Khanyisa 400kV Power Line and Substation Servitude
Wetland Delineation

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1. INTRODUCTION

Paverstar Trading proposes to construct a 400kV power line over the farms portion 1 and 145 of the farm Klipfontein 322 JS and portion 49 of the farm Naauwpoort 335 JS, and a 400kV substation on portion 51 of the farm Naauwpoort 335 for the proposed ACWA Power Khanyisa Independent Power Producer (IPP) Project.

Aurecon, the Environmental Assessment Practitioner for this project, appointed EMROSS Consulting to delineate the wetlands and undertake a functional assessment in terms of the Present Ecological State (PES) and Ecological Importance and Sensitivity (EIS) of the wetlands along the proposed power line and substation servitude as required for the Water Use License Application (WULA). Recommendations to mitigate any possible impacts on the wetlands will be provided.

2. METHODOLOGY

Wetlands generally include three zones, namely the central, saturated permanent zone of wetness, the peripheral seasonal zone saturated for a significant period during the rainy season and the outer temporary zone saturated for shorter periods, but sufficiently so to form hydromorphic soils and encourage the growth of wetland vegetation. The methodology employed in this study follows the guidelines as stated in the Department of Water Affairs (DWAF, 2005) publication entitled, “A practical field procedure for the identification and delineation of wetlands and riparian areas”. Given that the object of the delineation procedure is primarily to identify the outer edge of the temporary zone, the latter is determined in this study.

The guidelines state the following wetland indicators must be considered when delineating:

- The terrain unit (TU),
- Soil form,
- Soil wetness, and,
- Vegetation.

The Terrain Unit Indicator includes the distinction between five landscape units, including the crest (TU1), scarp (TU2), midslope (TU3), footslope (TU4) and valley bottom (TU5). The valley bottom occurs in depression areas where one would typically find wetland areas. It is possible to find TU5 on a crest, midslope or footslope as well. In the case of a valley bottom as a depression on a footslope, for example, the terrain unit indicator would be expressed as 4(5).

Using the soil form indicator, the permanent zone will always have either Champagne, Katspruit, Willowbrook or Rensburg soil forms present (Soil Classification Working Group, 1991). The seasonal and temporary zones will have one or more of the following soil forms present: Kroonstad, Longlands, Wasbank, Lamotte, Estcourt, Klapmuts, Vilafontes, Kinkelbos, Cartref, Fernwood, Westleigh, Dresden, Avalon, Glencoe, Pinedene, Bainsvlei, Bloemdal, Witfontein, Sepane, Tukulu and Montagu.

The soil wetness indicator is used as the primary determinant for assessing the presence of hydromorphic soils. Colour is used as the indicator in practice in that the frequency and duration of soil saturation influences soil colour:

- Grey colours are indicative of high duration and frequency of saturation.
- Coloured mottles are present in seasonally and temporarily saturated soils, becoming less prominent in the latter.
- Mineral soils must have a grey soil matrix and/or mottles in the temporary, seasonal and permanent zones to qualify as having signs of wetness.
- In highly organic soils, the characteristics described in the points above may not exist.
- The signs of wetness must be evident within the upper 50cm of the soil.

The temporary zone is bounded by the edge of the wetland and is characterised by a minimal grey matrix (<10%), few high chroma mottles and periods of saturation of less than three months per annum.

The seasonal zone, proximal to the temporary zone, is characterised by a grey matrix (>10%), many low chroma mottles present and periods of saturation of greater than three months per annum.

The permanent zone is characterised by a prominent grey matrix, few to no high chroma mottles and a sulphuric odour.

Although vegetation is important in the definition of a wetland according to the National Water Act, 1998 (Act No. 36 of 1998), the application of the vegetation indicator requires that the area under investigation be predominantly in an untransformed state. The wetland zones may, to a certain extent, be identified by examining the types of hydrophilic vegetation they support (Table 2.1).

Table 2.1. The wetland zones and their associated vegetation types

Vegetation type	Temporary	Seasonal	Permanent or semi-permanent
Herbaceous	Dominated by a mixture of grass species that are found in non-wetland areas, as well as hydrophilic plant species typical of a wetland	Hydrophilic wetland sedge and grass species	The dominant presence of a mixture of reeds (*Phragmites* sp.), sedges (Cyperaceae) and bulrushes (Typhaceae), over 1.0m in height, or floating or submerged aquatic plants
Woody	A mixture of non-wetland woody species, as well as hydrophilic plant species typical of a wetland	Hydrophilic wetland woody species	Hydrophilic wetland woody species adapted to prolonged hydric conditions

Further to the above, more specific criteria may be employed, including those detailed in Kotze and Marneweck (1999).

The PES and EIS of the wetland was assessed using DWS Manual for the assessment of a Wetland Index of Habitat Integrity for South African floodplain and channeled valley bottom wetland types (DWAF, 2007).

"The Wetland Index of Habitat Integrity (WETLAND-IHI) is a tool developed for use in the National Aquatic Ecosystem Health Monitoring Programme (NAEHMP), formerly known as the River Health Programme (RHP). The WETLAND-IHI has been developed to allow the NAEHMP to include floodplain and channeled valley bottom wetland types to be assessed and the monitoring data incorporated into the national monitoring programme. The output scores from the WETLAND-IHI model are presented in the standard DWAF A-F ecological categories (Table 2.2), and provide a score of the PES of the habitat integrity of the wetland system being examined" (DWAF, 2007).

The model is composed of four modules, three addressing the wetland drivers, namely hydrology, geomorphology and water quality and one addressing land use modification namely, vegetation alteration. The integration of the scores from the four modules provides the PES score. In the case of seepage wetlands types the PES is determined using hydrology and land use modification criteria.

Table 2.2. Description of the ecological categories used for the determination of the PES for the WETLAND-IHI.

Ecological Category	PES % Score	Description
A	90-100%	Unmodified, natural.
B	80-90%	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-60%	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions has occurred.
E	20-40%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.
F	0-20%	Critically / Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Ecological sensitivity analysis

The ecological sensitivity of the area was based on available data and the results obtained in the field during the site visits in August 2015. The sensitivity is determined on a descriptive scale from **Very Low to High** (Table 2.3), where **Very Low** reflects a **highly transformed** natural environment with little or no ecological sensitivity, typically represented where there is existing infrastructure, to **High,** which may be described as **Natural and Unmodified.**

Table 2.3: The classification system used to describe the ecological sensitivity of the site

Description of sensitivity	Comment
Very Low	No ecological significance. Highly transformed, dominated by infrastructure development. Ecological functions may be considered nearly irreversibly impaired.
Low	Low ecological significance. Highly transformed, dominated by agriculture development. Ecological functions seriously modified.
Medium-Low	Low to medium ecological significance. Ecological functions largely modified.
Medium	Medium ecological significance. Ecological functions moderately modified.
Medium-High	Medium to high ecological significance. Ecological functions with few modifications.
High	High ecological significance. Ecological functions unmodified.

Note: Classification partly based on that represented for EcoClassification determination as stated in Kleynhans and Louw (2008).

Wetland field surveys of the sites were undertaken on 13 August 2015. GPS positions were taken at each survey point. The GPS positions were used to map the boundaries of the wetland areas.

The recommendations and mitigation measures follow from the wetland delineation.

3. RESULTS

3.1. Description of the study site

The proposed 400kV power line will traverse Portions 1 and 145 of the Farm Klipfontein 322 JS and Portion 49 of the Farm Naauwpoort 335 JS approximately 1.5km south of eMalahleni, within the eMalahleni Local Municipality. The power line servitude extends approximately 100m to 340m within the farms and runs parallel to an existing secondary road. The proposed substation servitude is situated on portion 51 Naauwpoort 335 JS. The proposed developments are situated within the Olifants River quaternary catchment B11G and above a semi-perennial stream which flows into the Witbank Dam on the Olifants River. The areas surrounding the proposed power line and substation servitudes have been significantly transformed by coal mining, agriculture and settlements.

3.2 Description of the wetland

The proposed 400kV power line servitude does not cross any wetland areas or streams. The 400kV substation servitude falls within 250m of a seepage wetland.

Seepage wetland:

The 9.9ha seepage wetland has been affected by a dam, dirt roads, mining rehabilitation, furrows, overgrazing, firebreaks and agricultural activities. The shallow dam creates a permanent wetland zone covered by Bullrush (*Typha capensis*). The dam and wetland area above the dam has been affected by sediment load washed into the wetland from adjacent opencast mining rehabilitation. The same rehabilitation has covered some of the seepage wetland area and immediate catchment area of the wetland. Furrows have been dug into the wetland above and below the dam, draining the wetland areas. Firebreaks have been ploughed through the seasonal and temporary wetland areas surrounding the Typha wetland area. Dirt roads have been built through the wetland area. The wetland area is heavily grazed and some areas are used for hay bailing.

The catchment of the wetland has been transformed in some areas by opencast mining and subsequent rehabilitation. Most of the surrounding vegetation can be classified as degraded secondary grassland with some areas classified as secondary grassland.

Photo 1: View of roads, furrows and rehabilitated opencast mining area over seepage wetland

Photo 2: View of ploughed firebreak alongside *Typha* wetland area

Photo 3: View of dam wall below *Typha* wetland area

3.3 Present Ecological State and Ecological Importance and Sensitivity

The PES of the seepage wetland has been estimated as a 'D-E' due to the fact that the wetland has been affected by the opencast mining rehabilitation, dam, furrows, roads, firebreaks and agricultural activities and the catchment has been affected by opencast mining activities and rehabilitation.

The wetland is classified as having a Medium-Low EIS due to the extent of transformations within the wetland and surrounding catchment.

4. DISCUSSION

South Africa is a water stressed country and wetlands play an important role in flood attenuation as they store water and release water during dry periods, thus helping to maintain the low flow of rivers. Wetlands are also important from a biodiversity perspective as they provide habitat for different species. It is for these reasons that it is important to conserve wetland systems.

The wetland areas have been described as a Mesic Highveld Grassland Seep with a PES score of 'D' by the Water Research Commission Report "Supporting better decision-making around coal mining in the Mpumalanga Highveld through the development of mapping tools and refinement of spatial data on wetlands" (2015). These wetlands are given a threat status of Least Threatened in the study. The Mpumalanga Biodiversity Sector Plan identifies the wetland area as either Moderately Modified or Other Natural Areas. The results from this assessment gives the wetland a lower PES score than the Water Research Commission Study (2015) assessment, as it adversely affected by various activities such as the opencast mining rehabilitation, dam, furrows, roads, firebreaks and agriculture. The Ecological Importance and Sensitivity assessment of Medium to Low is consistent with the Mpumalanga Biodiversity Sector Plan.

The 400kV power line servitude does not affect any of the wetland areas identified or on 32m wetlands buffer area.

The majority of the area identified for the 400kV substation servitude is situated outside of the wetland area and the 32m buffer area. The construction of the 400kV substation must take place outside of the 32m wetland buffer area.

5. RECOMMENDATIONS

The following recommendations are made:

- The construction of the 400kV substation must take place outside of the 32m wetland buffer area.

- The construction phase must limit the loss of loose sediment into the wetland areas.

- All vehicles and personal must be kept out of the wetland area.

- Any disturbed area must be rehabilitated immediately after the construction of the 400kV substation.

6. CONCLUSION

Although the seepage wetland has a low PES and EIS score, it still performs an ecological function within a catchment that has been highly affected by mining and agriculture. Therefore, it is important to protect and minimise the impacts the substation will have on the wetland. By remaining outside of the 32m wetland buffer area and preventing the loss of sediment into the wetland, the impact of the construction of the substation will be kept to the minimum.

7. REFERENCES

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Appendix A: Map 1: Khanyisa 400kV power line and Substation Servitude: Wetland Delineation