AQUATIC BIODIVERSITY AND SPECIES SPECIALIST ASSESSMENT:

Scoping and Environmental Impact Assessment for the Proposed Ujekamanzi Wind Energy Facility 2 Grid Connection near Amersfoort, in the Mpumalanga Province

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Executive Summary

The aquatic features within the study area consist of a tributary of the Vaalbankspruit River with its associated tributaries and wetland areas. The ecological habitat integrity of the rivers within the study area is moderately modified with the riparian zones being more impacted by the surrounding land use activities. The larger Vaalbankspruit River in the study area has a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition of moderately modified and should not be allowed to degrade further.

The Vaalbankspruit River Sub-catchment is mapped as a Freshwater Ecosystem Priority Area (FEPA) River sub-catchment. There are no wetlands mapped at the site of the Main Transmission Substation (MTS). The Loop-In-Loop-Out (LILO) will need to cross a channelled valley bottom wetland mapped in the National Wetland Map that is associated with a smaller tributary of the Vaalbankspruit River. In the Mpumalanga Biodiversity Sector Plan mapping the proposed MTS and LILO are located within aquatic Ecological Support Areas. In terms of the Screening Tool, the proposed MTS and LILO are located within the south-western portion that is considered Very high Aquatic Combined Biodiversity Sensitivity. The very high sensitivity is associated with the FEPA River sub-catchments of the Vaalbankspruit and Rietspruit Rivers. The larger rivers (Vaalbankspruit and Rietspruit) and associated valley bottom wetlands are mapped as Aquatic Critical Biodiversity Areas.

*This assessment thus largely concurs with the **Very high** Aquatic Biodiversity Combined Sensitivity mapping of the screening tool for the larger Rietspruit and Vaalbankspruit Rivers with their associated tributaries and wetland areas. The surrounding catchments, after taking into account the recommended 50m areas are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.*

With mitigation, the potential freshwater impacts of the proposed Ujekamanzi Wind Energy Facility (WEF) 2 Electrical Grid Infrastructure (EGI) for the construction, operation and decommissioning phases are likely to be low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

The recommended buffer area between the aquatic features and the project components (MTS and LILO) to ensure these aquatic ecosystems are not impacted by the proposed activities, is at least 50m from the delineated edge of the river channels in the case of the larger watercourses or from the centre of the stream for the smaller watercourses.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- *Any disturbance during the construction and operation phases should be limited to the approved MTS and LILO footprints and should avoid disturbance of the soil and natural vegetation cover. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.*
- *During the construction phase, site management must be undertaken at the laydown area and the construction area. This should specifically address on-site prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. Any stormwater that does arise within the construction site must be handled appropriately, where necessary, to trap sediments and reduce flow velocities.*
- *Invasive alien plant growth should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.*
- *Stormwater runoff infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.*
- *Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.*

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should

not be authorized. Cognisance has been taken of the initial aquatic ecosystem constraints mapping in the placing of the proposed buildable areas.

The risk assessment determined that the proposed development of the MTS and LILO poses a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

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List of Abbreviations

BA	Basic Assessment
CBA	Critical Biodiversity Area
CSIR	Council for Scientific and Industrial Research
DEA	Department of Environmental Affairs
DFFE	Department of Forestry, Fisheries and the Environment
DWA(F)	Department of Water Affairs (and Forestry)
DWS	Department of Water and Sanitation
EGI	Electrical Grid Infrastructure
EIA	Environmental Impact Assessment
EI&ES	Ecological Importance and Ecological Sensitivity
EMPr	Environmental Management Program
ESA	Ecological Support Area
FEPA	Freshwater Ecosystem Priority Area
GA	General Authorisation
GG	Government Gazette
GIS	Global Information System
GN	Government Notice
ha	hectare
HI	Habitat Integrity
IUCN	International Union for Conservation of Nature
kW	kilowatt
LILO	Loop-In-Loop-Out
MMP	Maintenance Management Plan
MW	megawatt
MTS	Main Transmission Substation
OHL	Overhead Line
ONA	Other Natural Areas
NEMA	National Environmental Management Act
NFEPA	National Freshwater Ecosystem Priority Area
NWA	National Water Act
PA	Protected Area
PES	Present Ecological Status
REC	Recommended Ecological Condition
REDZ	Renewable Energy Development Zone
SANBI	South African National Biodiversity Institute
SEA	Strategic Environmental Assessment
SCC	Species of Conservation Concern
WCBSP	Western Cape Biodiversity Spatial Plan
WEF	Wind Energy Facility
WMA	Water Management Area
WUL	Water Use License
WULA	Water Use License Application

Glossary

Definitions	
Aquifer	A geological formation that has structures or textures that hold water or permit appreciable water movement through them.
Catchment	The area from which any rainfall will drain into the watercourse or watercourses or part of a watercourse, through a surface flow to a common point or common points
Critical Biodiversity Areas	Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure.
Drainage feature	A minor channel down which surface water naturally concentrates and flows that is poorly defined and usually does not contain any distinctive riparian and aquatic vegetation or habitat.
Ecological Importance and Sensitivity	The rating of any given wetland or river reaches that provides an indication of the ecological importance of the aquatic system using criteria such as conservation needy habitat or species, protected ecosystems or unique habitat observed. The sensitivity is then derived by assessing the resilience the habitat exhibits under stress as a result of changes in flow or water quality.
Ecological Support Areas	Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of Protected Areas or Critical Biodiversity Areas and are often vital for delivering ecosystem services.
Other Natural Areas	Areas that have not been identified as a priority in the biodiversity spatial plans but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for meeting biodiversity targets, they are still an important part of the natural ecosystem.
Perennial / Non-perennial rivers	Perennial rivers are those rivers that exhibit a continuous flow of water throughout the year except during extreme drought conditions. Non-perennial rivers are those rivers that have no flow for at least a part of the year. These rivers are seasonal.
Present Ecological State	The current ecological condition of a watercourse as measured against the deviation from the natural or pre-impacted condition of the system
Protected Areas	Areas that are formally protected by law and recognised in terms of the National Environmental Management: Protected Areas Act. This includes gazetted private Nature Reserves and Protected Environments concluded via a stewardship programme.
Riparian habitat	The physical structure and associated vegetation of the areas associated with a watercourse which are commonly characterised by alluvial soils, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with composition and physical structure distinct from those of adjacent land areas
River FEPA	Rivers currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition to contribute to the biodiversity goals of the country.
Watercourse	(a) a river or spring; (b) a natural channel in which water flows regularly or intermittently; (c) a wetland, lake or dam into which, or from which, water flows; and (d) any collection of water which the Minister of DWS may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;
Water management area	An area established as a management unit in the national water resource strategy within which a catchment management agency will conduct the protection, use, development, conservation, management and control of water resources
Wetland	Land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil.
Wetland FEPA	Wetlands currently in a good condition (A or B ecological category) that have been identified to achieve biodiversity targets for river ecosystems and threatened/near-threatened fish species. They should remain in a good condition to contribute to the biodiversity goals of the country.

AQUATIC BIODIVERSITY AND SPECIES SPECIALIST ASSESSMENT

This report serves as the Aquatic Biodiversity and Species Specialist Assessment that was prepared as part of the Scoping and Environmental Impact Assessment (S&EIA) for the proposed Grid Connection for the Ujekamanzi Wind Energy Facility (WEF) 2, near Amersfoort, Mpumalanga Province.

1. Introduction

1.1. Scope, Purpose and Objectives of this Specialist Report

This Aquatic Ecological (including wetlands) Impact Assessment is intended to inform the Basic Assessment (BA) process for the proposed grid connection (Main Transmission Substation (MTS) potentially including 2 x 132kV overhead powerlines and a Loop-In-Loop-Out (LILO)) for Ujekamanzi WEF2 that forms part of a combined approximate 650 MW Ujekamanzi WEF development on several properties south of Ermelo in the Dr Pixley Ka Isaka Seme Local Municipality within the Mpumalanga Province. The proposed EGI is not located within any Renewable Energy Development Zone (REDZ) published in terms of Section 24(3) of the National Environmental Management Act, 1998 (NEMA) or a strategic power corridor.

1.2. Details of Specialist

This specialist assessment has been undertaken by Toni Belcher. She is registered with the South African Council for Natural and Scientific Professions (SACNASP), with Registration Number 400040/10 in the fields of Ecological Science and Environmental Science. A curriculum vitae is included in Appendix A of this specialist assessment.

In addition, a signed specialist statement of independence is included in Appendix B of this specialist assessment.

1.3. Terms of Reference

The Terms of Reference for this Aquatic Biodiversity and Species specialist study are as follows:

- Conduct field surveys and compile specialist studies in adherence to:
  - the gazetted Environmental Assessment Protocols of the NEMA EIA Regulations (2014, as amended), where applicable (**Protocol for the Specialist Assessment and Minimum Report Content Requirements of Environmental Impacts on Aquatic Biodiversity** (GG 43110 / GN 320, 20 March 2020)). This protocol replaces the requirements of Appendix 6 of the 2014 NEMA EIA Regulations (as amended); and
  - any additional relevant legislation and guidelines that may be deemed necessary.
- The Specialist must undertake a site visit to identify the level of sensitivity assigned to the project areas and to verify and confirm this sensitivity and land use as per the national Screening Tool. The Specialist must then provide Site Sensitivity Verification Reports based on the requirements documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- Based on the outcome of the site sensitivity verification, the Specialist must then either compile Aquatic Biodiversity and Species Impact Assessment Reports or Compliance Statements, as documented in the Assessment Protocols published on 20 March 2020, in Government Gazette 43110, GN 320.
- The Impact Assessment Reports and/or Compliance Statements must also be in adherence to any additional relevant legislation and guidelines that may be deemed necessary. It must also comply with the report templates provided by the CSIR.
- For ‘very high’ aquatic biodiversity sensitivity, an Impact Assessment Report must be prepared (the input complying with the content requirements of the said Aquatic Biodiversity Protocol).

- Determine, describe and map the baseline environmental condition and sensitivity of the study areas. Specify setbacks or buffers and provide clear reasons for these recommendations. Also, map the extent of disturbance and transformation of the sites.
- Provide sensitivities in KMZ or similar GIS format.
- Provide review input on the preferred infrastructure layout following the sensitivity analysis and layout identification.
- The reports must also describe the aquatic ecology features of the project areas, with a focus on features that are potentially impacted by the proposed projects. The description should include the major habitat forms within the study sites, giving due consideration to aquatic fauna and flora, and freshwater ecosystems, in particular natural wetlands.
- Consider seasonal changes and long-term trends, such as due to climate change.
- Identify any species of conservation concern (SCC) or protected species on site.
- The assessment is to be based on existing information, national and provincial databases, and professional experience and fieldwork conducted by the Specialist, as considered necessary and in accordance with relevant legislated requirements. The assessment must also consider the maps generated by the National Screening Tool.
- Identify and assess the potential direct, indirect and cumulative impacts of the proposed development on aquatic biodiversity and species. Impact significance must be rated both without and with mitigation and must cover the construction, operational and decommissioning phases of the project.
- Identify and delineate wetlands that may occur on the sites, using the relevant protocols established.
- Compile a Risk Matrix (Appendix A to GN R509 of 2016) and determine if a Water Use License (WUL) is required and if so, determine the requirements thereof.
- Identify any additional protocols, legal and permit requirements that are relevant to this project and the implications thereof.
- Provide recommendations with regard to potential monitoring programmes.
- Determine mitigation and/or management measures, which could be implemented to as far as possible reduce the effect of negative impacts and enhance the effect of positive impacts. Also, identify best practice management actions, monitoring requirements, and rehabilitation guidelines for all identified impacts. This must be included in the EMPr.
- Incorporate and address all review comments made by the Project Team.
- Incorporate and address all issues and concerns raised by Stakeholders, Competent Authority, I&APs and the public during the Public Participation Process (where relevant and applicable).
- Review the Generic EMPr for Power Lines (if required) and Substations (GN 435) and confirm if there are any specific environmental sensitivities or attributes present on the sites and any resultant site-specific impact management outcomes and actions that are not included in the pre-approved generic EMPr (Part B – Section 1). If so, provide a list of these specific impact management outcomes and actions.

2. Approach and Methodology

Input into this report was informed by a combination of desktop assessments of existing freshwater ecosystem information for the study area and surrounding catchments, as well as by a more detailed assessment of the freshwater features on the various farm portions that comprise the study area.

The field verification was undertaken on 18 January 2023. The timing of the site visit was deemed suitable for the assessment as the area has summer rainfall and had recently received rain that assisted with the delineation and assessment of aquatic features. No additional site visits are deemed necessary.

The field assessment comprised delineation, characterisation and integrity assessments of the aquatic habitats within the site. Mapping of the freshwater features was undertaken using a GPS Tracker and mapped in PlanetGIS and Google Earth Professional.

The 1 in 50 000 topographical rivers cover was used as a basis and refined based on knowledge of the aquatic features in the area as well as Satellite imagery. The SANBI Biodiversity GIS, Cape Farm Mapper and Freshwater Biodiversity Information System websites were consulted to identify any constraints in terms of features of aquatic biodiversity conservation importance within the area. The following techniques and methodologies were utilised to undertake the assessments:

- The guideline document, “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas” document, as published by DWAF (2005) was followed for the delineation of the aquatic habitats;
- The present ecological condition of the watercourses and wetlands was determined using the National River Health Programme and Wet-Health methodologies;
- The ecological importance and ecological sensitivity (EI&ES) assessment of the wetlands and watercourses was conducted according to the guidelines as developed by DWAF (1999); and
- Recommendations are made concerning the adoption of buffer zones within the site based on the watercourse and wetland functioning and site characteristics.
- The potential impacts identified in this specialist study have been assessed based on the criteria and methodology outlined in Appendix D of this assessment.

2.1. Information Sources

A summary of the main information sources used in this assessment is provided in Table 1 below:

Table 1. Information Sources for the Aquatic Biodiversity Assessment

Data / Information	Source	Date	Type	Description
Satellite imagery	Google Earth	Nov 2006 to Nov 2022	Spatial	Recent history of aerial imagery for the site
Mpumalanga Biodiversity Sector Plan	South African National Biodiversity Institute (SANBI), obtained from Biodiversity GIS	2014	Report and mapping	Systematic biodiversity planning assessment that delineates Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs)
National Screening Tool	Department of Forestry, Fisheries and the Environment	2023	Report and spatial	National environmental screening tool
National Biodiversity Assessment	South African National Biodiversity Institute (SANBI), obtained from Biodiversity GIS	2018	Report and Spatial	Latest assessment of South African biodiversity & ecosystems, including wetlands and rivers.
National Vegetation Map	SANBI, obtained from CapeFarmMapper	2018	Report and Spatial	Latest national vegetation type mapping
South African Atlas of Climatology and Agrohydrology	R.E. Schulze, obtained from CapeFarmMapper	2009	Spatial	Climate data
Aquifer classification and Groundwater Resource Assessment information	Department of Water and Sanitation, obtained from CapeFarmMapper	2005, 2012 and 2013	Spatial	Mapping of aquifer class, type, yields, susceptibility and Vulnerability as well as depths, recharge and quality
National Soil types	ENPAT, obtained from CapeFarmMapper		Spatial	Mapping of soil types
National Freshwater Ecosystem Priority Areas (FEPA)	CSIR, obtained from CapeFarmMapper and Biodiversity GIS	2011	Report and spatial	Mapping of areas of aquatic ecosystem conservation importance
National River Present Ecological Status, Ecological Importance and Ecological Sensitivity	DWA	2012	Spreadsheet and spatial	River reach assessments of ecological importance, sensitivity and condition
National Wetland Map 5	CSIR and SANBI - South African National Biodiversity Assessment 2018 obtained from CapeFarmMapper	2018	Spatial	Mapping of wetland habitats
Freshwater Biodiversity Information System	Freshwater Research Centre, SANBI and JRS Biodiversity Foundation	2023	Spatial	Mapping of aquatic biodiversity (fish, invertebrates and algae)

iNaturalist	National Geographic Society and California Academy of Sciences	2023	Spatial	Mapping of aquatic and terrestrial fauna and flora

2.2. Assumptions, Knowledge Gaps and Limitations

Limitations and uncertainties often exist within the various techniques adopted to assess the condition of ecosystems. The methodologies and techniques used in this assessment have been developed nationally and are typical of a rapid nature as is required for this freshwater impact assessment.

No baseline long-term monitoring was undertaken as part of this assessment. There is also very little existing information available for the aquatic features within the study area. Data was utilised from adjacent aquatic ecosystems where available. The nature of the proposed activities however also allows them to be placed some distance from any mapped aquatic features such that the likely impacts would be very low. It is usually the associated infrastructure that has the potential to have a greater impact on the aquatic features. The impacts of roads and powerlines on the aquatic features are however well understood and can be effectively mitigated to ensure the impacts remain low. The preferred mitigation measure is to limit the disturbance to aquatic features as far as possible by avoiding and minimising the number of crossings and providing adequate buffer areas. This will also ensure that the cumulative impacts will remain low.

The level of aquatic assessment undertaken was considered to be adequate for this study. No further fieldwork will be required. The ground-truthing of aquatic features was undertaken at the end of the rainy season and when the use of vegetation as an indicator was possible. As it was not possible to cover the entire site in a high level of detail, extrapolation of the areas ground-truthed to those not covered was done using the latest available aerial imagery for the site.

Cumulative impacts of the proposed project were assessed by reviewing all available documentation for the other renewable energy facilities within a 35km radius of the site, particularly in terms of the aquatic features occurring in and adjacent to the site; the proposed mitigation measures and the indicated potential impacts to these ecosystems as well as the association of these ecosystems with that within the study area.

2.3. Consultation Processes Undertaken

Limited consultation was undertaken with landowners at the time of the site visit.

3. Description of Project Aspects Relevant to Aquatic Biodiversity

The proposed 400/132 kV Main Transmission Substation (MTS) includes the associated infrastructure at the MTS (such as 132 kV busbar and feeder bay(s) and 500 MVA 400/132 kV transformer with transformer bay). A single Substation hub is proposed to be combined with the Main Transmission Substation (MTS) or alternatively a 132kV line will connect the Substation hub with the MTS. To facilitate the connection of the proposed projects to the national grid, it is proposed that the electrical grid connection will likely comprise a new 400 kV Loop-In-Loop-Out (LILO) from the existing 400 kV Overhead Line (OHL) to the proposed MTS. The proposed LILO will be located at a point where the existing powerline crosses the study area/ project site. The proposed development of up to 2 x 132kV OHLs, including the Substation hub (at each WEF), running from each WEF up to the proposed Collector Station or Main Transmission Substation will be undertaken as separate Basic Assessments.

The construction of the MTS and LILO would require the following activities:
- Site clearing and levelling;
- Construction of access roads to the proposed substation site (where required);
- Construction of substation terraces and foundations;
- Assembly and installation of equipment (including transformers);
- Connection of conductors to equipment;
- Testing of equipment; and

- Rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Cognisance has been taken of the initial aquatic ecosystem constraints mapping in the placing of the EGI.

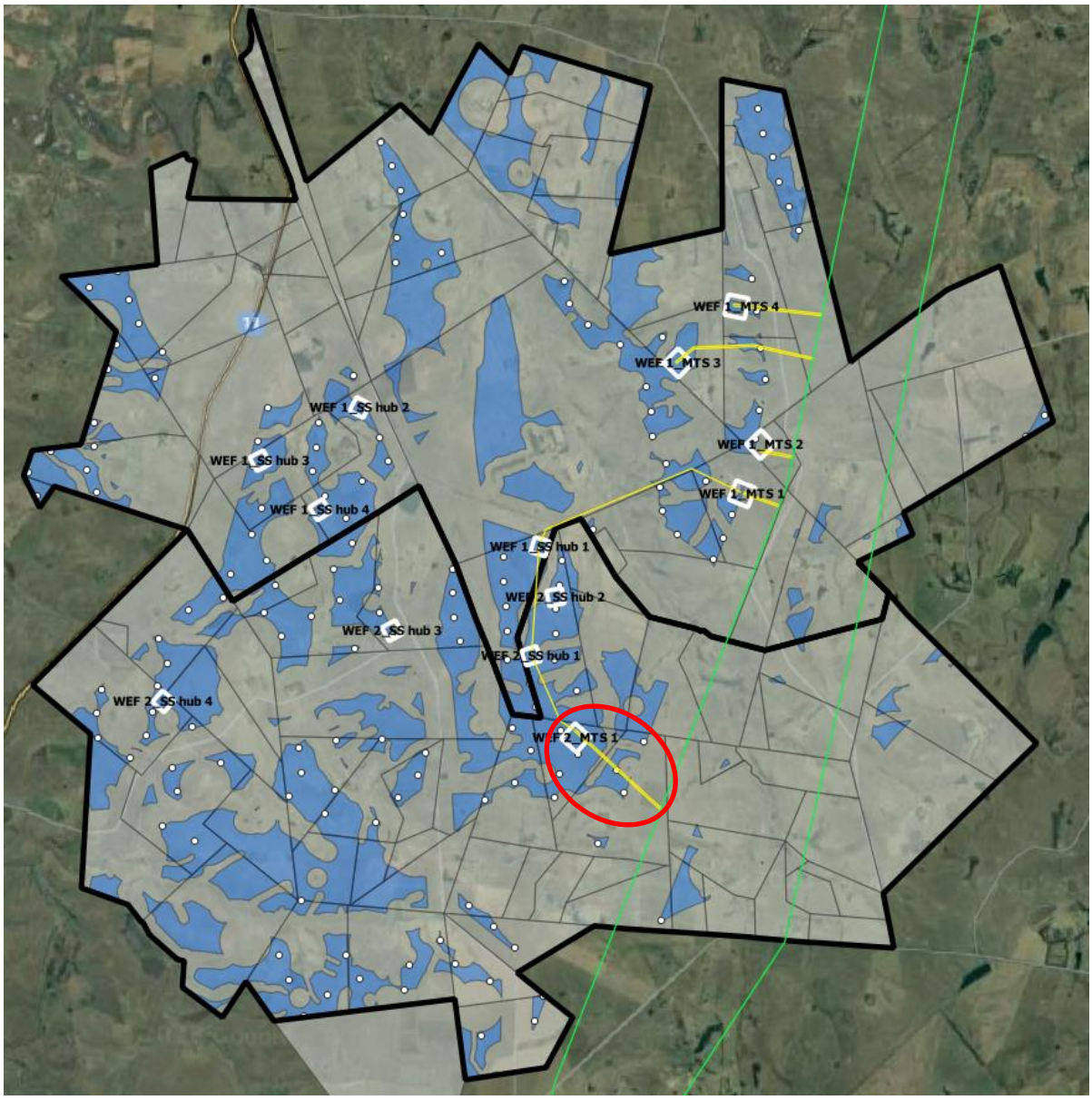

Figure 1. Proposed layout for the proposed Ujekamanzi WEF1 and WEF2 and associated EGI projects. The red oval indicates the focus area for this assessment.

4. Baseline Environmental Description

4.1. General Description

The grid connection for Ujekamanzi WEF2 is proposed to link up to the existing Eskom 400kV OHL that passes in a north-east to south-west direction through the eastern extent of the study area. The MTS is proposed to be located on Portion 8 of Farm Knelpoort No. 368 near Amersfoort in the Dr Pixley Ka Isaka Seme Local Municipality within the Mpumalanga Province.

The total extent of the larger Ujekamanzi WEF2 site is spread over several properties with a combined area of approximately 12 480 ha. The study area is in the Mesic Highveld Grassland Bioregion of the Grassland Biome near the Vaalbankspruit in the upper Vaal River Catchment. The Vaalbankspruit River

rises on the Elandsberg to the southeast of the study area and flows in the north-westerly direction to join the Vaal River approximately 11.5 km north of the study area. Details of the watercourses are provided in the table below.

Table 2. Water resource information related to the site assessed.

Descriptor	Name / Details
Water Management Area	Upper Vaal
Catchment Area	Tributaries of the Vaal River, of which Vaalbankspruit is the largest
Quaternary Catchment	C11E
Present Ecological State	Vaalbankpruit: B category (largely natural)
Ecological Importance and Ecological Sensitivity	Vaalbankspruit: High Importance and Sensitivity

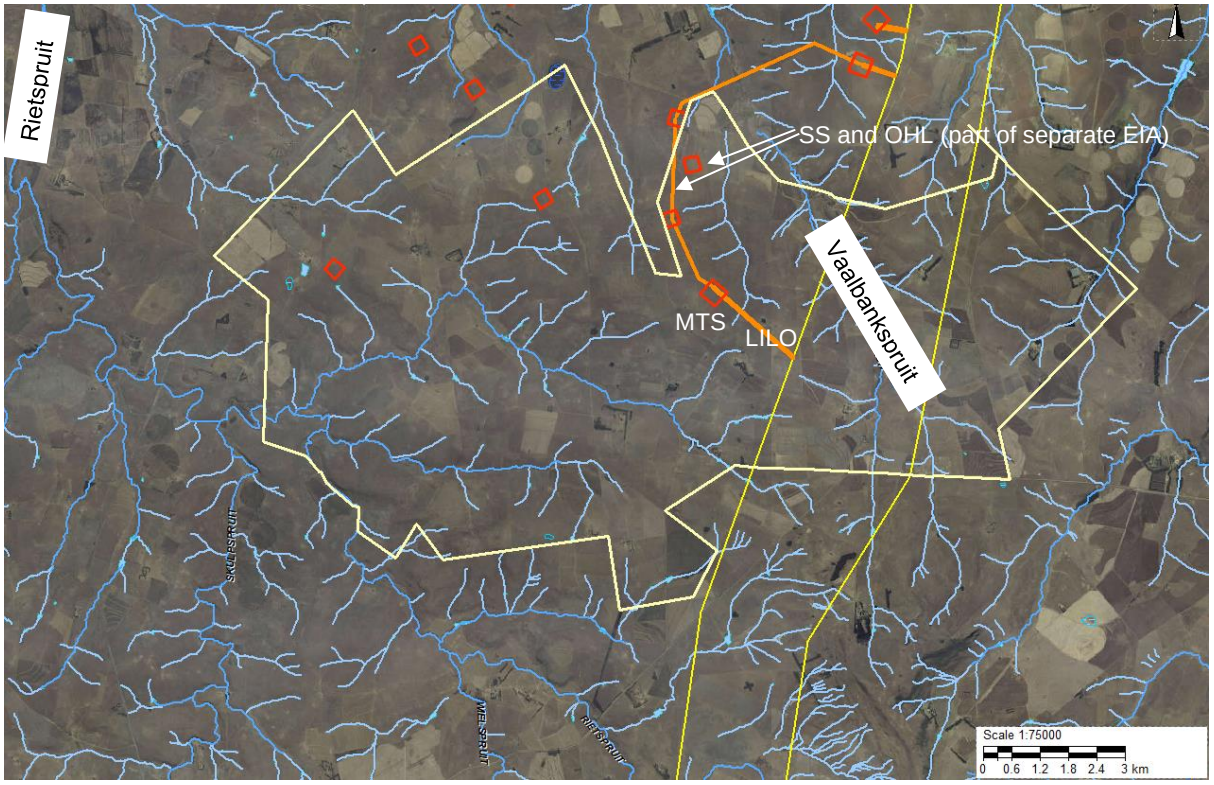

Figure 2. Rivers map for the study site (cream polygon represents the study boundaries) overlaid on a 2018 Orthophotograph of the area, with the associated grid connection infrastructure shown

Topography

The topography comprises low hills and undulating plains interspersed with tributaries of the upper Vaal River (Figure 3). Drainage in the study area is predominately north-westwards and associated with the Vaalbankspruit River. The altitude at the proposed MTS and LILO is on slightly higher areas of about 1740 m. The hilltops are orientated on a north-south orientation with the Vaalbankspruit River Valley draining in a north-westerly direction. The site is in the upper to middle reaches of the tributaries where the watercourses are relatively small.

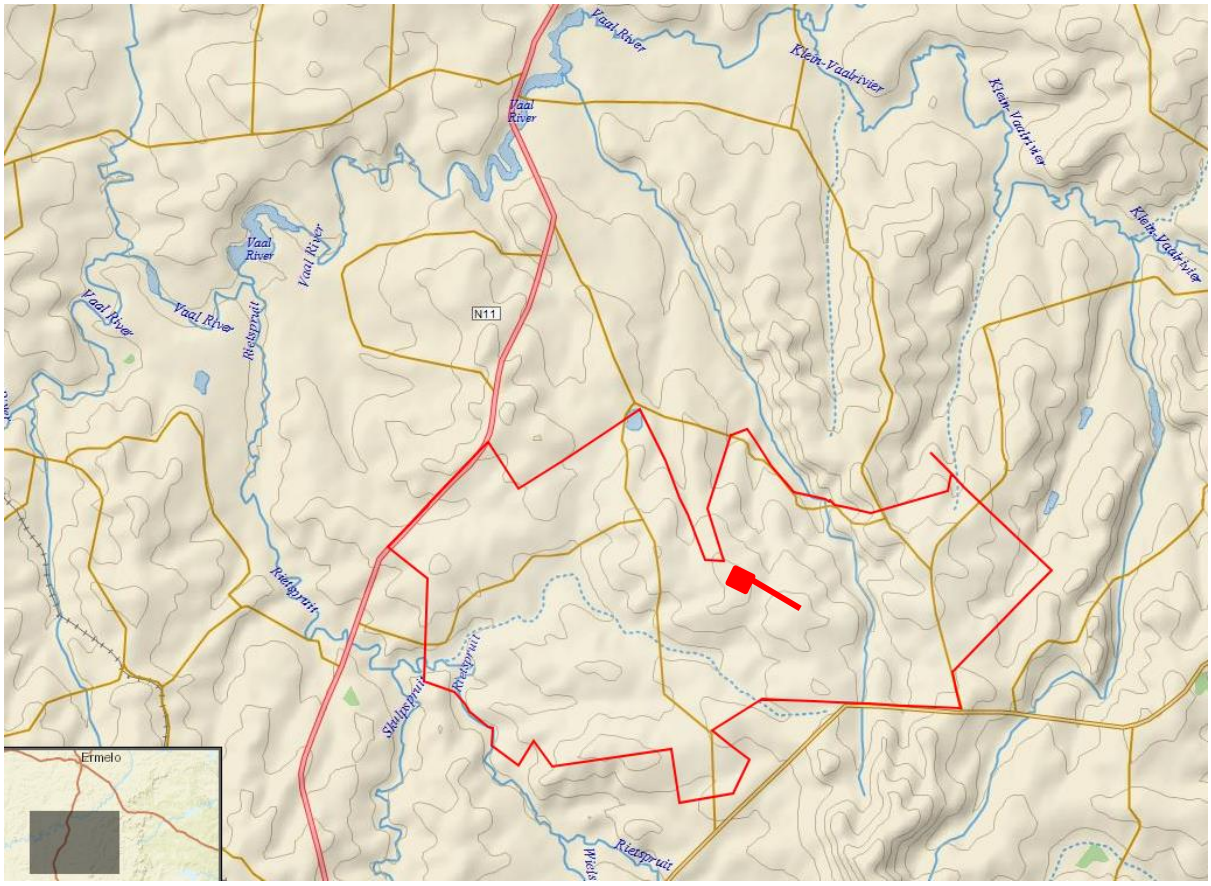

Figure 3. A map of the study area indicating the locality of the larger study area as well as the approximate location of the MTS and LILO (red line and polygon)

The geology of the area comprises dolerite of the Karoo Dolerite Suite in the south-western portion of the site and fine- to coarse-grained sandstone, shale, coal seams of the Vryheid Formation in the north-eastern portion. The associated soils are vertic clay soils that are often conducive to wetland formation but also have a high potential for erosion when dry. Alluvium occurs within the valleys and in particular along the larger watercourses.

Climate, Hydrology and Geohydrology

The area normally receives about 640mm of rain per year, mostly during summer. On average, it receives no rainfall in June and the highest rainfall (99mm) occurs in November and January (Figure 4). As a result of the very low rainfall in winter, the smaller rivers are seasonally flowing in the summer, however, most of the watercourses are fed from springs and do stay moist throughout the year (this is under natural conditions as today there are also several farm dams in the upper reaches of these watercourses that impede the low flow and usually result in the eroded and degraded lower reaches of the streams). The larger Vaalspruit River is perennial and is fed from its larger catchment as well as groundwater. Its tributaries are seasonally flowing.

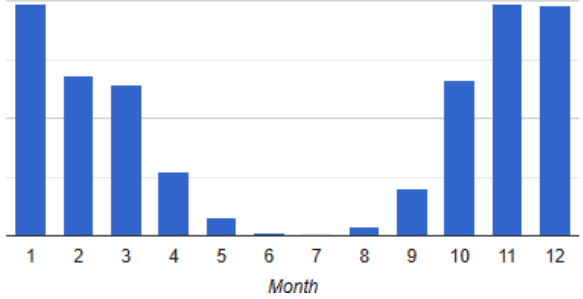

Figure 4. Average monthly rainfall pattern for the area (SA Atlas of Climatology and Agrohydrology, R.E. Schulze, 2009 – obtained from CapeFarmMapper, 2023)

The area does not lie within a strategic water source area for surface or groundwater. A minor intergranular and fractured aquifer occurs within the area, with the water table typically occurring at depths of more than 8.5 m below ground level and yields of less than 0.5 liters a second. The surface and groundwater quality is good, with natural electrical conductivity concentrations of less than 70 mS/m. The recharge of the aquifer is estimated to be about 30 to 40 mm/a. The aquifer has a medium to high susceptibility and vulnerability to contamination.

Vegetation

The natural vegetation of the study area is mapped as comprising Amersfoort Highveld Grassland vegetation (Least Concern) of the Mesic Highveld Grassland Bioregion. This vegetation reflects the highly variable landscape in which it occurs (undulating plains with dolerite outcrops) and comprises short grassland cover, dominated by *Themeda triandra* and often severely grazed (Mucina and Rutherford, 2006). Plants along the watercourses in the area include *Phragmites australis, Typha capensis, Pennisetum macrourum, Cyperus denudatus, Cyperus rigidifolius, Cyperus macranthus, Cyperus teneristolon, Cyperus erectus, Juncus exsertus, Scirpoides burkei, Pycreus polystachyos, Eleocharis limosa, Gunnera perpensa, Cotula anthemoides, Kniphofia albescens, Crinum graminicola, Zantedeschia albomaculata, Wahlenbergia undulata, Pericaria lapathifolia, Gomphostigma virgatum, Imperata cylindrica, Agrostis eriantha* and *Cynodon dactylon*. Invasive alien species occurring are *Eucalyptus* spp., black wattle *Acacia mearnsii*, grey poplars *Populus canescens*, and thistle *Cirsium vulgare.*

Biodiversity Importance of the Aquatic Features

Three sets of conservation mapping at a national, provincial and local scale are of relevance to the identification of aquatic features of ecological and biodiversity conservation importance. These are the 2011 National Freshwater Ecosystem Priority Areas (FEPA) map, the 2018 National Wetland Map (version 5), and the provincial Mpumalanga Biodiversity Sector Plan of Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).

FEPAs are intended to provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting the sustainable use of water resources. The river and wetland FEPAs are required to be maintained in a largely natural ecological state, while Fish Support Areas should not be allowed to degrade from their existing ecological condition. The Vaalbankspruit and adjacent Rietspruit River Sub-catchments are mapped as FEPA River sub-catchments while the Klein-Vaal River to the east of the study area is mapped as a Fish Support Area (Figure 5). The wider area also contains many FEPA wetlands and wetlands in the National Wetland Map (seeps, valley bottom and floodplain wetlands) that are associated with the rivers (Figure 6). There are also some natural depression wetlands (vernal ponds). There are no wetlands mapped at the site of the MTS. The LILO will need to cross a channelled valley bottom wetland associated with a smaller tributary of the Vaalbankspruit River.

In the Mpumalanga Biodiversity Sector Plan mapping (Figure 7), the larger rivers (Vaalbankspruit and Rietspruit) and associated valley bottom wetlands are mapped as Aquatic CBAs. The wider river corridors are also mapped as aquatic ESAs where it would be important to maintain ecological services. The proposed MTS and LILO are located within aquatic ESAs.

The study site lies mostly within an area in which the south-western half is considered Very high Aquatic Combined Biodiversity Sensitivity, and the north-eastern half has Low Aquatic Combined Biodiversity Sensitivity (Figure 8). The very high sensitivity is associated with the FEPA River sub-catchments of the Vaalbankspruit and Rietspruit Rivers. The larger rivers (Vaalbankspruit and Rietspruit) and associated valley bottom wetlands are mapped as Aquatic CBAs. The proposed MTS and LILO are located within the south-western portion considered Very high Aquatic Combined Biodiversity Sensitivity.

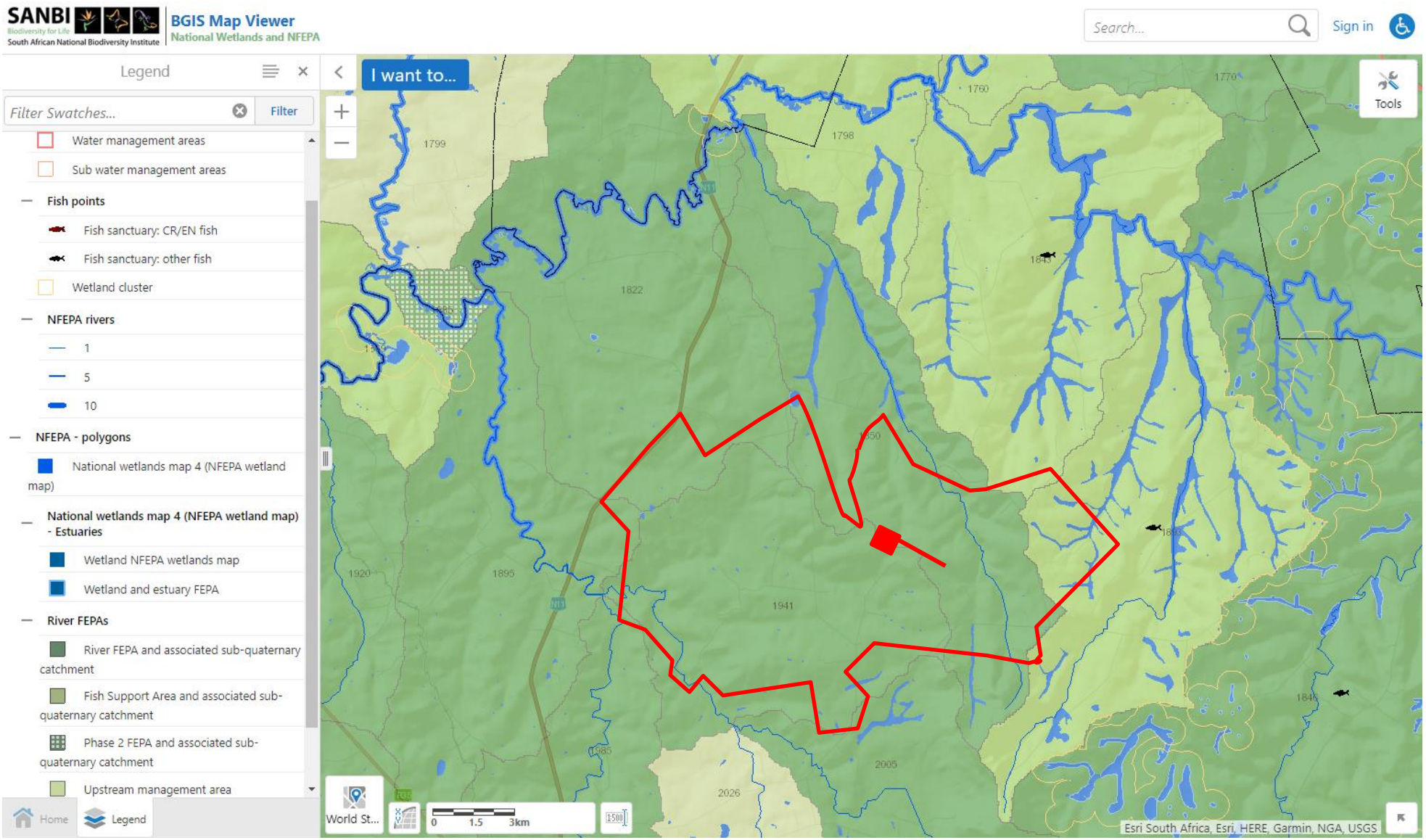

Figure 5. National Freshwater Ecosystem Priority Areas for the study site and the approximate location of the MTS and LILO (red line and polygon) (SANBI Biodiversity GIS, 2023)

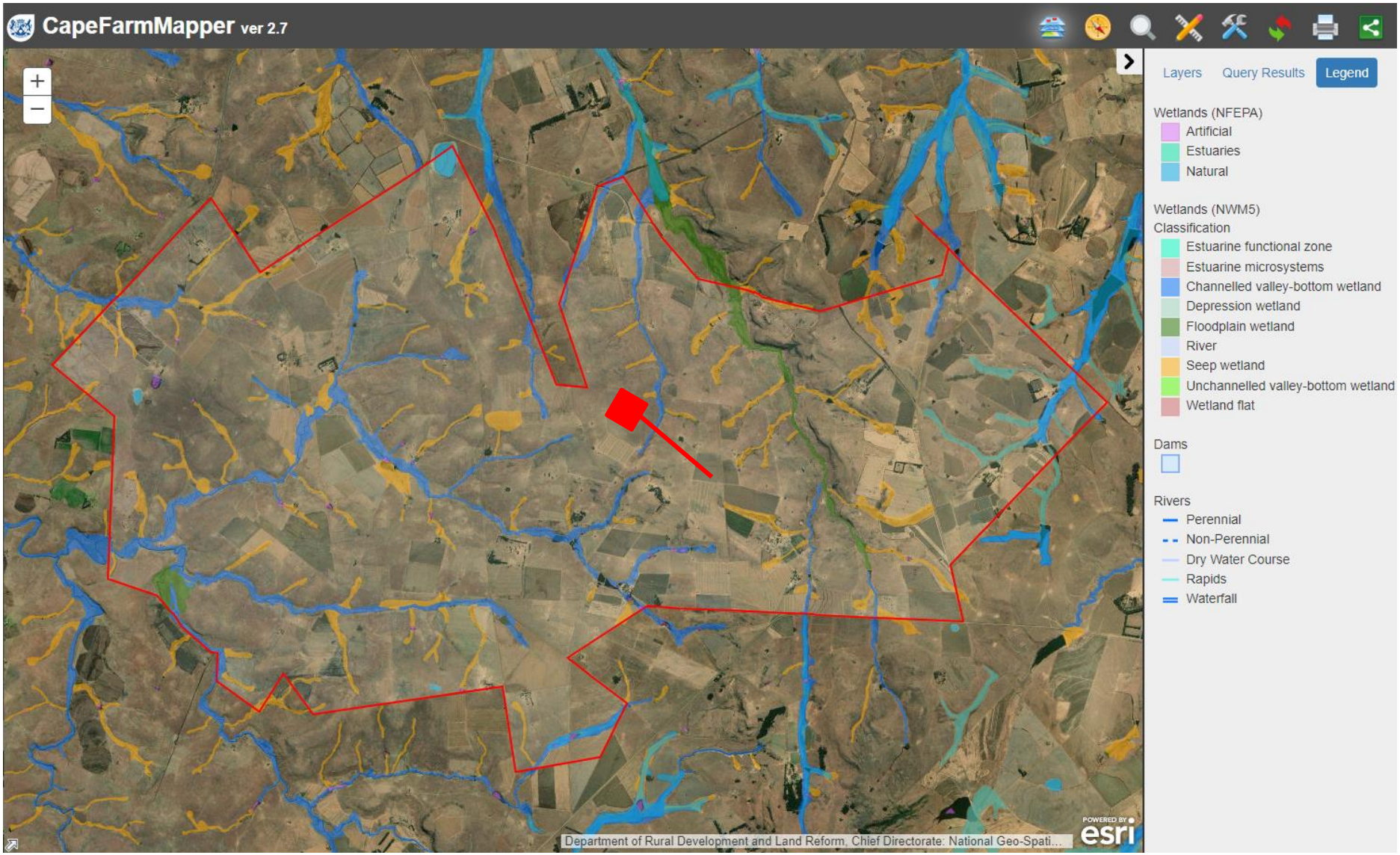

Figure 6. National Freshwater Ecosystem Priority Area wetland mapping and National Wetland Map version 5 mapping for the site and the approximate location of the MTS and LILO (red line and polygon) (obtained from CapeFarmMapper, April 2023)

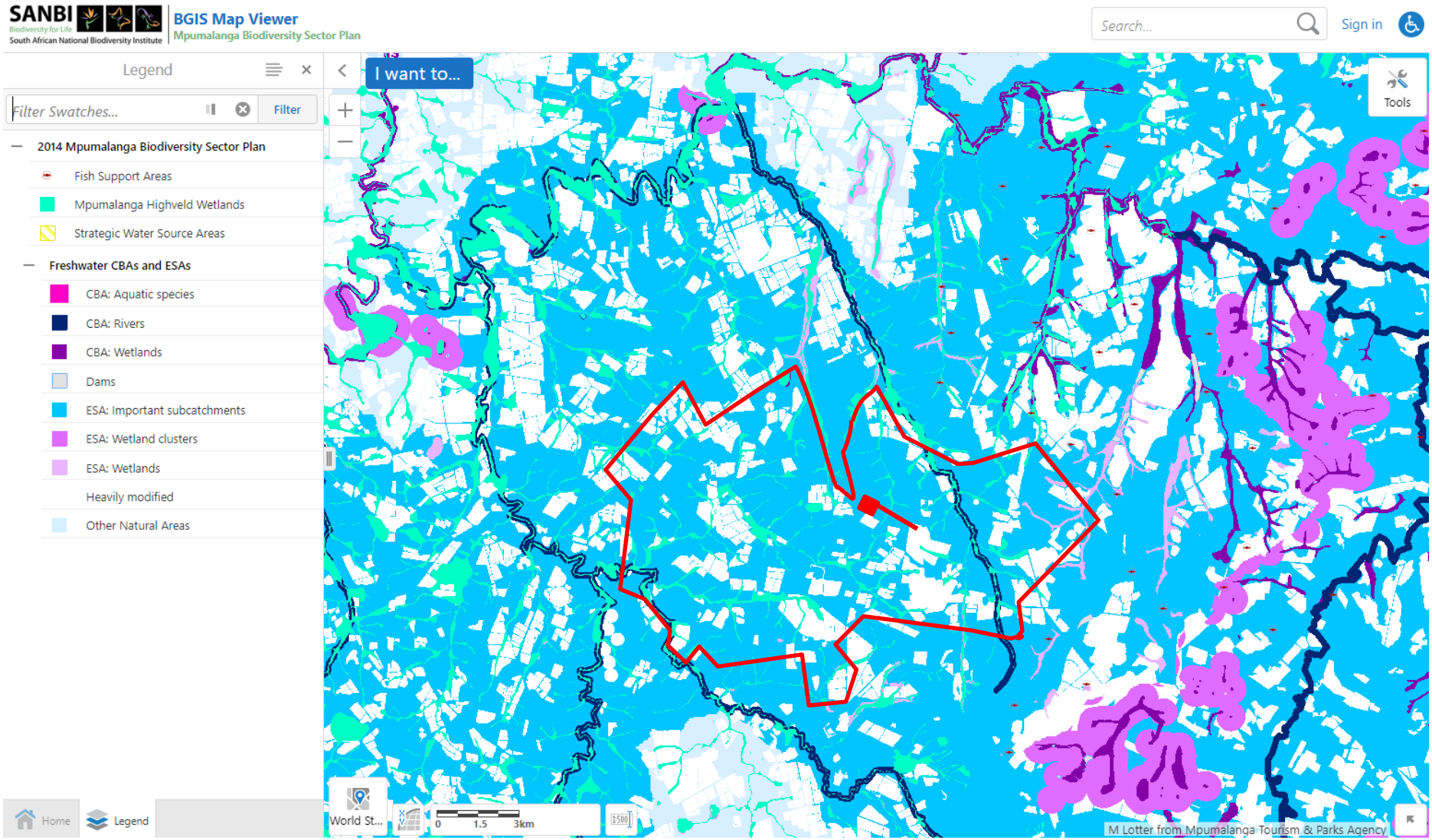

Figure 7. Mpumalanga Critical Biodiversity Areas map for the study site, where the red polygons indicate the study boundaries and the approximate location of the MTS and LILO (red line and polygon) (SANBI Biodiversity GIS, 2023)

MAP OF RELATIVE AQUATIC BIODIVERSITY THEME SENSITIVITY

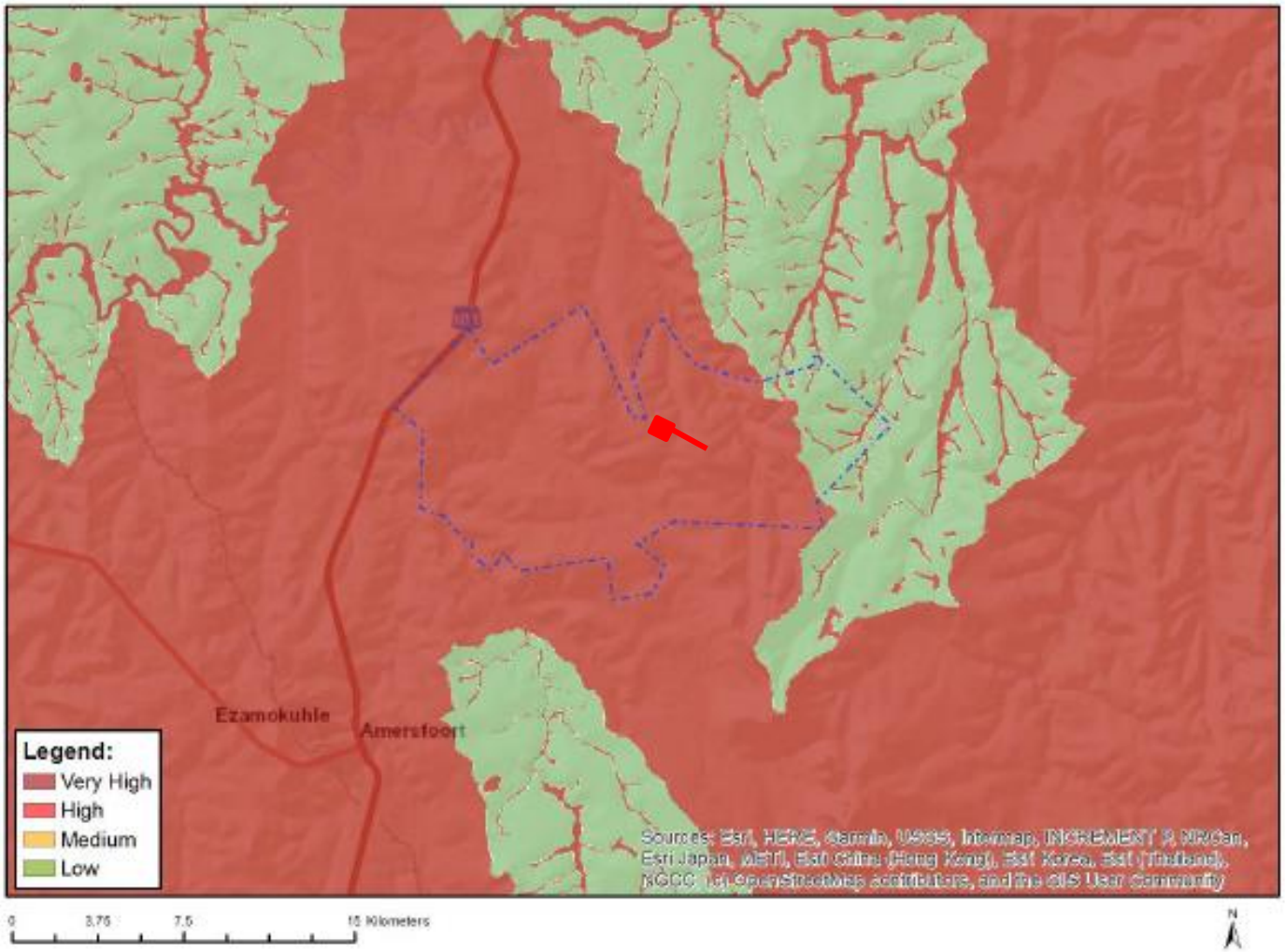

Figure 8. DFFE Screening Tool map for the mapped Aquatic Biodiversity Combined Sensitivity with the site (blue polygon) and the approximate location of the MTS and LILO (red line and polygon) shown

Landcover
The typical land cover of the area comprises a mix of natural grassland used for livestock grazing, fallow land and dryland crops. The town of Ermelo lies approximately 36 km to the north and Amersfoort lies approximately 10 km to the south. There are no formally protected areas near the site.

4.2. Aquatic Biodiversity and Ecosystems

Description of Aquatic Features
The aquatic features within the site comprise smaller tributaries of the Vaalbankspruit River. The Vaalbankspruit River rises on the Elandsberg to the southeast of the study area and flows in the north-westerly direction to join the Vaal River approximately 3 km north of the study area (Figure 1). The river is a tributary of the Vaal River that drains in a south-westerly direction along the northern edge of the site to eventually join the Orange River near Douglas more than 650 km south-west of the site.

Within the study area, the streams fall within the foothill zones of the Highveld Ecoregion. The larger watercourse in this region (Vaalbankspruit River) is a perennial river that flows throughout the year while its smaller tributaries flow seasonally. The larger river comprises a wide meandering river channel with associated valley bottom wetland areas. The distinct riparian and wetland vegetation comprises a mix of indigenous plants such as *Phragmites australis, Typha capensis, Pennisetum macrourum, Cyperus denudatus, Cyperus rigidifolius, Cyperus macranthus, Cyperus teneristolon, Cyperus erectus, Juncus exsertus, Scirpoides burkei, Pycreus polystachyos, Eleocharis limosa, Gunnera perpensa, Cotula anthemoides, Kniphofia albescens, Crinum graminicola, Zantedeschia albomaculata, Wahlenbergia undulata, Pericaria lapathifolia, Gomphostigma virgatum, Imperata cylindrica, Agrostis eriantha and Cynodon dactylon.* Invasive alien species occurring are *Eucalyptus spp.,* black wattle *Acacia mearnsii,* grey poplars *Populus canescens,* and thistle *Cirsium vulgare.* Images of the watercourses within the site are provided on the following pages.

Figure 9. View of the upper Vaalbankspruit River and associated valley bottom wetland in the south-eastern portion of the study area

Figure 10. View of the smaller tributaries of the Vaalbankspruit River with its associated valley bottom wetland that will be crossed by the proposed LILO

Site verification of the aquatic features at the site determined the watercourses to be perennial and seasonal streams that have been modified by the surrounding agricultural activities within or adjacent to watercourses, as well as flow modification associated with the number of instream dams that have been constructed in the upper reaches of the feeder streams where seeps often occur. In places, the flow modification has resulted in the development of erosion dongas within the stream channels. There has also been the removal of riparian vegetation which has been replaced with alien plants. The watercourses, as a result, are, in general, in a moderately modified condition instream and are often more impacted in their riparian zones. In places, however, there are still watercourses that are in a largely natural ecological condition.

Classification of aquatic features

The geomorphological and physical characteristics of the watercourses within the site can be classified as follows:

Table 3. Geomorphological and physical features of the watercourses on site

River	Larger Vaalbankspruit River	Minor unnamed tributaries
Geomorph Zone	Upper to Lower Foothill and Lowland Zones	
Lateral mobility	Unconfined to Semi-Confined	
Channel form	Single to multiple channels	
Channel pattern	Single or braided channel with moderate sinuosity	Moderate to low sinuosity
Channel type	Primarily Alluvium with some boulders	Alluvial and loamy soils with gravel
Channel modification	Channel is fairly natural to moderately modified with localised habitat and flow modifications	Localise disturbances to watercourses and associated habitats
Hydrological type	perennial	Seasonal
Ecoregion	Highveld	
DWA catchment	C11D and C11E	
Vegetation type	Amersfoort Highveld Grassland vegetation	
Rainfall region	Summer	

Present Ecological Condition

The evaluation of Habitat Integrity provides a measure of the degree to which a river has been modified from its natural state, in other words, an indication of the present ecological state (PES) of the watercourse. The methodology (DWAF, 1999) involves a qualitative assessment of the number and severity of anthropogenic perturbations on a river and the damage they potentially inflict upon the system. The severity of each impact is ranked using a six-point scale from 0 (no impact) to 25 (critical impact). The Habitat Integrity Assessment is based on an assessment of the impacts of two components of the river, the riparian zone and the instream habitat. The total scores for the instream and riparian zone components are then used to place the habitat integrity of both in a specific habitat category (Table 5).

Table 4. Instream Habitat Integrity assessment for the watercourses within the study area

Instream Criteria	Larger Rivers	Unnamed tributaries	Riparian Category	Larger Rivers	Unnamed tributaries
Water Abstraction	10	7	Vegetation Removal	12	12
Flow Modification	8	9	Exotic Vegetation	9	7
Bed Modification	7	12	Bank Erosion	8	9
Channel Modification	4	9	Channel Modification	4	9
Water Quality	7	8	Water Abstraction	7	6
Inundation	6	5	Inundation	6	5
Exotic Macrophytes	2	4	Flow Modification	8	8
Exotic Fauna	4	0	Water Quality	6	8
Rubbish Dumping	2	3			
Instream Integrity Class	C	C	Riparian Integrity Category	C	C/D

The habitat integrity assessment was divided into the smaller watercourses and the larger main watercourses (Vaalbankspruit River) within the study area. The ecological habitat integrity of the rivers within the study area is in general moderately modified with the image of adjacent agricultural activities impacting more on the riparian zones.

Table 5. Habitat Integrity categories (From DWAF, 1999)

Category	Description	Score (%)
A	Unmodified, natural.	90-100
B	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.	80-90
C	Moderately modified. A loss and change of natural habitat and biota have occurred but the basic ecosystem functions are still predominantly unchanged.	60-79
D	Largely modified. Large loss of natural habitat, biota & ecosystem function occurred.	40-59
E	The loss of natural habitat, biota and basic ecosystem functions is extensive.	20-39
F	Modifications have reached a critical level and the lotic system has been modified completely with an almost complete loss of natural habitat and biota. In worst instances, ecosystem functions have been destroyed and changes are irreversible.	0

Ecological Importance and Sensitivity

The Ecological Importance and Ecological Sensitivity (EI&ES) assessment for watercourses considers several biotic and habitat determinants surmised to indicate either importance or sensitivity. The determinants are rated according to a four-point scale that ranges from 1 (of local importance) to 4 (of national importance). The median of the resultant score is calculated to derive the EI&ES category (Table 6). The results of the EIS assessment are shown in Table 7.

Table 6. Ecological importance and sensitivity categories (DWAF, 1999)

EISC	General description	Median
Very high	Quaternaries/delineations unique on a national and international level based on unique biodiversity. The rivers are usually very sensitive and have little to no capacity for use.	>3-4
High	Quaternaries/delineations unique on a national scale based on biodiversity. The rivers may be sensitive to flow modifications and may have substantial capacity for use.	>2-≤3
Moderate	Quaternaries/delineations unique on a provincial/ local scale due to biodiversity. The rivers are not very sensitive to flow modification and have substantial capacity for use.	>1-≤2
Low/ marginal	Quaternaries/delineations not unique on any scale. The rivers are generally not very sensitive to flow modifications and usually have substantial capacity for use.	≤1

Table 7. Results of the EI&ES assessment of the watercourses in the study area

Biotic and Aquatic Habitat Determinants	Larger River	Unnamed tributaries
Rare and endangered biota	2.5	2
Unique biota	2.5	1
Intolerant biota	2	2
Species/taxon richness	2.5	1.5
Diversity of aquatic habitat types or features	2.5	2
Refuge value of habitat type	3	2

Sensitivity of habitat to flow changes	2.5	3
Sensitivity of flow related water quality changes	2	2.5
Migration route/corridor for instream & riparian biota	3	1
National parks, wilderness areas, Nature Reserves & areas, PNEs	2	1.5
EIS CATEGORY	High/very high	Moderate

The larger rivers on the valley floors are deemed to be of high/very high importance. They are usually associated with valley bottom wetlands and provide valuable habitat for biota. They also provide important corridors for the movement of biota. These larger watercourses, with their associated wetland habitat, are also particularly sensitive to disturbance and changes to flow. The smaller watercourses draining the valley sites are of lesser ecological importance. However, they are often associated with hillslope seeps that drain into the larger streams and are very sensitive to disturbance. The isolated depression wetlands are also deemed to be of high/very high ecological importance and sensitivity.

Several amphibian species, such as the striped stream frog *Stronylopus fasciatus*, common river frog *Amietia delalandii*, Platanna *Xenopus laevis,* Senegal running frog *Kassina senegalensis*, Boettger's dainty frog or common caco *Cacosternum boettgeri*, Tremolo-Tandy-Confused Sand Frog Complex *Complex Tomopterna tandyi*, guttural toad *Sclerophys gutturalis* have been recorded in the wider area. All the amphibian species are listed as 'Least concern'.

Fish species occurring in the larger perennial rivers in the area include:

Taxon	Origin	Endemism	Cons. Status (Global)
Enteromius anoplus	Native	Subregional endemic	Least concern
Labeo capensis	Native	Regional endemic level 2	Least concern
Labeobarbus aeneus	Native	Regional endemic level 2	Least concern
Pseudocrenilabrus philander	Native	Subregional endemic	Least concern
Tilapia sparrmanii	Native	Widespread	Least concern
Clarias gariepinus	Native	Widespread	Least concern

Recommended Ecological Condition of Aquatic Ecosystems

The water resource classes and resource quality objectives have been gazetted for the Upper Vaal Catchment (Government Gazette No 39943, dated 22 April 2016). The larger watercourses in quaternary C11D and C11E have a recommended ecological category of moderately modified (C category). Considering the moderately modified ecological condition of the aquatic ecosystems within the study area and their moderate to high ecological importance and ecological sensitivities, the recommended ecological condition (REC) of these features would be that they at least remain in their current ecological condition or are improved where possible. This would be in line with the recommended resource class. Where localised impacts to the watercourses have taken place, the habitat integrity of the watercourse has been reduced in places however these impacts are direct habitat disturbances and do not impact the overall ecological integrity or ecological importance and sensitivity of the watercourses.

4.3. Aquatic Habitat and Species of Concern

The larger river on the valley floor is deemed to be of high/very high importance. This importance is largely associated with aquatic habitat. The rivers are usually associated with valley bottom wetlands and provide valuable habitat for many aquatic biota. As mentioned above, the aquatic biota occurring in the rivers are all listed as being of 'Least Concern'.

The rivers provide important corridors for the movement of biota. These larger watercourses, with their associated wetland habitat, are particularly sensitive to disturbance and changes to flow. The smaller watercourses draining the valley sites are of lesser ecological importance. However, they are often associated with hillslope seeps that drain into the larger streams and are very sensitive to disturbance. The isolated depression wetlands are also deemed to be of high/very high ecological importance and sensitivity. It can thus be said that this assessment concurs with the Screening Tool mapping for the site in that all of the aquatic features within the study area are of high importance.

4.4. Specialist Sensitivity Analysis and Verification

The site visit confirmed that the larger Vaalbankspruit River and many of its larger tributaries within the site are in a moderately modified ecological condition and are of high ecological importance and sensitivity due to the wetland habitats associated with these watercourses that are very sensitive to impact and help provide important ecological corridors in the landscape for the movement of biota.

Based on the PES, EIS and REC determined in the previous section, buffers have been recommended to protect these ecosystems. The recommended buffer area between the aquatic features and the project components (MTS and LILO) to ensure these aquatic ecosystems are not impacted by the proposed activities, is at least 50m from the delineated edge of the river channels in the case of the larger watercourses or from the centre of the stream for the smaller watercourses. Figure 11 provides the aquatic ecosystem sensitivity mapping for the site.

Figure 11. Google Earth image with the Aquatic Ecosystem Sensitivity mapping where the green area indicates low sensitivity, the yellow the moderate sensitivity and the red the high sensitivity areas. The location of an existing farm roads as a potential access road to the MTS and LILO is shown by the cream lines

Sensitivity Analysis Summary Statement

This assessment thus largely concurs with the **Very high** Aquatic Biodiversity Combined Sensitivity mapping of the screening tool for the larger Vaalbankspruit River with its associated tributaries and wetland areas. The surrounding catchments, after taking into account the recommended 50m areas are considered as of **Low** Aquatic Biodiversity Combined Sensitivity. The site verification report is included in Appendix C.

5. Alternative Development Footprints

The proposed development layout has considered the aquatic ecosystem constraints such that the proposed MTS is located outside of the aquatic features and the recommended buffer areas. The LILO will be able to span (approx. 200m) the very high mapped wetland area associated with a tributary of the Vaalbankspruit River such there would be no potential aquatic ecosystem impact. While one could shift the MTS slightly southwards to avoid crossing the watercourse with the LILO, this is felt to be unnecessary given the potential low impact of the LILO crossing the watercourse. Thus any layout alternative that

contains the MTS outside of the mapped high sensitivity aquatic features and the recommended buffers would have equal (very low) potential aquatic ecosystem impacts. It is however recommended that the existing farm road (cream line shown in Figure 11) that crosses just south of the watercourse be used to access the proposed LILO and limit any potential impact on this more sensitive aquatic ecosystem.

The No-go Alternative would imply that the proposed EGI is not developed and that the status quo is maintained. This would imply that, if approved, the WEF would not be able to connect to Eskom OHL and the existing land use practice and the current activities with their associated aquatic ecosystem impacts would remain as is. The current land use activities have resulted in the present ecological condition of the aquatic features of moderately modified. It can be expected that the aquatic features will remain in the present ecological condition or even deteriorate as the observed trend in the ecological state of the aquatic ecosystems is negative. The proposed development provides the opportunity for some potential ecological improvement.

6. Issues, Risks and Impacts

6.1. Identification of Potential Impacts/Risks

The potential impacts identified during this basic freshwater assessment are as follows:

Construction Phase: **Direct Impacts**: Disturbance or Loss of riparian vegetation and aquatic habitat; increased water use and water quality impacts (largely sedimentation)
Operational Phase**:** **Direct Impacts:** Aquatic habitat disturbance **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems; modification of surface water runoff and alien vegetation invasion in aquatic features
Decommissioning Phase**:** **Direct Impacts:** Disturbance of aquatic habitats and water quality impacts.
Cumulative impacts**:** **Indirect Impacts:** Degradation of the ecological condition of aquatic ecosystems.

Most of the potential aquatic ecosystem impacts of the proposed WEF grid connection are likely to take place during the construction phase. These potential impacts and the associated issues identified include:

1. Disturbance of aquatic habitats within the watercourses with the associated impacts on sensitive aquatic biota. Construction activities within the watercourses could result in the disturbance or destruction of sensitive habitats and any listed and or protected plant or animal species. No aquatic obligate species were observed on the MTS site. The construction activities would thus be unlikely to modify the aquatic habitat and biota to such an extent that the present or future desired state of the watercourses would be compromised provided that the activities remain outside of the areas of high aquatic sensitivity.

2. Demand for water for construction could place stress on the existing available water resources. The associated water requirements are however likely to be low and are only during construction. The General Authorisation for groundwater abstraction has a limit of 75 m^3/ha/a for the associated property area where the water would be abstracted. The limit in the General Authorisation for surface water is 2000 m^3/a per property. An additional capping limit of no more than 40 000 m^3/a per property may be taken in terms of the general authorisation. The water consumption for the proposed works should be within the ambit of the General Authorisation.

3. Alien vegetation infestation within the aquatic features due to disturbance. The current presence of alien vegetation on the site is limited. Sources of alien seed should be prevented from being brought onto the site with imported materials. Monitoring post-construction for the growth of alien vegetation can mitigate this potential impact.

4. Increased sedimentation and risks of contamination of surface water runoff during construction. During construction, the earthworks near watercourses will expose and mobilise soil as well as construction materials and chemicals that may end up in the water resources. Any spills during transport or while works are conducted in proximity to a watercourse also have the potential to affect

the surrounding biota. Given the low rainfall in the area, if the works are undertaken during the drier periods of the year, this impact would be unlikely.

During the operational phase of the proposed EGI, potential impacts would include:

1. Ongoing disturbance of aquatic features and associated vegetation along access roads or adjacent to infrastructure that needs to be maintained. As for the disturbance of aquatic features described under construction impacts, the disturbance of aquatic habitat is likely to be very localised and would not impact the larger aquatic ecosystem.

2. Modified runoff characteristics from hardened surfaces at the MTS have the potential to result in erosion. Limited hardening of surfaces will take place as a result of the proposed projects. Increased sedimentation and risks of contamination of surface water runoff may also occur.

During the decommissioning phase, the potential impacts would largely be associated with an increased disturbance of aquatic habitat due to the increased activity on the site. Increased sedimentation and risks of contamination of surface water runoff may also occur.

The cumulative impact of the project activities together with the existing activities in the area could have the potential to reduce the integrity of the watercourses if not properly mitigated and managed. By implementing suitable buffers (50m from the delineated edge of the larger streams (including their associated wetland areas) or the centre of the smaller watercourses is recommended) along the watercourses and minimising the works within the river/stream corridors the impact of the proposed project activities would be low and unlikely to impact on the integrity of the aquatic ecosystems.

No consultation process was deemed to be required during preparing this baseline freshwater specialist report.

6.2. Summary of Issues Identified during the Public Consultation Phase

No aquatic ecosystem issues have as yet been raised.

7. Impact Assessment

The identified impacts have been assessed in this Section, with respect to the proposed layout components and the sensitivity of the aquatic habitats observed.

The proposed EGI has the potential to impact the freshwater features if located within or immediately adjacent to the aquatic features. As there is some flexibility relating to the exact location of the pylons for the LILO and the MTS within a large project site, it is usually easy to mitigate the impact of the proposed EGI on the freshwater features within the site by locating the infrastructure sufficiently far enough away from the freshwater features. This approach has been taken with the proposed buildable areas layout, where all the areas are located outside of the recommended buffers to the aquatic features. Thus, it is usually the associated infrastructure that potentially impacts more on the freshwater features, since the LILO usually need to cross freshwater features. Such crossings and disturbances of the freshwater features need to be minimised and mitigated as far as possible, with use being made of existing roads and river crossings.

7.1. Potential Impacts during the Construction Phase

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts

Activities during the construction phase of the project could also be expected to result in some disturbance of soil and vegetation cover. Only a limited amount of water is utilised during construction (12 to 18-month period). A construction camp with a temporary laydown area would likely need to be placed within the site

for the construction works. There is thus also the potential for some water quality impacts associated with construction activities on the site. The location of the proposed works is located sufficiently far from the delineated aquatic features that they do not pose any significant risk to the aquatic features.

Proposed mitigation:

- A buffer of up to 50 m between the delineated aquatic ecosystems and the proposed project activities should be maintained as far as possible. Clearing of indigenous vegetation should be avoided within the aquatic features and the recommended buffers.
- The existing road infrastructure should be utilised as far as possible to minimise the overall disturbance. An access road for the LILO should avoid crossing the watercourse corridor and should make use of existing farm roads.
- During the construction phase, site management must be undertaken at the laydown and construction areas. This should specifically address on-site stormwater management and prevention of pollution measures from any potential pollution sources during construction activities.
- Any stormwater that does arise within the construction sites must be handled appropriately to trap sediments and reduce flow velocities where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

7.2. Potential Impacts during the Operational Phase

Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance, modification of surface water runoff and alien vegetation invasion in aquatic features

During the operation phase, change to the runoff characteristics along the access road and in the developed areas may lead to increased erosion and sedimentation of the adjacent areas. An impact of negligible significance post-mitigation may occur in terms of its impact on aquatic ecosystems in the area.
Proposed mitigation:

- Any disturbance during the operation phase should be limited to the approved gridline servitude and should avoid disturbance of the soil and natural vegetation cover.
- Invasive alien plant growth and signs of erosion should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- The project infrastructure and access roads must be designed to mitigate the stormwater runoff impacts leaving the developed areas. The runoff should rather be dissipated over a broad area covered by natural vegetation or managed using appropriate shaping of the road with berms or channels and swales adjacent to hardened surfaces where necessary.

Significance of impacts after mitigation: The overall significance of the impact on the aquatic ecosystems is expected to be very low.

7.3. Potential Impacts during the Decommissioning Phase

Aquatic habitat disturbance and water quality impacts
During decommissioning, the potential freshwater impacts will be very similar to that of the Construction Phase, although the potential for water quality and flow-related risks will be lower.

Proposed mitigation:

- During decommissioning, disturbance to the freshwater ecosystems should be limited as far as possible.

- Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.

7.4. Consideration of alternatives

As stated in Section 5, the location of all of the proposed MTS alternatives for the proposed project have been placed outside of the aquatic no-go areas, including the recommended buffers from the aquatic features, as such all proposed MTS alternatives would have a potential aquatic ecosystem impact of very low to negligible significance. The LILO will be able to span the medium and very high sensitivity mapped wetland areas such that the potential aquatic ecosystem impacts remain low. There is no preference with regards to the proposed substation alternatives. It is however recommended that the existing access road be used if watercourses need to be crossed and limit any additional potential impact from access roads.

The No-go Alternative would imply that existing land use practice and the current activities with their associated aquatic ecosystem impacts would remain as is. It can be expected that the potential aquatic impact would be negative and of a low significance.

7.5. Cumulative Impacts

The typical land cover of the area comprises a mix of natural grassland used for livestock grazing, fallow land and dryland crops. Current land and water use impacts on the Vaalbankspruit River with its associated tributaries and wetland areas within the larger study area have resulted in their current ecological condition of moderately modified. The nature of the proposed grid connection for the WEF project allows it to have minimal impact on the surface water features since the associated infrastructure can be placed far enough away from the freshwater features so as to not impact them.

The largest potential impact of these projects is as a result of the associated infrastructure which can be mitigated such that its impact on the aquatic ecosystems will be of a low significance. For the project concerned, the proposed activities will be located outside of the watercourses and buffers and it is proposed to use existing roads where possible. ***One could thus expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.***

In terms of other renewable energy projects within 35km of the associated WEF for the EGI, the only project (approved) is a 65MW solar PV facility at Majuba Power Station. The project is a relatively small project in the catchment of the Geelklipspruit a tributary of the Vaal River in quaternary catchment C11J, more than 20 km south-west of the current project. The cumulative impacts of renewable energy projects on the larger river system would be negligible. It is however highly recommended that there also be an attempt to reduce the erosion potential of the rivers in the wider area through some reshaping and rehabilitation of the watercourse corridors by revegetating them with suitable indigenous vegetation and removal of invasive alien species.

7.6. Summary of Impact Tables for Construction, Operation and Decommissioning Phases

The summary tables for the various impacts identified during the construction, operation and decommissioning phases of the proposed project are provided on the following pages.

Impact Summary Tables: Construction, Operation and Decommissioning Phases

Table 8. Impact table for the potential aquatic biodiversity impacts of the project during the construction, operation and decommissioning phases

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		Extent [E]	Probability [P]	Reversibility [R]	Irreplaceable loss of resources [I]	Duration [D]	Intensity / Magnitude [I / M]	TOTAL	STATUS	Significance Rating [S]		E	P	R	L	D	I / M	TOTAL	STATUS	
Construction Phase																				
Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance and water quality impacts	Construction within or adjacent to aquatic habitats	1	2	2	2	2	2	18	N	Low	Minimise any works within aquatic ecosystems	1	1	2	2	2	1	8	N	Low
Operation Phase																				
Degradation of the ecological condition of aquatic ecosystems; aquatic habitat disturbance, modification of surface water runoff and alien vegetation invasion in aquatic features	Operation and maintenance of EGI infrastructure	1	2	1	1	2	1	7	N	Low	The moderate to high sensitivity aquatic habitats should be avoided in the layout design such that it is only the low sensitivity habitats that would be disturbed during construction. The disturbance of these habitats would only result in a slight (negligible) alteration to aquatic ecosystems and processes.	1	2	1	1	2	1	7	N	Low
Decommissioning Phase																				
Aquatic habitat disturbance and water quality impacts	Decommissioning activities within or adjacent to aquatic habitats	1	2	1	1	1	1	6	N	Low	Minimise works within aquatic ecosystems as far as possible. If the layout of the MTS and LILO has avoided these areas, the decommissioning of the EGI would also be able to avoid aquatic habitats on the property. Rehabilitate disturbed areas.	1	2	1	1	1	1	6	N	Low

Impact Summary Tables: Cumulative Impacts

Table 9. Impact table for the potential cumulative aquatic biodiversity impacts of the project during the construction, operation and decommissioning phases

ENVIRONMENTAL PARAMETER	ISSUE / IMPACT / ENVIRONMENTAL EFFECT/ NATURE	ENVIRONMENTAL SIGNIFICANCE BEFORE MITIGATION									RECOMMENDED MITIGATION MEASURES	ENVIRONMENTAL SIGNIFICANCE AFTER MITIGATION								
		Extent [E]	Probability [P]	Reversibility [R]	Irreplaceable loss of resources [I]	Duration [D]	Intensity / Magnitude [I / M]	TOTAL	STATUS	Significance Rating [S]		E	P	R	L	D	I / M	TOTAL	STATUS	
Cumulative																				
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Construction activities within or adjacent to aquatic habitats	1	2	1	2	2	2	16	N	Low	Minimise works within aquatic ecosystems as far as possible. Construct in the dry season. Rehabilitate disturbed areas. Rationalise infrastructure as far as possible by sharing of the infrastructure of using existing disturbed areas. Manage stormwater impacts	1	2	1	2	2	1	8	N	Low
Degradation of ecological condition of aquatic ecosystems	Operation and maintenance of renewable energy facility and associated infrastructure	1	1	1	2	2	2	14	N	Low	Monitor and manage for impacts such as alien vegetation growth and erosion. Limit disturbance and rehabilitate disturbed areas. Ensure there is sufficient stormwater management to prevent erosion along roads. Ensure road crossings structures are properly designed to not result in blockage in the watercourses or erosion. Limit and monitor water use.	1	1	1	2	2	1	7	N	Low
Increased disturbance of aquatic habitat due to the increased activity in the wider area	Decommissioning activities within or adjacent to aquatic habitats	1	2	1	2	2	2	16	N	Low	Decommission works near aquatic features should preferably be undertaken in the dry season. Minimise disturbance and rehabilitate.	1	2	1	2	2	1	8	N	Low

8. Impact Assessment Summary

This section provides the overall impact significance findings, following the implementation of the proposed mitigation measures. These are shown in the table below:

Table 10: Overall Impact Significance (Post Mitigation)

Phase	Overall Impact Significance
Construction	Low
Operational	Low
Decommissioning	Low
Nature of Impact	Negative
Cumulative - Construction	Low
Cumulative - Operational	Low
Cumulative - Decommissioning	Low

9. Legislative and Permit Requirements

The proposed activity needs to take cognizance of the legislative requirements, policies, strategies, guidelines and principles of the relevant regulatory documents of the Gert Sibanda District or Dr Pixley Ka Isaka Seme Local Municipality, as well as the National Water Act (NWA) and the National Environmental Management Act (NEMA).

9.1 The National Environmental Management Act (Act No. 107 of 1998)

NEMA is the overarching piece of legislation for environmental management in South Africa and includes provisions that must be considered to give effect to the general objectives of integrated environmental management.

Chapter Seven of the NEMA states that:
"Every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment".

The Act also clearly states that the landowner, or the person using or controlling the land, is responsible for taking measures to control and rectify any degradation. These may include measures to:
"(a) investigate, assess and evaluate the impact on the environment;
(b) inform and educate employees about the environmental risks of their work and the manner in which their tasks must be performed in order to avoid causing significant pollution or degradation of the environment:
(c) cease, modify or control any act, activity or process causing the pollution or degradation:
(d) contain or prevent the movement of pollutants or degradation: or
(e) eliminate any source of pollution or degradation: or
(f) remedy the effects of the pollution or degradation."

9.2 NEMA Environmental Impact Assessment Regulations, 2014, as amended

NEMA provides for the identification of activities that will impact the environment, in terms of Section 24. These activities were promulgated in terms of Government Notice No. R. 324, 325 and 327, dated 4 December 2014, as amended, and requires environmental authorisation. The impacts of the listed activities must be investigated in April 2017, assessed and reported to the competent authority before

authorisation to commence with such listed activities can be granted. The specialist report is intended to inform the environmental authorisation process under NEMA.

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

The purpose of the National Water Act, 1998 (NWA) is to provide a framework for the equitable allocation and sustainable management of water resources. Both surface and groundwater sources are redefined by the Act as national resources which cannot be owned by any individual, and rights which are not automatically coupled to land rights, but for which prospective users must apply for authorisation and register as users. The NWA also provides measures to prevent, control and remedy the pollution of surface and groundwater sources.

The Act aims to regulate the use of water and activities (as defined in Part 4, Section 21 of the NWA), which may impact water resources through the categorisation of 'listed water uses' encompassing water abstraction and flow attenuation within catchments as well as the potential contamination of water resources, where the DWS is the administering body in this regard. Defined water use activities require the approval of DWS in the form of a General Authorisation (GA) or WUL. There are restrictions on the extent and scale of listed activities for which General Authorisations apply.

Section 22(3) of the NWA allows for a responsible authority (DWS) to dispense with the requirement for a WUL if it is satisfied that the purpose of the Act will be met by the grant of a licence, permit or authorisation under any other law.

9.3.1 Regulations requiring that a water user be registered, GN R.1352 (1999)

Regulations requiring the registration of water users were promulgated by the Minister of Water Affairs in terms of provisions made in Section 26(1)(c), read together with Section 69 of the National Water Act, 1998. Section 26(1)(c) of the Act allows for registration of all water uses including existing lawful water use in terms of Section 34(2). Section 29(1)(b)(vi) also states that in the case of a GA, the responsible authority may attach a condition requiring the registration of such water use. The Regulations (Art. 3) oblige any water user as defined under Section 21 of the Act to register such use with the responsible authority and effectively apply for a Registration Certificate as contemplated under Art.7(1) of the Regulations.

9.3.2 General Authorisations in terms of Section. 39 of the NWA

According to the preamble to Part 6 of the NWA, 1998, "This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette…" and further states that "The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary…"

The GAs for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA were revised in 2016 (Government Notice R509 of 2016). The proposed works within or adjacent to the wetland areas and river channels are likely to change the characteristics of the associated freshwater ecosystems and may therefore require authorization. Determining if a water use licence is required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a GA. A risk assessment has been undertaken for the proposed Ujekamanzi WEF2 EGI and is discussed below.

The GAs for groundwater use in Quaternary Catchment C11D and C11E has a limit of 75 m^3/ha/a for the associated property area where the water would be abstracted. The limit in the General Authorisation for surface water is 2000 m^3/a per property. An additional capping limit of no more than 40 000 m^3/a per property may be taken in terms of the general authorisation. In general, the water consumption for the proposed EGI is low enough that it could be within the ambit of the GAs.

Risk Assessment

A risk assessment was carried out for the proposed Ujekamanzi WEF2 EGI (MTS and LILO). The assessment indicates the level of risk certain activities pose to freshwater resources where the outcomes are used to guide decisions regarding water use authorisation of the proposed activity. A summary of the potential risks can be seen in Table 11. The risk rating classes can be seen in Table 12.

Table 11: Summary risk assessment for the proposed project

Phases	Activity	Impact	Likelihood	Significance	Risk Rating
Construction	Construction works associated with EGI	Loss of biodiversity & habitat, impeding flow & water quality impact	12	51	L
Operation	Operational activities associated with EGI	Disturbance to aquatic habitat - Facilitation of erosion and invasion by alien plants	12	36	L
Decommission	Removal of EGI infrastructure	Habitat disturbance and some flow and water quality impacts	12	36	L

Table 12: Risk rating classes for the Risk Assessment

RATING	CLASS	MANAGEMENT DESCRIPTION
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input. Wetlands are excluded.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

The risk assessment determined that the proposed EGI poses a low risk of impacting aquatic habitat, water flow and water quality. With these findings of the risk assessment, the water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

10. Environmental Management Programme Inputs

Very limited impact mitigation, monitoring or management actions and outcomes will be necessary for inclusion in EMPr as the proposed layout for the works has taken into consideration the aquatic ecosystem constraints and avoids the delineated aquatic ecosystems as well as the recommended buffer of up to 50 m between the significant aquatic features and the proposed project activities.

The recommended mitigation measures are as follows:

- Any disturbance during the construction and operation phases should be limited to the approved MTS and LILO footprints and should avoid disturbance of the soil and natural vegetation cover. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.
- During the construction phase, site management must be undertaken at the laydown area and the construction area. This should specifically address on-site prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. Any stormwater that does arise within the construction site must be handled appropriately, where necessary, to trap sediments and reduce flow velocities.
- Invasive alien plant growth should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.

- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.

Recommendations for inclusion into the EMPr are provided in the tables on the following pages.

Monitoring Requirements

Daily compliance monitoring of the implementation of the measures as laid out in the EMPr and associated method statements should be undertaken by the Site Manager in conjunction with the ECO. A record of the monitoring undertaken during the maintenance management activities should be kept.

Visual inspections and photographs should be taken weekly upstream and downstream of sites where construction activities will need to take place within aquatic features. Once the construction activities have ceased, the frequency of the monitoring can be reduced to monthly until DWS is satisfied that the site is adequately rehabilitated.

Ongoing monitoring of invasive alien plant growth and erosion within the aquatic features and the recommended buffers biannually (every six months) for the construction phase and the first three operational years of the project. That monitoring should preferably take place before the rainfall period and following high rainfall events.

Table 13. Environmental Management Program Recommendations

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DESIGN PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed MTS and LILO and associated infrastructure.	Limit the disturbance of aquatic habitat. Minimise potential for erosion	Ensure final layout of the MTS and LILO avoids watercourses and recommended buffers as far as possible; utilisation should be made of existing disturbed areas where possible. The design of an access road and other infrastructure should aim to reduce the intensity of runoff particularly on the steeper slopes and reduce the intensity of the discharge into the adjacent drainage lines. Water consumption requirements for the site for the construction and operation of the site if not obtained from an authorised water user within the area, must be authorised by the DWS. Waste and wastewater should be properly contained on-site and removed to a licensed facility that can treat/dispose of the waste.	Ensure that this is taken into consideration during the planning and design phase.	During design cycle and before construction commences.	Holder of the EA

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
CONSTRUCTION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed MTS AND LILO and associated infrastructure.	Limit the disturbance of aquatic habitat. Limit the potential for contamination/pollution of aquatic ecosystems	For all project-related components within the site, the aquatic features of high sensitivity should be treated as no-go areas during the construction phase. Any activities that require construction within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO. Rehabilitation of any disturbed areas within the aquatic features and the recommended buffer areas should be undertaken immediately following completion of the disturbance activity according to rehabilitation measures as included in a method statement for that specific activity as described above; Ablution facilities should not be placed within 50m of any of the aquatic features delineated within the site; Liquid dispensing receptacles (e.g. lubricants, diesel, shutter oil etc.) must have drip trays beneath them/beneath the nozzle fixtures. Material safety data sheets (MSDS) must be available on site (if required) where products are stored so that in the event of an incident, the correct action can be taken. Depending on the types of materials stored on-site during the maintenance activities, suitable product recovery materials (such as Spillsorb or Drizit products) must be readily available. Vehicles should ideally be washed at their storage yard as opposed to on-site. Proper waste management should be undertaken within the site with facilities provided for the on-site disposal of waste and the removal of stored waste to the nearest registered solid waste disposal facility	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the construction phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the construction phase. Weekly monitoring of basic water quality constituents (Dissolved oxygen, electrical conductivity, suspended solids, and pH) should be undertaken upstream and downstream of sites where construction activities will need to take place within aquatic features. This should be accompanied by ongoing visual inspections.	Ongoing during construction	Proponent/contractor and ECO

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
OPERATION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed MTS AND LILO and associated infrastructure.	Limit the disturbance of aquatic habitat; Minimise potential to modify flow/hydraulics related impacts and increase the potential for erosion; Control of invasive alien plants in riparian zones and wetland areas; Limit the potential for contamination/pollution of aquatic ecosystems	Ongoing control of invasive alien plants within the site should be undertaken according to an approved plan. The plan should make use of alien clearing methods as provided by the Working for Water Programme. Monitoring and control measures should take place at least biannually for the first 3 years of the project Invasive alien plant material that has been cleared should be removed from the riparian zones and not left on the river banks or burnt within the riparian zone and buffer area; Ongoing monitoring of the structures, in particular before the rainfall period, should be undertaken to ensure that the integrity of the structures is intact and that they are not blocked with sediment or debris. Ongoing monitoring post large rainfall events should also be undertaken to identify and address any erosion occurring within the watercourses.	Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan. Once the construction activities have ceased, the frequency of the monitoring can be reduced.	Ongoing during operation	Proponent/contractor

Impact	Mitigation/Management Objectives	Mitigation/Management Actions	Monitoring		
			Methodology	Frequency	Responsibility
DECOMMISSION PHASE					
FRESHWATER ECOLOGY IMPACTS					
Potential impact on freshwater ecology as a result of the proposed MTS AND LILO and associated infrastructure.	Limit the disturbance of aquatic habitat.	For all project-related components within the site, the aquatic features of high sensitivity should be demarcated by the appointed ECO before the commencement of the decommissioning activities and treated as no-go areas during the decommissioning phase. Any activities that require decommission activities within the delineated aquatic features and the recommended buffers should be described in method statements that are approved by the ECO Rehabilitation of any disturbed areas within the aquatic features and the recommended buffer areas should be undertaken immediately following completion of the disturbance activity according to rehabilitation measures as included in a method statement for that specific activity. Control of invasive alien plants within the site should be undertaken according to the approved plan	Monitoring that no-go areas are adhered to should be undertaken on an ongoing basis for the duration of the decommissioning phase. Ongoing monitoring of the implementation of method statements and rehabilitation measures should be undertaken in the decommissioning phase. Ongoing monitoring of invasive alien plants within the site should be undertaken according to an approved plan	Ongoing during decommissioning	Proponent/contractor and ECO

11. Final Specialist Statement and Authorisation Recommendation

11.1. Statement and Reasoned Opinion

The aquatic features within the study area consist of a tributary of the Vaalbankspruit River with its associated tributaries and wetland areas. The ecological habitat integrity of the rivers within the study area is moderately modified with the riparian zones being more impacted by the surrounding land use activities. The larger Vaalbankspruit River in the study area has a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition of moderately modified and should not be allowed to degrade further.

The Vaalbankspruit River Sub-catchment is mapped as a FEPA River sub-catchment. There are no wetlands mapped at the site of the MTS. The LILO will need to cross a channelled valley bottom wetland mapped in the National Wetland Map that is associated with a smaller tributary of the Vaalbankspruit River. In the Mpumalanga Biodiversity Sector Plan mapping the proposed MTS and LILO are located within aquatic ESAs. In terms of the Screening Tool, the proposed MTS and LILO are located within the south-western portion that is considered Very high Aquatic Combined Biodiversity Sensitivity. The very high sensitivity is associated with the FEPA River sub-catchments of the Vaalbankspruit and Rietspruit Rivers. The larger rivers (Vaalbankspruit and Rietspruit) and associated valley bottom wetlands are mapped as Aquatic CBAs.

This assessment thus largely concurs with the **Very high** Aquatic Biodiversity Combined Sensitivity mapping of the screening tool for the larger Rietspruit and Vaalbankspruit Rivers with their associated tributaries and wetland areas. The surrounding catchments, after taking into account the recommended 50m areas are considered as of **Low** Aquatic Biodiversity Combined Sensitivity.

With mitigation, the potential freshwater impacts of the proposed WEF2 EGI for the construction, operation and decommissioning phases are likely to be low. One can also expect that the cumulative impact of the proposed project would not be significant provided mitigation measures are implemented.

Based on the findings of this specialist assessment, there is no reason from a freshwater perspective, why the proposed activity (with the implementation of the above-mentioned mitigation measures) should not be authorized. Cognisance has been taken of the initial aquatic ecosystem constraints mapping in the placing of the MTS and LILO.

The risk assessment determined that the proposed MTS and LILO pose a low risk of impacting aquatic habitat, water flow and water quality. The water use activities associated with the proposed project could potentially be authorised through the general authorisations for Section 21(c) and (i) water uses.

11.2. EA Condition Recommendations

The recommended buffer area between the aquatic features and the project components (MTS and LILO) to ensure these aquatic ecosystems are not impacted by the proposed activities, is at least 50m from the delineated edge of the river channels in the case of the larger watercourses or from the centre of the stream for the smaller watercourses.

Recommended mitigation measures to be included in the environmental authorisation are as follows:

- Any disturbance during the construction and operation phases should be limited to the approved MTS and LILO footprints and should avoid disturbance of the soil and natural vegetation cover. Disturbed areas may need to be rehabilitated and revegetated. Mitigation and follow-up monitoring of residual impacts (alien vegetation growth and erosion) may be required.
- During the construction phase, site management must be undertaken at the laydown area and the construction area. This should specifically address on-site prevention of pollution measures from any potential pollution sources during construction activities such as hydrocarbon spills. Any stormwater

that does arise within the construction site must be handled appropriately, where necessary, to trap sediments and reduce flow velocities.
- Invasive alien plant growth should be monitored on an ongoing basis to ensure that the disturbed areas do not become infested with invasive alien plants.
- Stormwater runoff infrastructure must be maintained to mitigate both the flow and water quality impacts of any stormwater leaving developed areas.
- Any water supply, sanitation services as well as solid waste management services that should be required for the site should preferably be provided by an off-site service provider. In a scenario where services are installed, these systems need to be adequately installed and maintained to prevent any potential contamination of the water resources on site.

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Appendices

Appendix A - Specialist Expertise

Name:	Antonia (Toni) Belcher ***(Pr. Sci. Nat)***
Profession:	Aquatic scientist
Nationality:	South African
Years of experience:	30+ years
Professional Registration:	Professional Environmental Scientist (Pr. Sci. Nat 400040/10) Professional Ecological Science (Pr. Sci. Nat 400040/10)
Accreditation:	SASS5 (Macro-invertebrate assessment method)
Academic Qualifications:	1998 - M.Sc. in Environmental Management, Potchefstroom University (*cum laude*) 1989 - B.Sc. (Hons) in Oceanography, University of Port Elizabeth 1987 - B.Sc. – Mathematics, Applied Mathematics, University of Port Elizabeth 1984 – Matriculation, Lawson Brown High School, Port Elizabeth
Areas of specialisation:	Environmental water requirement studies River maintenance and management plans (MMP) Aquatic ecosystem monitoring and assessments Design of water quality and monitoring programmes for aquatic ecosystems Compilation of State of River reports (aquatic data collection, interpretation, presentation, graphic layout and design and preparation of technical and glossy print ready copies) Environmental Impact Assessments River classification and environmental water requirements (Ecological Reserve determinations) Integrated Water Resource Management River, Wetlands and Estuary management Water quality assessment and management reporting Water resource legislation Water resource institutions Water education
Countries Worked in:	South Africa, Namibia, Swaziland, Lesotho, Rwanda
Employment Record:	2020 – present Self-employed 2013 -2020 BlueScience (Pty) Ltd (Principal Specialist Scientist) 2007 – 2012 Self-employed 1999 – 2007 Assistant and Deputy Director, Water Resource Protection, Western Cape Regional Office, Department of Water Affairs, Cape Town 1995 – 1999 Institute for Water Quality Studies, Department of Water Affairs 1991 – 1995 Water Pollution Control Officer, Water Quality Management, Department of Water Affairs, Pretoria 1989 – 1990 Mathematics tutor and administrator, Master maths, Randburg and Braamfontein Colleges, Johannesburg 1987 – 1988 Part-time field researcher, Department of Oceanography, University of Port Elizabeth
Awards and Achievements:	Woman in Water award for Environmental Education (2006) Runner up for the Woman in Water prize for Water Research (2006)
Summary of recent experience	2008 – **Environmental water requirement studies** for various rivers in South Africa and Lesotho; Berg (Zones 1-3), Kingna, Baden, Konings and Poesjesnel **rivers maintenance and management plans**; **Water quality impact assessment** for the upgrade of more than 15 waste water treatment works in the Western Cape and consideration of reuse of the treated wastewater from many of these works for potable water supply; More than **500 freshwater impact assessments studies** as input into EIA decision making processes. Toni has conducted more than **150 water use authorisation applications**. This included more than 40 freshwater impact assessments for roads, power line and substation and renewable energy projects.

	Development of RDM (**Resource Directed Measures**) curriculum for a Master degree programme at University of science institutions in South Africa. Free State **river health monitoring** programme (monitoring for 3 year period). **Classification of the water resources** of the Olifants Doorn Water Management Area. Graphic design, layout, technical compilation and preparation of print ready glossy publications for the **State-of-River reports** for the Gouritz and Breede Water Management Areas Development and piloting of a National Strategy to **Improve Gender Representation in Water Management Institution**s, where the focus is on improving the capacity (specifically amongst women) to participate in water related decision making in Limpopo, Eastern Cape and KZN. Compilation of a background document as well as a framework management plan towards the development of an **integrated water resources management plan for the Sandveld**; Aquatic specialist to the City of Cape Town project: Determination of additional resources to **manage pollution in stormwater and river systems**; Framework for Education and Training in Water (FETWATER), Resource Directed Measures Network partner which has undertaken **training initiatives on environmental water requirements** in the SADC region; Resource Directed Management of Water Quality: **Development of training materials**, Department of Water Affairs and Forestry; and 2000 –2007: Manager responsible for the implementation of the Reserve Directed Measures component of the National Water Act Western Cape Regional Office; and Provincial Champion for the River Health Programme in the Western Cape and designed, implemented and compiled State-of-River reports for 7 catchment areas in the Western Cape. 1995 - 2000: Project manager and coordinator for the freshwater and marine water quality guidelines for South Africa; and Provided specialist input into various aspects of the new National Water Act and its implementation 1991 -1995: Water quality catchment studies Development and implementation of marine water quality policy for South Africa.

Appendix B - Specialist Statement of Independence

I, **Antonia Belcher**, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist: 

Name of Company: -

Date: 21 April 2023

Appendix C: Site Sensitivity Verification (in terms of Part A of the Assessment Protocols published in GN 320 on 20 March 2020

1. Introduction

This Site Sensitivity Verification report serves as the Aquatic Biodiversity and Species Specialist Verification Assessment for the proposed MTS and LILO for the Ujekamanzi WEF2, near Amersfoort, Mpumalanga Province. The report is in accordance with Appendix 6 of the National Environmental Management Act (Act 107 of 1998, as amended) (NEMA) Environmental Impact Assessment (EIA) Regulations of 2014 and has been undertaken in order to confirm the current land use and environmental sensitivity of the proposed project area as identified by the National Web-Based Environmental Screening Tool (Screening Tool).

2. Site sensitivity verification

The details of the site sensitivity verification are noted below:

Date of Site Visit	18 January 2023
Specialist Name	Toni Belcher
Professional Registration Number	400040/10
Specialist Affiliation / Company	Toni Belcher Sole Proprietary

The timing of the site visit was deemed suitable for the assessment as the area has summer rainfall and had recently received rain that assisted with the delineation and assessment of aquatic features. No additional site visits are deemed necessary.

The field visit comprised delineation, characterisation and integrity assessments of the aquatic habitats within the site. Mapping of the freshwater features was undertaken using a GPS Tracker and mapped in PlanetGIS and Google Earth Professional.

The following techniques and methodologies were utilised to undertake the assessments:

- The guideline document, “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas” document, as published by DWAF (2005) was followed for the delineation of the aquatic habitats;
- The present ecological condition of the watercourses was determined using the National River Health Programme and Wet-Health methodologies;
- The ecological importance and ecological sensitivity (EI&ES) assessment of the watercourses was conducted according to the guidelines as developed by DWAF (1999); and
- Recommendations are made concerning the adoption of buffer zones within the site based on watercourse functioning and site characteristics.

3. Outcome of site sensitivity verification

The aquatic features within the study area consist of a tributary of the Vaalbankspruit River with its associated tributaries and wetland areas. The ecological habitat integrity of the rivers within the study area is moderately modified with the riparian zones being more impacted by the surrounding land use activities. The larger Vaalbankspruit River in the study area has a high ecological importance and sensitivity while the smaller tributaries/drainage features are of a moderate ecological importance and sensitivity. The recommended ecological condition of the aquatic features in the area would be that they remain in their current ecological condition of moderately modified and should not be allowed to degrade further.

The Vaalbankspruit River Sub-catchment is mapped as a FEPA River sub-catchment. There are no wetlands mapped at the site of the MTS. The LILO will need to cross a channelled valley bottom wetland mapped in the National Wetland Map that is associated with a smaller tributary of the Vaalbankspruit River.

4. National Screening Tool

In the Mpumalanga Biodiversity Sector Plan mapping the proposed MTS and LILO are located within aquatic ESAs. In terms of the Screening Tool, the proposed MTS and LILO are located within the south-western portion that is considered Very high Aquatic Combined Biodiversity Sensitivity. The very high sensitivity is associated with the FEPA River sub-catchments of the Vaalbankspruit and Rietspruit Rivers. The larger rivers (Vaalbankspruit and Rietspruit) and associated valley bottom wetlands are mapped as Aquatic CBAs.

This assessment thus largely concurs with the Very high Aquatic Biodiversity Combined Sensitivity mapping of the screening tool for the larger Rietspruit and Vaalbankspruit Rivers with their associated tributaries and wetland areas. The surrounding catchments, after taking into account the recommended 50m areas are considered as of Low Aquatic Biodiversity Combined Sensitivity.

Google Earth image with the Aquatic Ecosystem Sensitivity mapping where the green area indicates low sensitivity, the yellow the moderate sensitivity and the red the high sensitivity areas.

5. Conclusion

By implementing suitable buffers, as indicated in the figure above, adjacent to the watercourses and wetlands, and minimising the disturbance within the watercourse corridors, the impact of the proposed project activities would be low and unlikely to impact the integrity of the aquatic ecosystems. The recommended buffers are deemed adequate, irrespective of the proposed infrastructure. It is however highly recommended that there also be an attempt to reduce the erosion potential at the site through some reshaping and rehabilitation of the watercourse corridors by revegetating them with suitable indigenous vegetation and removal of invasive alien species.

Appendix D: Impact Assessment Methodology

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

1.1 Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include the context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in Table 1. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

1.2 Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue/impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included. The significance of Cumulative Impacts should also be rated.

1.2.1 Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 1: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).

REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.** The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Appendix E: Compliance with the Aquatic Biodiversity Protocol (GN 320, 20 March 2020)

Protocol for the Specialist Assessment and Minimum Report Conten Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has beer addressed in the Specialis Report
2.3. The assessment must provide a baseline description of the site which includes, as a minimum, the following aspects: 2.3.1. a description of the aquatic biodiversity and ecosystems or the site, including; a) aquatic ecosystem types; and b) presence of aquatic species, and composition of aquatic species communities, their habitat, distribution and movement patterns;	Section 4.2
2.3.2. the threat status of the ecosystem and species as identified by the screening tool;	Section 4.3
2.3.3. an indication of the national and provincial priority status o the aquatic ecosystem, including a description of the criteria for the given status (i.e. if the site includes a wetland or a rive freshwater ecosystem priority area or sub catchment, a strategic water source area, a priority estuary, whether or no they are free -flowing rivers, wetland clusters, a critica biodiversity or ecologically sensitivity area); and	Section 4.1
2.3.4. a description of the ecological importance and sensitivity o the aquatic ecosystem including: a) the description (spatially, if possible) of the ecosystem processes that operate in relation to the aquatic ecosystems on and immediately adjacent to the site (e.g. movement o surface and subsurface water, recharge, discharge sediment transport, etc.); and b) the historic ecological condition (reference) as well as present ecological state of rivers (in- stream, riparian and floodplain habitat), wetlands and/or estuaries in terms o possible changes to the channel and flow regime (surface and groundwater).	Section 4.2
2.4. The assessment must identify alternative development footprints within the preferred site which would be of a "low" sensitivity as identified by the screening tool and verified through the site sensitivity verification and which were not considered appropriate.	Section 5
2.5. Related to impacts, a detailed assessment of the potentia impacts of the proposed development on the following aspects must be undertaken to answer the following questions: 2.5.1. Is the proposed development consistent with maintaining the priority aquatic ecosystem in its current state and according to the stated goal? 2.5.2. Is the proposed development consistent with maintaining the resource quality objectives for the aquatic ecosystems present? 2.5.3. How will the proposed development impact on fixed and dynamic ecological processes that operate within or across the site? This must include: a) impacts on hydrological functioning at a landscape level and across the site which can arise from changes to flood regimes (e.g. suppression of floods, loss of flood attenuation capacity, unseasonal flooding or destruction of floodplain processes); b) will the proposed development change the sediment regime of the aquatic ecosystem and its sub -catchment (e.g. sand movement, meandering river mouth or estuary, flooding o sedimentation patterns);	Section 4.4 and Section 6

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has been addressed in the Specialist Report
c) what will the extent of the modification in relation to the overall aquatic ecosystem be (e.g. at the source, upstream or downstream portion, in the temporary I seasonal permanent zone of a wetland, in the riparian zone or within the channel of a watercourse, etc.); and d) to what extent will the risks associated with water uses and related activities change;	
2.5.4. how will the proposed development impact on the functioning of the aquatic feature? This must include: a) base flows (e.g. too little or too much water in terms of characteristics and requirements of the system); b) quantity of water including change in the hydrological regime or hydroperiod of the aquatic ecosystem (e.g. seasonal to temporary or permanent; impact of over -abstraction or instream or off stream impoundment of a wetland or river); c) change in the hydrogeomorphic typing of the aquatic ecosystem (e.g. change from an unchannelled valley- bottom wetland to a channelled valley -bottom wetland); d) quality of water (e.g. due to increased sediment load contamination by chemical and/or organic effluent, and/or eutrophication); e) fragmentation (e.g. road or pipeline crossing a wetland) and loss of ecological connectivity (lateral and longitudinal); and f) the loss or degradation of all or part of any unique or important features associated with or within the aquatic ecosystem (e.g. waterfalls, springs, oxbow lakes meandering or braided channels, peat soils, etc.);	Section 6 and 7
2.5.5. how will the proposed development impact on key ecosystems regulating and supporting services especially: a) flood attenuation; b) streamflow regulation; c) sediment trapping; d) phosphate assimilation; e) nitrate assimilation; f) toxicant assimilation; g) erosion control; and h) carbon storage?	Section 6 and 7
2.5.6. how will the proposed development impact community composition (numbers and density of species) and integrity (condition, viability, predator - prey ratios, dispersal rates etc.) of the faunal and vegetation communities inhabiting the site?	Section 6 and 7
2.6. In addition to the above, where applicable, impacts to the frequency of estuary mouth closure should be considered, in relation to: a) size of the estuary; b) availability of sediment; c) wave action in the mouth; d) protection of the mouth; e) beach slope; f) volume of mean annual runoff; and g) extent of saline intrusion (especially relevant to permanently open systems).	N/A
2.7. The findings of the specialist assessment must be written up in an Aquatic Biodiversity Specialist Assessment Report that contains, as a minimum, the following information:	

Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity	Section where this has been addressed in the Specialist Report
2.7.1. contact details of the specialist, their SACNASP registration number, their field of expertise and a curriculum vitae;	Section 1.2 and Appendix A
2.7.2. a signed statement of independence by the specialist;	Appendix B
2.7.3. a statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	Section 2
2.7.4. the methodology used to undertake the site inspection and the specialist assessment, including equipment and modelling used, where relevant;	Section 2
2.7.5. a description of the assumptions made, any uncertainties or gaps in knowledge or data;	Section 2.2
2.7.6. the location of areas not suitable for development, which are to be avoided during construction and operation, where relevant;	Section 4.4
2.7.7. additional environmental impacts expected from the proposed development;	Section 7
2.7.8. any direct, indirect and cumulative impacts of the proposed development on site;	Section 6
2.7.9. the degree to which impacts and risks can be mitigated;	Section 7
2.7.10. the degree to which the impacts and risks can be reversed;	Section 7
2.7.11. the degree to which the impacts and risks can cause loss of irreplaceable resources;	Section 7
2.7.12. a suitable construction and operational buffer for the aquatic ecosystem, using the accepted methodologies;	Section 4.4
2.7.13. proposed impact management actions and impact management outcomes for inclusion in the Environmental Management Programme (EMPr);	Section 10
2.7.14. a motivation must be provided if there were development footprints identified as per paragraph 2.4 above that were identified as having a "low" aquatic biodiversity sensitivity and that were not considered appropriate;	-
2.7.15. a substantiated statement, based on the findings of the specialist assessment, regarding the acceptability or not of the proposed development and if the proposed development should receive approval or not; and	Section 11.1
2.7.16. any conditions to which this statement is subjected.	Section 11.2
2.8. The findings of the Aquatic Biodiversity Specialist Assessment must be incorporated into the Basic Assessment Report or the Environmental Impact Assessment Report including the mitigation and monitoring measures as identified, that are to be included in the EMPr.	
2.9. A signed copy of the assessment must be appended to the Basic Assessment Report or Environmental Impact Assessment Report.	

Appendix F: DWS PES, EI and ES

SELECT SQ REACH	SQR NAME	LENGTH km	STREAM ORDER	PES ASSESSED BY XPERTS? (IF TRUE="Y")	REASONS NOT ASSESSED	PES CATEGORY DESCRIPTION	PES CATEGORY BASED ON MEDIAN OF METRICS
C11E-01850	Vaalbankspruit	27.04	1	y		LARGELY NATURAL	B
MEAN EI CLASS	**MEAN ES CLASS**	**DEFAULT ECOLOGICAL CATEGORY (EC)**	**RECOMMENDED ECOLOGICAL CATEGORY (REC)**				
HIGH	HIGH	B	#NUM!				

PRESENT ECOLOGICAL STATE		ECOLOGICAL IMPORTANCE				ECOLOGICAL SENSITIVITY	
INSTREAM HABITAT CONTINUITY MOD	SMALL	FISH SPP/SQ	9.00	INVERT TAXA/SQ	42.00	FISH PHYS-CHEM SENS DESCRIPTION	HIGH
RIP/WETLAND ZONE CONTINUITY MOD	SMALL	FISH: AVERAGE CONFIDENCE	1.00	INVERT AVERAGE CONFIDENCE	1.00	FISH NO-FLOW SENSITIVITY DESCRIPTION	HIGH
POTENTIAL INSTREAM HABITAT MOD ACT.	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY HIGH	INVERT REPRESENTIVITY PER SECONDARY, CLASS	HIGH	INVERT PHYS-CHEM SENS DESCRIPTION	VERY HIGH
RIPARIAN-WETLAND ZONE MOD	SMALL	FISH REPRESENTIVITY PER SECONDARY: CLASS	VERY HIGH	INVERT RARITY PER SECONDARY: CLASS	VERY HIGH	INVERTS VELOCITY SENSITIVITY	VERY HIGH
POTENTIAL FLOW MOD ACT.	SMALL	FISH RARITY PER SECONDARY: CLASS	HIGH	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	HIGH	RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) INTOLERANCE WATER LEVEL/FLOW CHANGES DESCRIPTION	HIGH
POTENTIAL PHYSICO-CHEMICAL MOD ACTIVITIES	SMALL	ECOLOGICAL IMPORTANCE: RIPARIAN-WETLAND-INSTREAM VERTEBRATES (EX FISH) RATING	HIGH	HABITAT DIVERSITY CLASS	VERY HIGH	STREAM SIZE SENSITIVITY TO MODIFIED FLOW/WATER LEVEL CHANGES DESCRIPTION	HIGH
		RIPARIAN-WETLAND NATURAL VEG RATING BASED ON % NATURAL VEG IN 500m (100%=5)	VERY HIGH	HABITAT SIZE (LENGTH) CLASS	LOW	RIPARIAN-WETLAND VEG INTOLERANCE TO WATER LEVEL CHANGES DESCRIPTION	LOW
		RIPARIAN-WETLAND NATURAL VEG IMPORTANCE BASED ON EXPERT RATING	LOW	INSTREAM MIGRATION LINK CLASS	VERY HIGH		
				RIPARIAN-WETLAND ZONE MIGRATION LINK	VERY HIGH		
				RIPARIAN-WETLAND ZONE HABITAT INTEGRITY CLASS	VERY HIGH		
				INSTREAM HABITAT INTEGRITY CLASS	VERY HIGH		