AQUATIC ECOLOGICAL ASSESSMENT AND WETLAND STUDIES AS PART OF THE WATER USE LICENSING PROCESS FOR THE CONSTRUCTION OF A POWERLINE FROM THE CASHAN SUB-STATION TO THE NEW PROPOSED SUB-STATION

Prepared for

SRK Consulting (Pty) Ltd

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Declaration of Independence

This report has been prepared according to the requirements of Section 32 (3b) of the Environmental Impact Assessment Regulations, 2010 (GNR 543). We (the undersigned) declare the findings of this report free from influence or prejudice.

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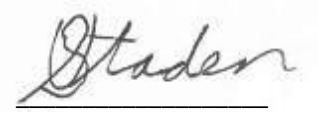

Date: 2014/11/14

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EXECUTIVE SUMMARY

Scientific Aquatic Services (SAS) was appointed to conduct an aquatic ecological assessment and wetland studies as part of the water use licensing process for the construction of a proposed powerline route from the Cashan sub-station to the new proposed sub-station. Two alternative lines were proposed for this study, one of which being the existing line which may be upgraded (alternative 1). The second alternative is to develop a new line (alternative 2). The alternative powerline 1 is located adjacent to the R560 Road. Alternative line 2 runs approximately parallel, at a distance of approximately 1km from the alternative powerline 1

After conclusion of this ecological assessment, it is the opinion of the ecologists that alternative powerline 1 be considered preferable due to less construction impacts that the area will be exposed to, since the line will only be upgraded, and taking into consideration the fact that the area has been previously impacted by similar construction.

WETLAND ASSESSMENT

The following general background conclusions were drawn:

- The proposed powerline route falls within the Western Bankenveld Aquatic Ecoregion.and within the A21F quaternary catchment;
- According to the National Biodiversity Assessment (2011), the proposed powerline route is located within a 'poorly protected' area;
- The NFEPA database was consulted with regards to areas in close proximity to or traversed by the proposed powerline route that may be of ecological importance. Aspects applicable are discussed below:
    - The proposed powerline route falls within the Crocodile (West) and Marico Water Management Area (WMA). Each Water Management Area is divided into several SubWater Management Areas (subWMA) and the subWMA indicated is the Upper Crocodile;
    - According to the NFEPA database, both natural and artificial wetlands are present within close proximity to the proposed powerline route, some of these wetlands are also intersected;
    - In addition two features identified as being rivers by the NFEPA database are also located in the vicinity of the proposed powerline route namely:
        - Magalies River, classified as a PES Class C (moderately modified); and
        - Klein River, classified as a PES Class C (moderately modified).
    - Both rivers were recognised as fish support areas;
    - Neither of the rivers were recognised as flagship rivers;
    - The subWMA is not regarded important in terms of fish sanctuaries, rehabilitation or corridors;
    - The subWMA is not considered important in terms of translocation and relocation zones for fish; and
    - The subWMA is not listed as a fish Freshwater Ecosystem Priority Area (FEPA).
- A minor portion in the eastern section of the proposed powerline route falls under North West province, whereas the remaining portion of the powerlines falls under Gauteng province;

The following conclusions were drawn during the survey of the wetland resources:

- Two classes of drainage features were observed namely, rivers and wetland. The HGM units were classified as an Inland System falling within the Western Bankenveld Ecoregion and the Central Bushveld Grassland Group 1 and the Central Bushveld Group 5 WetVeg Groups. Both features were situated within a valley bottom landscape unit, and classified as rivers and unchannelled valley bottom hydrogeomorphic units;
- In terms of the ecosystem function and service provision assessment, the HGM units are considered to provide a moderately low level of ecological function and service provision;
- The results of the WET-Health assessment was applied to the unchannelled valley bottom wetland, and indicates that the feature has been moderately modified. The IHI methodology was used to determine the PES categories for the rivers. The results of this assessment indicates that the rivers have been moderately modified;

- The results of the Vegetation Response Assessment Index (VEGRAI) assessment indicates that the rivers fall within Ecological Category C (Moderately modified), which implies that loss and change of natural habitat have occurred, but the basic ecosystem functions are still predominately unchanged;
- The Ecological Importance and Sensitivity (EIS) assessment indicates that the features are considered to be moderately ecologically important and sensitive on a local scale, and obtained a score placing it in an EIS Category C;
- The Recommended Ecological Category (REC) for the wetland features as well as the riparian features in close proximity of the proposed powerline route was determined, taking into consideration the results of the ecosystem function and service provision assessment, WET-Health, IHI and EIS assessments. Therefore, a REC Category C was assigned to the rivers, whereas the channelled valley bottom wetland was assigned a REC Category B in order to ensure the maintenance and enhancement of present levels of ecological services and functioning of the wetland system is retained.

Impact Assessment
The impact of both alternatives were considered to vary negligibly although alternative powerline 1 (existing line) would have slightly lower levels of impact due to the effects of past disturbances caused by the existing line. Based on the assessment it is evident that there are 5 possible impacts that may have an effect on the overall wetland and riparian integrity.

In the consideration of mitigation it is assumed that a high level of mitigation takes place but which does not lead to prohibitive costs. The table below summarises the findings indicating the significance of the impacts before mitigation takes place as well as the significance of the impacts if appropriate management and mitigation takes place.

The following summary was drawn from the results obtained from the assessment of the ecological impacts for alternative powerline 1:

- During construction phase, prior to mitigation implementation, the impacts ranged between medium-low and low level impacts. During operational phase, all impacts are considered to be of low level, both prior to mitigation as well as after implementation of mitigation measures.

Construction phase		
Impact	**Unmanaged**	**Managed**
1 Impacts on wetland recharge, inundation and instream flow	Medium-Low	Low
2 Impacts due to sedimentation, canalization and erosion	Medium-Low	Low
3 Impacts on ecological and sociocultural service provision	Low	Low
4 Impacts on instream and wetland habitat	Medium-Low	Low
5. Impacts on refugia for aquatic species	Medium-Low	Low
Operational phase		
Impact	**Unmanaged**	**Managed**
1 Impacts on wetland recharge, inundation and instream flow	Low	Low
2 Impacts due to sedimentation, canalization and erosion	Low	Low
3 Impacts on ecological and sociocultural service provision	Low	Low
4 Impacts on instream and wetland habitat	Low	Low
5 Impacts on refugia for aquatic species	Low	Low

The following summary was drawn from the results obtained from the assessment of the ecological impacts for alternative powerline 2 (new proposed route)*:*

- During construction phase, prior to mitigation implementation, the impacts ranged between medium-high and medium-low level impacts. During operational phase, all impacts are considered to be of low level, both prior to mitigation as well as after implementation of mitigation measures.

Construction phase		
Impact	**Unmanaged**	**Managed**
1 Impacts on wetland recharge, inundation and instream flow	Medium-High	Low
2 Impacts due to sedimentation, canalization and erosion	Medium-High	Low
3 Impacts on ecological and sociocultural service provision	Medium-Low	Low
4 Impacts on instream and wetland habitat	Medium-High	Low
5. Impacts on refugia for aquatic species	Medium-Low	Low
Operational phase		
Impact	**Unmanaged**	**Managed**
1 Impacts on wetland recharge, inundation and instream flow	Low	Low
2 Impacts due to sedimentation, canalization and erosion	Low	Low
3 Impacts on ecological and sociocultural service provision	Low	Low
4 Impacts on instream and wetland habitat	Low	Low
5 Impacts on refugia for aquatic species	Low	Low

AQUATIC ASSESSMENT

The following general conclusions were drawn upon completion of the aquatic assessment of the Magalies River and its unnamed tributary which will be traversed by the proposed development:

- The water quality data indicates that both sites on the Magalies River and unnamed tributary have slightly elevated salt concentrations.
- The electrical conductivity (EC) at the Cash2 site on the unnamed tributary of the Magalies River is slightly higher than the Cash1 site. This is likely due to the location of the site in close proximity to the bridge crossing.
- The pH value at the Cash1 site can be considered as largely neutral while the pH at the Cash2 site can be regarded as slightly acidic at the time of the assessment.
- The water quality guideline for aquatic ecosystems (DWAF, 1996) states that dissolved oxygen concentrations should range between 80% and 120% of saturation.
- The DO concentrations at both sites fall below the recommended saturation. The low DO at the Cash2 site may be related to impacts from the surrounding agricultural activities.
- Temperatures can be regarded as normal for the time of year when sampling took place.
- From the results of the application of the IHIA to the Cash1 assessment site, it is evident that instream impacts included large impacts from flow modification, channel modification, bed modification and water quality modification. Overall, the site achieved a 59.1% score for instream integrity.
- The largest riparian zone impacts included bank erosion and flow modification. The site achieved a 65.6% score for riparian zone integrity.
- The site obtained an overall IHIA rating of 62.3%, which indicates moderately modified (Class C conditions). The site, therefore, falls within the DEMC for the quaternary catchment in terms of habitat integrity.
- From the results of the application of the IHIA to the Cash2 assessment site, it was observed that instream impacts included large impacts from flow modification, channel modification, bed modification and water quality modification. Overall, the site achieved a 58.1% score for instream integrity.
- The largest riparian zone impacts included flow modification, exotic vegetation encroachment and channel modification. The site achieved a 66.7% score for riparian integrity.
- The site obtained an overall IHIA rating of 62.4%, which indicates moderately modified (Class C conditions). The site, therefore, falls within the DEMC for the quaternary catchment in terms of habitat integrity.
- The macro-invertebrate community of the sites may be considered to be in a Class C (moderately impaired) condition at the Cash1 site while the Cash2 site may be considered a Class D (largely impaired) according to the Dallas (2007) classification system. Both the sites can be classified as a Class D (largely impaired) condition according to the Dickens & Graham (2001) classification system.
- From the MIRAI results in terms of (Ecological Category classification) the sites follow the same trends as that obtained using the SASS class classifications. Both sites can be

classified as Class D conditions. The general deterioration from the expected natural condition in terms of macro-invertebrate community integrity is clearly evident. This is due to the modified flow conditions and decreased water quality at the time of the assessment.

- No fish species was observed or caught during the site assessment. In addition no threatened fish species are highlighted within the Quaternary catchment A21F (Kleynhans et al., 2007). For these reasons the FRAI ecostatus tool was not applied to the two sites.

Impact Assessment

Based on the assessment it is evident that there are four possible impacts that may have an effect on the overall aquatic integrity of the Magalies River and its tributary. The table below summarises the findings indicating the significance of the impacts before mitigation takes place as well as the significance of the impacts if appropriate management and mitigation takes place. In the consideration of mitigation it is assumed that a high level of mitigation takes place but which does not lead to prohibitive costs.

A summary of the impact significance of the construction phase on the Magalies River and its tributary.

Impact	Unmanaged	Managed
1: Changes to instream flow	Medium - High	Low
2: Impacts due to sedimentation and increased turbidity	Medium - Low	Low
3: Impacts on aquatic migratory corridors	Medium - Low	Low
4: Impacts on taxa sensitive to change in water quality	Medium - High	Low

A summary of the impact significance of the operational phase on the Magalies River and its tributary.

Impact	Unmanaged	Managed
1: Changes to instream flow	Medium - High	Low
2: Impacts due to sedimentation and increased turbidity	Medium - Low	Low
3: Impacts on aquatic migratory corridors	Medium - Low	Low
4: Impacts on taxa sensitive to change in water quality	Medium - Low	Low

From the tables it is evident that prior to mitigation, the impact on the instream flow of the Magalies River and its tributary can be considered as Medium-High impacts during both the construction and operational phases. Should mitigatory measures be implemented as recommended, impacts will be reduced to Low level impacts. The impact on the aquatic resources due to sedimentation and turbidity as well as the impact on migratory corridors during both the construction and operational phases can be considered as Medium-Low impacts before the implementation of mitigatory measures. After implementation, these impacts will be reduced to Low level impacts. While the impact on the aquatic biodiversity and sensitive taxa of the Magalies River and its tributary during the construction phase can be considered as a Medium-High impact and as a Medium-Low impact during the operational phase before the implementation of mitigatory measures, the impact will be reduced to a Low level impact with the implementation of mitigation measures.

Conclusion:

Based on the findings of this study, it can be concluded that the study area has low level of ecological importance and sensitivity; and the proposed powerline development is therefore likely to result in a moderate transformation of important habitats and systems, and the loss of biodiversity should impact minimisation measures not be implemented adequately. Adherence to the recommended mitigation measures will assist in reducing the impact on the aquatic resources on the subject property to an overall low level. It is therefore the opinion of the aquatic and wetland ecologists that, from a water resource conservation point of view, the project be considered favourably. The following key mitigation measures are highlighted:

- It is recommended that support structures be placed outside the wetlands, and rivers as well as the allocated buffer zones, as far as possible;
- Avoid placement of construction material within the surrounding areas, especially within more sensitive areas such as the wetland or riparian habitat or the associated buffer zones;
- The bed profile should be re-instated in such a way as to prevent incision and erosion in all areas that may be disturbed;

- As far as possible no activities, with special mention of access roads, should occur within the riparian zones of stream channels as well as the stream channels themselves;
- The construction, as well as the associated rehabilitation, should take place in the dry season, if at all possible, and be completed before the first rains of the new spring season;
- The duration in which soils are exposed during construction activities should remain as short as possible;
- Construction activities should not lead to altered hydrology of the wetlands and rivers and stream connectivity must be maintained. In this regard special mention is made of not altering the river bed characteristics leading to upstream ponding and downstream erosion or loss of flow;
- Adequate stormwater management must be incorporated into the design of the proposed upgrade in order to prevent erosion and the associated sedimentation of the riparian and instream areas, as these systems have aquatic communities which rely on stream substrates clear of sediment and on, fast flowing water over rocky substrates;
- Any damage to the drainage lines necessary to complete the work must be limited in extent;
- Permit only essential construction personnel within 32m of the riparian habitat, if absolutely necessary that they enter the buffer zone;
- All areas should be monitored for erosion and incision. Specific mention is made of sedimentation of riparian areas;
- To prevent the erosion of topsoils, management measures to minimise erosion should include installation of berms, silt traps, hessian curtains at erodible areas and stormwater diversion away from areas susceptible to erosion;
- Berms every 50m should be installed where any disturbed soils have a slope of less than 2%, every 25m where the track slopes between 2% and 10%, every 20m where the track slopes between 10% and 15% and every 10m where the track slope is greater than 15% to prevent gully formation;
- All soils compacted as a result of activities falling outside of project footprint areas should be ripped and profiled;
- Implement effective waste management in order to prevent construction related waste from entering the drainage line and riparian environments;
- Rehabilitate all drainage line and riparian habitat areas if required, in order to ensure that the ecology of these areas is re-instated after construction;
- Edge effects of activities including erosion and alien/weed control need to be strictly managed in these areas;
- All alien vegetation should be removed and reseeded with indigenous grasses as specified by a suitably qualified specialist (ecologist); and
- All reseeding activities must be undertaken at the end of the dry season to ensure optimal conditions for germination and rapid vegetation establishment;
- Proliferation of alien and invasive species is expected within disturbed areas. These species should be eradicated and controlled to prevent their spread beyond the development footprint. Alien plant seed dispersal within the top layers of the soil within footprint areas, that will have an impact on future rehabilitation, has to be controlled;
- All soils compacted as a result of construction activities falling outside of the areas where towers will be placed, should be ripped and profiled. Special attention should be paid to alien and invasive control within these areas. Alien and invasive vegetation control should take place throughout the rehabilitation and operational phases to prevent loss of floral habitat;
- Wetland and riparian areas disturbed during construction should be monitored for erosion and incision; and
- Ensure that all activities impacting on water resources are managed according to the relevant Department of Water and Sanitation (DWA) Licensing regulations until completion of the construction phase of the development to ensure that wetland functions are re-instated.

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Prepared for

SRK Consulting

November 2014

SECTION A – INTRODUCTION

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INTRODUCTION

Scientific Aquatic Services (SAS) was appointed to conduct an aquatic ecological assessment and wetland studies as part of the water use licensing process for the construction of a proposed powerline route from the Cashan sub-station to the new proposed sub-station. Two alternative lines were proposed for this study, one of which being the existing line which may be upgraded (alternative 1). The second alternative is to develop a new line (alternative 2). The alternative powerline 1 is located adjacent to the R560 Road. Alternative line 2 runs approximately parallel, at a distance of approximately 1km from the alternative powerline 1.

A single site visit and sampling round was conducted on the 28th of October 2014. Based on desktop research as well as observations in the field the Ecological Importance and Sensitivity of the systems was defined. During this site visit an aquatic ecological assessment was conducted in order to define the Present Ecological State (PES) and Ecostatus of the aquatic ecosystems within the proposed powerline route. An impact assessment on the aquatic resources of the proposed powerline route was performed to determine the significance of the perceived impacts on the receiving environment. In addition, mitigatory measures were developed which aim to minimise the impacts, followed by an assessment of the significance of the impacts after mitigation, assuming that they are fully implemented.

In addition, wetland areas were delineated and an assessment was conducted in order to define the Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS) thereof, as well as to determine wetland functionality and service provision in terms of ecological and socio-economic functioning of the systems, in order to guide construction activities within the project footprint and to inform the Water Use Licence Application (WULA) to be submitted for the proposed powerline route.

This report, after consideration and the description of the ecological integrity of the proposed powerline route, must guide the Environmental Assessment Practitioner (EAP), regulatory authorities and developing proponent, by means of the presentation of results and recommendations, as to the ecological viability of the proposed development activities. This report has been divided into two sections addressing various aspects of the ecology of the surfaces water resources potentially affected by the proposed development. The main portions of this report are presented as follows: