BTE RENEWABLES

MARALLA WIND ENERGY FACILITY

FRESHWATER ASSESSMENT

20 MAY 2022

DRAFT

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PROJECT NO.: 41103480
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WSP
BUILDING C, KNIGHTSBRIDGE
33 SLOANE STREET
BRYANSTON, 2191
SOUTH AFRICA

T: +27 11 361 1380
F: +086 606 7121
WSP.COM

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1 INTRODUCTION

WSP in Africa (WSP), a wholly owned affiliate of WSP Global Inc., was commissioned by BTE Renewables to undertake a hydrological assessment that is required for the Basic Assessment (BA) process for the proposed Maralla 132kV overhead transmission line (OHTL). The development of a 132kV OHTL is required to connect the Maralla East and West Wind Energy Facilities (WEF) Energy Facility to the national grid via the existing Karusa substation. The OHTL is approximately 18 km long.

This report will address the freshwater habitat systems (i.e. wetlands and watercourses) located within the project footprint and provide a high-level assessment of the potential environmental impacts associated with the proposed development.

1.1 BACKGROUND

To strengthen their grid integration options, Biotherm has opted to undertake an additional transmission integration project whereby the Maralla WEFs will be connected to the authorised Hidden Valley WEF substation. This substation will be located within the Karuso WEF phase of the three collective Hidden Valley WEFs. The other two phases are called the Soetwater and Great Karoo WEFs.

The proposed transmission line options (addressed in this report) include six alternatives, namely:

— **Alternative 1A (17.5km)**

Proposed route. This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 7.5km, crossing an unnamed drainage line before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment, west of the Perdekraal se Berg, before entering the Hidden Valley substation.

— **Alternative 1B (19km)**

Proposed route. This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for approximately 10km. It crosses an unnamed drainage line, the Perdeplaas se Berg ridgeline and the Meintjiesplaas River before veering west towards the Hidden Valley substation.

— **Alternative 2A (15.4km)**

Proposed route. This is the shortest alternative and it traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden valley substation.

— **Alternative 3 (20km)**

Suggested route as proposed within the Biodiversity and Ecology Study (The Biodiversity Company (TBC), November 2021) This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 5km before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment and continues south to the Hidden Valley substation.

— **Alternative 4A (16km)**

Landowner proposed route. This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

— **Alternative 4B (16km)**

Landowner proposed route. This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

1.2 TERMS OF REFERENCE

WSP has been commissioned to undertake a Wetland Assessment relating to the proposed OHTL. The objective of the assessment is to identify freshwater habitats (wetland and riparian systems) present at the proposed site and within the regulated boundary of a watercourse and undertake an assessment of the impact associated with the proposed OHTL.

This was undertaken in order to determine whether the proposed OHTL project and associated activities may impact on the regulated boundary of a watercourse (i.e. the outer edge of the 1:100-year flood line or delineated riparian habitat; and/or 500 m radius from the delineated boundary of a wetland, as defined in GN509 of 2016[1]).

The potential impacts associated with the construction and operation of the proposed Project on the identified watercourses were assessed and associated mitigation recommendations provided in order to conduct the Risk Assessment.

The scope of work undertaken broadly encompassed the following:

— Review of any existing reports relevant to the proposed OHTL project;
— Identification and delineation of wetland and riparian systems;
— Description of the wetlands and riparian systems identified;
— A functional assessment of the identified wetlands and riparian systems, and
— An impact assessment considering the impacts that the proposed OHTL project and associated activities may have on the identified wetland and/or riparian systems.

2 STUDY AREA

2.1 LOCALITY SETTING

The proposed Maralla OHTL project is located along the provincial boarder between the Western Cape and Northern Cape, approximately 40 km south of the town of Sutherland, (**Figure 1**). Other nearby towns include Matjiesfontein and Liangsburg. The site is accessible via the R354 regional road. The area falls within the Central Karoo and Namakwa District Municipalities.

The 132kV grid connection crosses the following properties:

— Farm Kentucky 206 remainder
— Farm Drie Roode Heuwels 180 Remainder
— Farm Orangefontein 203 Portion 1 and Remainder
— Farm De Hoop 202 Remainder

There are three proposed OHTL options, which are illustrated in **Figure 2**.

[1] General Authorisation in terms of Section 39 of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21 (c) or Section 21 (i).

2.2 PROJECT INFRASTRUCTURE

2.2.1 TRANSMISSION LINE

The OHTL will be a 132kV steel single or double structure with a kingbird conductor standing between 15m and 20m above ground level. Standard overhead line construction methodology will be employed – placement of poles, stringing of conductors. It is not envisaged that any large excavations and stabilized backfill will be required, however this will only be verified on site once the geotechnical assessment has been undertaken at each pole position (as part of construction works).

Pole positions will only be available post preferred bidder award once the proposed OHTL design has started.

2.2.2 SERVITUDE

The servitude width of the 132 kV OHTL (single and double circuit) is between 36m and 40m and the length of the transmission line is approximately 18km, which will result in a servitude area of approximately 72ha.

The servitude is required to ensure safe construction, maintenance, and operation of the OHTL. Registration of the servitude grants BTE Renewables the right to erect, operate and maintain the OHTL and to access the land to carry out such activities, but it does not constitute full ownership of the land. Construction and operation activities and access to the OHTL must be carried out with due respect to the affected landowners.

Figure 1: Regional Setting

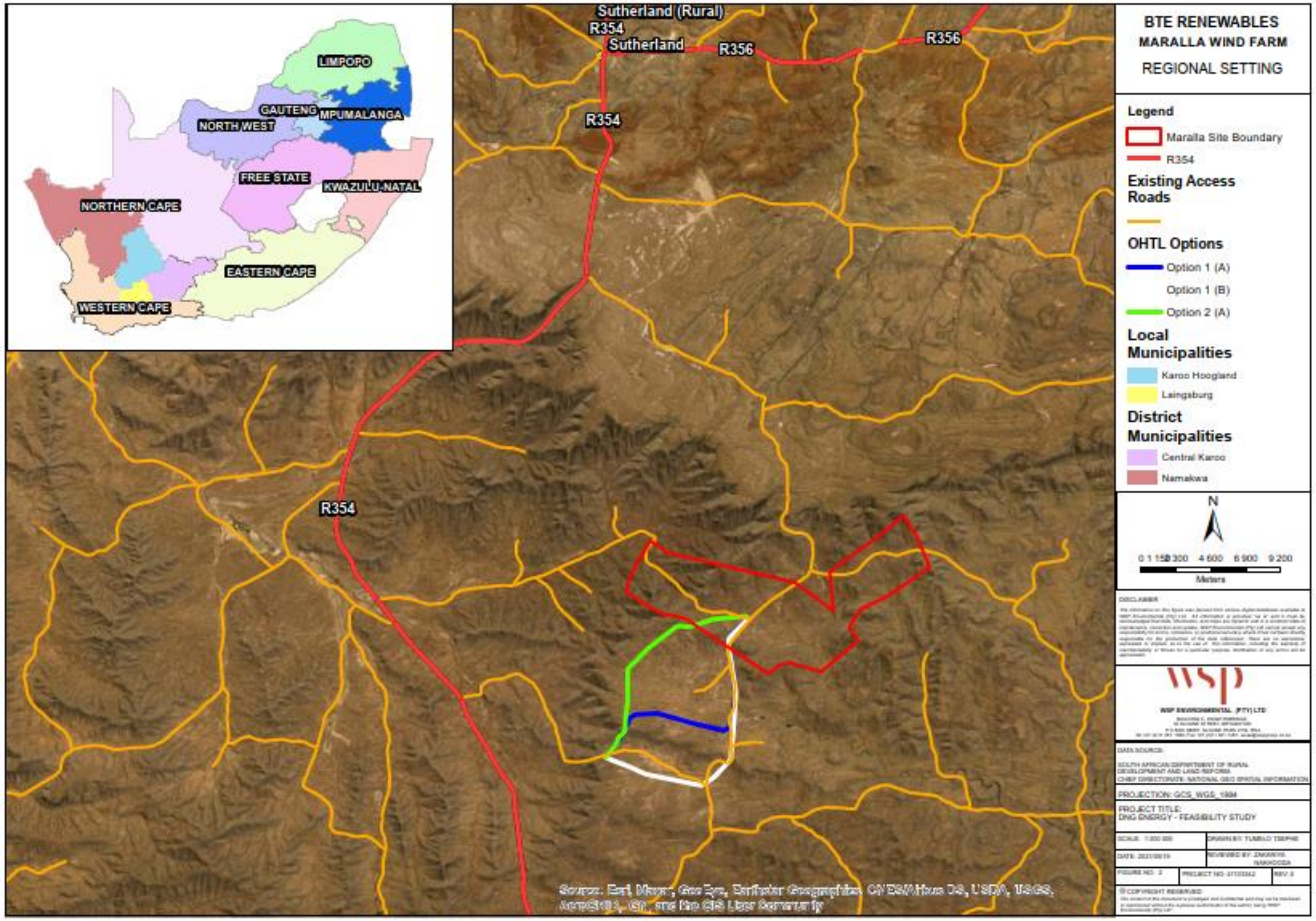
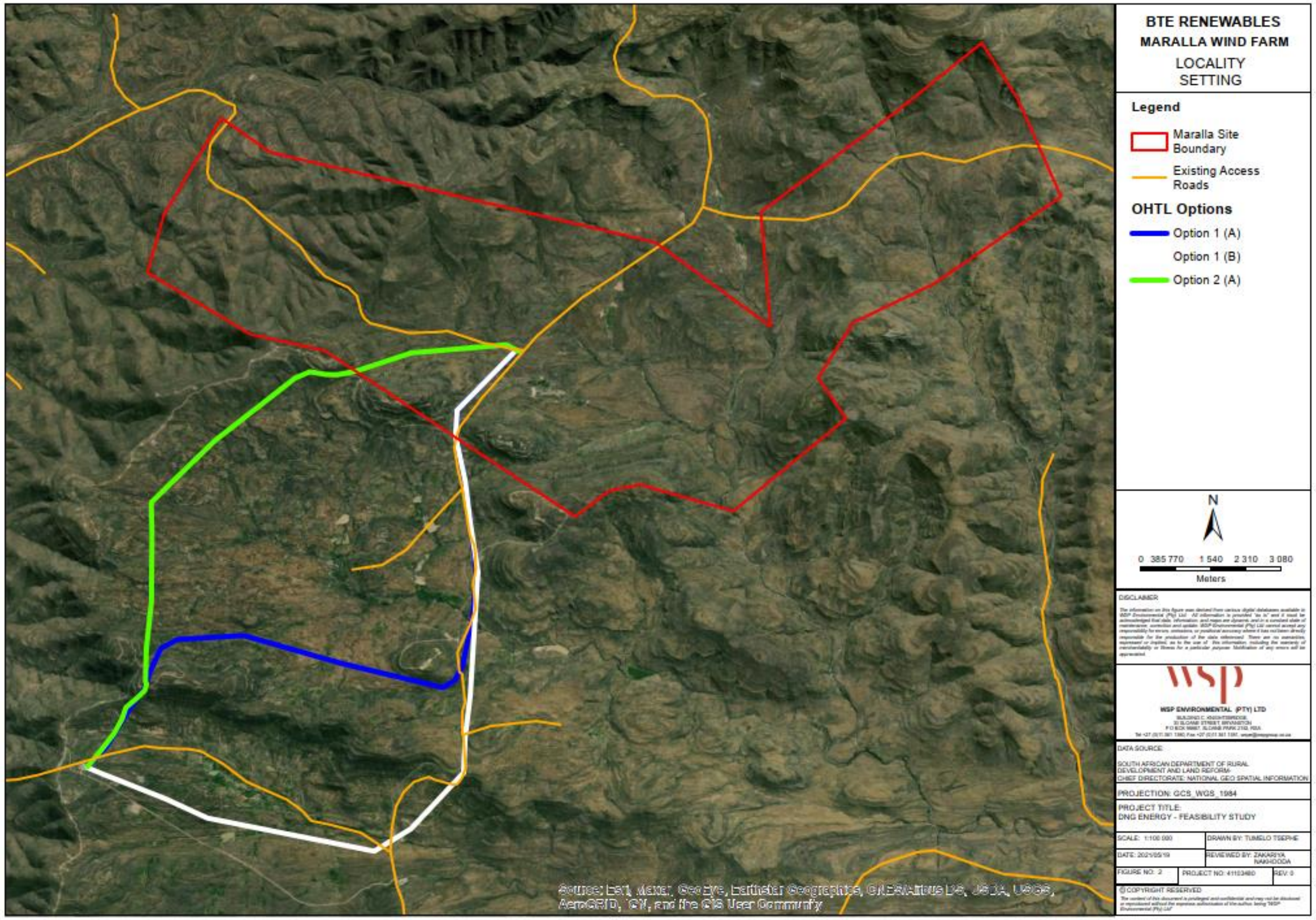


Figure 2: Locality Setting



3 BASELINE RECEIVING ENVIRONMENT

This section describes the baseline environment for the proposed 132kV OHTL.

3.1 CLIMATE

The climate of the region is arid to semi-arid. Rainfall is low and occurs throughout the year but predominantly in the winter months between March and August. Mean annual precipitation is approximately 290mm, ranging from 180 – 410mm rainfall per year. The region experiences dry hot summers and the warmest month of the year is February which averages 23.4°C. The lowest average temperatures in the year occur in July, averaging approximately 9.3°C. The region experiences steady, strong winds between December and April; however the winds calm between the months of June and October.

3.2 LAND COVER

Based on the Mucina and Rutherford (2006) natural vegetation classification map, the area of the proposed OHTL is mostly Central Mountain Shale Renosterveld, with a minor contribution of Koedoesberge-Moordenaars Karoo. The Department of Agriculture, Forestry and Fisheries (DAFF) define the land use within the Esizayo Site, as predominantly Shrubland and Low Fynbos (DAFF, 2012).

During the site visit, the vegetation was identified as mostly shrub-like vegetation and Fynbos which is primarily used for sheep grazing. Indigenous antelope (Springbok) were also present within site boundary.

3.3 SOILS AND GEOLOGY

Based on the information included in the land type maps of South Africa (AGIS, 2007) the soils in the region of the Maralla Site are mostly "Glenrosa and/or Mispha forms with lime generally present in the landscape" and "miscellaneous land classes, rocky areas with miscellaneous soils".

The general geological description of the area is based on the 1:1 000 000 geological map for the Northern Cape Province, published by the Trigonometrical Survey Office in 1970 (Schifano *et.al*.,1970). The Esizayo Site is nested in the Roggeveld Mountains range, in the Larger Cape Fold belt system. The site is located on the Beaufort Series which forms part of the Karoo system. The rock type for the series comprises of shale, mudstone, sandstone and limestone (Schifano *et al*., 1970). During the site visit, it was observed that shale and mudstone were the dominant rock type for the area.

3.4 TOPOGRAPHY

The topography of the area comprises of mountainous hillslopes (part of the Roggeveld Mountain Range) with small patches of open rocky ground in between these, and numerous watercourses and drainage channels. The hillslopes have an average gradient of 34.4 % and 1.1% on the open flat ground. The elevation of the Esizayo Site ranges from 984 m to 1 379 m above mean sea level (amsl).

3.5 HYDROLOGY

The proposed OHTL lie mostly within tertiary catchment J11A and partially in J11D. The J11A and J11D tertiary hydrological characteristics are summarised in **Table 1** and illustrated in **Figure 3**, including catchment area, Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR). The MAE largely exceeds the MAP, reinforcing the arid conditions of the region.

Table 1: Quaternary J11A and J11D Hydrological Characteristics

QUATERNARY	CATCHMENT AREA (km^2)	MAP (mm)	MAE (mm)	MAR (mcm)
J11A	438	295	1965	5.86
J11D	801	240	2000	5.58

SOURCE: WRC/DWA, 2012

The hydrology of the area is shown in **Figure 3**. There are numerous dry natural channels which drain the area of water from a westerly to easterly direction. The water courses are generally ephemeral in nature which seldom shows evidence of surface water runoff due to the arid conditions of the area. The area within the footprint of the OHTL drains into the Maintjiesplaas and Roggeveld Rivers, which flow into the Buffels River. However, a few of the watercourses that were visited within the area were dry. Given the arid climatic condition of the region, the majority of the watercourses are ephemeral and are likely to only convey water during infrequent high rainfall events.

3.6 NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS

The National Freshwater Ecosystem Priority Areas (NFEPA) is a tool developed to assist in the conservation and sustainable use of South Africa's freshwater ecosystems, including rivers, wetlands and estuaries. Nel *et al.* (2011) classified the freshwater ecosystems according to their Present Ecological State 'AB', 'C', and 'DEF' or 'Z' (**Table 2**).

Table 2: Description of NFEPA wetland conditions categories

PES Equivalent	NEEPA Condition	Description	% of total National wetland area
Natural or Good	AB	Percentage natural land cover ≥ 75%	47
Moderately Modified	C	Percentage natural land cover 25-75%	18
Heavily to critically modified	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2
	Z1	Wetland overlaps with a 1:50 000 'artificial' inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as 'artificial' in the wetland locality GIS layer	4
	Z3	Percentage natural land cover ≤ 25%	20

According to the NFEPA database, a total of thirteen wetland systems were identified within 500m of the proposed OHTL (**Table 3, Figure 3**).

Table 3: NFEPA Wetlands Located within 500m buffer

HGM unit	Natural/Artificial	NFEPA Condition	Field Observation
Seep	Artificial	Z3	Portion of a naturally occurring CVB system
Flat	Artificial	Z3	Dam
Seep	Artificial	Z3	These systems form part of a dam constructed on a CVB system
Seep	Artificial	Z3	
Channelled valley-bottom wetland	Artificial	Z3	Dam
Channelled valley-bottom wetland	Artificial	Z3	These systems for part of a dam constructed on a CVB system
Channelled valley-bottom wetland	Natural	Z3	
Channelled valley-bottom wetland	Natural	Z3	
Channelled valley-bottom wetland	Natural	Z3	
Channelled valley-bottom wetland	Artificial	Z3	
Channelled valley-bottom wetland	Natural	Z3	
Channelled valley-bottom wetland	Artificial	Z3	
Channelled valley-bottom wetland	Natural	Z3	

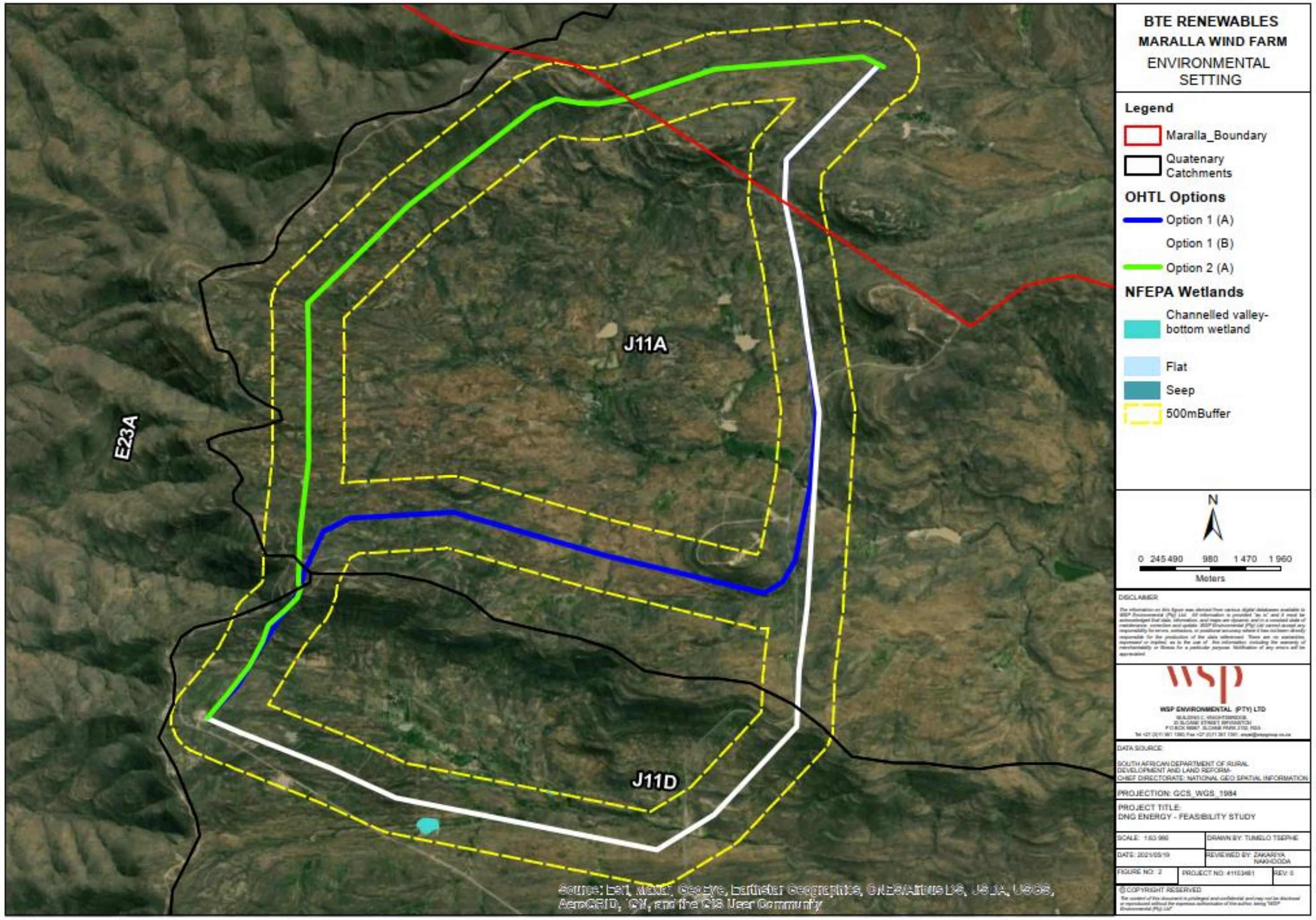
4 EXPERTISE OF THE SPECIALIST

The assessment was conducted by Zakariya Nakhooda with support from Karen King as summarised in **Table 4**.

Table 4: Qualifications and Expertise of the Specialists

Name	Qualification	Professional Registration	Experience
Zakariya Nakhooda	BSc Hydrology (Hons) and Environmental Sciences	Pr Sci Nat	Zakariya Nakhooda is a Wetland Assessment specialist and Hydrologist within WSP. He has 5+ years' work experience in environmental hydrology, wetland assessments and water use licence applications. He has completed a BSc degree in Hydrology and Geography/Environmental Sciences. He has also completed a BSc Honours degree in hydrology UKZN, and is currently pursuing an MSc degree in Hydrology. His interests include integrated water resources management, water quality, catchment hydrology and GIS.
Karen King	MSc Hydrology	Pr Sci Nat	Karen King is a professional soil scientist and hydrologist with WSP. She has 15+ years' work experience and specialises in soil classification, capability and risk studies, hydrological modelling, flood risk modelling, storm water management planning, mining/development hydrology (with adherence to GN704), water resources planning, wetland delineation, water research, agricultural studies and related risk assessments and management plans. Karen's modelling experience has focussed on the Pitman, ACRU, Hec-HMS, Hec-RAS and SWAT models. She has been primarily involved in the engineering and environmental hydrology and soil science fields, initially as a soil science lecturer at UKZN for 3 years, and then as a hydrologist in various engineering and environmental consultancies both in South Africa and in the United Kingdom.

Figure 3: Environmental Setting



5 AIMS AND OBJECTIVES

The aim of this assessment was to complete a Wetland Habitat Assessment with the following objectives:

- Identify and delineate wetlands and/or riparian habitats within the proposed 132kV OHTL and servitude, and within the regulated area of a watercourse;
- Determine the Present Ecological State (PES), Ecological Importance and Sensitivity (EIS) and functional importance of the identified wetlands and/ or riparian habitats; and,
- Determine whether the identified wetlands and/or riparian habitats have the potential to be impacted on by the proposed 132kV OHTL and servitude and associated activities.

In order to achieve the aforementioned objectives, the following activities were undertaken:

- Desktop identification and delineation of all watercourses (wetlands and riparian zones included) within the proposed 132kV OHTL and servitude utilising available site-specific data;
- Infield delineation and classification of the identified wetlands and riparian habitats within the proposed 132kV OHTL and servitude;
- Risk/impact probability screening of the identified wetlands and riparian habitats to determine which have any risk of being impacted upon by the proposed construction, operation and decommissioning of the OHTL;
- Determination of the wetlands and riparian habitats that have the potential to be impacted on by the proposed construction and operational activities of the proposed 132kV OHTL and servitude;
- Conduct an assessment of the PES, EIS and functional importance (wetland only) of the delineated wetland and riparian habitats; and,
- Compilation of the Impact Assessment.

6 METHODOLOGY

The methods and tools utilised to conduct the Wetland Habitat Assessment within the study area were determined utilising desktop and in-field assessments together with professional opinion. An in-depth description of each method is provided in the chapters that follow. National and provincial datasets were utilised to supplement the information gathered on site.

6.1 WETLAND IDENTIFICATION AND MAPPING

In order to identify the wetland types present, using Kotze *et al*. (2009) and Ollis *et al*. (2013), a characterisation of hydrogeomorphic (HGM) types was conducted. These have been defined based on the geomorphic setting of the wetland in the landscape (e.g. hillslope or valley bottom wetlands, whether drainage is open or closed), water source (surface water dominated or sub-surface water dominated), how water flows through the wetland (diffusely or channelled) and how water exits the wetland (see **Figure 4** from Ollis *et al*. 2013).

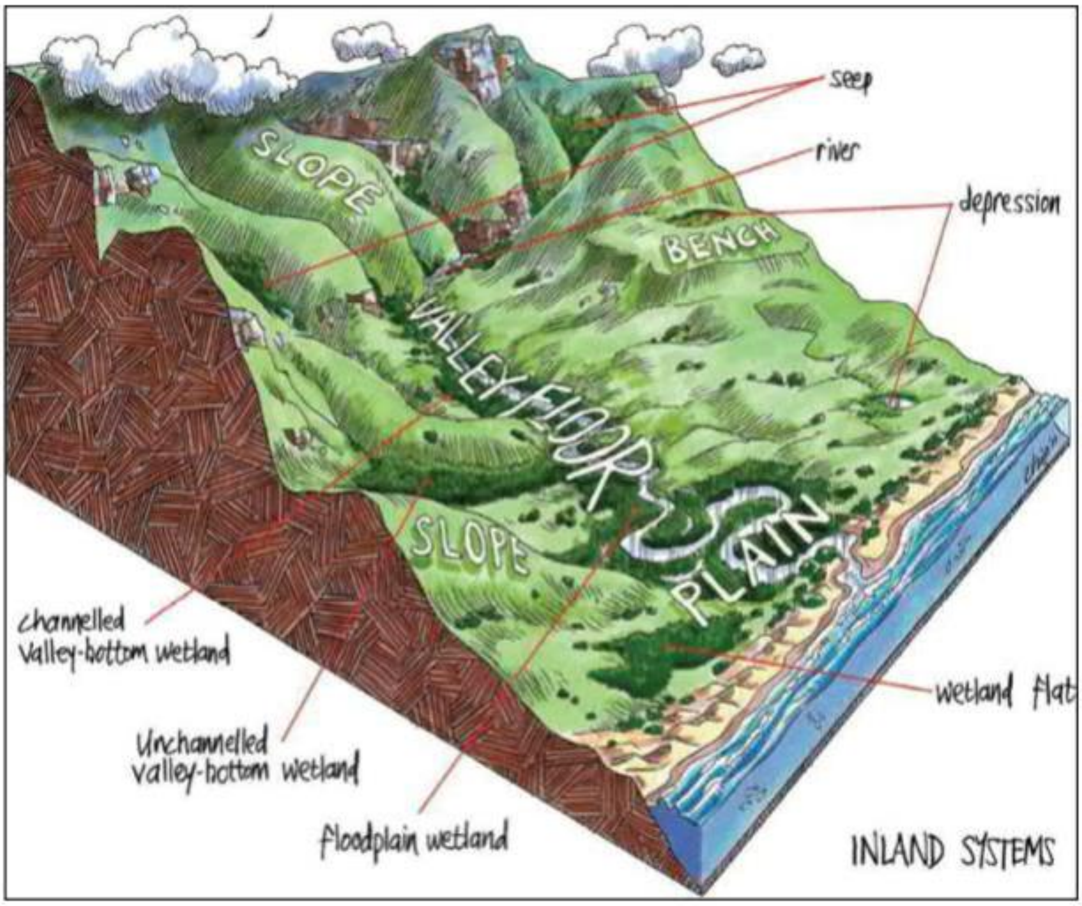


Figure 4: Illustration of wetland types and their typical landscape setting

6.2 DELINEATION

6.2.1 WETLAND DELINEATION

Wetland delineation includes the confirmation of the occurrence of a wetland and the determination of the outermost edge of the wetland. As an initial step, a desktop assessment utilising aerial imagery and available datasets was conducted to determine potential wetland and riparian habitats. This desktop analysis was vital due to the extent of the area under assessment. Following the desktop assessment, an in-field assessment was conducted between the 7th and 10th September 2021 to groundtruth and assess the desktop-identified systems, and identify any potential systems that may have been overlooked during the desktop assessment phase.

The outer boundary of the wetlands present at the site were identified and delineated according to the DWS wetland delineation manual, 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005a). The wetland indicators that are utilised in the detailed field delineation of wetlands:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur;
- The Soil Wetness Indicator identifies the morphological 'signatures' developed in the soil profile as a result of prolonged and frequent saturation (determined through soil sampling with a soil auger and examining the degree of soil mottling and gleying);
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils; and,
- The Soil Form Indicator.

According to the wetland definition used in the NWA, vegetation is the primary indicator, which must be present under normal circumstances. However, in practice, the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role. The reason for this is that vegetation responds relatively quickly to changes in the soil moisture regime or management and may be transformed, whereas the morphological indicators in the soil are far more permanent and will hold the signs of frequent saturation long after a wetland has been drained (perhaps for several centuries).

6.3 WETLAND FUNCTIONAL ASSESSMENT

Functional assessments were developed principally for evaluating the potential impacts of developments and/or projects which threaten wetland ecosystems, and are used to assess the success of wetland rehabilitation projects, by evaluating the change in wetland functioning over time (DWAF, 2004).

These protocols are usually designed to estimate the change in functioning resulting from the alteration of a wetland (either positive or negative). Minimally-impacted wetlands (within each wetland class) are used as a reference or benchmark. Each function is scored relative to that of reference wetlands in the same locality and class/type and subclass/subtype. The index value of each variable is accompanied by descriptions of estimates and measurements.

WET-Health (described below) is designed for the rapid assessment of the integrity of wetlands. It focuses on the question of how far a system has deviated from its historical, undisturbed reference condition, and does not assess ecosystem services. WET-EcoServices (Kotze *et al*., 2007), is designed for the rapid assessment of the delivery of ecosystem services by a wetland in its current state. It does not assess how far this state is from the reference condition (i.e., its integrity).

The WET-EcoServices tool (Kotze *et al*., 2005) allows measurement of ecosystem goods and services (eco-services) provided by a wetland system. Eco-services refer to the benefits obtained from ecosystems. These benefits may be derived from outputs that can be consumed directly, indirectly (which arise from functions or attributes occurring within the ecosystem), or possible future direct or indirect uses (Howe *et al*., 1991).

The WET-EcoServices tool provides structured guidelines that allow the importance of the wetland to be scored according to its ability to deliver various ecosystem services, shown in **Table 5**.

Table 5: Ecosystem Services Considered in a South African Context

Direct Benefits	Indirect Benefits
Cultural benefits Cultural heritage Tourism and recreation Education and research	Regulating and supporting benefits Flood attenuation Streamflow regulation Carbon storage
Provisioning benefits Provision of cultivated foods Provision of harvestable resources Provision of water for human use Biodiversity maintenance	Water quality enhancement benefits Sediment trapping Phosphate assimilation Nitrate assimilation Toxicant assimilation Erosion control

6.4 DETERMINING THE PRESENT ECOLOGICAL STATE (INTEGRITY) OF THE WETLANDS

WET-Health is a tool designed to assess the health (present state) or integrity of a wetland. Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition (Macfarlane *et al*., 2009). This tool is utilised to assess hydrological, geomorphological and vegetation health in three separate modules.

Hydrology is defined in this context as the distribution and movement of water through a wetland and its soils. This module focuses on changes in water inputs, as a result of changes in catchment activities and characteristics that affect water supply and its timing, as well as on modifications within the wetland that alter the water distribution and retention patterns within the wetland.

Geomorphology is defined in this context as the distribution and retention patterns of sediment within the wetland. This module focuses on evaluating current geomorphic health through the presence of indicators of excessive sediment inputs and/or losses for clastic (minerogenic) and organic sediment (peat).

Vegetation is defined in this context as the vegetation structural and compositional state. This module evaluates changes in vegetation composition and structure as a consequence of current and historic onsite transformation and/or disturbance.

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present State score. The tool attempts to standardise the way that impacts are calculated and presented across each of the modules. This takes the form of assessing the spatial extent of impact of individual activities and then separately assessing the intensity of impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact.

An overall wetland health score is calculated by weighting the scores obtained for each module and combining them to give an overall combined score using the following formula:

Overall health rating = [(Hydrology*3) + (Geomorphology*2) + (Vegetation*2)] / 7

This overall score assists in providing an overall indication of wetland health/functionality which can in turn be used for recommending appropriate management measures.

Impact scores obtained for each of the modules reflect the degree of change from natural reference conditions. Resultant health scores fall into one of six health categories (A-F) on a gradient from “unmodified/natural” (Category A) to “severe/complete deviation from natural” (Category F) as depicted in **Table 6**.

Table 6: Health categories used by WET-Health for describing the integrity of wetlands

Impact Category	Description	Range	PES Category
None	Unmodified, natural.	0 - 0.9	A
Small	Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1 – 1.9	B
Moderate	Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2 – 3.9	C
Large	Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4 – 5.9	D
Serious	The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6 – 7.9	E
Critical	Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8 - 10	F

6.5 DETERMINING THE ECOLOGICAL IMPORTANCE AND SENSITIVITY OF WETLANDS

The Ecological Importance and Sensitivity of the wetlands present was determined by utilising a rapid scoring system. The system has been developed to provide a scoring approach for assessing the Ecological and Hydrological Functions, and the Direct Human Benefits of importance and sensitivity of wetlands. These scoring assessments for these three aspects of wetland importance and sensitivity have been based on the requirements of the NWA, the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999), and the work conducted by Kotze *et al.* (2008) on the assessment of wetland ecological goods and services from the WET-EcoServices tool (Rountree and Kotze, 2013). The aspects which are assessed in terms of their importance/sensitivity are indicated in **Table 7**. A rating of 0 (low sensitivity / low importance) to 4 (very high) is allocated to each aspect. An overall score is based on the highest score out of the three categories.

Table 7: Elements assessed to determine the Ecological Importance and sensitivity

Ecological/Biological Importance	Hydrological/Functional Importance	Importance of Direct Human Benefits
Biodiversity support — Presence of Red Data species — Populations of unique species — Migration/breeding/feeding sites **Landscape scale** — Protection status of the wetland — Protection status of the vegetation type — Regional context of the ecological integrity — Size and rarity of the wetland type/s present — Diversity of habitat types **Sensitivity of the wetland** — Sensitivity to changes in floods — Sensitivity to changes in low flows/dry season — Sensitivity to changes in water quality	**Regulating and supporting benefits** — Flood attenuation — Streamflow regulation **Water Quality Enhancement** — Sediment trapping — Phosphate assimilation — Nitrate assimilation — Toxicant assimilation — Erosion control **Carbon Storage**	**Subsistence benefits** — Water for human use — Harvestable resources — Cultivated foods **Cultural benefits** — Cultural heritage — Tourism and recreation — Education and research
OVERALL IMPORTANCE ***(highest out of the three categories)***		

6.6 ECOLOGICAL CLASSIFICATION AND DESCRIPTION

EcoClassification - the term used for the Ecological Classification process - refers to the determination and categorisation of the PES (health or integrity) of various biophysical attributes of watercourses relative to or close to the natural reference condition. The purpose of the EcoClassification process is to gain insights and understanding into the causes and sources of the deviation of the PES of biophysical attributes from the reference condition. This provides the information needed to derive desirable and attainable future ecological objectives for the watercourse.

The WET-Health is a tool designed to assess the health or integrity of a wetland (McFarlane *et al*., 2009). Wetland health is defined as a measure of the deviation of wetland structure and function from the wetland's natural reference condition. Based on the delineation and classification, the systems identified do comprise of wetland like conditions (i.e. hydrological, geomorphic and vegetation).

The procedure of EcoClassification describes the health of a water resource and derives and formulates management targets / objectives / specifications for the resource. This provides the context for monitoring the water resource within an adaptive environmental management framework.

6.7 RECOMMENDED ECOLOGICAL CATEGORY

The recommended ecological category (REC) is the target or desired state of freshwater ecosystems required to meet water resource management objectives and quality targets. It is determined through the consideration of the PES, EIS and realistic opportunities to improve the PES that is driven by the context / setting. A generic matrix for the determination of RECs for water resources is shown in **Table 8** below.

Table 8: Generic Matrix for the Determination of REC for Water Resources

			EIS			
			Very High	**High**	**Moderate**	**Low**
PES	**A**	**Pristine/Natural**	A Maintain	A Maintain	A Maintain	A Maintain
	B	**Largely Natural**	A Improve	A/B Improve	B Maintain	B Maintain
	C	**Good-Fair**	B Improve	B/C Improve	C Maintain	C Maintain
	D	**Poor**	C Improve	C/D Improve	D Maintain	D Maintain
	E/F	**Very Poor**	D Improve	E/F Improve	E/F Maintain	E/F Maintain

6.8 IMPACT ASSESSMENT

6.8.1 ASSESSMENT OF IMPACTS AND MITIGATION

The assessment of impacts and mitigation evaluates the likely extent and significance of the potential impacts on identified receptors and resources against defined assessment criteria. This is undertaken in order to develop and describe measures that will be taken to avoid, minimise or compensate for any adverse environmental impacts, to enhance positive impacts, and to report the significance of residual impacts that occur following mitigation.

The key objectives of the risk assessment methodology are to identify any additional potential environmental issues and associated impacts likely to arise from the proposed project, and to propose a significance ranking. Issues / aspects will be reviewed and ranked against a series of significance criteria to identify and record interactions between activities and aspects, and resources and receptors to provide a detailed discussion of impacts. The assessment considers direct[2], indirect[3], secondary[4] as well as cumulative[5] impacts.

A standard risk assessment methodology is used for the ranking of the identified environmental impacts pre-and post-mitigation (i.e. residual impact). The significance of environmental aspects is determined and ranked by considering the criteria[6] presented in **Table 9**.

Table 9: Impact Assessment Criteria and Scoring System

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Magnitude (M) The degree of alteration of the affected environmental receptor	Very low: No impact on processes	Low: Slight impact on processes	Medium: Processes continue but in a modified way	High: Processes temporarily cease	Very High: Permanent cessation of processes

[2] Impacts that arise directly from activities that form an integral part of the Project.
[3] Impacts that arise indirectly from activities not explicitly forming part of the Project.
[4] Secondary or induced impacts caused by a change in the Project environment.
[5] Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.
[6] The definitions given are for guidance only, and not all the definitions will apply to all the environmental receptors and resources being assessed. Impact significance was assessed with and without mitigation measures in place.

CRITERIA	SCORE 1	SCORE 2	SCORE 3	SCORE 4	SCORE 5
Impact Extent (E) The geographical extent of the impact on a given environmental receptor	Site: Site only	Local: Inside activity area	Regional: Outside activity area	National: National scope or level	International: Across borders or boundaries
Impact Reversibility (R) The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Reversible: Recovery without rehabilitation		Recoverable: Recovery with rehabilitation		Irreversible: Not possible despite action
Impact Duration (D) The length of permanence of the impact on the environmental receptor	Immediate: On impact	Short term: 0-5 years	Medium term: 5-15 years	Long term: Project life	Permanent: Indefinite
Probability of Occurrence (P) The likelihood of an impact occurring in the absence of pertinent environmental management measures or mitigation	Improbable	Low Probability	Probable	Highly Probability	Definite
Significance (S) is determined by combining the above criteria in the following formula:	$[S = (E + D + R + M) \times P]$ $Significance = (Extent + Duration + Reversibility + Magnitude) \times Probability$				
IMPACT SIGNIFICANCE RATING					
Total Score	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
Environmental Significance Rating (Negative (-))	**Very low**	**Low**	**Moderate**	**High**	**Very High**
Environmental Significance Rating (Positive (+))	**Very low**	**Low**	**Moderate**	**High**	**Very High**

6.8.2 IMPACT MITIGATION

The impact significance without mitigation measures will be assessed with the design controls in place. Impacts without mitigation measures in place are not representative of the proposed development's actual extent of impact and are included to facilitate understanding of how and why mitigation measures were identified. The residual impact is what remains following the application of mitigation and management measures and is thus the final level of impact associated with the development. Residual impacts also serve as the focus of management and monitoring activities during Project implementation to verify that actual impacts are the same as those predicted in this report.

The mitigation measures chosen are based on the mitigation sequence/hierarchy which allows for consideration of five (5) different levels, which include avoid/prevent, minimise, rehabilitate/restore, offset and no-go in that order. The idea is that when project impacts are considered, the first option should be to avoid or prevent the impacts from occurring in the first place if possible, however, this is not always feasible. If this is not attainable, the impacts can be allowed, however they must be minimised as far as possible by considering reducing the footprint of the development for example so that little damage is encountered. If impacts are unavoidable, the next goal is to rehabilitate or restore the areas impacted back to their original form after project completion. Offsets are then considered if all the other measures described above fail to remedy high/significant residual negative impacts. If no offsets can be achieved on a potential impact, which results in full destruction of any ecosystem for example, the no-go option is considered so that another activity or location is considered in place of the original plan.

The mitigation sequence/hierarchy is shown in **Figure 5** below.

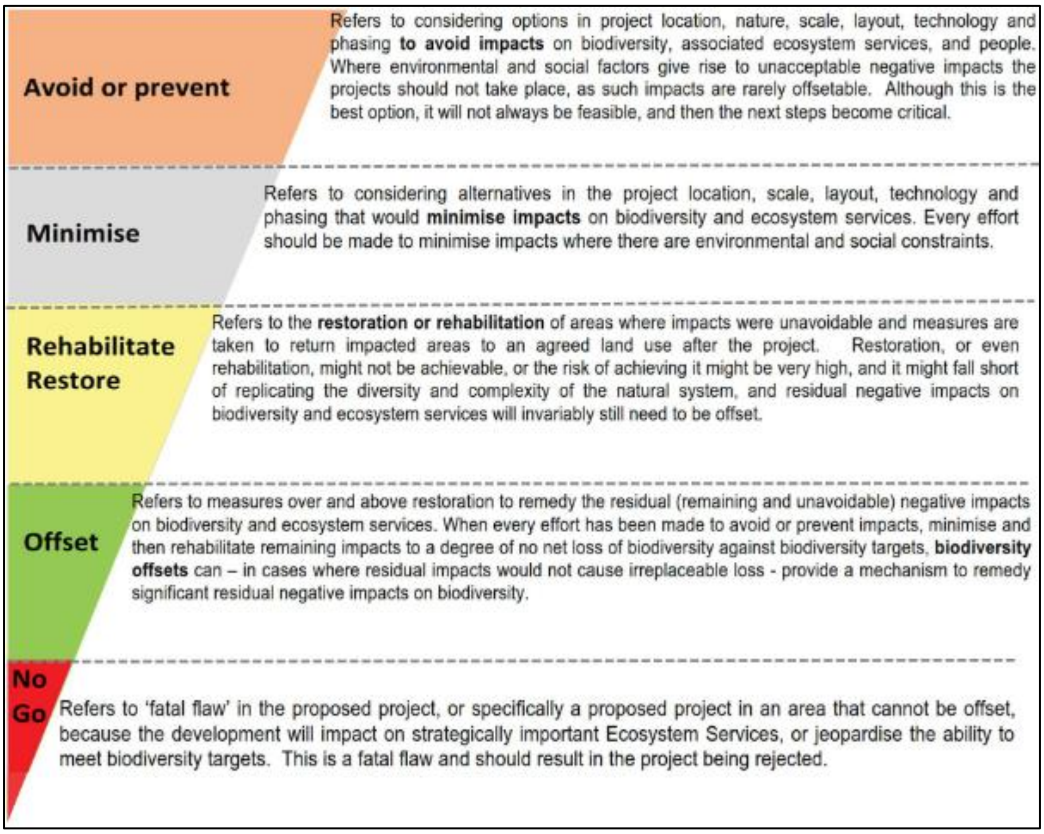


Figure 5: Mitigation Sequence/Hierarchy

7 KNOWLEDGE GAPS

Key assumptions and limitations relevant to the assessment included:

— The location and associated infrastructure were determined from information provided by BTE Renewables;

— Wetlands and/or riparian systems identified for delineation within the adjacent properties were based on a desktop review of available information and through a site inspection. This is reliant on various published data sources (e.g. aerial imagery and mapping) which have been assumed by WSP to be representative of site conditions;

— The wetland/riparian boundary comprises a gradually changing gradient of wetland/riparian indicators and varies both temporally and spatially; the wetland delineation thus occurs within a certain degree of tolerance;

— It should be recognised that there are several confounding effects on the interpretation of the historic and current extent, and functioning of the respective systems such as the historic and current industrial practices, roads, infilling, excavations/erosion, etc.;

— The wetland/riparian boundaries were accurately delineated based on the initial desktop review and site observations. The remaining watercourses were delineated at a desktop level and broadly verified in the field to obtain an extent of the wetland/riparian areas;

— This report accounts for the potential impacts of the proposed project and associated activities only; and,

— The findings, results, observations, conclusions and recommendations given in this report are based on WSP's best scientific and professional knowledge as well as available information.

8 RESULTS

8.1 WETLAND DELINEATION

A desktop assessment, utilising aerial imagery (2004 – 2021) and available datasets (NFEPA, 2011), was conducted to determine potential wetland or riparian habitats in the area under consideration. An in-field assessment was conducted in September 2021. The desktop review and subsequent infield assessment (through soil sampling and an analysis of vegetation) identified a total of twenty-seven (27) seasonal channelled valley-bottom (CVB) wetlands, twenty-eight (28) riparian zones associated with the ephemeral headwaters and twenty-one (21) riparian zones associated with the ephemeral tributaries (**Table 10**, illustrated in **Figure 6**) within a 500m radius of the proposed OHTL.

Table 10: Number of Identified Watercourses

Watercourse Type	Number Identified
Seasonal CVB	34
Riparian Ephemeral Headwaters	28
Riparian Ephemeral Tributaries	21

Table 11 provides a breakdown of the identified watercourse crossings per proposed OHTL option, with **Figure 7** providing an illustration. It should be noted that watercourses were identified within a 500m buffer from the OHTL, as such the OHTL may not necessarily cross over all the identified systems.

Table 11: Identified Watercourse Crossings Associated with each OHTL option

Option	Seasonal CVB	Riparian Ephemeral Headwaters	Riparian Ephemeral Tributaries	Total
Option 1 (A)	4	19	5	28
Option 1 (B)	6	13	11	30
Option 2 (A)	9	19	1	29
3rd Alternative	16	15	0	31
Alternative 4 (A)	11	8	0	19
Alternative 4 (B)	13	11	0	24

The total number of watercourses anticipated to be crossed by the OHTL are roughly the same, with the exception of Alternative 4 (A), which has a total number of 19 crossings. Alternative 4 (A) has the lowest number of crossings whereas the 3rd Alternative has the highest number of crossings (30). With regards to the seasonal CVB systems, the 3rd Alternative crosses the most with nine (16) crossings whereas Option 1 (A) crosses four (4).

Figure 6: Identified Watercourses

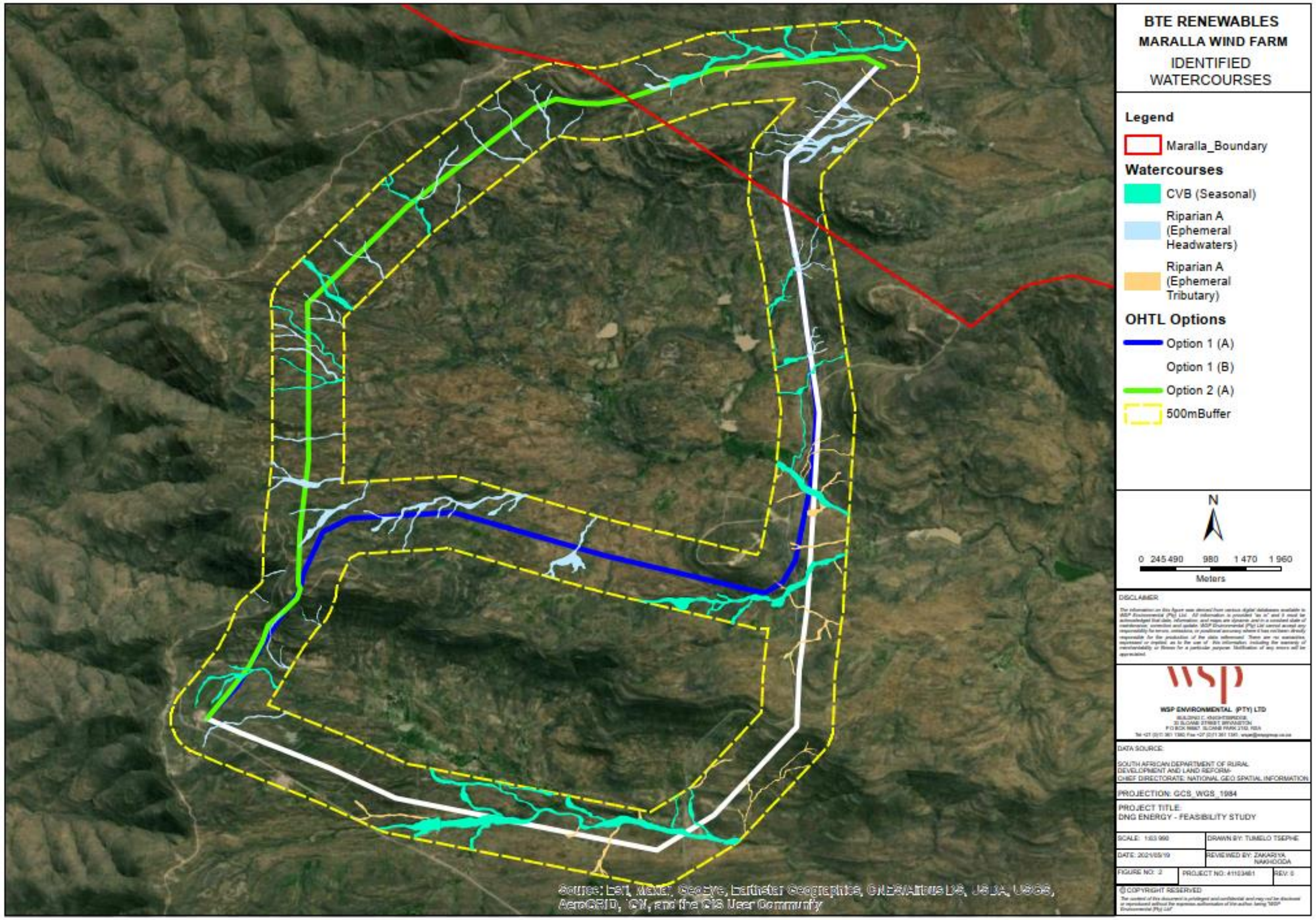
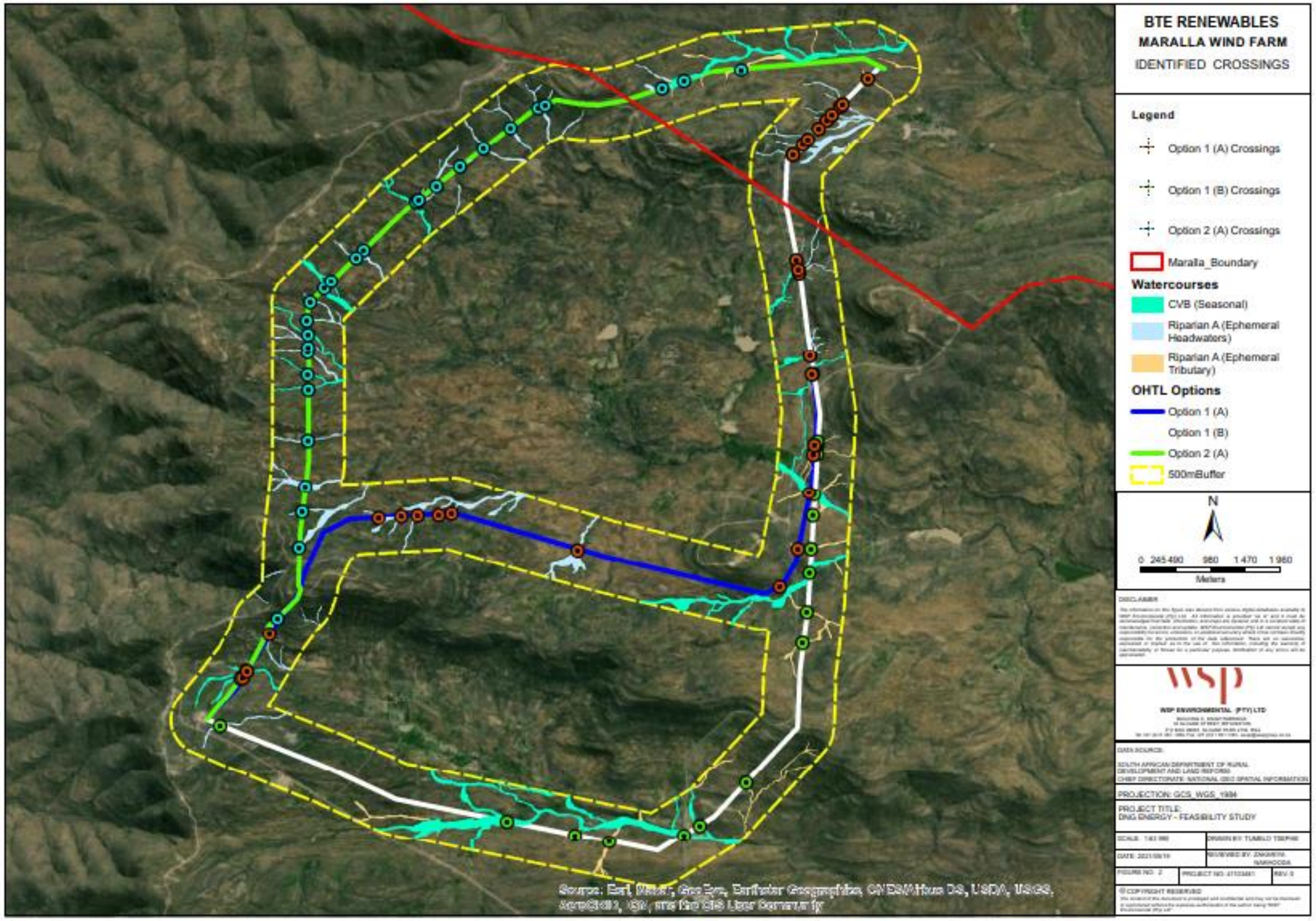


Figure 7: Identified OHTL Crossings



8.1.1 DESCRIPTION AND FUNCTIONALITY OF THE WETLANDS

CHANNELLED VALLEY-BOTTOM WETLANDS

Channelled valley-bottom wetlands are characterised by their location on valley floors, the absence of characteristic floodplain features and the presence of a river channel flowing through the wetland (Ollis *et al.*, 2013). The dominant water inputs to these wetlands are from the river channel flowing through the wetland, either as surface flow resulting from flooding or as subsurface flow, and/or from adjacent valley-side slopes (as overland flow or interflow). Water generally moves through the wetland as diffuse surface flow, although occasional, short-lived concentrated flows are possible during flooding events (Ollis *et al.*, 2013).

Water generally exits a channelled valley-bottom wetland in the form of diffuse surface or subsurface flow into the adjacent river, with infiltration into the ground and evapotranspiration of water from these wetlands also being potentially significant (Ollis *et al.*, 2013). An illustration of the typical features associated with a floodplain wetland are presented in **Figure 8**.

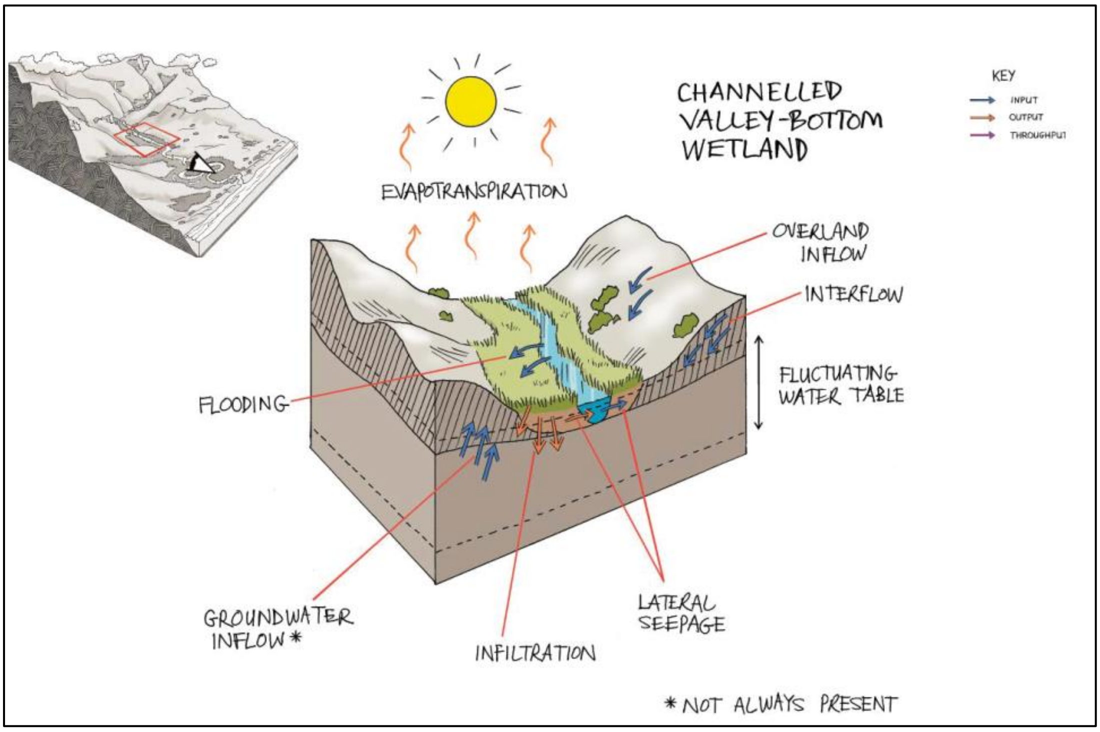


Figure 8: Conceptual Illustration of a Channelled Valley-Bottom Wetland (Ollis *et al.*, 2013)

RIPARIAN ZONES

A riparian zone is a habitat, comprising bare soil, rock and/or vegetation that is: (i) associated with a watercourse; (ii) commonly characterised by alluvial soils; and (iii) inundated or flooded to an extent and with a frequency sufficient to support vegetation species with a composition and physical structure distinct from those of adjacent land areas (DWAF, 2005) (**Figure 9**). In terms of Section 1 of the NWA, riparian habitat is legally defined as: 'habitat that "…includes 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 a composition and physical structure distinct from those of adjacent land areas."

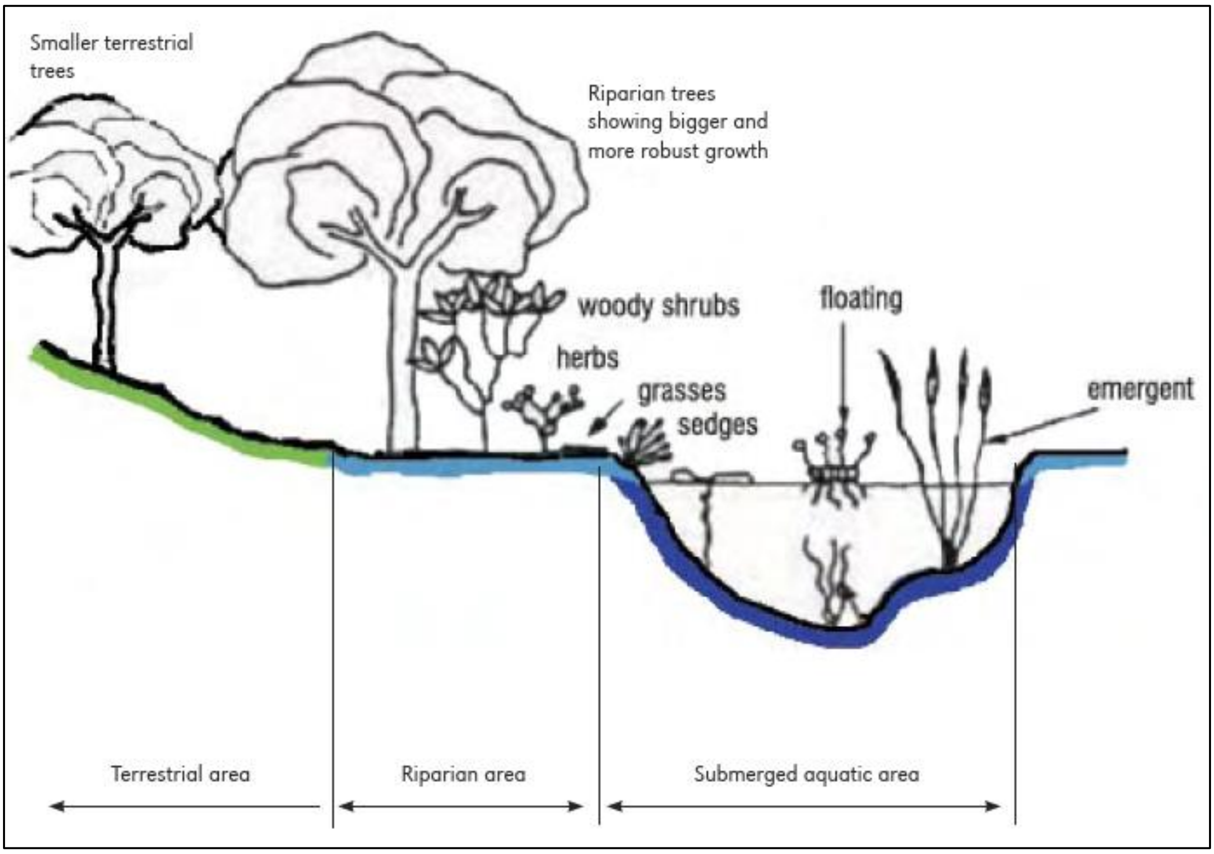


Figure 9: Typical Cross Section of a River Channel (DWAF, 2005)

8.2 WETLAND UNIT SETTING

The setting of the identified wetland was classified as per **Table 11** below.

Table 12: Wetland/Watercourse Unit Setting

Unit	Regional Setting (Level 2) (NFEPA WetVeg)	Landscape Setting (Level 3)	HGM Unit (Level 4)
CVB Systems	Karoo Shale Renosterveld	Valley Bottom	Channelled Valley Bottom
Riparian Zone (Headwaters)		Slope	Riparian Zone
Riparian Zone (Tributaries)		Slope	Riparian Zone

8.3 PES ASSESSMENT

8.3.1 CVB WETLAND SYSTEMS

The PES assessment of a wetland systems is based on an understanding of both catchment and on-site impacts and the impact that these aspects have on the wetland hydrology, geomorphology and vegetation. The level 1 WET-Health assessment determined the PES of the identified wetlands (**Table 13**).

Table 13: Overall PES of the Identified Wetlands

Unit	PES Score (out of 10)	Class
CVB 1	5.1	D: Largely Modified
CVB 2	5.6	D: Largely Modified
CVB 3	2.4	C: Moderately Modified
CVB 4	4.5	D: Largely Modified
CVB 5	2.2	C: Moderately Modified
CVB 6	2.3	C: Moderately Modified
CVB 7	2.5	C: Moderately Modified
CVB 8	2.3	C: Moderately Modified
CVB 9	2.4	C: Moderately Modified
CVB 10	2.3	C: Moderately Modified
CVB 11	2.6	C: Moderately Modified
CVB 12	2.3	C: Moderately Modified
CVB 13	2.4	C: Moderately Modified
CVB 14	2.3	C: Moderately Modified
CVB 15	2.6	C: Moderately Modified
CVB 16	2.3	C: Moderately Modified
CVB 17	2.3	C: Moderately Modified
CVB 18	6.2	E: Critically Modified
CVB 19	2.4	C: Moderately Modified
CVB 20	2.3	C: Moderately Modified
CVB 21	2.2	C: Moderately Modified
CVB 22	2.3	C: Moderately Modified
CVB 23	2.3	C: Moderately Modified
CVB 24	2.3	C: Moderately Modified
CVB 25	2.3	C: Moderately Modified
CVB 26	2.3	C: Moderately Modified
CVB 27	2.3	C: Moderately Modified

The CVB systems have been moderately modified (with the exception of CVB 1, 2, 4 and 18) owing to the changes in the surrounding land use. This includes the presence of road infrastructure, grazing and minor volumes of water abstraction. Additionally, minor evidence of sediment deposits, possibly emanating from the adjacent hillslopes was observed within the CVB systems possibly emanating from the adjacent hillslopes.

The CVB 1 and CVB 4 systems have been largely modified owing to the land use types within the system itself and on the banks. Historically natural areas have been transformed to agricultural areas, resulting in habitat loss and altered the movement and retention of flows. These activities have also resulted in vegetation loss within the wetland system itself.

The geomorphology of the system has been impacted upon by sediment deposition within resulting from land use changes. The systems also experience changes to flood peaks and transport of sediments as a result of the upstream dams.

The upper reaches of the CVB 2 system appear to have been modified for the use of agricultural practices. Historically natural areas have been transformed to agricultural areas, resulting in habitat loss and altered the movement and retention of flows. These activities have also resulted in vegetation loss within the wetland system itself.

The geomorphology of the system has been impacted upon by sediment deposition as a result of the agricultural activities. The lower reaches of the system contain a small dam, impacting on the natural flows of the system.

The CVB 18 system has been nearly completely transformed owing to the presence of a large dam within the system. As such, the system has experienced major changes to the natural vegetation, geomorphology as well as hydrology.

The hydrological, geomorphological and vegetation integrity of the CVB systems is assessed to decrease slightly over the next 5 years.

8.3.2 EPHEMERAL RIPARIAN SYSTEMS

For the purposes of this assessment, the present ecological state of the ephemeral riparian zone units was assessed at the process unit scale by qualitatively rating the condition of vegetation communities using the vegetation impact rating guidelines provided in the vegetation component of the Level 1 WET-Health tool (Macfarlane *et al*., 2008). The condition of the vegetation within each process unit was rated as a percentage condition or habitat value score (out of 100). This qualitative rating approach was considered acceptable in this context[7] owing to the absence of hydrogeomorphic conditions within the ephemeral riparian zones.

The riparian systems identified were assessed as being moderately modified (**Table 14**) owing to changes associated with the surrounding land use.

Table 14: Overall PES of the Identified Riparian Area

Unit	PES Score (out of 10)	Class	Unit	PES Score (out of 10)	Class
RH 1	2.4	C: Moderately Modified	**RT 1**	2.9	C: Moderately Modified
RH 2	2.6	C: Moderately Modified	**RT 2**	2.4	C: Moderately Modified
RH 3	2.5	C: Moderately Modified	**RT 3**	2.6	C: Moderately Modified
RH 4	2.7	C: Moderately Modified	**RT 4**	2.9	C: Moderately Modified
RH 5	2.9	C: Moderately Modified	**RT 5**	2.8	C: Moderately Modified

[7] It is important to note however that more formal sampling methods are prescribed to appropriately quantify current conditions and to act as a baseline.

Unit	PES Score (out of 10)	Class	Unit	PES Score (out of 10)	Class
RH 6	2.3	C: Moderately Modified	**RT 6**	2.5	C: Moderately Modified
RH 7	2.4	C: Moderately Modified	**RT 7**	2.7	C: Moderately Modified
RH 8	2.4	C: Moderately Modified	**RT 8**	2.9	C: Moderately Modified
RH 9	2.6	C: Moderately Modified	**RT 9**	2.8	C: Moderately Modified
RH 10	2.8	C: Moderately Modified	**RT 10**	2.5	C: Moderately Modified
RH 11	2.7	C: Moderately Modified	**RT 11**	2.7	C: Moderately Modified
RH 12	2.7	C: Moderately Modified	**RT 12**	2.9	C: Moderately Modified
RH 13	2.9	C: Moderately Modified	**RT 13**	2.8	C: Moderately Modified
RH 14	2.5	C: Moderately Modified	**RT 14**	2.6	C: Moderately Modified
RH 15	2.3	C: Moderately Modified	**RT 15**	2.8	C: Moderately Modified
RH 16	2.4	C: Moderately Modified	**RT 16**	2.8	C: Moderately Modified
RH 17	2.4	C: Moderately Modified	**RT 17**	2.7	C: Moderately Modified
RH 18	2.6	C: Moderately Modified	**RT 18**	2.9	C: Moderately Modified
RH 19	2.8	C: Moderately Modified	**RT 19**	2.6	C: Moderately Modified
RH 20	2.5	C: Moderately Modified	**RT 20**	2.9	C: Moderately Modified
RH 21	2.5	C: Moderately Modified	**RT 21**	2.9	C: Moderately Modified
RH 22	2.6	C: Moderately Modified	-	-	-
RH 23	2.4	C: Moderately Modified	-	-	-
RH 24	2.5	C: Moderately Modified	-	-	-
RH 25	2.3	C: Moderately Modified	-	-	-
RH 26	2.3	C: Moderately Modified	-	-	-

Unit	PES Score (out of 10)	Class	Unit	PES Score (out of 10)	Class
RH 27	2.7	C: Moderately Modified	-	-	-
RH 28	2.5	C: Moderately Modified	-	-	-

8.4 ECOLOGICAL FUNCTIONAL ASSESSMENT

8.4.1 CVB WETLAND SYSTEMS

The typical functionality of channelled valley-bottom wetland tends to contribute less towards flood attenuation and sediment trapping compared to that of typical floodplain wetland types but would supply these benefits to a certain extent. The potential for removal of nutrients and toxicants would generally be expected to some degree, particularly from diffuse water inputs from adjacent hillslopes (Kotze *et al*. 2009).

The overall goods and services provided by the CVB wetland systems were assessed range between moderately high and moderately low. The scores on the higher end were as a result of maintenance of biodiversity within the systems and use of water, whereas the scores on the lower end related to water quality enhancement and use of the resource for cultural or recreational activities.

8.4.2 EPHEMERAL RIPARIAN SYSTEMS

Riparian areas perform a variety of functions that are of value to society, particularly the protection and enhancement of water resources, and provision of habitat for plant and animal species.

The overall goods and services provided by the ephemeral riparian systems were assessed to range between moderate to high. The scores on the higher end were as a result of maintenance of biodiversity within the riparian zones, whereas the scores on the lower end related to water quality enhancement (removal of toxicants) and use of the resource for cultural or recreational activities.

8.5 ECOLOGICAL IMPORTANCE AND SENSITIVITY

8.5.1 CVB WETLAND SYSTEMS

The CVB wetland systems were assessed as having an overall moderate to high EIS (**Appendix A**) driven by the high bio-diversity maintenance scores. It is not classified as a 'Wetland FEPA' (Nel *et al*., 2011) and is thus not considered important in meeting national wetland conservation targets.

All the identified CVB systems have low direct benefits to society mainly due to the lack of harvestable resources.

8.5.2 EPHEMERAL RIPARIAN SYSTEMS

The ephemeral riparian systems associated with the headwaters were assessed as having an overall moderate to high EIS (**Appendix A**). The EIS scores are driven by the high bio-diversity maintenance scores.

The ephemeral riparian systems associated with the tributaries were assessed as having an overall moderate EIS (**Appendix A**). The EIS scores are driven by the bio-diversity maintenance scores.

All the ephemeral riparian systems have low direct benefits to society mainly due to the lack of harvestable resources.

8.6 RECOMMENDED ECOLOGICAL CATEGORY

Utilising the methodology outlined in **Chapter 6.7** and the matrix provided for in **Table 8**, the management objective of the project should be to maintain (**Appendix A**) the current status of the identified systems by ensuring that all impacts (associated with the proposed OHTL) are minimised such that there is no change in PES for all systems assessed.

9 IMPACT ASSESSMENT

The impacts identified for the proposed 132kv OHTL are assessed in the section that follows. The methodology for defining the significance of the respective impacts is described in section 6.8 of this report. The impacts have been assessed for the construction, operational and de-commissioning phases of the project.

9.1 CONSTRUCTION PHASE

The following activities will be carried out during the construction of the proposed 132kV OHTL.

— Drilling of holes (typically 2-3m in depth);
— Planting of poles;
— Stringing of conductors, and
— Possible excavations and stabilized backfill.

The anticipated impacts for the proposed 132kV OHTL during the construction phase of the project are presented in **Table 15**, together with associated mitigative measures**.**

Table 15: Construction Phase Impact Assessment

Impact	**Alteration of the Natural Flow Regime**
Impact description	The construction of access roads and laydown areas may result in alterations to the natural flow regimes through increased runoff, water abstractions or flow diversions.
Mitigation	— No water should be abstracted from the wetland area. Ideally water required during the construction phase must be sourced from an external source (i.e. outside of the wetland contributing area). — Existing access routes should be utilised. Should access roads need to traverse watercourse, these should be perpendicular to the watercourse with appropriately designed culverts. — It is recommended that, where possible, laydown areas and construction camps are to be developed outside the riparian zone or 100m from a watercourse, whichever is greatest. — Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season. — If possible, construction activities should be undertaken during the dry season.

Ease of mitigation	**Moderate**

Significance rating

Pre-Mitigation						Post-Mitigation					
(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
4	3	3	2	4	48	2	2	3	2	2	18
N3 - Moderate						N2 – Low					

Impact	**Water Quality**
Impact description	Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems.
Mitigation	— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are located outside the riparian zone or 100m from a watercourse, whichever is greatest. — Procedures for containment of leaks/spills as well as associated emergency response plans should be developed. — Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the riparian zone or 100m from a watercourse, whichever is greatest. — Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks. — Adequate ablution facilities should be developed and located outside the riparian zone or 100m from a watercourse, whichever is greatest.
Ease of mitigation	Moderate

Significance rating

Pre-Mitigation						Post-Mitigation					
(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
4	3	3	2	3	36	2	2	1	2	3	21
N3 - Moderate						N2 - Low					

Impact	**Loss of wetland and riparian functionality**
Impact description	Degradation of wetland/riparian habitat due to the positioning of the OHTL stand poles
Mitigation	— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures. — The identified wetlands and riparian areas are to be designated as “highly sensitive”.

<table>
<tr><td></td><td>
— Planning the location of poles should factor in the wetlands and riparian areas, with pole placement taking place outside these systems.
— In the event that poles need to be placed within the wetland or riparian systems, an application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) must be undertaken
</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
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<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Loss of wetland and riparian functionality</td></tr>
<tr><td>Impact description</td><td>Degradation of wetland/riparian habitat due to the need for access roads</td></tr>
<tr><td>Mitigation</td><td>
— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures.
— The identified wetlands and riparian areas are to be designated as “highly sensitive”.
— Existing access routes must be utilised.
— Should the need for additional access routes arise, these should be perpendicular to the watercourse and developed with appropriately sized culvers.
— In the event that access roads need to be constructed, an application for a Water Use Licence (WUL) in terms of Section 21 of the National Water Act (NWA) (Act 36 of 1998) must be undertaken
</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
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<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Increased soil erosion and sedimentation.</td></tr>
<tr><td>Impact description</td><td>Increased soil erosion due to vegetation clearance, soil disturbance and high traffic movement on site. Subsequent potential sedimentation of watercourses.</td></tr>
<tr><td>Mitigation</td><td>
— During the construction phase sediment control measures must be adopted in order to prevent sediment entering the wetland.
— Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season.
</td></tr>
</table>

	— Traffic of construction vehicles should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical. — Soils excavated during construction of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles). — Upon completion of construction, the laydown areas and construction camp sites are to be rehabilitated. — Gabions or Reno Mattresses should be used where evidence of erosion is present.
Ease of mitigation	Moderate
Significance rating	See table below

Pre-Mitigation						Post-Mitigation					
(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
4	2	3	2	4	44	2	2	3	2	3	27
N3 - Moderate						N2 - Low					

Impact	**Alien vegetation establishment**
Impact description	Potential for alien vegetation to colonise impacted areas.
Mitigation	— It is essential that all alien invasive species be removed from the site. — As part of the rehabilitation initiatives, an alien removal and monitoring plan should be established that addresses alien vegetation in the wetland areas. The programme is to include regular clearing of alien vegetation and monitoring thereof to assess the success of activities and recommend additional measures if required. Alien vegetation removal and monitoring is to be implemented based on the plan.
Ease of mitigation	Moderate
Significance rating	See table below

Pre-Mitigation						Post-Mitigation					
(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
4	2	3	2	3	44	2	2	1	2	2	14
N3 - Moderate						N1 – Very Low					

9.2 OPERATIONAL PHASE

The anticipated impacts for the proposed 132kV OHTL during the operational phase of the project are summarised in **Table 16**. The impacts summarised below are relevant to the freshwater habitats identified within a 500m radius of the proposed OHTL.

Table 16: Operational Phase Impact Assessment

<table>
<tr><th>Impact</th><th colspan="12">Water Quality</th></tr>
<tr><td>Impact description</td><td colspan="12">Potential spillage of hazardous substances such as oils, fuel, grease from maintenance vehicles, and sewage from on-site sanitation systems.</td></tr>
<tr><td>Mitigation</td><td colspan="12">— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are located outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Procedures for containment of leaks/spills as well as associated emergency response plans should be developed.
— Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks.
— Adequate ablution facilities should be developed and located outside the riparian zone or 100m from a watercourse, whichever is greatest.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>3</td><td>3</td><td>3</td><td>2</td><td>3</td><td>33</td><td>2</td><td>2</td><td>1</td><td>2</td><td>2</td><td>14</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N1 - Very Low</td></tr>
<tr><th>Impact</th><th colspan="12">Loss of wetland and riparian habitat</th></tr>
<tr><td>Impact description</td><td colspan="12">Degradation of wetland/riparian habitat when undertaking maintenance activities</td></tr>
<tr><td>Mitigation</td><td colspan="12">— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures.
— The identified wetlands and riparian areas are to be designated as “highly sensitive”.
— Existing access routes should be utilised to access the OHTL infrastructure.</td></tr>
</table>

<table>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>3</td><td>3</td><td>2</td><td>3</td><td>36</td><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 –Low</td></tr>
<tr><td>Impact</td><td colspan="12">Increased soil erosion and sedimentation.</td></tr>
<tr><td>Impact description</td><td colspan="12">Increased soil erosion due to vegetation clearance, soil disturbance and high traffic movement on site. Subsequent potential sedimentation of watercourses.</td></tr>
<tr><td>Mitigation</td><td colspan="12">— During maintenance, sediment control measures must be adopted in order to prevent sediment entering the wetland.
— Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season.
— Traffic of construction vehicles should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical.
— Soils excavated during maintenance of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles).
— Upon completion of maintenance, the laydown areas and construction camp sites are to be rehabilitated.
— Gabions or Reno Mattresses should be used where evidence of erosion is present.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>2</td><td>3</td><td>2</td><td>3</td><td>33</td><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 – Low</td></tr>
</table>

9.3 DECOMISSIONING PHASE

The anticipated impacts for the proposed 132kV OHTL during the decommissioning phase of the project are summarised in **Table 17**. The impacts summarised below are relevant to the freshwater habitats identified within a 500m radius of the OHTL.

Table 17: Decommissioning Phase Impact Assessment

<table>
<tr><th>Impact</th><th colspan="12">Water Quality</th></tr>
<tr><td>Impact description</td><td colspan="12">Potential spillage of hazardous substances such as oils, fuel, grease from vehicles, and sewage from on-site sanitation systems.</td></tr>
<tr><td>Mitigation</td><td colspan="12">— Areas for waste disposal should be clearly demarcated and should be bunded and on hard standing. These areas should be located outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Ensure that no equipment is washed in the streams and wetlands of the area, and if washing facilities are provided, that these are located outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Procedures for containment of leaks/spills as well as associated emergency response plans should be developed.
— Machinery and equipment must be inspected regularly for faults and possible leaks. If required, servicing of these should occur off outside the riparian zone or 100m from a watercourse, whichever is greatest.
— Potential contaminants used and stored at the proposed project site should be stored and prepared on bunded surfaces to contain spills and leaks.
— Adequate ablution facilities should be developed and located outside the riparian zone or 100m from a watercourse, whichever is greatest.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>3</td><td>3</td><td>2</td><td>3</td><td>36</td><td>2</td><td>2</td><td>1</td><td>2</td><td>2</td><td>14</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N1 - Very Low</td></tr>
<tr><td>Impact</td><td colspan="12">Loss of wetland and riparian habitat</td></tr>
<tr><td>Impact description</td><td colspan="12">Degradation of wetland/riparian habitat when undertaking maintenance activities</td></tr>
<tr><td>Mitigation</td><td colspan="12">— A layout plan must be compiled indicating the limits of disturbance associated with the proposed infrastructure in relation to the identified sensitive areas (i.e. wetlands). No-go areas and any stormwater infrastructure must be indicated on this plan together with erosion and sediment, controls and measures.
— The identified wetlands and riparian areas are to be designated as “highly sensitive”.
— Existing access routes should be utilised to access the OHTL infrastructure.</td></tr>
</table>

<table>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>3</td><td>3</td><td>2</td><td>3</td><td>36</td><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 –Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Increased soil erosion and sedimentation.</td></tr>
<tr><td>Impact description</td><td>Increased soil erosion due to vegetation clearance, soil disturbance and high traffic movement on site. Subsequent potential sedimentation of watercourses.</td></tr>
<tr><td>Mitigation</td><td>— Sediment control measures must be adopted in order to prevent sediment entering the wetland.
— Vegetation clearing, soil stripping and major earthmoving activities must be phased to minimise the extent of bare soils surfaces exposed at any one time. Ideally, this should be undertaken during the dry season.
— Traffic should be kept to a minimum to reduce soil compaction, and limited to existing or proposed roadways where practical.
— Soils excavated during decommissioning of the infrastructure should be appropriately stored in stockpiles which are protected from erosion (i.e. through use of vegetation cover in the case of long-term stockpiles).
— Upon completion of decommissioning, the work area, laydown areas and construction camp sites are to be rehabilitated.
— Gabions or Reno Mattresses should be used where evidence of erosion is present.</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>3</td><td>3</td><td>2</td><td>3</td><td>36</td><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 – Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Alien vegetation establishment</td></tr>
<tr><td>Impact description</td><td>Potential for alien vegetation to colonise impacted areas.</td></tr>
<tr><td>Mitigation</td><td>— It is essential that all alien invasive species be removed from the site.
— As part of the rehabilitation initiatives, an alien removal and monitoring plan should be established that addresses alien vegetation in the wetland areas. The programme is to include regular clearing of alien vegetation and monitoring thereof to assess the success of activities and recommend additional measures if required. Alien vegetation removal and monitoring is to be implemented based on the plan.</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
</table>

Significance rating	Pre-Mitigation						Post-Mitigation					
	(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
	4	2	3	2	3	33	2	2	3	2	2	18
	N3 - Moderate						N2 – Low					

10 CONCLUSIONS

The freshwater habitat assessment identified a total of twenty-seven (27) seasonal channelled valley-bottom (CVB) wetlands, twenty-eight (28) riparian zones associated with the ephemeral headwaters and twenty-one (21) riparian zones associated with the ephemeral tributaries within a 500m radius of the proposed OHTL.

The CVB wetland systems were assessed to have a **PES** of **C**, with the exception CVB 1, CVB 2, SVB 4 and CVB 18, which have a **PES** of **D** and **E** (CVB 18 only). The riparian systems were assessed to have a **PES** of **C**. The **EIS** of the wetland and riparian systems ranged between **moderate** to **moderately high** for biodiversity maintenance.

The outcomes of the impact assessment determined that the construction, operation of the proposed infrastructure does have the potential to impact the identified wetland and riparian systems, with impact ratings between **Low** and **Medium**. However with mitigative measures in place the risks associated with the proposed infrastructure are **Low**.

Prior to undertaking the proposed activities, construction method statements and emergency response plans must be developed, with specific consideration given to the environment, including wetland habitats. Furthermore, the required authorisation must be attained from the Department of Water and Sanitation.

It is envisaged that the implementation of these measures would provide sufficient mitigation in order to reduce the environmental impact. If the recommended mitigative measures are implemented correctly, including adherence to the DWS Environmental Best Practice Guidelines and the Work Method Statements, the overall significance of the impacts may be reduced.

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APPENDIX

A PES, EIS AND REC DATA

APPENDIX

HGM_TYPE	Unit	PES	EIS	REC
CVB (Seasonal)	CVB 1	5.1	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 2	5.6	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 3	2.4	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 4	4.5	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 5	2.2	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 6	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 7	2.5	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 8	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 9	2.4	2.1 (MOD)	MAINTAIN
CVB (Seasonal)	CVB 10	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 11	2.6	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 12	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 13	2.4	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 14	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 15	2.6	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 16	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 17	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 18	6.2	2.1 (MOD)	MAINTAIN
CVB (Seasonal)	CVB 19	2.4	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 20	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 21	2.2	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 22	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 23	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 24	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 25	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 26	2.3	2.6 (MOD-HIGH)	MAINTAIN
CVB (Seasonal)	CVB 27	2.3	2.6 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 1	2.4	2.4 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 2	2.6	2.4 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 3	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 4	2.7	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 5	2.9	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 6	2.3	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 7	2.4	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 8	2.4	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 9	2.6	2.3 (MOD-HIGH)	MAINTAIN

APPENDIX

HGM_TYPE	Unit	PES	EIS	REC
Riparian A (Ephemeral Headwaters)	RH 10	2.8	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 11	2.7	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 12	2.7	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 13	2.9	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 14	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 15	2.3	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 16	2.4	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 17	2.4	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 18	2.6	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 19	2.8	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 20	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 21	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 22	2.6	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 23	2.4	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 24	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 25	2.3	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 26	2.3	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 27	2.7	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Headwaters)	RH 28	2.5	2.3 (MOD-HIGH)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 1	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 2	2.4	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 3	2.6	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 4	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 5	2.8	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 6	2.5	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 7	2.7	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 8	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 9	2.8	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 10	2.5	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 11	2.7	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 12	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 13	2.8	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 14	2.6	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 15	2.8	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 16	2.8	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 17	2.7	2.1 (MOD)	MAINTAIN

APPENDIX

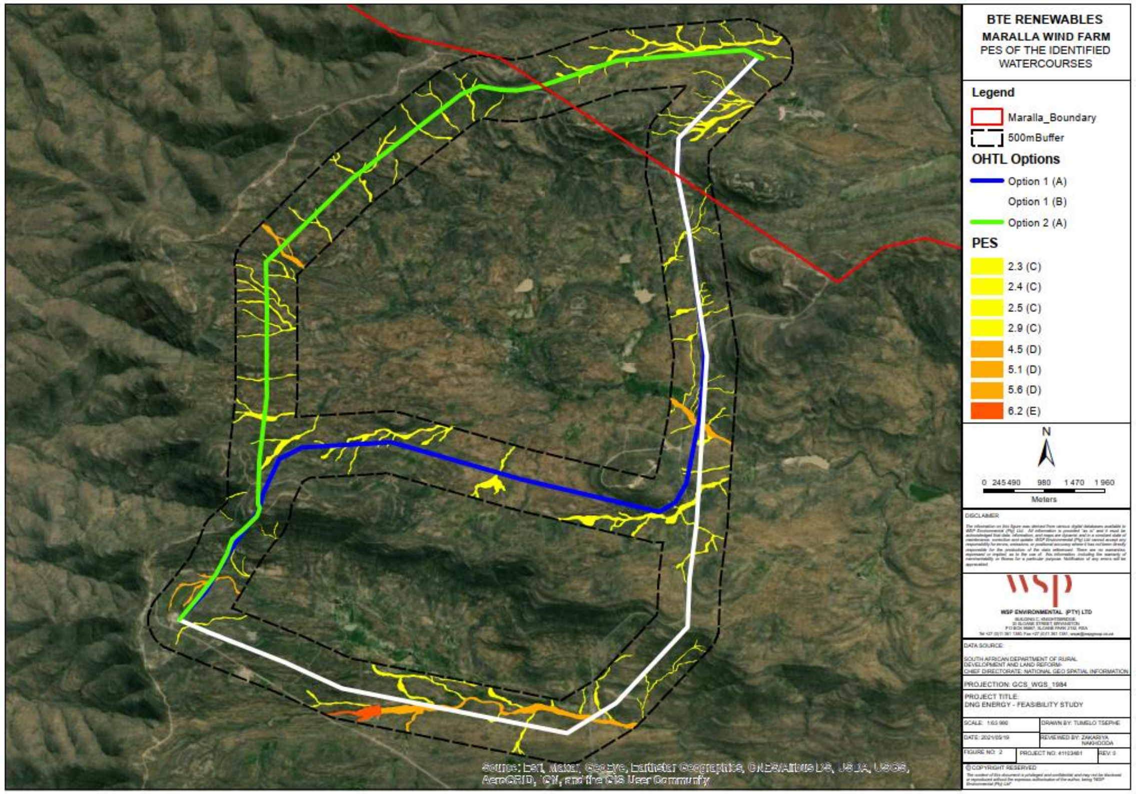
HGM_TYPE	Unit	PES	EIS	REC
Riparian A (Ephemeral Tributary)	RT 18	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 19	2.6	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 20	2.9	2.1 (MOD)	MAINTAIN
Riparian A (Ephemeral Tributary)	RT 21	2.9	2.1 (MOD)	MAINTAIN

APPENDIX

B PES AND EIS IMAGES

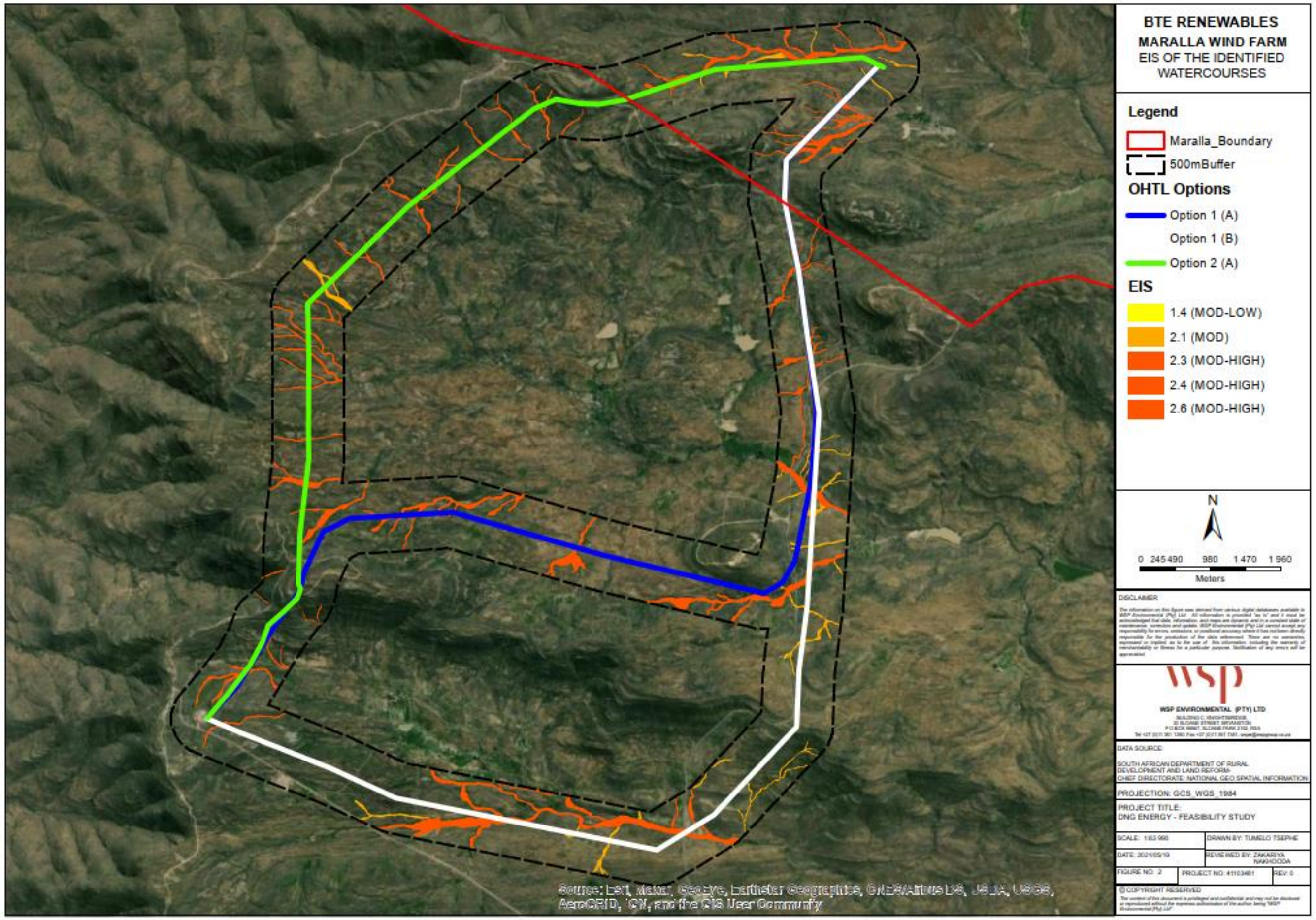
APPENDIX

B-1 *PES*



APPENDIX

B-2 *EIS*



BTE RENEWABLES (PTY) LTD

MARALLA ENVIRONMENTAL CONSENTS

HYDROLOGICAL ASSESSMENT

20 MAY 2022

DRAFT

MARALLA ENVIRONMENTAL CONSENTS

HYDROLOGICAL ASSESSMENT

BTE RENEWABLES (PTY) LTD

DRAFT

PROJECT NO.: 41103480
DATE: MAY 2022

WSP
BUILDING C, KNIGHTSBRIDGE
33 SLOANE STREET
BRYANSTON, 2191
SOUTH AFRICA

T: +27 11 361 1380
F: +086 606 7121
WSP.COM

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TABLES

FIGURES

1 INTRODUCTION

WSP in Africa (WSP), a wholly owned affiliate of WSP Global Inc., was commissioned to undertake a hydrological assessment, which is required for the Basic Assessment (BA) process for the new Maralla 132kV powerline. The development of a 132kV overhead power line is required to connect the Maralla East and West Wind Energy Facilities (WEF) Energy Facility to the national grid via the existing Karusa substation. The powerline is approximately 18 km long. The project is situated south-east of the town of Sutherland in the Karoo Hoogland Local Municipality in the Northern Cape Province.

The desktop Hydrological Assessment aimed to assess the impacts of the proposed powerline on the receiving surface water environment and implications to downstream surface water users. The outcomes of the Hydrological Assessment were utilised to develop an erosion management plan. The plan incorporated the monitoring as well as the rehabilitation of soils in the event of an erosion event. The objectives of the assessment were as follows:

— Desktop study;
— Site walkover;
— Erosion management plan;
— Impact assessment.

1.1 BACKGROUND

To strengthen their grid integration options, Biotherm has opted to undertake an additional transmission integration project whereby the Maralla WEFs will be connected to the authorised Hidden Valley WEF substation. This substation will be located within the Karuso WEF phase of the three collective Hidden Valley WEFs. The other two phases are called the Soetwater and Great Karoo WEFs.

The proposed transmission line options (addressed in this report) include six alternatives, namely:

— **Alternative 1A (17.5km)**

Proposed route. This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 7.5km, crossing an unnamed drainage line before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment, west of the Perdekraal se Berg, before entering the Hidden Valley substation.

— **Alternative 1B (19km)**

Proposed route. This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for approximately 10km. It crosses an unnamed drainage line, the Perdeplaas se Berg ridgeline and the Meintjiesplaas River before veering west towards the Hidden Valley substation.

— **Alternative 2A (15.4km)**

Proposed route. This is the shortest alternative and it traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden valley substation.

— **Alternative 3 (20km)**

Suggested route as proposed within the Biodiversity and Ecology Study (The Biodiversity Company (TBC), November 2021) This alternative will traverse southwards from the Maralla substation alongside the Komsberg/Kareedoringkraal secondary road for 5km before veering west towards the Klein-Roggeveldberge. It turns southwards near the escarpment and continues south to the Hidden Valley substation.

— **Alternative 4A (16km)**

Landowner proposed route. This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

— **Alternative 4B (16km)**

Landowner proposed route. This alternative traverses west from the Maralla substation towards the Klein-Roggeveldberge. It continues in a south-westerly direction past the Heuwels substation and alongside the authorised Heuwels-Hidden Valley power lines to the Hidden Valley substation.

2 SITE DESCRIPTION

The proposed Maralla powerline is located along the provincial boarder between the Western Cape and Northern Cape, approximately 28 km north-west of the town of Laingsburg, (**Figure 2-1**). Other nearby towns include Matjiesfontein and Sutherland. The area falls within the Central Karoo District Municipality DC5.

The 132kV grid connection crosses the following properties:

- Drie Roode Heuvels 180 (C07200000000018000000);
- Orangie Fontein 203 (C07200000000020300000);
- Orangie Fontein 203 Portion 2 (C07200000000020300002);
- Orangie Fontein 203 Portion 1 (C07200000000020300001);
- Kentucky 206 (C07200000000020600000), and
- De Hoop 202 (C07200000000020200000).

The overhead-line will be a 132kV steel single or double structure with kingbird conductor (between 15 and 20m in height, above ground level). Standard overhead line construction methodology will be employed, which consists of drilling holes (typically 2 – 3m in depth), planting poles and stringing conductors. It is not envisaged that any large excavations and stabilized backfill will be required, however this will only be verified on site once the geotechnical study has been undertaken at each pole position (as part of construction works).

There are three proposed powerline options, which are illustrated in **Figure 2-2**.

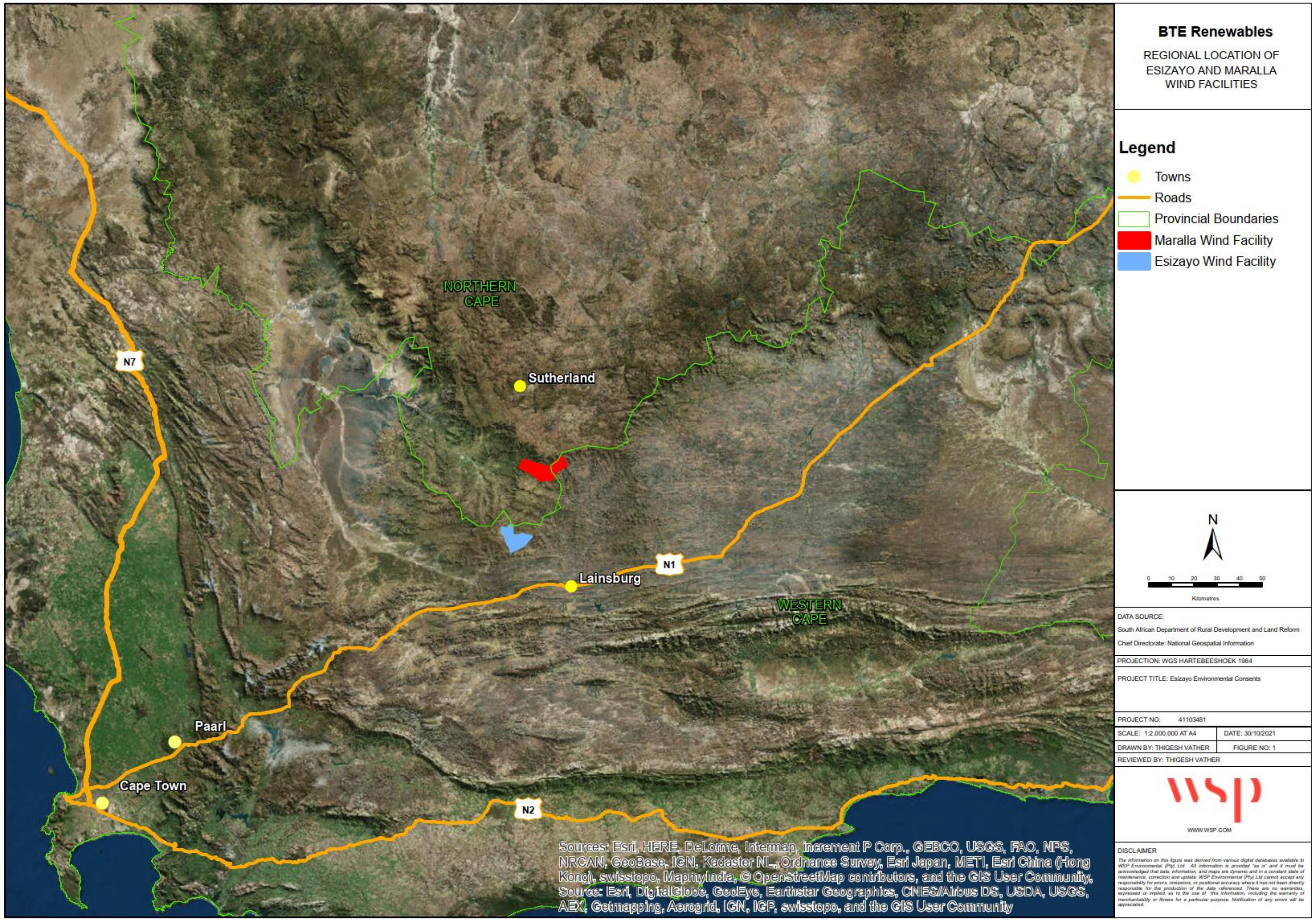


Figure 2-1: Regional Setting of the Maralla East and West WEFs

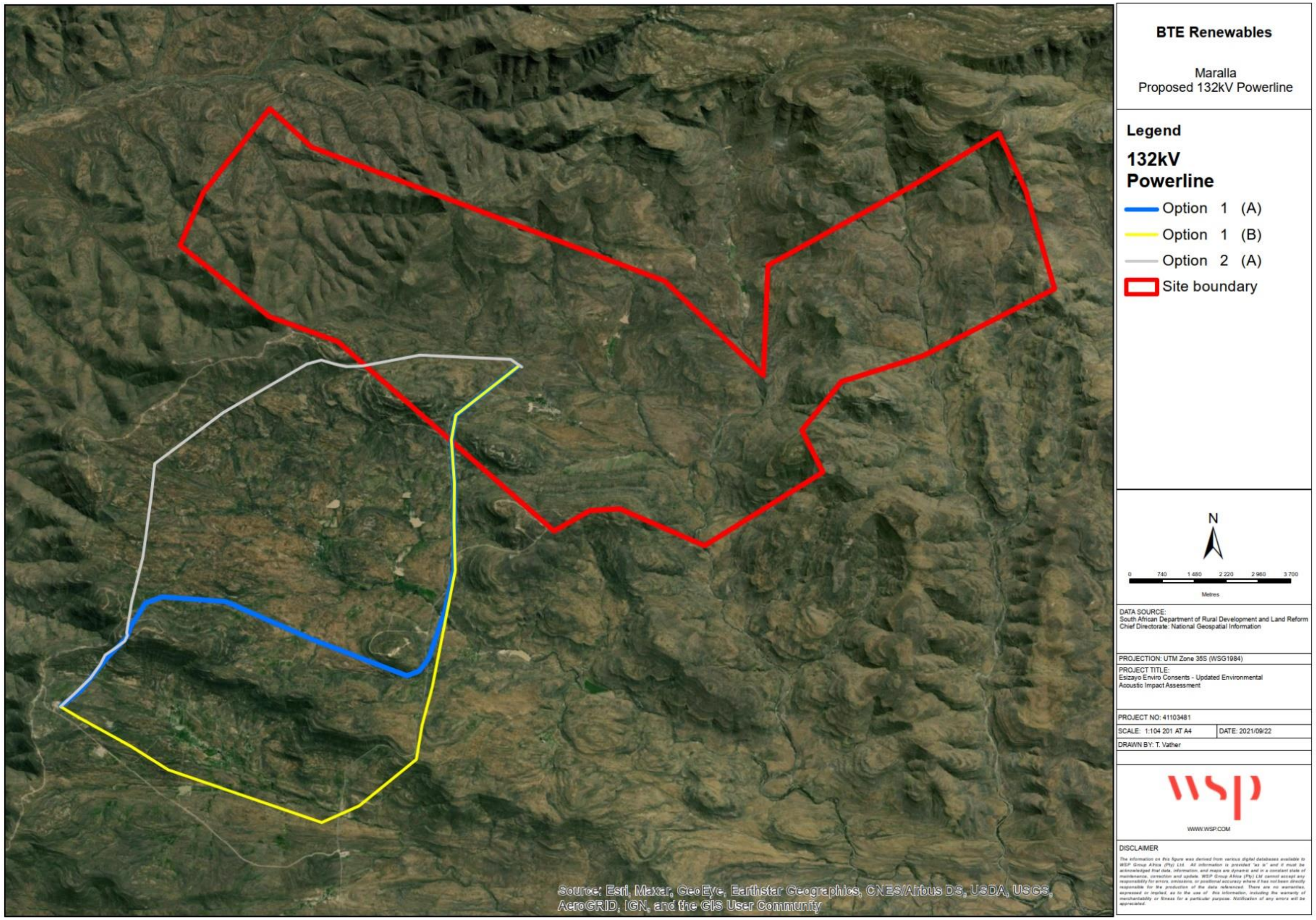


Figure 2-2: Proposed Maralla powerline options

3 LEGAL CONTEXT

The objective of the hydrological assessment is to limit any potential impacts on the surface water and groundwater resources associated with the power station. The South African National Water Act (NWA) was used as the guidance document to meet this objective.

The preamble to the NWA recognises that the aim of water resource management is to achieve sustainable water use for the benefit of all users and that the quality of these resources are protected to ensure ongoing sustainability. The purpose of the NWA is stated, as inter alia:

— Promoting the efficient, sustainable and beneficial use of water in the public interest;
— Facilitating social and economic development;
— Protecting aquatic and associated ecosystems and their biological diversity;
— Reducing and preventing pollution and degradation of water resources; and
— Meeting international obligations.

The NWA presents strategies to facilitate sound management of water resources, provides for the protection of water resources, and regulates use of water by means of Catchment Management Agencies, Water User Associations, Advisory Committees and International Water Management.

4 BASELINE RECEIVING ENVIRONMENT

This section describes the baseline environment of the power station, which provided the fundamental understanding of the hydrological assessment.

4.1 CLIMATE

The climate of the region is arid to semi-arid. Rainfall is low and occurs throughout the year but predominantly in the winter months between March and August. Mean annual precipitation is approximately 290mm, ranging from 180 – 410mm rainfall per year. The region experiences dry hot summers and the warmest month of the year is February which averages 23.4°C. The lowest average temperatures in the year occur in July, averaging approximately 9.3°C. The region experiences steady, strong winds between December and April; however the winds calm between the months of June and October.

4.2 LAND COVER

Based on the Mucina and Rutherford (2006) natural vegetation classification map, the area is mostly Central Mountain Shale Renosterveld, with a minor contribution of Koedoesberge-Moordenaars Karoo. The Department of Agriculture, Forestry and Fisheries (DAFF) define the land use within the Site, as predominantly Shrubland and Low Fynbos (DAFF, 2012).

During the site visit, the vegetation was identified as mostly shrub-like vegetation and Fynbos, which is primarily used for sheep grazing. Indigenous antelope (Springbok) were also present within the site boundary.

4.3 GEOLOGY AND SOILS

Based on the information included in the land type maps of South Africa (AGIS, 2007) the soils in the region are mostly classified as the Glenrosa and/or Mispha forms with lime generally present in the landscape" and "miscellaneous land classes, rocky areas with miscellaneous soils".

The general geological description of the area is based on the 1:1 000 000 geological map for the Northern Cape Province, published by the Trigonometrical Survey Office in 1970 (Schifano *et.al*., 1970). The area is nested in the Roggeveld Mountains range, in the Larger Cape Fold belt system. The area is located on the Beaufort Series which forms part of the Karoo system. The rock type for the series comprises of shale, mudstone, sandstone and limestone. During the site visit it was observed that shale and mudstone were the dominant rock type for the area.

4.4 TOPOGRAPHY

The topography of the area comprises of mountainous hillslopes (part of the Roggeveld Mountain Range) with small patches of open rocky ground in between, and numerous watercourses and drainage channels. The hillslopes have an average gradient of 34.4 % and 1.1% on the open flat ground. The elevation of the area ranges from 984 m to 1 379 m above mean sea level (amsl).

4.4.1 QUATERNARY CATCHMENTS

The three proposed powerlines lie mostly within tertiary catchment J11A and Partially in J11D. The J11A and J11D tertiary hydrological characteristics are summarised in **Table 4-1**, including catchment area, Mean Annual Precipitation (MAP), Mean Annual Evaporation (MAE) and Mean Annual Runoff (MAR). The MAE largely exceeds the MAP, reinforcing the arid conditions of the region.

Table 4-1: Quaternary J11A and J11D Hydrological Characteristics

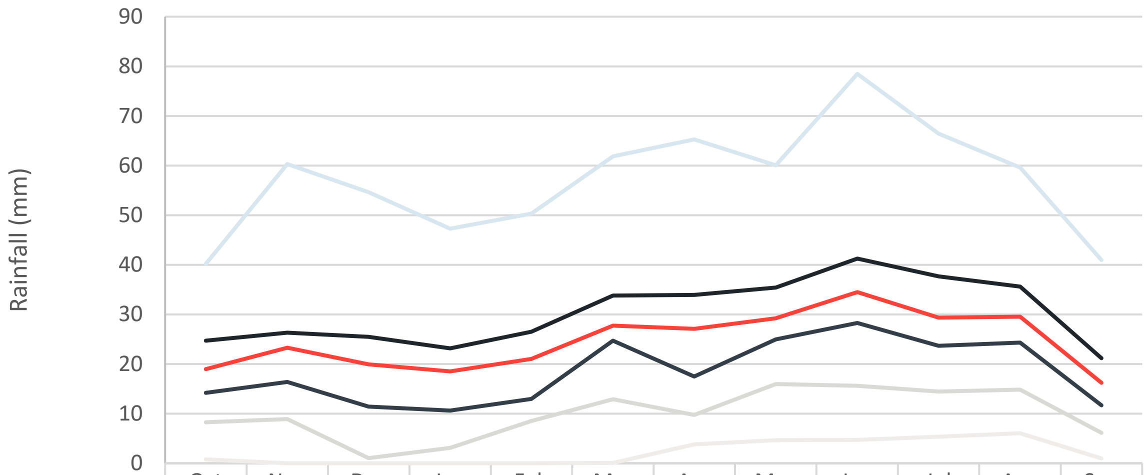
QUATERNARY	CATCHMENT AREA (km^2)	MAP (mm)	MAE (mm)	MAR (mcm)
J11A	438	295	1965	5.86
J11D	801	240	2000	5.58

Source: WRC/DWA, 2012

During the site visit there were several watercourses/drainage channels present within the area, the main river being the Roggeveld, which is south of the powerline. However, a few of the watercourses that were visited within the area were dry. Given the arid climatic condition of the region, the majority of the watercourses are ephemeral and are likely to only convey water during infrequent high rainfall events.

4.4.2 PRECIPITATION

The site falls within rainfall zone J1A associated with quaternary J11A, with an MAP of 295mm. The monthly rainfall distribution is represented in **Figure 4-1**. The 'E' values show the probability of non-exceedance, so highlight the likelihood that the specific rainfall event will not be exceeded.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average	19	23	20	19	21	28	27	29	34	29	30	16
E10	40	60	55	47	50	62	65	60	78	66	60	41
E30	25	26	25	23	27	34	34	35	41	38	36	21
E50	14	16	11	11	13	25	18	25	28	24	24	12
E70	8	9	1	3	9	13	10	16	16	14	15	6
E90	1	0	0	0	0	0	4	5	5	5	6	1

Figure 4-1: Monthly Rainfall for Quaternary J1A (WR2012, 2021)

4.4.3 EVAPORATION

Evaporation data for the site was extracted from the WR2012 (WRC, 2021) database. The evaporation zone representative of the site is 24A with an MAE of 1965 mm. The MAE is clearly considerably higher than the MAP, making this a dry area. The monthly evaporation distribution is presented in **Figure 4-2**.

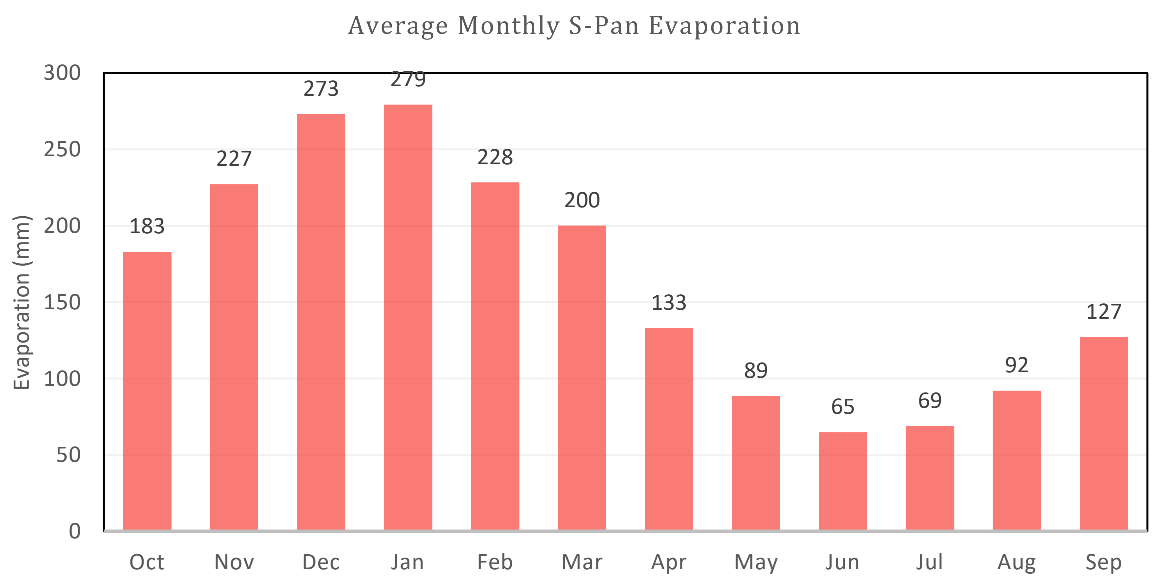
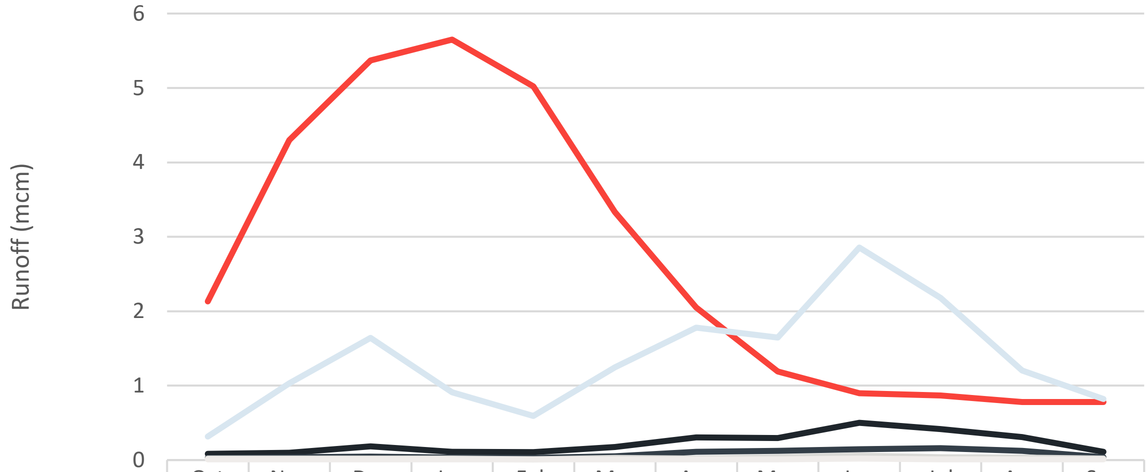


Figure 4-2: Monthly S-Pan Evaporation for Evaporation Zone 12A (WR2012, 2020)

4.4.4 NATURALISED RUNOFF

WR2012 (WRC, 2019) simulates average runoff of this quaternary at 5.58mcm per annum. The monthly runoff is presented in **Figure 4-3**. The 'E' values show the probability of non-exceedance.



	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Average	2.13	4.3	5.37	5.65	5.02	3.33	2.05	1.19	0.9	0.87	0.78	0.78
E10	0.316	1.033	1.642	0.909	0.594	1.248	1.779	1.646	2.856	2.181	1.204	0.821
E30	0.084	0.1	0.184	0.11	0.107	0.174	0.304	0.294	0.501	0.417	0.307	0.11
E50	0.03	0.04	0.045	0.035	0.03	0.05	0.11	0.125	0.145	0.16	0.125	0.04
E70	0.02	0.02	0.02	0.02	0.01	0.03	0.02	0.04	0.06	0.04	0.033	0.023
E90	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.01	0.01	0.01

Figure 4-3: Naturalised Runoff for Quaternary Catchment C12K (WR2012, 2019)

4.4.5 SITE SPECIFIC DATA

The Daily Rainfall Extraction Utility, developed by the Institute for Commercial Forestry Research (ICFR) in conjunction with the School of Bio-resources Engineering and Environmental Hydrology (BEEH) at the University of KwaZulu-Natal, Pietermaritzburg, was used to obtain summary data for all rainfall stations within the vicinity of the site **(Table 4-2)**. This data was assessed in terms of length of record, completeness of the data set, MAP and location of the rainfall station with respect to the site and the catchment.

Table 4-2: Rainfall Gauging Station Summary (Kunz, 2003)

Rainfall Station	Station Number	Latitude	Longitude	Distance from site (km)	Record (years)	Reliable data (%)	MAP (mm)
Skietfontein	0066582 W	32.701	20.834	8.029	122	24.3	266
Rondawel	0066446 A	32.751	20.917	16.055	5	88.8	177
Gunsfontein	0066304 W	32.567	20.684	17.772	122	34.0	355
Helderwater	0066737 W	32.917	20.767	22.235	1	63.4	-
Dumure	0066027 W	32.951	20.517	33.866	120	56.5	259

The Dumure rain gauge station (0066027 W) was considered representative of the area, despite being the furthest station from the site, which was primarily due to the reliability of the dataset and record length. This dataset is presented in **Figure 4-4** for the period 1878 to 2002.

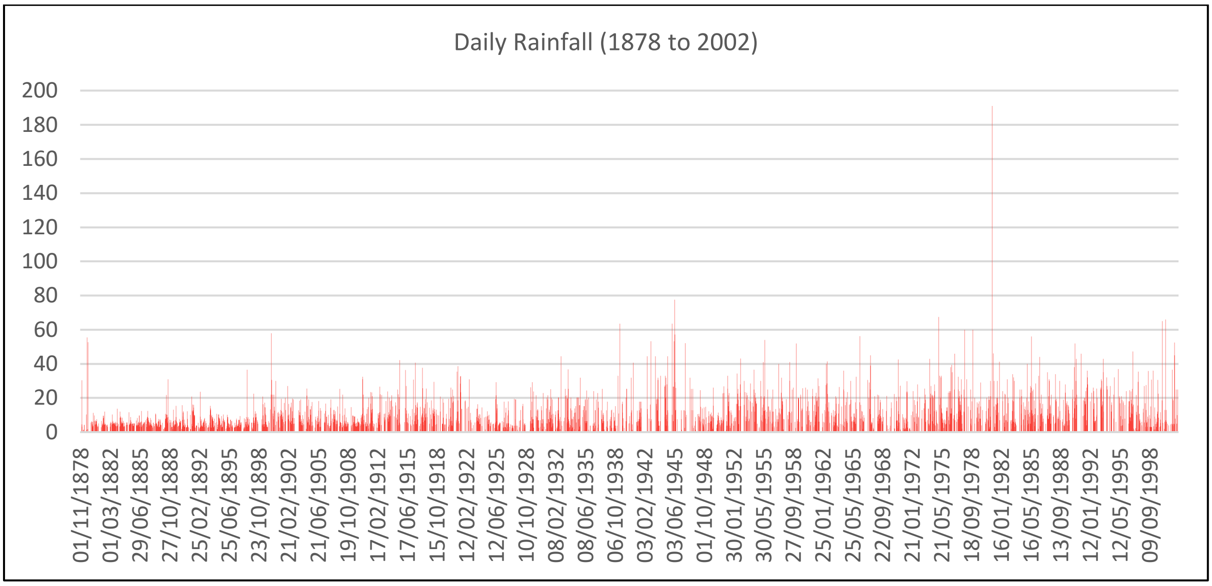


Figure 4-4: Daily Rainfall plot of the Dumure Rain Gauge

4.5 HYDROLOGY

The hydrology of the area is shown in **Figure 4-5.** There are numerous dry natural channels which drain the area of water from a westerly to easterly direction. The water courses are generally ephemeral in nature which seldom shows evidence of surface water runoff due to the arid conditions of the area. The area within the footprint of the powerline drains into the Maintjiesplaas and Roggeveld Rivers, which flow into the Buffels River.

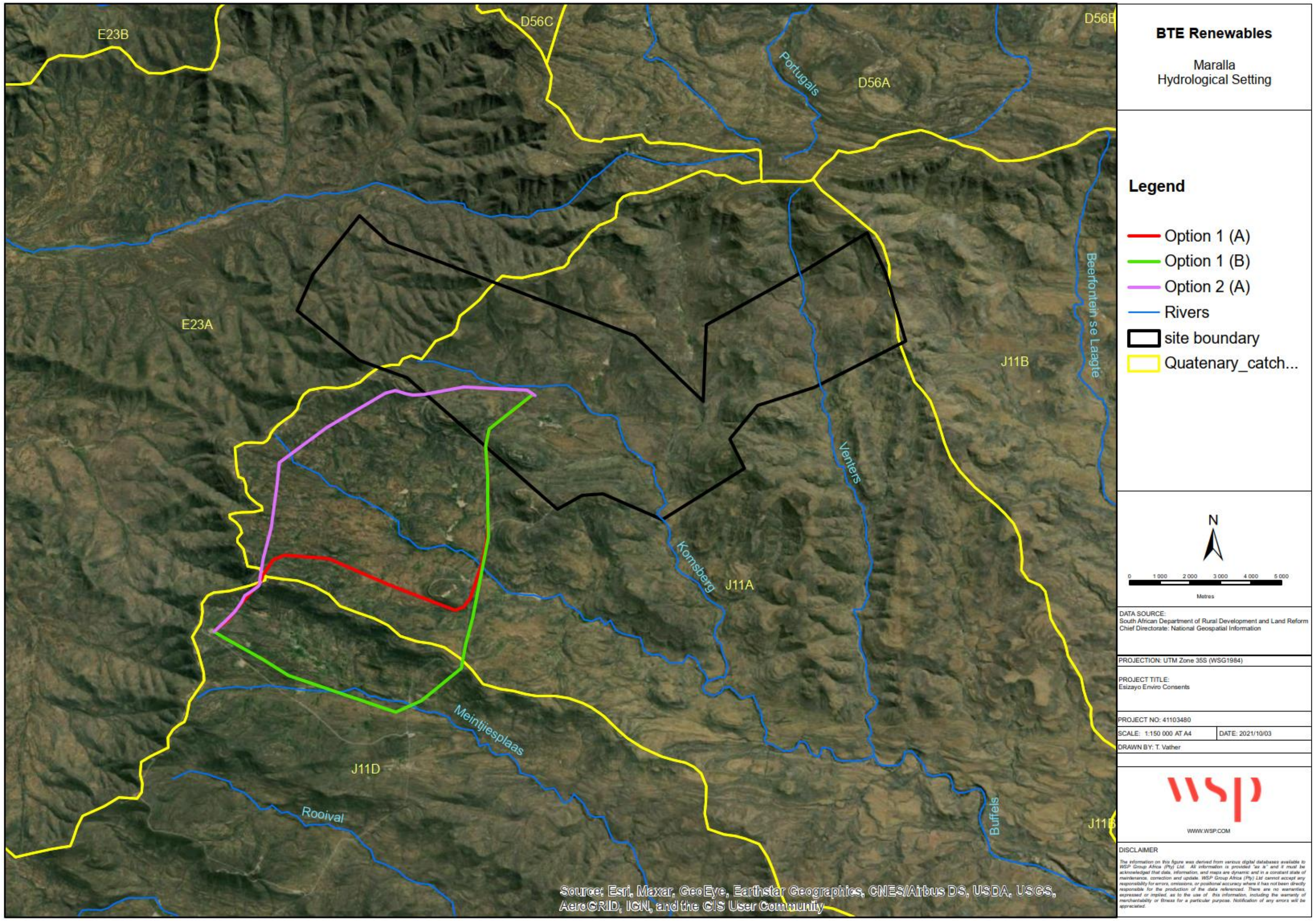


Figure 4-5: Hydrological Setting for the Maralla powerline

5 SITE WALKOVER

A site walkover was undertaken by WSP on the 8th and 9th of September 2021 to determine the site layout and catchment characteristics. A photographic log highlighting the main features of the site visit is shown in **Table 5-1** and expanded on below:

- Photograph 1 shows the area where the three proposed lines converge near the north eastern portion of the alignment.
- Photograph 2 shows Karusa in the distance and is the area in which all three proposed alignments converge at the south west of the alignment.
- Photograph 3 shows a drainage line and vegetation that is representative of the area.
- Photograph 4 shows a wetland within the area of the proposed powerlines.

Table 5-1: Photographic Log of the Site Assessment

Photograph 1	Photograph 2
	
Photograph 3	Photograph 4
	

6 EROSION MANAGEMENT

6.1 INTRODUCTION

Erosion is a form of land degradation that poses major environmental and ecological problems. It may occur at an alarming rate causing serious topsoil loss. Erosion may lead to progressive inability of vegetation and soil to regenerate. Developments tend to result in numerous disturbances, which leave a site vulnerable and susceptible to soil erosion. Large areas of hardened surface created by a development will generate significant volumes of runoff during storm events and this will also pose a potential erosion hazard to the runoff receiving areas. Erosion preventative mechanisms must be implemented throughout the construction phase and monitoring during the operational phase. Erosion resulting from the development should be appropriately rehabilitated to prevent further habitat deterioration.

The aim of an Erosion Management Plan is to provide a framework for the management of soil erosion during the construction and operation of the 132kV powerline, by implementing avoidance and mitigation measures to reduce the erosion potential and impact of erosion.

The broad objectives of this erosion management plan are to:

— Introduce measures to reduce the erosion potential;
— Reduce the susceptibility of the area;
— Develop and implement monitoring and rehabilitation measures;
— Manage runoff and reduce the impact on sensitive areas;
— Achieve long-term stabilisation of all disturbed areas and
— Promote the natural re-establishment and planting of indigenous species to reduce erosion.

6.2 EROSION BACKGROUND

Erosion is the detachment of soil particles and transportation of these particles by erosive agents (water and wind). The removal of vegetation is the major cause of soil detachment since it exposes the soil to these erosive agents. There are several types of erosion which include raindrop impact, sheet erosion, rill erosion, gully erosion and wind erosion. Erosion may be influenced by several factors simultaneously, such as rainfall intensity, antecedent soil moisture content, slope steepness and land use/land cover.

6.3 EROSION CONTROL PRINCIPLES

In the design phase, various stormwater management principles should be considered, including:

— Protect the land surface from erosion.
— Minimise the area of exposure of bare soils to minimise the erosive forces of wind, water and all forms of traffic.
— Contain soil erosion, whether induced by wind or water forces, by constructing protective works to trap sediment at appropriate locations. This applies particularly during construction.
— Avoid situations where slopes may become saturated and unstable (during and after construction process).
— All roads and other hardened surfaces should have runoff control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk.
— Regular monitoring for erosion after construction to ensure that no erosion problems have developed as result of the disturbance.
— All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and re-vegetation techniques.
— A cover of indigenous species should be established in disturbed areas to bind the soil and prevent erosion.

- Construction activities must be restricted and carefully monitored to keep disturbance to a minimum and disturbed areas must be appropriately rehabilitated and managed.
- Planting of vegetation should commence as soon as possible after construction is completed to minimise the potential for erosion.
- Progressive rehabilitation is an important element of the rehabilitation strategy and should be implemented where feasible. Re-vegetation of disturbed surfaces must occur immediately after construction activities are completed
- Once revegetated, areas should be protected to prevent trampling and erosion.
- No construction equipment, vehicles or unauthorised personnel should be allowed onto areas that have been vegetated

  Regular audits and maintenance programmers to ensure that plants are growing and serving the purpose for which they were planted. This erosion control can be achieved by:
  - Integrating project design with site constraints.
  - Planning and integrating erosion and sediment control with construction activities.
  - Minimising the extent and duration of disturbance.
  - Using erosion controls to prevent on-site damage.

6.3.1 ON-SITE EROSION MANAGEMENT

General factors to consider regarding erosion risk at the site includes:

- Any eroded areas observed should be rehabilitated as soon as possible.
  - Reinstate as much of the eroded area to its pre-disturbed geometry.
  - Install protective works (gabions, reno-mattresses) to stabilise and protect unstable banks.
  - Earthen berms or plugs, rock packs or gabions can be used for the plugging of erosion gullies.
  - The area should then be allowed to re-vegetate itself.
  - Any activities within these areas should be avoided as far as possible.
- Soil loss will be greater on steeper slopes. Ensure that steep slopes are not de-vegetated unnecessarily and subsequently becomes hydrophobic, which will increase erosion potential.
- All bare areas should be revegetated with appropriate locally occurring species, to bind the soil and limit the erosion potential.
- Gabions and other stabilisation features should be used on steep slopes and other areas vulnerable to erosion minimise the erosion risk as far as possible.

6.3.2 EROSION CONTROL MECHANISMS

The following mechanisms may be used to combat erosion when necessary:

- Reno mattresses
- Slope attenuation
- Hessian material
- Shade catch nets
- Gabion baskets
- Silt fences
- Storm water channels and catch pits
- Soil binding
- Geofabrics
- Hydroseeding and/or re-vegetating
- Mulching over cleared areas
- Boulders and size varied rocks

— Tiling

6.4 MONITORING REQUIREMENTS

To monitor the impact of construction activities, follow-ups and rehabilitation efforts, monitoring must be undertaken. This section provides a description of a possible monitoring programme that will provide assessment of the erosion on site as well as an assessment of the success of the management programme.

In general, the following principles apply for monitoring:

- Photographic records must be kept of areas to be cleared prior to work starting and at regular intervals during initial clearing activities. Similarly, photographic records should be kept of the area from immediately before and after follow-up clearing activities. Rehabilitation processes must also be recorded.
- The cause of soil erosion must be determined.
- Simple records must be kept of daily operations (location cleared and labour units).
- It is important that, if monitoring results in detection of invasive alien plants, that this leads to immediate action.

The following monitoring should be implemented to ensure erosion management during the construction phase:

Table 6-1: Erosion management monitoring during construction

Monitoring Action	Indicator	Timeframe
Identification of drainage lines which may be impacted by the development	Hydrological map	Preconstruction & monthly
Monitor cleared areas for erosion problems	Recording the monitoring site, issues encountered and remedial actions implemented	3 Monthly and following the significant rainfall events
Monitor vegetation clearance in sensitive areas	Activity log of monitoring actions and any mitigation and avoidance measures implemented	3 Monthly and following the significant rainfall events
Monitor re-vegetated and stabilised areas	Recording the monitoring site, issues encountered and remedial actions implemented	3 Monthly and following the significant rainfall events

The following monitoring should be implemented to ensure erosion management during the operation phase:

Table 6-2: Erosion management monitoring during operation

Monitoring Action	Indicator	Timeframe
Monitor for the development of new erosion problems across the site	Map erosion problem areas	Quarterly
Document erosion control measures implemented & success rate achieved	Records of control measures and their success	Quarterly
Document the extent of erosion and site rehabilitation measures implemented and	Decline in erosion and vulnerable bare areas over time	Biannually

success achieved in problem areas		

7 IMPACT ASSESSMENT

The objective of this section of the report is to assess the risk posed by the activity-related processes to the hydrological environment.

7.1 CONSTRUCTION

The following activities will be carried out during the construction of the 132kV powerline.

— Drilling of holes (typically 2-3m in depth);
— Planting of poles;
— Stringing of conductors, and
— Possible excavations and stabilized backfill.

Table 7-1: Construction phase impact assessment

<table>
<tr><th>Impact</th><th colspan="12">Drainage alteration</th></tr>
<tr><td>Impact description</td><td colspan="12">Construction activities will result in alterations of flow regimes of watercourses</td></tr>
<tr><td>Mitigation</td><td colspan="12">Construction of the powerlines should, where feasibly possible, occur during the dry season and the site rehabilitated before major rainfall events occur. Cables must only cross perpendicular to a watercourse and the chosen alignment must endeavour that the span across the watercourse is minimalised.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>2</td><td>3</td><td>2</td><td>4</td><td>44</td><td>2</td><td>2</td><td>1</td><td>2</td><td>3</td><td>21</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
<tr><td>Impact</td><td colspan="12">Soil erosion and sedimentation</td></tr>
<tr><td>Impact description</td><td colspan="12">Construction activities will result in soil disturbance, resulting in a higher potential for soil erosion and sedimentation</td></tr>
<tr><td>Mitigation</td><td colspan="12">Areas of construction should be (where practical) limited to the extent of the footprint, and activities outside of the footprint should be kept to a minimum. Traffic of construction vehicles should be kept to a minimum to reduce soil compaction and limited to existing or proposed roadways where practical. Any soil excavated during construction, should be appropriately stored in stockpiles which are protected from erosion. Wind erosion is dominant for the region. Water erosion action is considered limited, however backfilling with soil and use of gabions or Reno Mattresses should be used where evidence of erosion is present.</td></tr>
</table>

<table>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><th colspan="6">Pre-Mitigation</th><th colspan="6">Post-Mitigation</th></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>2</td><td>3</td><td>2</td><td>3</td><td>33</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>12</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Water quality degradation</td></tr>
<tr><td>Impact description</td><td>Potential spillage of hazardous substances such as oils, fuel, grease from construction vehicles and machinery.</td></tr>
<tr><td>Mitigation</td><td>The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of drip trays on machinery and vehicles.</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><th colspan="6">Pre-Mitigation</th><th colspan="6">Post-Mitigation</th></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td><td>1</td><td>1</td><td>1</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td colspan="6">N2 - Low</td><td colspan="6">N1 - Very Low</td></tr>
</table>
</td></tr>
<tr><td>Impact</td><td>Loss of wetland and riparian functionality</td></tr>
<tr><td>Impact description</td><td>Temporary degradation of wetland/riparian habitat due to the positioning of the powerlines</td></tr>
<tr><td>Mitigation</td><td>The detailed freshwater habitat assessment must be used to determine the most suitable placement of the powerline poles.</td></tr>
<tr><td>Ease of mitigation</td><td>Moderate</td></tr>
<tr><td>Significance rating</td><td>
<table>
<tr><th colspan="6">Pre-Mitigation</th><th colspan="6">Post-Mitigation</th></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>2</td><td>3</td><td>2</td><td>4</td><td>44</td><td>4</td><td>1</td><td>1</td><td>2</td><td>3</td><td>24</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
</table>
</td></tr>
</table>

7.2 OPERATION

Table 7-2: Operation phase impact assessment

<table>
<tr><th>Impact</th><th colspan="12">Soil erosion and sedimentation</th></tr>
<tr><td>Impact description</td><td colspan="12">The overall increase in soil disturbance results in a higher potential for soil erosion and sedimentation. The increase in compaction post construction phase will result in more runoff. Routine monitoring and maintenance of the powerline infrastructure will further compact the soil.</td></tr>
<tr><td>Mitigation</td><td colspan="12">Erosion control management procedures should be implemented to monitor and rehabilitate erosion.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>4</td><td>2</td><td>3</td><td>2</td><td>3</td><td>33</td><td>2</td><td>1</td><td>1</td><td>2</td><td>2</td><td>12</td></tr>
<tr><td colspan="6">N3 - Moderate</td><td colspan="6">N2 - Low</td></tr>
<tr><td>Impact</td><td colspan="12">Water quality degradation</td></tr>
<tr><td>Impact description</td><td colspan="12">Potential spillage of hazardous substances such as oils, fuel, grease from vehicles and machinery.</td></tr>
<tr><td>Mitigation</td><td colspan="12">The proper handling and storage of hazardous materials, the use of hardstanding in storage areas of hazardous substances and where spillages are possible. The use of drip trays on machinery and vehicles.</td></tr>
<tr><td>Ease of mitigation</td><td colspan="12">Moderate</td></tr>
<tr><td rowspan="4">Significance rating</td><td colspan="6">Pre-Mitigation</td><td colspan="6">Post-Mitigation</td></tr>
<tr><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td><td>(M+</td><td>E+</td><td>R+</td><td>D)x</td><td>P=</td><td>S</td></tr>
<tr><td>2</td><td>2</td><td>3</td><td>2</td><td>2</td><td>18</td><td>1</td><td>1</td><td>1</td><td>2</td><td>1</td><td>5</td></tr>
<tr><td colspan="6">N2 - Low</td><td colspan="6">N1 - Very Low</td></tr>
</table>

8 CONCLUSION

The development of the 132kV Maralla powerline may result in numerous negative impacts on the environment. To reduce these impacts, proper mitigation and management procedures are to be adhered to. Erosion is a predominant negative impact associated with the development. If adequate erosion control measures are implemented correctly during and after the construction of the 132kV powerline, the risk of erosion may be minimized. Implementation of these measures is not only good practice to ensure the minimisation of degradation, but also necessary to ensure further compliance with the necessary legislative requirements.

APPENDIX

A ITLE

APPENDIX

A-1 *TITLE*