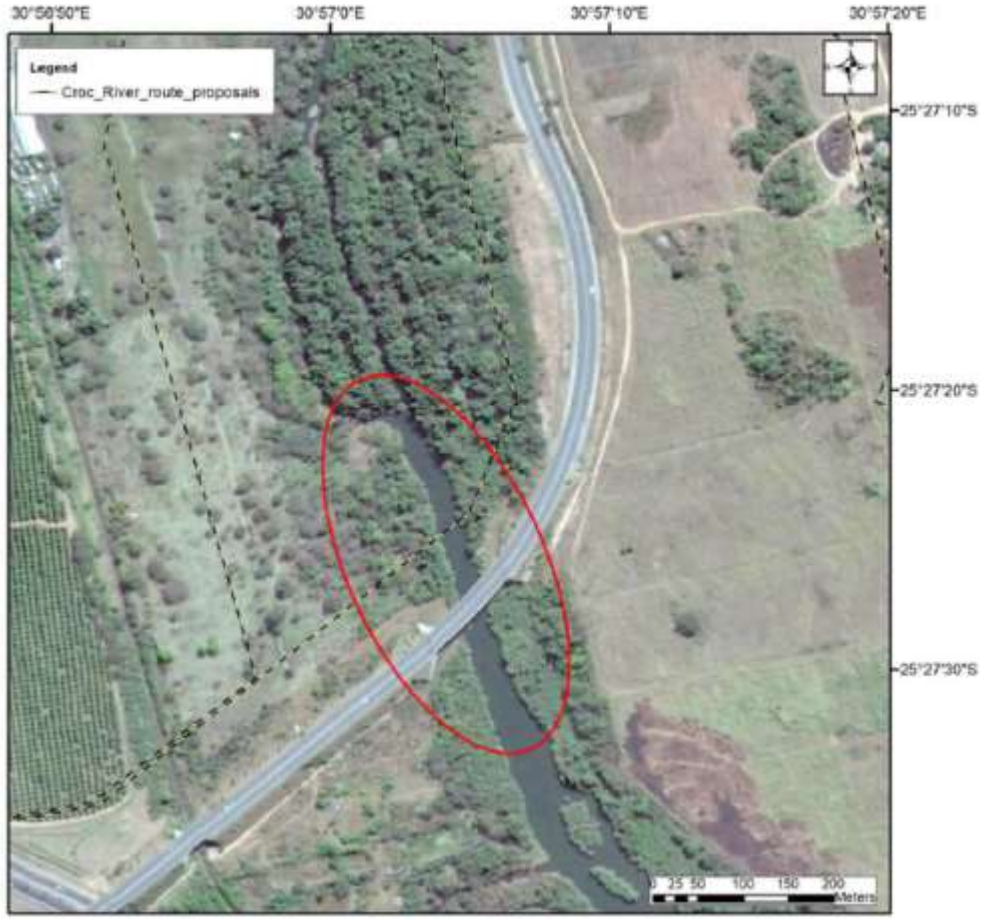
5.5.6 Present Ecological State

Wetlands:
The Present Ecological State of Seepage Wetlands adjacent to the P166 (Seep 1 and Seep 2) was rated in January 2018 as Moderately Modified (Category C: 70%). The main causes of degradation were associated with cultivation, fallow lands, high levels of alien invasive vegetation, drainage canals and associated invasion of terrestrial woody species. The Present Ecological State of the Valley Bottom Wetland adjacent to the proposed Substation 1 was rated in January 2018 as Moderately Modified (Category C: 75%). The main causes of degradation were associated with increased sediment inputs from upstream erosion, and invasion of alien vegetation.

Crocodile River:
The Present Ecological State of the Crocodile River adjacent to the P166 road bridge was rated in January 2018 as Moderately Modified (Category C: 68%). The main causes of degradation were associated with high levels of alien vegetation; the removal of riparian vegetation for pecan trees; inundation caused by backup from a diversion weir; flow regulation caused by operation of Kwena Dam and smaller dams in the catchment; water abstraction for irrigation; and increased sediment inputs from forestry and other activities in the catchment.

Riparian Vegetation:
The natural (reference) state of riparian vegetation in the marginal zone in the Crocodile River at the P166 road bridge is likely to have comprised large areas of open alluvium and bedrock because of periodic high flow events, similar to that shown in an aerial photograph from 1936.

The Present Ecological State of riparian vegetation in the Crocodile River at the P166 road bridge was rated as borderline between *Largely and Seriously Modified* (Category D/E: 40%). The main causes of degradation were associated with inundation from a diversion weir, cultivation of pecan trees within the riparian zone, reduction in high flow events caused by operation of Kwena Dam and small dams throughout the catchment, and high levels of invasion of alien vegetation associated with general disturbance. Refer to the report for a more detailed account of the PES which includes a description of the species in the marginal and non-marginal zones.



Google Earth image of the Crocodile River at P166 road bridge. Red lines show the extent of the vegetation assessment [Image date: 13/06/2017].

5.6 Cultural and Historical Features

A Phase 1 Archaeological and Heritage Impact Assessment on the farms Boschrand 283 JT and Riverside 308 JT in respect of the proposed Crocodile River substations and power line construction, Mbombela, Mpumalanga Province – 25 January 2018 was conducted by Kudzala Antiquity. Refer to Appendix 6 for the full report.

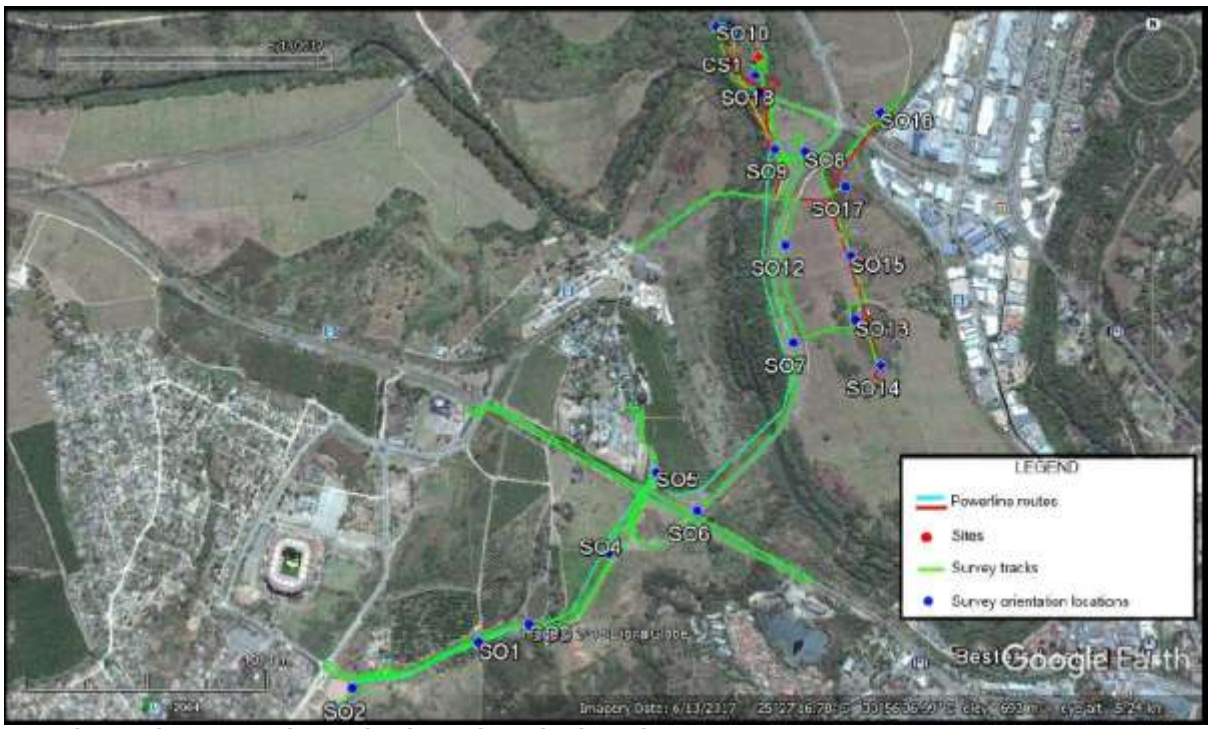
The study was conducted in order to identify cultural heritage resources in respect of proposed erection of a power line and sub stations and following are the findings of the report.

The report includes a detailed account of archaeological and archival background studies as well as detailed information on the historic period and archaeology. Refer to the report for these details. The following section only summarises the archaeological finds that could be impacted by the proposed powerline and substation:

The survey was conducted on foot and with the aid of a motor vehicle in an effort to locate archaeological remains and historic sites, structures and features. Archival information including scrutiny of previous heritage surveys of the area formed the baseline information against which the survey was conducted.

Only one site of heritage significance was found and documented, this is a formal graveyard containing at least 50 marked and unmarked graves (site CS1).

A total of eighteen (18) survey orientation locations were documented (SO 1-18) which includes a GPS location and photographs of the landscape at that particular location.



Google Earth 2018 – Site and orientation site locations

This (phase 1) investigation is aimed at getting an overview of cultural resources in the project area, assigning significance to these resources, assessing the possible impact that the proposed activity may have on these resources, making recommendations pertaining to the management of heritage resources and putting forward mitigation measures where applicable.

Graves are considered very sensitive sites and should never under any circumstances be jeopardized by development activities. Graves and burial grounds are incorporated in the NHRA under section 36 and in all instances where graves are found by the surveyor, the recommendation would be to steer clear of these areas. If this is not possible or if construction activities have for some reason damaged graves, specialized consultants are normally contacted to aid in the process of exhumation and re-interment of the human remains.

Table 7: Significance ratings of heritage sites

Type of site	Identified sites	Significance
Graves and graveyards		High LS 3A
Late Iron Age	None	N/A
Early Iron Age	None	N/A
Historical buildings or structures	None	N/A
Historical features and ruins	None	N/A
Stone Age sites	None	N/A

Significance rating guideline:

Field rating	Grade	Significance	Recommended mitigation
Local significance (LS 3A)	Grade 3A	High	Conservation, no mitigation advised
Generally Protected A (GPA)	GPA	High / Medium significance	Mitigation before destruction

Site CS 1:
Location:
S25°26'33.36" E30°57'04.48"

Description: A large formal graveyard which encompasses and area of approximately 0.3 hectares. There are at least 50 marked and unmarked graves located here.

General description:

Type of significance	Degrees of significance	NHRA heritage resource & Rating
Burial grounds and graves	Archaeological – Not Known Historic - High	Burial grounds and graves. High Significance. LS GPA

Site condition assessment:

Type of heritage resource	Integrity of cultural material	Preservation condition of site	Relative location	Quality of archaeologial/historic material	Quantity of site features	Recommended conservation management
Burial grounds & graves	Not known	Fair - poor	Boschrand 283 JT & Riverside 308 JT	Archaeology: N/A Historically: Fair	<50	Avoid if possible & fence or relocation permit

In terms of the archaeological component of the Act (25 of 1999, section 35) no sites were located or recorded. In terms of the built environment in the project area (section 34 of the Act) no significant buildings were identified.

In terms of burial grounds and graves (section 36 of the Act) a large formal graveyard was recorded. It is recommended that the graveyard be fenced prior to any construction activity in order to protect the graves. Any surviving relatives should be allowed access.

There will be no impact on the graveyard from the 132 kV line, substation or underground cable. A temporary fence will be erected during the construction period of the substation to prevent construction workers entering the graveyard.

5.7 Social characteristics

The proposed project site is in a sense situated on the outskirts of Nelspruit. The broader area includes a high density residential setting (Matsafeni Township) and also the lower density Mataffin Macadamia and Halls office area and dairy with approved but undeveloped townships where the new substation and secondary substations will be located.

The social characteristics of the area include a range of income classes from the very poor to high income citizens.

The main township development to benefit from the proposed electrical infrastructure is the Mpumalanga Fresh Produce Market which is a provincial priority.

6. Public Participation Process

6.1 Introduction

In order to afford the Interested and Affected Parties (I&AP's) the opportunity to become involved and be part of the process the following public participation process was followed. During the process I&AP's are provided with the opportunity to raise issues of concern that will be recorded and included in the environmental impact assessment.

6.2 Identification of Interested and Affected Parties

Effort was made to identify and register interested and affected parties to the proposed site. This included people who may be affected by the activity e.g. adjacent or nearby landowners, downstream water users, environmental organisations as well as relevant authorities (Refer to Appendix 7A for the list of I&AP's).

A Background Information Document was sent to identified potentially affected parties which included authorities, the ward councillor and others. This document provided a brief description of the project and main issues identified at the time. It provided a schedule of the process and description of the different steps of the environmental process.

IAP's were invited to register and send comments or make enquiries. The irrigation board registered in response to the notices. The BAR will be made available to all identified parties.

6.3 Newspaper and Site Notices

A notice in the prescribed format was placed in The Lowvelder of 16 February 2018. Site notices was placed at the sites and along the route on 19 February 2018. The notices informed the public and potentially affected parties of the project, EIA process and opportunity to partake as well as the availability of the report for comment. The affected landowner gave consent to the EIA process that is underway.

Refer to Appendix 7B for proof of communication and documents.

6.4 Public Participation Meeting

A public participation meeting was not scheduled.

If the response from the I&AP's to the BAR deems it to be necessary and issues cannot be resolved through direct consultation, a meeting will be considered.

6.5 Basic Assessment Report

The Basic Assessment report (BAR) comprises an overview of the assessment of the proposed project in the detail available and an outline of the identified issues and potential concerns.

The assessments and findings of the specialist study have been included in the BAR.

The environmental impacts of the proposed stream crossing has been assessed and rated and mitigation and management measures were defined in this report.

The BAR was made available to the Interested and Affected Parties including State Departments and the Competent Authority for a commenting period of 30 days in accordance with Chapter 6 of the 2014 EIA Regulations (as amended).

Any comments received was included in the report with a response to the commenting party where required. Refer to Appendix 7C.

Comments were received from the MDARDLEA and the MTPA. No further comments were received from the irrigation board. Refer to appendix 7D for the proof of communication with all parties.

No comments were received that resulted in substantial amendments to the contents of the BAR other than only the inclusion thereof. It was not necessary to make the report available for another period of review before submission to the MDARDLEA.

6.6 Environmental Authorisation

On review of the information submitted the Department will either decide to grant or deny Environmental Authorisation for the proposed activities. If authorisation is granted the Environmental Authorisation would include conditions that would apply to the activities.

The Authorisation or decision will be communicated to all registered I&AP's as soon as received from MDARDLEA.

6.7 Authority Liaison

An application with the relevant documentation was submitted to the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs for the undertaking of a Basic Impact Assessment process on

A site visit with the MDARDLEA official will be conducted on request and such a visit would serve to investigate the site, discuss the proposed concept and to identify and discuss any issues the Department would like to be addressed in addition to the content of the report.

7. Environmental Legislation and Policy applicable to this activity

7.1 The National Environmental Management Act, 1998 (Act no.107 of 1998)

The Basic Environmental Impact Assessment is undertaken in terms of the EIA regulations (amended), R982 and R983 as published under Section 24(5) 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

The activities requiring a Basic Assessment Process are as follows:

R.983, 2014: Activity 11 - The development of facilities or infrastructure for the transmission and distribution of electricity— (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts; excluding the development of bypass infrastructure for the transmission and distribution of electricity where such bypass infrastructure is — (a) temporarily required to allow for maintenance of existing infrastructure; (b) 2 kilometres or shorter in length; (c) within an existing transmission line servitude; and (d) will be removed within 18 months of the commencement of development.

R.983, 2014: Activity 12 - The development of — (ii) infrastructure or structures with a physical footprint of 100 square metres or more; where such development occurs — (a) within a watercourse; or (c) if no development setback exists, within 32 metres of a watercourse, measured from the edge of a watercourse; — excluding — (dd) where such development occurs within an urban area; (ee) where such development occurs within existing roads, road reserves or railway line reserves.

R.985, 2014: Activity 14 – The development of — (ii) infrastructure or structures with a physical footprint of 10 square metres or more; where such development occurs — (a) within a watercourse; (c) if no Development setback has been adopted, within 32 metres of a watercourse, measured from the edge of a watercourse f. Mpumalanga - i. Outside urban areas: (ff) Critical biodiversity areas or ecosystem service areas as identified in systematic biodiversity plans adopted by the competent authority or in bioregional plans.

As required by the EIA regulations, an Environmental Authorisation from the Mpumalanga Department of Agriculture, Rural Development, Land and Environmental Affairs (DARDLEA) would be required before the activities could commence.

7.2 Other relevant legislation

Legislation aimed at the protection of natural resources:

- The Mpumalanga Conservation Act, 1998 (Act No. 10 of 1998)
- National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998)
- The National Water Act, 1998 (Act No. 36 of 1998)
- The National Heritage Resources Act, 1999 (Act no.25 of 1999)
- National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004)
- National Environment Management: Waste Act, 2008 (Act No. 59 of 2008)

The main objective of the legislation listed above is to ensure a safe and healthy environment as well as the sustainable use of natural resources.

The activity can comply with the mentioned legislation by means of the applicant having to apply for the necessary licences authorisations and permits in terms of the applicable legislation.

Other legislation that may in general be relevant to the proposed activity includes:

- Occupational Health and Safety Act, 1993 (Act No. 85 of 1993)

- The Constitution, 1996 (Act No. 108 of 1996)
- Promotion of Access to Information Act, 2000 (Act No. 2 of 2000)
- National Environment Management: Waste Act, 2008 (Act No. 59 of 2008)

8. Project considerations

The following aspects need to be considered for the proposed project.

8.1 Water Requirements

Water required during the construction period for either construction staff or any other activities must be provided for by the applicant and contractor. No water will be used during the operational phase of the activities.

8.2 Solid, Liquid waste, Gaseous Emissions

8.2.1 Solid Waste

Removal of solid waste during the construction period would be the responsibility of the contractors.

The activity will not result in solid waste during the operational phase.

8.2.2 Sanitation

The contractor will have to provide the necessary ablutions of an acceptable standard to the workers during the construction phase.

Sanitation is not required during the operational phase.

8.2.3 Gaseous Emissions

The proposed activities will not result in any gaseous emissions.

8.3 Electricity

The electricity that will be distributed will be provided by the City of Mbombela local municipality.

8.4 Access

Access to the existing substation is currently from the road to the Mbombela Stadium and it will remain this way. The access route to the new substation and secondary infrastructure will follow an existing dirt road also lowering the potential loss of indigenous vegetation.

The necessary servitudes will be registered for the electrical line as well as the proposed substations.

8.5 Stormwater management

Surface and storm water needs to be handled on site during the construction period, especially in close proximity to the river and identified wetlands.

9. Environmental Issues and Potential Impacts

9.1 Assessment Methodology

The activities associated with the project will bring about certain aspects for example dust emissions, effluent etc. Aspects in turn interact with and have negative impacts on the receiving environment (e.g. air, water, soil, fauna and flora).

Impacts have certain consequences on the receiving environment and these needs to be identified and mitigated to ensure that the effects are prevented, minimised and/or controlled.

The potential impacts are assessed under the different receiving environments.

The following criteria and rating mechanism is used for the evaluation of significance of potential environmental impacts.

Table 8: Impact Assessment Rating Criteria

Nature of Potential Impact	Rating or Category	Description of Impact on the Environment
Extent	Site	Limited to the site and its immediate surroundings
	Local	Up to 5km from the project site
	Regional	Beyond 5km of site. Up to 20km radius from the project site
	Provincial/National	Will affect beyond 20km from the site
Duration	Short term	0 - 5 years. Construction and early operation.
	Medium term	Operational phase up to 25 years
	Long term	Operational phase longer than 25 years
	Permanent	Impact will continue after the operational phase
Intensity	Very low	Limited damage to a small area. Natural, cultural or social functions or processes are not affected/negligible.
	Low	Where the affected environment is altered but natural, cultural or social functions or processes are only marginally affected.
	Medium	Natural, cultural or social functions or processes is notably altered but can continue although in a modified way.
	High	Where the natural, cultural or social functions or processes are severely altered to the Extent that they temporarily/permanently cease.
	Very high	Where the natural, cultural or social functions or processes are altered in such a way that they will permanently cease. Irreparable damage.
Probability	Unlikely	Less than 20% probability that impact may occur.
	Probable	There is a good chance that the impact may occur.
	High Probability	It is most likely that the impact will occur, more than 50% probability that impact may occur.
	Definite	More than 90% probability that impact may occur.
Significance	Very low	Impact likely to be very low and mitigation is not required
	Low	Impact likely to have little real effect or Mitigation is easily achieved or little will be required.
	Medium	Moderate impact and could influence decision if not mitigated or Mitigation is both feasible and fairly easily possible. Modification of the project design or alternative action may be required.
	High	Mitigation essential to reduce to acceptable level or Mitigation difficult, time-consuming and/expensive and it may affect the decision to continue or approve.

	Very High	No possible mitigation or mitigation is extremely difficult, time consuming and/or expensive. Decision to approve will be affected.

Environmental impacts are assessed with reference to the nature, extent, duration, intensity and probability of identified impacts. The significance of the potential impact is a qualitative assessment based on the rating of the different criteria. The significance of impacts before and after mitigation will be indicated in the report.

The assessment must also mention the degree to which impacts can be reversed, may cause irreplaceable loss of resources and can be avoided, managed or mitigated.

9.2 Environmental Concerns and Potential Impacts

This section identifies and assesses the environmental issues and potential impacts of the proposed activities.

Impacts are expected during the construction as well as operational phase. The decommissioning of any of the infrastructure related to the activity is not foreseen in the near future.

In assessing the impacts, in particular for the terrestrial and aquatic ecosystems, the following facts are important to keep in mind:

- Some of the new poles will be erected on the same footprints as that of existing 11 kV lines located in the same area.
- The footprints for the steel poles are very small – at most 15 x 15m impacted during construction.
- The powerline poles will look similar to those located adjacent Enos Mabuza Drive:

- The powerline will be located on the edge of the P166 servitude or just within the servitude. When the bypass road was constructed, SANRAL cleared the servitude and it is mostly grassed areas. Few to no trees will need to be removed for the power line support structures.
- No riparian trees will need to be removed for the two lattice structure pylons which will allow the 132 kV line to span the almost 300m of the Crocodile River.
- Once the poles are up, the powerline will be attached to the poles across the river with the help of a helicopter. The clearing of additional areas apart from the footprint of the poles will not be required.
- The substation site was an old soccer field and is level and transformed.

- The specialist reports described the alignment and surrounds in detail as required. The impact assessment however will take into account the actual impact footprint. Refer to the impact assessment.

Table 9: Impact summary

Impact description	Period	Extent	Duration	Intensity	Probability	Significance pre-mitigation	Significance post mitigation
Air (dust) pollution	Construction	Site	Short	Low	Probable	Very Low	Very Low
Erosion and sedimentation	Construction	Site	Short	Low	Unlikely	Low	Very Low
Soil contamination	Construction	Site	Short	Low	Unlikely	Medium	Low
Erosion and sedimentation	Operation	Site	Long	Medium	Unlikely	Low	Very Low
Oil contamination of soil	Operation substation	Site	Long	High	Unlikely	High	Low
Surface water pollution	Construction	Site	Short	Low	Probable	Medium	Low
Surface water pollution	Operation	Site	Long	Medium	Unlikely	Very Low	Very Low
Disturbance of seepage wetlands	Construction	Site	Short	Low	Unlikely	Low	Very Low
Disturbance of valley bottom wetland (alternative sub site)	Construction	Site and local	Short	Medium	Definite	Medium	Medium
Disturbance of valley bottom wetland (alternative sub site)	Operation	Site and local	Long	Medium	Definite	High	High-Medium
Disturbance of Croc River riparian zone – preferred alignment	Construction	Site	Short	Low	Unlikely	Medium	Low
Disturbance of Croc River riparian zone – alternative route	Construction	Site	Short	Medium	High	High	High
Degradation of a Critically Endangered vegetation type	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of an Endangered vegetation type	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of vegetation communities with High Biodiversity Value – preferred alignment	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of vegetation communities with High Biodiversity Value – alternative alignment	Construction	Site	Short	Medium	High	Medium	Medium
Loss or damage of plant species of conservation importance – preferred alignment and sub	Construction	Site	Short	Low	Unlikely	Low	Very Low
Loss or damage of plant species of conservation importance – alternative sub	Construction	Site	Short	Medium	High	High	Medium
Degradation of watercourses	Construction	Site	Short	Low	Unlikely	Low	Very Low
Invasion of natural habitat by alien plants	Construction	Local	Short	Medium	Probable	Medium	Low
Loss of habitat for conservation-important fauna	Construction	Site	Short	Medium	Unlikely	Very Low	Very Low

Impact description	Period	Extent	Duration	Intensity	Probability	Significance pre-mitigation	Significance post mitigation
Increase in poaching activities	Construction	Local	Short	Medium	Probable	Medium	Medium-Low
Powerline collisions and electrocutions	Operation	Local	Long	Medium to high	High	High-Medium	Low
Visual impact	Construction	Site	Short	Low	Probable	Low	Very Low
Visual impact	Operation	Local	Long	Low	Definite	Low	Low
Noise impact	Construction	Site	Short	Low	Probable	Low	Low
Traffic impact	Construction	Site	Short	Low	High	Low	Very low
Socio-economic impact (+) job opportunities	Construction	Local	Short	High	Definite	Medium (+)	Medium (+)
Social impact (+)	Operation	Regional	Long	Medium -High	High	Medium (+)	Medium (+)
Social impact (-)	Operation	Site	Long	Medium	Probable	Low	Very Low
Impact on heritage sites	Construction	Local	Short	Medium	Probable	Medium	Very Low
Safety and Security impact	Construction	Local	Short	Medium	Unlikely	Low	Low
Safety risks - labourers	Operation	Site	Long	Medium	Probable	Medium	Low

Biophysical impacts

9.2.1 Topography

The footprints of powerline poles will be very small and the area required for the substation and secondary stations will also be relatively small. The proposed activities will not change the topography of the area and there will be no impact.

9.2.2 Air quality

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance after mitigation
Air (dust) pollution	Construction	Site	Short	Low	Probable	Very Low	Very Low

Construction:
Limited dust emissions may be associated with the preparing of the substation yard, the foundations of the poles and upgrading of the access road to the sub.

The construction period will be for a year but will be small footprints phased over time and expected impacts will not be of a permanent nature. Little to no impact is expected on surrounding landowners.

The impact could be of a cumulative nature but this is rated to also be of very low significance.

Operation:
The operation of the powerline and substation will have no impacts on the air quality.

Mitigation measures must include:
- No burning of cleared vegetation or any wastes is allowed on site or on the surrounding area.
- During clearance of surfaces, topsoil must be removed and stored as prescribed under the soil and erosion impacts.

- Exposed soil surfaces outside of the footprints must be appropriately stabilised as soon as practically possible.
- All equipment must be maintained accordingly to minimise potential air pollution.

9.2.3 Geology and soil conditions

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance after mitigation
Erosion and sedimentation	Construction	Site	Short	Low	Unlikely	Low	Very Low
Soil contamination	Construction	Site	Short	Low	Unlikely	Medium	Low
Erosion and sedimentation	Operation	Site	Long	Medium	Unlikely	Low	Very Low
Oil contamination of soil	Operation substation	Site	Long	High	Unlikely	High	Low

Construction:
Limited vegetation removal is expected and the footprints of the poles will be very small.
But some poles will be in or close to wetlands and soil disturbances increase the risk for erosion. Hardening of soil surfaces may also increase stormwater flow which may cause erosion. Erosion, if any, could impact on the aquatic ecosystems that will be passed or traversed.

The cumulative nature of the impact is of low significance as the footprints will be small and there is no evidence of erosion at the existing poles. The impact is of low significance before mitigation.

Potential oil and diesel spillages as well as uncontrolled concrete preparation and spillages may cause soil contamination. Some work will take place close to water resources and the impact is of medium significance before mitigation.

Impacts may result in the permanent loss of topsoil if not mitigated and this is not easily reversible but it can be prevented.

Operation:
The transformers contain oil and any uncontrolled spillage (during filling) or oil leakage from the transformers will contaminate soil and cause water pollution.

The design already mitigates for the risk of oil spillage. The transformers are placed on plinths in a leak proofed bunded area which can contain the total volume of oil held inside the transformer. The oil then drains to a tank from where it can be recovered and recycled.

The activities will not change the soil conditions of the site or surrounding area.

There are no signs of erosion due to pole or existing substation footprints. If the areas are appropriately stabilised and rehabilitated, the expected impact will be of low significance before mitigation even though it can result in sedimentation of the downstream environment if uncontrolled run-off does occur.

Mitigation measures may include:
- Ensure that leak proofed bunded area with oil pit is installed for each of the transformers.
- Limit disturbances to the required footprints of the sub-stations and poles.
- Exposed soil must be protected against erosion.
- Corrective actions have to be taken as and when required to stop any signs of erosion (prior, during and after construction).

- Stabilise disturbed soil surfaces surrounding the sites as soon as practically possible.
- Also refer to the mitigation measures for Surface water impacts (Section 9.2.4).

9.2.4 Surface water pollution

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance after mitigation
Surface water pollution	Construction	Site	Short	Low	Probable	Medium	Low
Surface water pollution	Operation	Site	Long	Medium	Unlikely	Very Low	Very Low
Disturbance of seepage wetlands	Construction	Site	Short	Low	Unlikely	Low	Very Low
Disturbance of valley bottom wetland (alternative sub site)	Construction	Site and local	Short	Medium	Definite	Medium	Medium
Disturbance of valley bottom wetland (alternative sub site)	Operation	Site and local	Long	Medium	Definite	High	High-Medium
Disturbance of Croc River riparian zone – preferred alignment	Construction	Site	Short	Low	Unlikely	Medium	Low
Disturbance of Croc River riparian zone – alternative route	Construction	Site	Short	Medium	High	High	High

The following is the assessment from the Crocodile River Substations and Powerlines EIA Specialist Report: Aquatic Ecosystems:

Construction Phase:
Preferred powerline route

- Disturbance of Seepage Wetlands

Clearing of wetland vegetation for the proposed servitudes and bulk earthworks for the proposed pylons is expected to impact directly on the two Seepage Wetlands near the P166 (Seep 1 and Seep 2). The Present Ecological State of both wetlands is rated as *Moderately Modified* (Category C), and the Ecological Importance and Sensitivity is rated as *Very Low*. The risk of this before mitigation is rated as **Low.**

(Note - The footprint of the pylons will be very small and the indirect impacts can be mitigated to be of a very low significance.)

- Disturbance of Crocodile River Riparian Zone

If clearing of riparian vegetation for the proposed servitudes and bulk earthworks for the proposed pylons is required it would impact directly on the riparian zone of the Crocodile River. The Present Ecological State of the riparian zone within the direct footprint is degraded by alien invasive potential, and rated as *Largely to Seriously Modified* (Category D/E), while Ecological Importance and Sensitivity of the riparian zone as a whole is rated as *High*. The risk of this before mitigation is rated as **Moderate.**

As indicated the 132 kV line will span the Crocodile River a height that will not require the removal of riparian trees. This specific two anchor pylons will also be placed outside the riparian edge and the impact after these design mitigation measures will reduce the impact to **Low**.

Alternative substation site
The following impact is only associated with the alternative substation site that is not the preferred option for the reason that it will directly impact on this wetland. As it is not the preferred option this is unlikely to happen but in context of this being the authorised alternative the impact would be definite.

- Disturbance of Valley Bottom Wetland

Clearing of wetland vegetation for the proposed Substation 1 (alternative) is expected to impact directly on a permanently saturated *Phragmites mauritianus* Valley Bottom Wetland. The Ecological Importance and sensitivity of this wetland is rated as *Moderate.* The risk of this before mitigation is rated as **Moderate.**

Authorisation of the proposed Substation 1 is not recommended because of the close proximity of a Valley Bottom Wetland, but authorisation of the alternative Substation 2, on the old soccer field, is recommended on the grounds that there are no aquatic ecosystems at or near the proposed Substation 2, and there are no fatal flaws in relation to national or provincial legislation concerning aquatic ecosystems.

Recommended Route
The eastern powerline route alternative that runs along the P166 is recommended because this option crosses the Crocodile River were the riparian zone is already degraded, mainly by backup from a diversion weir. This route crosses an episodic to seasonal Seepage Wetland, but this wetland is largely terrestrialised, and the Ecological Importance and Sensitivity of this wetland is rated as *Very Low.* The alternative, western powerline route is not recommended because the ecological state of the riparian zone adjacent to the proposed substations is not impacted by inundation, and therefore in better ecological state than at the P166 road bridge.

Operational phase:
- Increase in Alien Invasive Vegetation

Disturbance and compaction of soils during the Construction Phase, and maintenance of the powerline servitude during the Operational Phase, are likely to create conditions suitable for the spread and proliferation of alien invasive vegetation, and associated reduction in biodiversity of indigenous species. The risk of this before mitigation is rated as **Low.** The area is already largely impacted by alien invasive vegetation, but conditions could get worse.

Refer to Appendix E of the specialist report for a detailed VEGRAI assessment.

Assessment discussion in addition to specialist findings above:
Construction:
Impacts on surface water and downstream resources could occur during the construction phase which would entail potential vegetation removal from water resources, limited groundworks and cement and concrete mixing operations in or close to resources.

Potential oil/fuel spillages from construction operations may also result in surface water pollution. An increase in hardened surfaces close to and around resources may result in an increased storm water run-off which may result in erosion, loss of top soil and sedimentation.

The footprints of the poles/pylons will be very small as indicated earlier and the river will be completely spanned with no footprint requiring the removal of riparian vegetation especially large trees.

If impacts are not mitigated it could be of a cumulative and medium significance. Mitigation is proposed and the impacts can be minimised and prevented. The proposed planning and alignment already mitigates for the severity of potential impacts.

Should the alternative alignment and alternative substation sites be considered, the impacts would be of a medium significance regardless of mitigation as it would entail riparian removal and direct impacts on wetlands as a result of the substation site.

Operation:
If the footprints and surrounds are sufficiently stabilised and rehabilitated, there should be no impact on the surface water resources identified within the study area.

The transformers contain oil and any uncontrolled spillage (during filling) or oil leakage from the transformers will contaminate soil and cause water pollution.

The design already mitigates for the risk of oil spillage. The transformers are placed on plinths in a leak proofed bunded area which can contain the total volume of oil held inside the transformer. The oil then drains to a tank from where it can be recovered and recycled.

Should the alternative substation site however be considered, the site will directly impact on the flow and likely the function of the small valley bottom wetland adjacent east of the proposed site. The impact is of a high significance.

Cumulative Impacts:
Wetlands are sensitive environments and the proposed infrastructure will have a cumulative effect to the impacts that already directly and indirectly impacted on these systems as a result from the construction of the P166 bypass road. If impacts are not mitigated for it could cause the alteration of wetland flows, potential loss of functionality and the further invasion of alien vegetation.

As a result of the small footprints within or close to the wetlands as identified and discussed in this BAR, the cumulative impact for the preferred route is rated to be of a low significance if mitigation is implemented and monitoring takes place.

A more detailed consideration of cumulative impacts was made in the specialist report but it refers to the wetlands within and around the Mpumalanga International Fresh Produce Market as the Area of Influence. This project only considers the wetlands within the study area as these are the systems that will be potentially impacted by the activities applied for under this application. The further infrastructure that will be required to distribute the electricity to the fresh produce market may result in the impacts as listed in the specialist report. It is however not included in this assessment.

The following mitigation measures are proposed:

- The construction area and footprints should be clearly demarcated.
- Removal of any riparian vegetation must be minimised.
- Construction activities must not result in an increased water flow velocity that may cause erosion of top soil.
- Carefully control all on-site operations that involve the use of cement or concrete.
- Dedicate storage areas for the collection of construction rubble and wastes.
- Contain fuel, oil or chemical spills, and arrange clean up in the event of spillage.
- Ensure that leak-proof bunded area with oil pit is installed for each of the transformers.
- Prevent the discharge of water containing polluting matter or visible suspended materials.
- Construction vehicles and equipment should be properly maintained and any spillages should be cleaned immediately.
- Storm water management must not result in an increased flow velocity that may cause erosion.
- Encourage the infiltration of surface water into the ground where possible and minimise the extent of hardened surfaces by allowing for natural areas where possible.

- Surface and storm water management most appropriate for the receiving environment must be implemented from the start of construction (use energy dissipation etc.) to avoid damage to the receiving environment at the discharge points.

Mitigation measures recommended in the aquatic specialist report (also refer to mitigation under the terrestrial assessment):

- Pylons should be spaced to minimise impacts on wetlands, and in particular, the riparian zones.
- Alien invasive vegetation within 30 m of the proposed servitudes and development footprint should be controlled. Personnel tasked to control alien vegetation should receive appropriate training in the following: methods and control measures; equipment and techniques; types of herbicides and dosages applied; mixing techniques; storage of chemicals and equipment; health and safety issues; plant identification; procedures for equipment washing; equipment maintenance; record keeping, *inter alia.*
- Monitoring of aquatic ecosystems is not considered necessary because of the low risks of the proposed development on aquatic ecosystems.

9.2.5 Terrestrial ecology

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance after mitigation
Degradation of a Critically Endangered vegetation type	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of an Endangered vegetation type	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of vegetation communities with High Biodiversity Value – preferred alignment	Construction	Site	Short	Medium	Unlikely	Low	Very Low
Degradation of vegetation communities with High Biodiversity Value – alternative alignment	Construction	Site	Short	Medium	High	Medium	Medium
Loss or damage of plant species of conservation importance – preferred alignment and sub	Construction	Site	Short	Low	Unlikely	Low	Very Low
Loss or damage of plant species of conservation importance – alternative sub	Construction	Site	Short	Medium	High	High	Medium
Degradation of watercourses	Construction	Site	Short	Low	Unlikely	Low	Very Low
Invasion of natural habitat by alien plants	Construction	Local	Short	Medium	Probable	Medium	Low
Loss of habitat for conservation-important fauna	Construction	Site	Short	Medium	Unlikely	Very Low	Very Low
Increase in poaching activities	Construction	Local	Short	Medium	Probable	Medium	Medium-Low
Powerline collisions and electrocutions	Operation	Local	Long	Medium to high	High	High-Medium	Low

The following are potentially significant impacts on untransformed vegetation communities as discussed in the terrestrial ecology report. It was not considered in detail in the specialist report. The EAP added a rating and further discussion to each following:

Potential Biodiversity / Development Conflict within the identified vegetation communities:

Vegetation Communities	Biodiversity / Development Conflict	Development Recommendations
Outcrop Woodland	High	Limited development with mitigation
Riparian Forest	High	Limited development with mitigation
Degraded Woodland	Low	Develop with mitigation
Wetland	High	Limited development with mitigation
Transformed	Very Low	Develop with no specific mitigations

- **Degradation of a Critically Endangered vegetation type** – Lowveld Riverine Forest is assessed as Critically Endangered and representative tracts occur along the Crocodile River.

  Loss of vegetation in this vegetation type could be of a permanent nature and high significance. With the preferred alignment the pylons on either side of the river will not require the removal of any riparian vegetation. The footprints will be relatively small. Mostly alien vegetation will need to be cleared for erecting the necessary pylons. The impact is therefore of very low significance. The cumulative nature of this impact is thus also low.

  With the alternative alignment the impact could however be of a higher significance as it will result in the removal of riparian trees.

- **Degradation of an Endangered vegetation type** – Legogote Sour Bushveld is assessed as Endangered and representative tracts of this provincially endemic vegetation type occur around the proposed Croc River Substation sites.

  Note that the preferred substation site is on a site that is completely transformed. The impact is of very low significance.

- **Degradation of vegetation communities with High Biodiversity Value** – Outcrop Woodland, Riparian Forest and Wetland are all assessed as having High Biodiversity Value. Any construction activity within these communities could lead to irreparable damage to these environments.

  As stated, the footprints will be very small and limited to the poles or pylons. The activities are not expected to cause the loss of any high biodiversity plants or habitats and are rated to be of a low significance.

  With the alternative alignment of the powerline the impact is however of a higher significance as it will definitely result in the loss and/or degradation of the riparian forest.

- **Loss or damage of plant species of conservation importance** – seven protected species could be impacted during the construction phase. The trees *Sclerocarya birrea* subsp. *caffra* and *Breonadia salicina* are nationally protected while the geophyte *Scadoxus puniceus*, the orchid *Eulophia streptopetala,* the succulents *Aloe barbertoniae* and *A. petricola* and the climber *Dioscorea cotinifolia* are protected under provincial legislation.

These plants occur in the *Combretum molle – Panicum maximum* Outcrop Woodland which the powerline will only just traverse and it won't be necessary to remove any of the plants listed. And as stated and is clear in aerial imagery as included in earlier sections of the report, the preferred substation footprint is already completely transformed.

The alternative site would however require strict mitigation as it will definitely result in the removal of several conservation important species from the site.

- **Degradation of watercourses** – the Crocodile River lies immediately adjacent to the study area and the proposed powerline routes will cross it in at least one location. This area could be sensitive to any negative impacts, including the erection of powerlines and construction of substations and associated road building, sedimentation and dumping of topsoil. Long-term changes in surface and subsurface runoff could also negatively affect the structure and function of this system, particularly with respect to channel erosion caused by increased stormwater runoff from the proposed access road.
  Refer to the impact as discussed under the Surface water impact.

- **Invasion of natural habitat by alien plants** – at least 43 alien plant species were located during fieldwork, some growing in impenetrable thickets, and additional invasion is possible as construction activities expose bare soil providing a base for alien seedlings to establish.

  This impact is an existing impact, could be of medium significance as a result of the proposed activities and is of a high cumulative nature. Mitigation is proposed.

- **Loss of habitat for conservation-important fauna** – one species of mammal listed as Vulnerable (Hippopotamus) was confirmed to utilise all the vegetation communities to forage in and is resident in the adjacent Crocodile River. Two additional mammals listed as Near Threatened (Natal Red Duiker and African Clawless Otter) are confirmed along the Crocodile River. Two bird species located are listed as Vulnerable, with African Finfoot being resident along the Crocodile River and Southern Bald Ibis confirmed to utilise the study area for foraging in. One Endangered bird species (Bat Hawk) potentially forages over the Riparian Forest community. One Near Threatened species was confirmed during a previous survey, namely Half-collared Kingfisher.

  The footprint of the powerline will entail only the poles and pylons. The substation site is transformed. The potential impact is rated to be of a very low significance before mitigation.

- **Increase in poaching activities** – unsupervised construction workers may participate in small-scale poaching through setting snares or traps for bushmeat. Medicinal plants such as *Dioscorea cotinifolia* may also be harvested for muthi.

  This is a real concern and the impact could be of a medium significance before mitigation. The area is accessible to people other than the construction workers and the risks do not stop with this project.

Operation:
The operation will not result in impacts on the terrestrial ecology apart from the following impact as identified in the terrestrial ecology report:

- **Powerline collisions and electrocutions –** a number of larger birds, such as cormorants, geese, herons, egrets, birds of prey and ibises, utilise the Crocodile River as a roosting, breeding or foraging area and regularly fly along its length. The erection of powerlines across the river may prove detrimental to these species as many larger birds

are prone to collisions, or may be electrocuted when attempting to perch or roost on the pylons and come into contact with two live components or a live and earthed component concurrently (Van Rooyen 1998). Even though few of the potentially impacted species are threatened, a significant number of larger birds utilise the Crocodile River and associated habitats and the impact is considered to be significant.

The impact is rated to be of a high significance and could be of a cumulative nature as it results in the death of the birds that fly into the line. It will impact directly on the population dynamics of these species in the greater area and on the function of these species in the ecosystem.

Recommendations and mitigation measures:

- Bird collisions can be minimised by installing highly visible markers on the conductors such as brightly coloured 'aviation' balls, thickened wire coils, luminescent, shiny or hinged flashing or flapping devices. The section where the 132 kV line traverse the Crocodile River will be fitted with the appropriate markers.
- No vegetation destruction should take place within the Riparian Forest community as this vegetation type is classified as Critically Endangered and is listed as a Vulnerable Ecosystem. Powerlines crossing the Crocodile River should be placed above the forest canopy.
- No construction to take place within Outcrop Woodland due to the area being representative of an Endangered vegetation type. The proposed Croc River Substation site is outside the Outcrop Woodland on a fully transformed area.
- The existing track giving access to the substation site must be upgraded and paved.
- The Powerline Option 2 is the preferred alignment as this route already contains sections of powerlines and runs along the P166, allowing for easier access during construction.
- Natural areas where road, pylon or substation construction is planned should be checked by a suitably experienced botanist prior to construction to locate and move any conservation-important species. This includes the many *Aloe* species found in the northern section of the study area.
- The placement of pylons should be carefully considered in terms of vegetation destruction. Pylons within wetland areas should be limited, and limited vegetation destruction should take place in the other sensitive vegetation communities.
- Poaching could be a significant threat. If any external labour teams are used during construction, then these teams should preferably be accommodated off site; if this is not possible then teams should be carefully monitored to ensure that no unsupervised access to plant and animal resources takes place.
- All alien plants currently established within the study area, especially the Crocodile River, should be destroyed and regular follow-ups should take place.

Further mitigation measures that must be implemented to reduce potential impacts are as follows:

- Limit vegetation clearance to the required footprint areas of the project.
- High Voltage 11 kV cables that must be laid from the new substation building (switchgear) to the proposed developments (secondary substations) must follow the access road (north of road) and other existing roads from where it will be aligned with the internal roads of the Riverside Park developments.
- No wild animals may under any circumstances be handled, removed, injured or killed.
- All reasonable steps to avoid unnecessary fires must be taken. Open fires for cooking purposes for construction workers must only be permitted on site in an area demarcated for this purpose.
- Alien plants invading disturbed soil surfaces on site must be targeted and controlled in terms of the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) Alien and Invasive Species Lists, 2014.

Socio-economic impacts

9.2.6 Aesthetic quality

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance after mitigation
Visual impact	Construction	Site	Short	Low	Probable	Low	Very Low
Visual impact	Operation	Local	Long	Low	Definite	Low	Low

Construction:
The activities are mostly of a linear nature and the visual impact as a result of construction and earthworks will be of low significance and not of a permanent nature.

Operation:
The powerline will follow the alignment of an existing but lower voltage line and thus replace an existing visual impact with a more pertinent one. The visual impact will be permanent and of a cumulative nature as the area surrounding the powerline and proposed substations will also be developed over time changing it to a more urban area.

The footprints of the poles will be small although the structures itself with the powerline will be of a permanent nature.

The impact is rated to be of low significance and with small impact on the ambience of the area.

The following mitigation measures are proposed:
- The footprint must be clearly demarcated and clearance of vegetation must be strictly limited to the footprints.
- The applicant/contractor must undertake “good housekeeping” practices during the construction and operational phase.
- Litter must be stored in such a manner that it does not attract animals.
- Ensure that no uncontrolled dumping or spillage of wastes of any nature takes place, especially in the surrounding undeveloped surrounds.
- Waste must be appropriately and regularly disposed of at a registered landfill site.
- The areas affected by construction activities other than the footprint must be stabilised and rehabilitated after construction.

9.2.7 Noise and Vibration

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance After mitigation
Noise impact	Construction	Site	Short	Low	Probable	Low	Low

Construction:
Noise from the construction activities during the construction period may impact on the ambient noise level of the surrounding area. The increase in people movement and the construction activities may also contribute to the noise factor. It will be of a low intensity. The impact is of low significance after mitigation and of a low cumulative nature due to the locality of the site/area.

Operation:
The powerline and substations will not result in noise during operation.

Mitigation measures are proposed and may include that:
- Noise should be controlled at the source during construction. Equipment control must be used to reduce the potential impact during construction.

- The construction activities must take place during normal working hours only from 06:00 – 18:00, Monday to Saturday and not on Sundays or public holidays.
- Complaints regarding noise during the operational phase must be addressed and practical measures implemented to reduce noise levels.

9.2.8 Traffic

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance After mitigation
Traffic impact	Construction	Site	Short	Low	High	Low	Very low

Construction:
The proposed construction activities will increase the flow of traffic on the roads in the area which may impact other road users. The construction period will be for a short duration of time depending on the phasing of the construction. The impact is of low significance and not of a cumulative nature.

Operation:
There will be no traffic impact during the operational phase.

Mitigation measures:
- Speed limits for all vehicles to the site must be enforced during construction as well as operational period.
- Heavy vehicles may not cause unnecessary obstructions on any of the public roads.
- Activities must be well planned and monitored.
- The regulation of traffic during the construction period must adhere to all applicable legislation and regulations. The necessary signage must be in place.

9.2.9 Social and Socio-economic impact

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance After mitigation
Socio-economic impact (+) job opportunities	Construction	Local	Short	High	Definite	Medium (+)	Medium (+)
Social impact (+)	Operation	Regional	Long	Medium-High	High	Medium (+)	Medium (+)
Social impact (-)	Operation	Site	Long	Medium	Probable	Low	Very Low

There is a need for the proposed infrastructure and without it the approved townships that it will service cannot operate. It will thus contribute to a positive social impact.

During the construction period a number of job opportunities will be created locally and regionally which is a positive impact. Labour can be sourced from the local communities.

The overall impact was rated to be positive and of medium significance and a cumulative nature.

Other potentially negative impacts on the terrestrial and aquatic environment can also indirectly result in negative social impacts. The impacts are of potentially of a low significance before mitigation.

Mitigation measures may include:
- The project must adhere to all applicable legislation, regulations and standards.

- Local labour should be employed from the surrounding communities during construction and operation.

9.2.10 Heritage resources

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance After mitigation
Impact on heritage sites	Construction	Local	Short	Medium	Probable	Medium	Very Low

Rating abstracted from HIA:

Site No.	Nature of impact	Type of site	Extent	Duration	Intensity	Probability	Score Total
CS 1	Electrical infrastructure	Graves	Site	Extent	High	Possible	5

*Notes:
Short term ≥ 5 years, Medium term 5 – 15 years, Long term 15 – 30 years, Permanent 30+ years
Intensity: very high (4), High (3), Moderate (2), Low (1)
Probability: Improbable (1), Possible (2), Highly probable (3), Definite (4)

Site condition assessment and management recommendations:

Site no.	Type of Heritage resource	Integrity of cultural material	Preservation condition of site	Relative location	Quality of archaeological/ historic material	Quantity of site features	Recommended conservation management
CS 1	Burial grounds & graves	N/K	Fair-Poor	Boschrand 283 JT & Riverside 308 JT	Archaeology: N/A Historically: Fair	<50	Avoid if possible & fence or relocation permit

Site current status and future impact scores:

Site No.	Current Status	Low impact (4-6 points)	Medium impact (7-9 points)	High impact (10-12 points)	Very high impact (13-16 points)	Score Total
CS 1	Neutral	Low (6)	-	-	-	6

Construction and operation:
The graveyard is not located within the proposed substation site – refer to the maps - but there may be unintentional impact during the construction activities. The cemetery site is approximately 150m from the nearest boundary of the proposed substation site.

The HIA rated the impact as a 5 this is a moderate rating combined from the High intensity (3) + Probability of Possible (2).

There were no other cultural or historically important finds.

The infrastructure will not impact on the gravesite during the operational phase.
Abstract from the HIA report (refer to Appendix 6) – note that these measures are not practical and therefor the mitigation measures below this section was formulated:
Recommendation:
It is recommended that the graveyard be fenced prior to any construction activity in order to protect the graves. Any surviving relatives should be allowed access.

Cumulative impacts can occur when a range of impacts which result from several concurrent processes have impact on heritage resources. The importance of addressing cumulative impacts is that the total impact of several factors together is often greater than one single process or activity that may impact on heritage resources. There may be some indirect impact on grave site CS 1. Any negative impact including damage caused by earthworks, alteration of the graves or demolition must be avoided. It is recommended that all gravesites be fenced to protect them and access be allowed to families of the deceased when needed.

A buffer zone of at least 20 metres should be provided for at the gravesites to minimize any impact.

Management objectives include not to impact on sites of heritage significance. Monitoring programmes which should be followed when a chance find of a heritage object or human remains occur, include the following:

- The contractors and workers should be notified that archaeological sites might be exposed during the construction work.
- Should any heritage artefacts be exposed during excavation, work on the area where the artefacts were discovered, shall cease immediately and the Environmental Control Officer shall be notified as soon as possible;
- All discoveries shall be reported immediately to a museum, preferably one at which an archaeologist is available, so that an investigation and evaluation of the finds can be made. Acting upon advice from these specialists, the Environmental Control Officer will advise the necessary actions to be taken;
- Under no circumstances shall any artefacts be removed, destroyed or interfered with by anyone on the site; and
- Contractors and workers shall be advised of the penalties associated with the unlawful removal of cultural, historical, archaeological or palaeontological artefacts, as set out in the National Heritage Resources Act (Act No. 25 of 1999).

The bulk of archaeological remains are normally located beneath the soil surface. It is therefore possible that some significant cultural material or remains were not located during this survey and will only be revealed when the soil is disturbed. Should excavation or large scale earth moving activities reveal any human skeletal remains, broken pieces of ceramic pottery, large quantities of sub-surface charcoal or any material that can be associated with previous occupation, a qualified archaeologist should be notified immediately. This will also temporarily halt such activities until an archaeologist has assessed the situation. It should be noted that if such a situation occurs it may have further financial implications.

Mitigation measures:

- Before construction of the substation starts a temporary fence must be erected around the graveyard to prevent construction workers from entering this area.
- The construction camp must not be located near the graveyard but rather west of the substation area.

9.2.11 Health, Safety and Security

Nature of Impact	Period	Extent	Duration	Intensity	Probability	Significance before mitigation	Significance After mitigation
Safety and Security impact	Construction	Local	Short	Medium	Unlikely	Low	Low
Safety risks - labourers	Operation	Site	Long	Medium	Probable	Medium	Low

General

During construction there may be a risk of safety especially for contractor workers. The project will entail excavations and working with heavy infrastructure.

Bad housekeeping and improper on-site storage of wastes may cause health and other nuisance impacts.

The general impact is of medium significance before mitigation and potentially of a medium cumulative nature.

Mitigation measures may include the following:
- Supervision should ensure that environmental, health and safety aspects are observed during the construction activities on the site.
- The applicant and contractor must comply with the Occupational Health and Safety Act, 1993 (Act no. 85 of 1993) especially during the construction phase to ensure the safety of workers.
- Ensure that no on site dumping of wastes or dumping onto adjacent areas take place.
- No waste must be burnt on the site under any circumstances.

10. Environmental Statement and Findings

Various potential environmental impacts were identified and considered in the BA Report.

10.1 The key environmental impacts identified

- Potential impact on terrestrial and aquatic ecology;
- Surface water pollution;
- Impacts on heritage and culturally important sites;
- Soil and erosion potential;
- Traffic;
- Aesthetics;
- Noise;
- Social and socio-economic impact
- Health, safety and security.

10.2 Primary positive and negative impacts

Positive aspects of the proposed activities:
- The preferred 132 kV route will traverse the Crocodile River at a high level and will not require the removal of any riparian trees.
- The preferred substation site is already completely transformed.
- The footprints are limited to the substation site and that of each pole. This will be relatively small.
- The 132 kV powerline will be just on the edge of the P166 servitude or just within it. This lowers the impact on the terrestrial and riparian ecology.
- There are existing access roads to the preferred alignment and substations.
- High Voltage 11 kV underground cables will follow the access road (north of road) and other existing roads from where it will be aligned with the internal roads of the Riverside Park developments.
- Mitigation is fairly easy and implementable.

Negative aspects of the proposed activities:
- The proposed alignment of the powerline must traverse the identified water resources and there remains a risk for impact.
- Although the preferred alternative will have less significant impacts than the alternative, some footprints for pylons in the seepage wetlands cannot be avoided. The impact is still low.
- Negative impacts can be of a cumulative nature on the Crocodile River if not mitigated.

10.3 Assumptions and uncertainties

The environmental assessment practitioner accepts that the information contained in this report as provided by the applicant is true and accurate.

To make an assessment of the potential impacts the EAP took into account the current state of environment and specialist findings. The EAP also depends on the opinions and feedback from the Interested and Affected Parties and State Departments during the commenting period provided.

There are no major gaps in knowledge regarding the description of the current state of the environment taking into account the following statements from the specialist reports:
Terrestrial ecology report:
The assessment was based on a single day field visit at the start of the wet season. It is possible that plants which flower at other times of the year are underrepresented although this is not seen as a limitation that could affect the Record of Decision as the specialist has extensive experience in the area and has assessed habitat suitability for potentially occurring Threatened plant species.

Heritage report:
The piece of land earmarked for the project consists of typical Legogote Sour Bushveld. This veldtype is dense and often quite impenetrable which limits surface visibility and accessibility especially alongside the Crocodile River.

The bulk of archaeological remains are normally located beneath the soil surface. It is therefore possible that some significant cultural material or remains were not located during this survey and will only be revealed when the soil is disturbed. Should excavation or large scale earth moving activities reveal any human skeletal remains, broken pieces of ceramic pottery, large quantities of sub-surface charcoal or any material that can be associated with previous occupation, a qualified archaeologist should be notified immediately. This will also temporarily halt such activities until an archaeologist has assessed the situation. It should be noted that if such a situation occurs it may have further financial implications.

There are no major gaps in the potential impacts on the natural and social environment. All sensitive environments within close proximity were identified and appropriate mitigation measures were identified.

There is a high level of confidence that the negative impacts can be appropriately minimised with the implementation of mitigation measures as proposed.

10.4 Indication of management and monitoring

An Environmental Management Programme (EMPr) has been compiled to ensure that the biophysical and social environments receive due consideration and that it is protected during the construction period and the operational phase (Refer to Appendix 8 for the EMPr).

The EMPr is a guideline document that will provide detailed specifications for the management and mitigation of activities that have the potential to impact negatively on the environment. The measures prescribed must aim to result in a cautious approach being applied to on-site environmental management to ensure prevention, minimising and remediation of potential impacts.

11. Conclusion and Recommendations

There is a need for the substation to service approved townships that require electricity.
The 132 kV line will follow existing roads and will be located in or on the edge of the road reserves. There are some existing 11 kV power lines in the project area which will become redundant. Some of the pylon/poles will be placed in the same positions as existing poles there reducing the additional impact. The preferred substation site is already transformed and the site will not impact on wetlands.

The preferred alignment and substation site is proposed for authorisation.

Appropriate mitigation measures to minimise or avoid the majority of potentially negative impacts have been formulated and can be implemented from the start of construction. No environmental fatal flaws were identified.

Comments on the BAR and content thereof was requested from affected State Departments as well as the public. Comments received were incorporated into the report before submission to the CA for consideration.

It is the recommendation of the EAP that if the application is considered favourably by the CA, the authorisation should be valid for a period of at least 5 years as the construction can be successfully completed during such a time.

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