BTE RENEWABLES (PTY) LTD

ESIZAYO WEF EXPANSION

FRESHWATER HABITAT DELINEATION

11 APRIL 2022

DRAFT

ESIZAYO WEF EXPANSION

FRESHWATER HABITAT DELINEATION

BTE RENEWABLES (PTY) LTD

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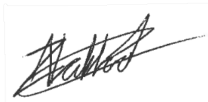
Signature				
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1 INTRODUCTION

WSP Group Africa (Pty) Ltd (WSP), a wholly owned affiliate of WSP Global Inc., was commissioned to undertake a Wetland Delineation for the proposed expansion of the Esizayo Wind Energy Facility (WEF) (herein referred to as the Project).

The Project lies approximately 30km Northwest of Laingsburg in the Western Cape, and falls within the Laingsburg Local Municipality, which is located within the Central Karoo District Municipality (**Figure 1**).

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

On 14 July 2017, BTE Renewables (Pty) Ltd (BTE) received an EA (DFFE Ref no: 14/12/16/3/3/2/967) for the Esizayo Wind Energy Facility (WEF) proposed to be constructed on the following portions:

- Portion 1 of Aanstoot Farm No 72;
- Annex Joseph's Kraal Farm No 84, and
- Aurora Farm No 285.

BTE now proposes to expand the existing authorised Esizayo WEF extent by adding three new land parcels as listed below:

- Portion 2 of Farm Aanstoot Farm 72 (2/72);
- Portion 1 of Farm Leeuwenfontein 71 (1/71), and
- Remainder of Farm Leeuwenfontein 71 (RE/71).

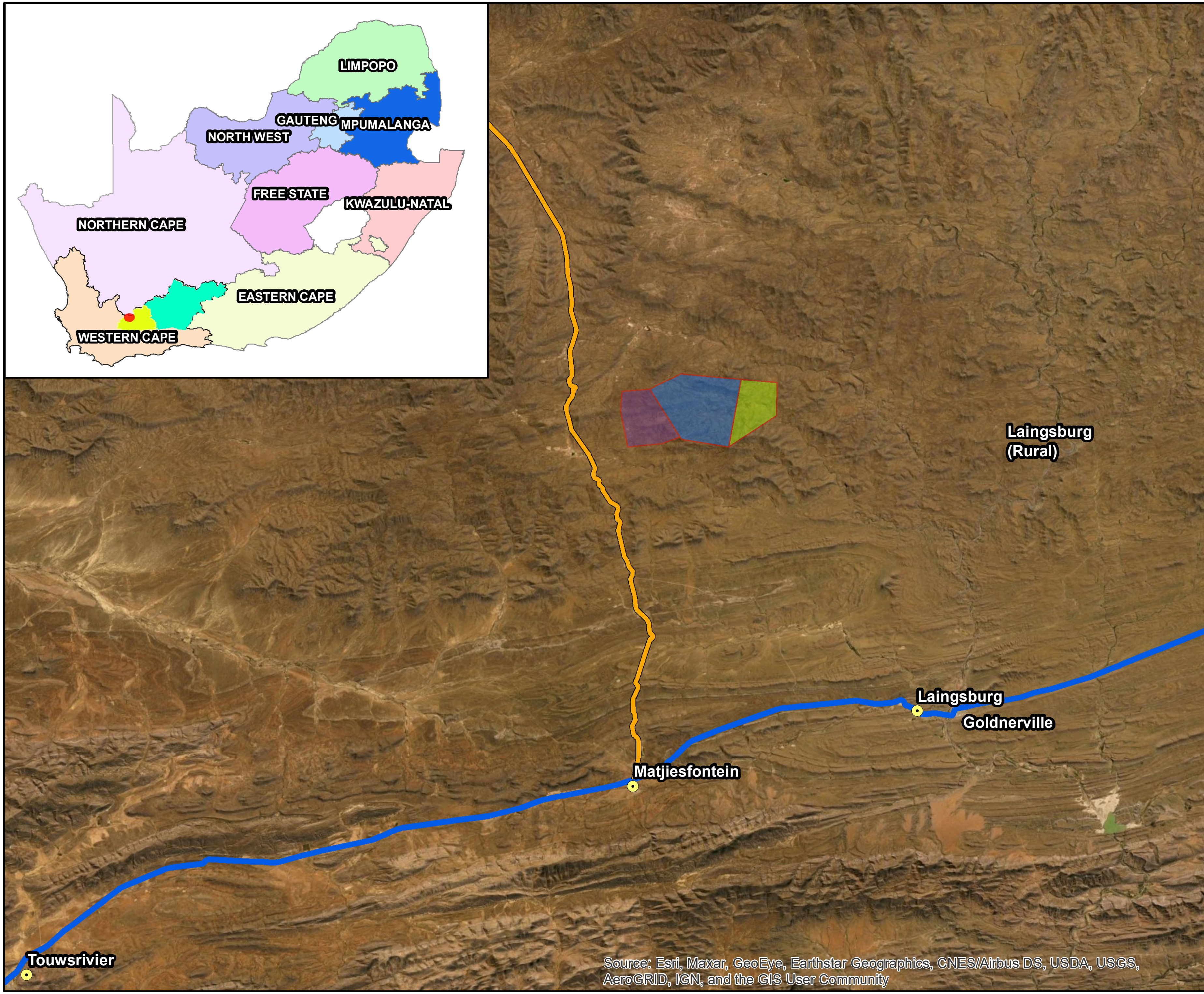
1.2 TERMS OF REFERENCE

The objective of the report 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 impacts associated with the Project.

The potential impacts associated with the construction and operation of the Project on the identified watercourses were assessed and associated mitigation recommendations provided.

The scope of work undertaken broadly encompassed the following:

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



BTE RENEWABLES
ESIZAYO WEF EXPANSION
REGIONAL SETTING

Legend

- Portion 1 of Farm Leeuwenfontein 71
- Remainder of Farm Leeuwenfontein 71
- Portion 2 of Farm Aanstoot Farm 72
- R354
- N1
- Laingsburg Local Municipality
- Central Karoo District Municipality

N

0 1 500 3 000 6 000 9 000 12 000
Meters

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PROJECT TITLE:
DNG ENERGY - FEASIBILITY STUDY

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DATE: 2021/05/19	REVIEWED BY: ZAKARIYA NAKHOODA

FIGURE NO: 1	PROJECT NO: 41103063	REV: 0

2 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.;
- Wetland/riparian areas in close proximity to the proposed infrastructure was accurately delineated based on the initial desktop review and site observations. Owing to the extent of the Project site, 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 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.

3 PROJECT DESCRIPTION

The Project entails the expansion of the existing Esizayo WEF extent through the addition of three (3) land parcels with a total development infrastructure footprint of approximately 200 ha. (**Figure 2**). To enable the facility to supply a contracted capacity of up to 200 MW, the proposed development will incorporate the following infrastructure (**Figure 2**):

- Up to 23 wind turbines. Each turbine with a foundation of up to 25 m in diameter and up to 4m in depth, compacted hard standing areas of up to 4.5 ha each;
- Internal roads traversing a length of 30 km with a width up to 9m;
- 33 kV underground cables or overhead powerlines;
- 33 kV and/or 132 kV substations;
- Fence around the project development area;
- Site offices and maintenance buildings, including workshop areas for maintenance and storage; and
- Laydown areas.

3.1 PROPOSED PROJECT DEVELOPMENT ACTIVITIES

- The typical steps involved in the construction and operation of a wind energy facility is summarised below:
- Planning Phase
  - Step 1: Surveying of the development area and negotiation with affected landowners; and
  - Step 2: Final design and micro-siting of the infrastructure based on geotechnical, topographical conditions and potential environmental sensitivities.
- Construction Phase

- Step 3: Vegetation clearing and construction of access roads/tracks (where required);
  - Step 4: Construction of tower structure foundations;
  - Step 5: Assembly and erection of infrastructure on site;
  - Step 6: Stringing of conductors; and
  - Step 6: Rehabilitation of disturbed areas and protection of erosion sensitive areas.
- Operational Phase
  - Step 7: Continued maintenance during operation.

3.1.1 CONSTRUCTION PHASE

CONSTRUCTION SCHEDULE

Construction of the WEF is anticipated for a period of up to 24 months.

The main activities associated with the construction phase of the wind energy project will include the following:

ESTABLISHMENT OF INTERNAL ROADS

Internal road access will be constructed onsite. These roads will be up to 9m in width. The length of the internal road network is approximately 30km.

SITE PREPARATION

Site preparation includes the clearance of vegetation and any bulk earthworks (including blasting if required) within the footprint of each construction area that may be required in terms of the facility design.

ESTABLISHMENT OF A LAYDOWN AREA ON SITE

Construction materials, machinery and equipment will be kept at relevant laydown and/or storage areas. The expansion project will use the authorised Esizayo project's construction laydown area. The laydown area will limit potential environmental impacts associated with the construction phase by limiting the extent of the activities to one designated area.

CONSTRUCT FOUNDATION

Concrete foundations will be constructed at each turbine location. Foundation holes will be mechanically excavated to a depth of 4m depending on the local geology. Concrete will be at the authorised Esizayo project's cement batching plant.

CONSTRUCTION OF THE TURBINE

A large lifting crane will be brought onto site to lift each of the tower parts into place.

CONSTRUCT IPP SUBSTATION AND INVERTORS

Invertors will be installed to facilitate the connection between the wind turbines and the Eskom Grid. The turbines will be connected to the substation via underground or overhead cabling. The substation will be constructed with a maximum footprint of approximately 150m x 150m.

ESTABLISHMENT OF ANCILLARY INFRASTRUCTURE

The expansion project will use the authorised Esizayo project's Operations and Maintenance building, storage areas, office and a temporary laydown area for contractor's equipment.

UNDERTAKE SITE REHABILITATION

The site will be rehabilitated once the construction phase is complete and all construction equipment and machinery have been removed from site.

3.1.2 OPERATIONAL PHASE

The proposed WEF Expansion is anticipated to have a minimum life of 20 years. The facility will operate 7 days a week. While the project is self-sufficient, maintenance and monitoring activities will be required. Potable water requirements for permanent staff will be limited and provided by bottled water.

During the operational phase there will be little to no Project-related movement along the servitude as the only activities are limited to maintaining the servitude (including maintenance of access roads and cutting back or pruning of vegetation to ensure that vegetation does not affect the WEF), inspection of the WEF infrastructure and repairs when required. Limited impact is expected during operation since there will not be any intrusive work done outside of maintenance in the event that major damage occurs to site infrastructure.

Operation of the WEF will involve the following activities, discussed below.

SERVITUDE MANAGEMENT AND ACCESS ROAD MAINTENANCE

Servitude and access road maintenance is aimed at eliminating hazards and facilitating continued access to the WEF. The objective is to prevent all forms of potential interruption of power supply due to overly tall vegetation/climbing plants or establishment of illegal structures within the right servitude. It is also to facilitate ease of access for maintenance activities on the WEF. During the operational phase of the project, the servitude will be maintained to ensure that the functions optimally and does not compromise the safety of persons within the vicinity of the WEF.

WIND ENERGY FACILITY MAINTENANCE AND OPERATIONS

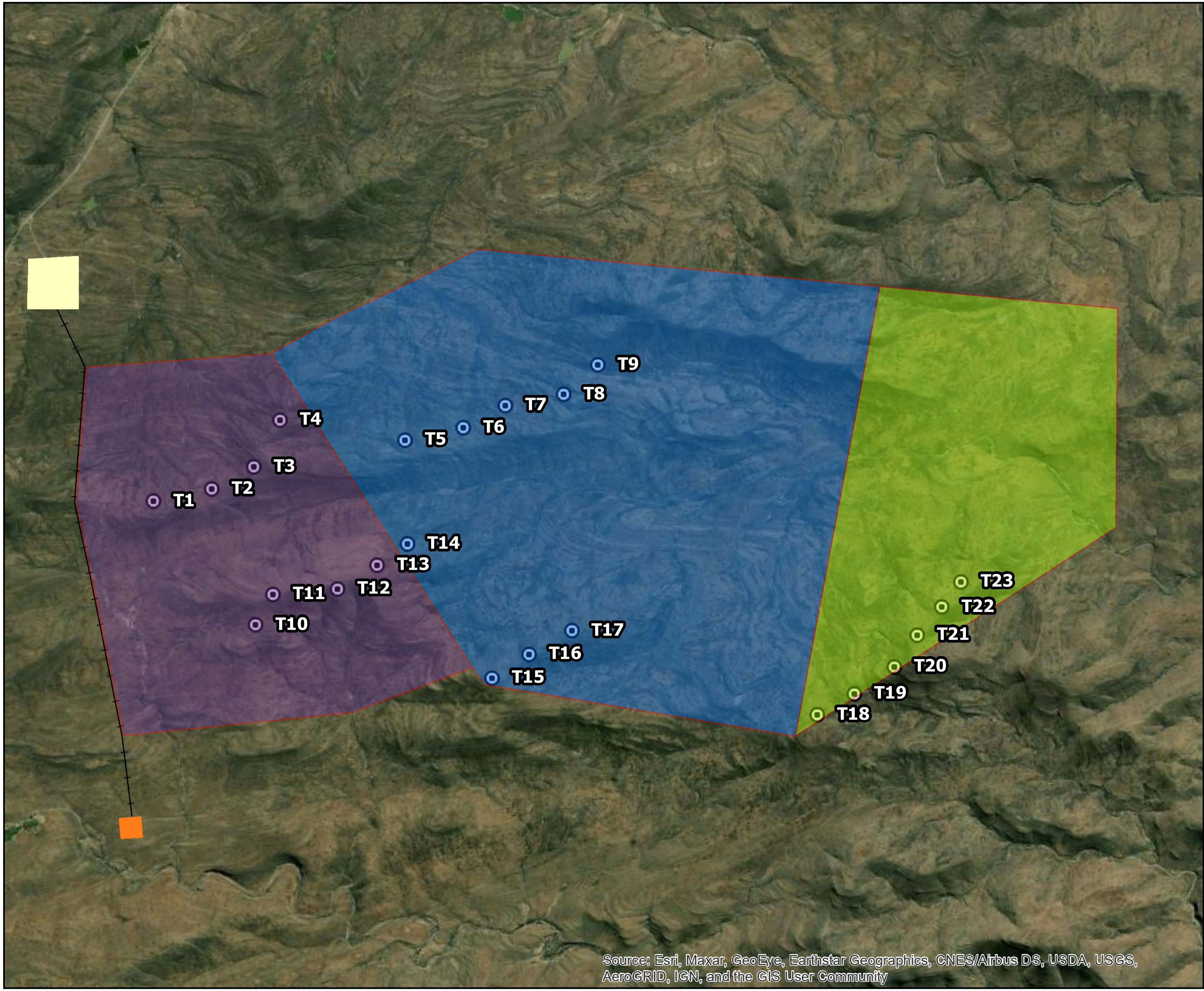
BTE will develop comprehensive planned and emergency programmes through its technical operations during the operation and maintenance phase for the WEF. The maintenance activities will include:

- BTE's Maintenance Team will carry out periodic physical examination of the WEF and its safety, security and integrity.
- Defects that are identified will be reported for repair. Such defects may include defective conductors, flashed over insulators, defective dampers, vandalised components, amongst others.
- Maintenance / repairs will then be undertaken.

BTE RENEWABLES

ESIZAYO WEF EXPANSION

SITE SETTING



Legend

- Portion 1 of Farm Leeuwenfontein 71
- Remainder of Farm Leeuwenfontein 71
- Portion 2 of Farm Aanstoot Farm 72
- Turbines
- Esizayo Collector Substation
- Komsburg Substation
- Proposed 132kV Line Route

N

0 230 460 920 1 380 1 840

Meters

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FIGURE NO: 2	PROJECT NO: 41103063
	REV: 0

3.1.3 DECOMMISSIONING PHASE

Following the initial 20-year operational period of the wind facility, the continued economic viability will be investigated. If the facility is still deemed viable, the life of the facility will be extended. The facility will only be decommissioned once it is no longer economically viable. If a decision is made to completely decommission the facility, this will be subject to a separate authorisation and impact assessment process, all the components will be disassembled, reused and recycled or disposed. The site would be returned to its current use i.e. agriculture (Grazing).

4 BASELINE RECEIVING ENVIRONMENT

This section describes the baseline environment of the Project, thereby providing an 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. Patches of cultivated areas were observed; however, these were no longer in use. Indigenous antelope (Springbok) were 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 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.

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).

4.5 HYDROLOGY

The surface 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 Project footprint drains into the Maintjiesplaas and Roggeveld Rivers, which flow into the Buffels River.

During the site visit there were several watercourses/drainage channels present within the area, all of which were dry with the exception of an un-named tributary, where a shallow pool was observed. 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.

4.5.1 QUATERNARY CATCHMENTS

The Project boundary lies within quaternary catchment J11D (**Figure 3**), with the hydrological characteristics are summarised in **Table 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 1: Quaternary J11D Hydrological Characteristics

Quaternary	Catchment Area(km^2)	MAP (mm)	MAE (mm)	MAR (mcm)
J11D	801	240	2000	5.58

Source: WRC/DWA, 2012

4.6 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
	DEF	Riverine wetland associated with a D, E, F or Z ecological category river	2

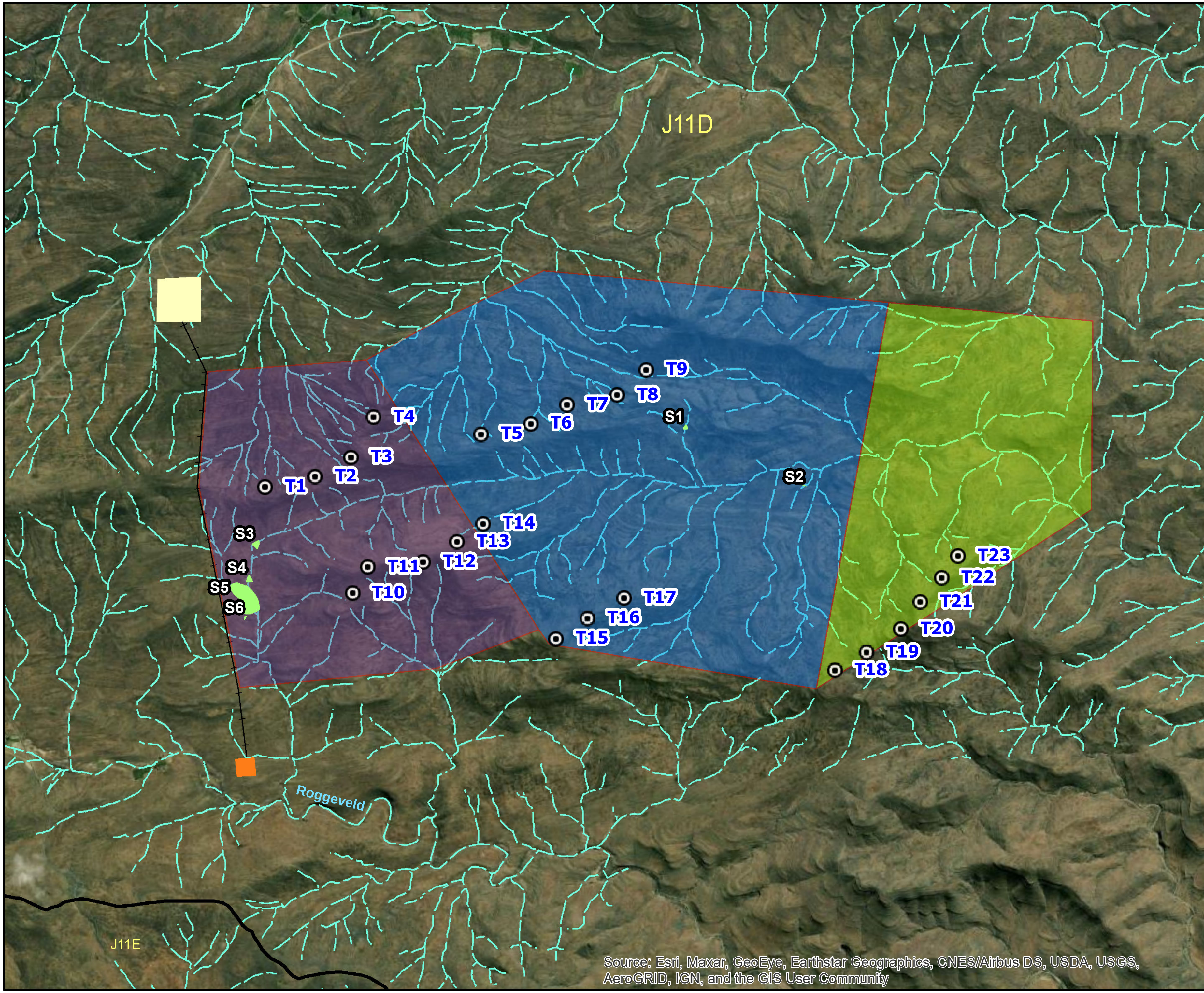
Heavily to critically modified	Z1	Wetland overlaps with a 1:50 000 ‘artificial’ inland water body from the Department of Land Affairs: Chief Directorate of Surveys and Mapping (2005-2007)	7
	Z2	Majority of the wetland unit is classified as ‘artificial’ in the wetland locality GIS layer	4
	Z3	Percentage natural land cover ≤ 25%	20

According to the NFEPA database, a total of nine (9) wetlands were identified within the of the Project area (**Table 3, Figure 3**).

Table 3: NFEPA Wetlands Located within the Project Area

HGM unit	Natural/Artificial	NFEPA Condition
Seep (S1)	Artificial	Z3
Seep (S2)	Natural	Z3
Seep (S3)	Artificial	Z3
Seep (S4)	Artificial	Z3
Seep (S5)	Natural	AB
Seep (S6)	Artificial	Z3

During the site visit, it was observed that Seep (S5) was representative of a channelled Valley Bottom type wetland and is currently utilised for small scale agricultural practices. The remaining Seep wetlands were observed as being dams that were located on the ephemeral tributaries.



BTE RENEWABLES ESIZAYO WEF EXPANSION

ENVIRONMENTAL SETTING

Legend

- Portion 1 of Farm Leeuwenfontein 71
- Remainder of Farm Leeuwenfontein 71
- Portion 2 of Farm Aanstoot Farm 72
- Turbines
- Proposed 132kV Line Route
- Esizayo Collector Substation
- Komsburg Substation
- Quatenary Catchments
- Seep
- Proposed 132kV Line Route
- Ephemeral Watercourses

N

0 270 540 1 080 1 620 2 160

Meters

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DATE: 2021/05/19	REVIEWED BY: ZAKARIYA NAKHOODA
PROJECT NO: 41103063	REV: 0

5 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.

6 AIMS AND OBJECTIVES

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

- Identify and delineate wetlands and/or riparian habitats within the Project Site, and
- Determine whether the identified wetlands and/or riparian habitats have the potential to be impacted on by the proposed Project activities.

To achieve the aforementioned objectives, the following activities were undertaken:

- Desktop identification and delineation of all watercourses (wetlands and riparian zones included) within the Project site utilising available site-specific data;
- Infield delineation and classification of the identified wetlands and riparian habitats, within the Project site;
- 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 and operations;
- Determination of the wetlands and riparian habitats that have the potential to be impacted on by the proposed Project activities, and
- Undertake an Impact Assessment.

7 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.

7.1 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).

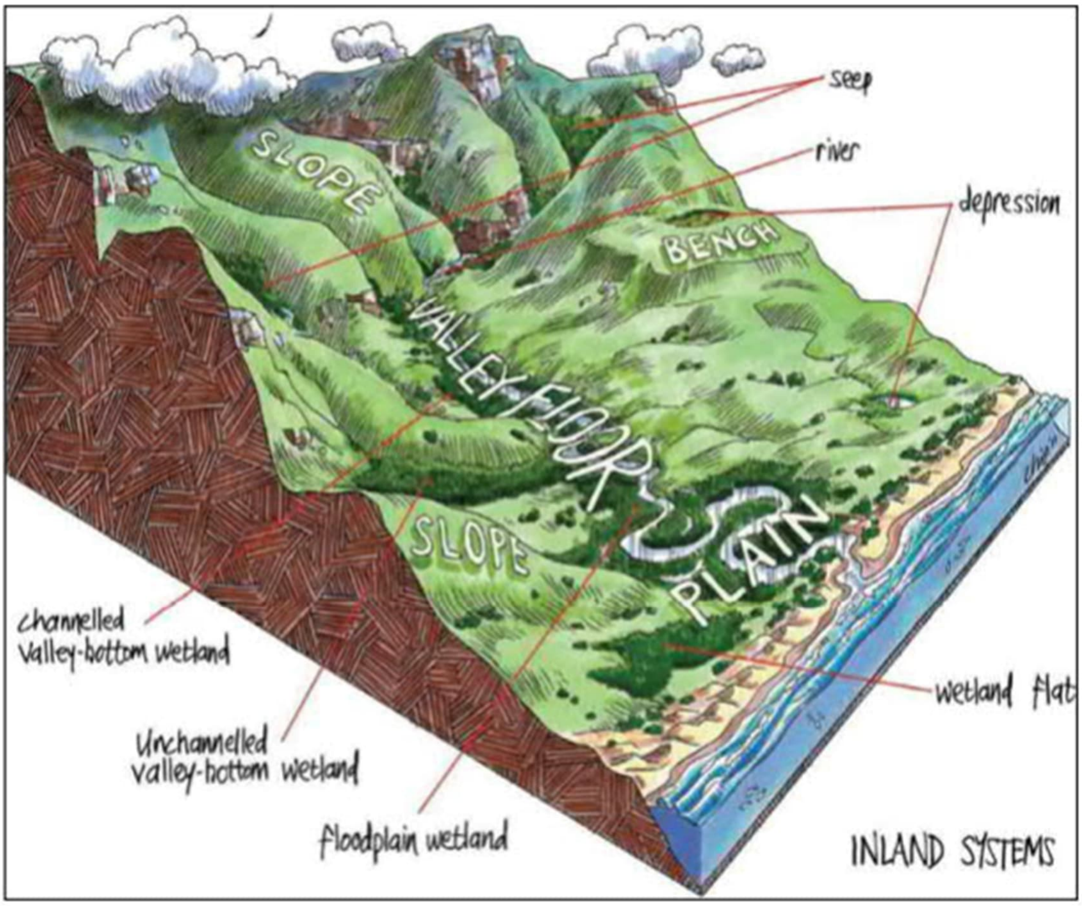


Figure 4: Illustration of wetland types and their typical landscape setting

7.2 DELINEATION

7.2.1 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 20th and 21st March 2022 to groundtruth 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).

7.3 IMPACT ASSESSMENT

This Wetland impact assessment used a methodological framework developed by WSP to meet the combined requirements of international best practice and NEMA, Environmental Impact Assessment Regulations, 2014, as amended (GN No. 326) (the "EIA Regulations").

As required by the EIA Regulations (2014) as amended, the determination and assessment of impacts was based on the following criteria:

a) The nature; a description of what causes the effect, what will be affected and how it will be affected.

Table 5: Nature or Type of Impact

Nature or Type of Impact	Definition
Beneficial / Positive	An impact that is considered to represent an improvement on the baseline or introduces a positive change.
Adverse / Negative	An impact that is considered to represent an adverse change from the baseline, or introduces a new undesirable factor.
Direct	Impacts that arise directly from activities that form an integral part of the Project (e.g. new infrastructure).

Indirect	Impacts that arise indirectly from activities not explicitly forming part of the Project (e.g. noise changes due to changes in road or rail traffic resulting from the operation of Project).
Secondary	Secondary or induced impacts caused by a change in the Project environment (e.g. employment opportunities created by the supply chain requirements).
Cumulative	Impacts are those impacts arising from the combination of multiple impacts from existing projects, the Project and/or future projects.

b) The physical extent.

Table 6: Physical Extent Rating of Impact

Score	Description
1	the impact will be limited to the site;
2	the impact will be limited to the local area;
3	the impact will be limited to the region;
4	the impact will be national; or
5	the impact will be international;

c) The duration, wherein it is indicated what the lifetime of the impact will be:

Table 7: Duration Rating of Impact

Score	Description
1	of a very short duration (0 to 1 years)
2	of a short duration (2 to 5 years)
3	medium term (5–15 years)
4	long term (> 15 years)
5	permanent

d) Reversibility: An impact is either reversible or irreversible. This value indicates how long it will take for impacts on receptors cease to be evident.

Table 8: Reversibility of Impact

Score	Description
1	The impact is immediately reversible.
3	The impact is reversible within 2 years after the cause or stress is removed; or
5	The activity will lead to an impact that is in all practical terms permanent.

e) The magnitude of impact on ecological processes, quantified on a scale from 0-10, where a score is assigned.

Table 9: Magnitude Rating of Impact

Score	Description

0	small and will have no effect on the environment.
1	minor and will not result in an impact on processes.
2	low and will cause a slight impact on processes.
3	moderate and will result in processes continuing but in a modified way.
4	high (processes are altered to the extent that they temporarily cease).
5	very high and results in complete destruction of patterns and permanent cessation of processes.

f) The probability of occurrence, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale where:

Table 10: Probability Rating of Impact

Score	Description
1	very improbable (probably will not happen.
2	improbable (some possibility, but low likelihood).
3	probable (distinct possibility).
4	highly probable (most likely).
5	definite (impact will occur regardless of any prevention measures).

g) The significance, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;

h) The status, which is described as either positive, negative or neutral;

i) The degree to which the impact can be reversed;

j) The degree to which the impact may cause irreplaceable loss of resources; and,

k) The degree to which the impact can be mitigated.

The significance is determined by combining the above criteria in the following formula:

Significance = (Extent + Duration + Reversibility + Magnitude) x Probability

$$[S= (E+D+R+M) \times P]$$

Where the symbols are as follows:

Symbol	Criteria	Description
S	Significance Weighting	-
E	Extent	Refer to **Table 10**
D	Duration	Refer to **Table 11**
R	Revrseibility	Refer to **Table 12**
M	Magnitude	Refer to **Table 13**
P	Probability	Refer to **Table 14**

The significance weightings for each potential impact are as follows:

Overall Score	Significance Rating (Negative)	Significance Rating (Positive)	Description
< 30 points	Low	Low	where this impact would not have a direct influence on the decision to develop in the area
31 - 60 points	Medium	Medium	where the impact could influence the decision to develop in the area unless it is effectively mitigated
> 60 points	High	High	where the impact must have an influence on the decision process to develop in the area

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.

8 SITE WALKOVER

A site walkover was undertaken by WSP on the 20th and 21st of March 2022 to determine the site characteristics. A photographic log highlighting the main features of the site visit is shown in **Table 11** and expanded on below:

- Photograph 1 illustrates an ephemeral tributary located on site. There were numerous ephemeral headwaters and tributaries located across the site (**Figure 3**), all of which drain to the much larger ephemeral rivers (Photograph 2).
- Photograph 2 illustrates a larger ephemeral river located on site.
- Photograph 3 illustrates pools of water located within the ephemeral river.
- Photograph 4 illustrates the Mispah soil type identified on site.
- Photograph 5 illustrates the Glenrosa soil type found on site.
- Photograph 6 illustrates the vegetation (Cyperaceae) found within the riparian zones.

Table 11: Photographic Log of the Site Assessment

Photograph 1

Photograph 2

Photograph 3

Photograph 4

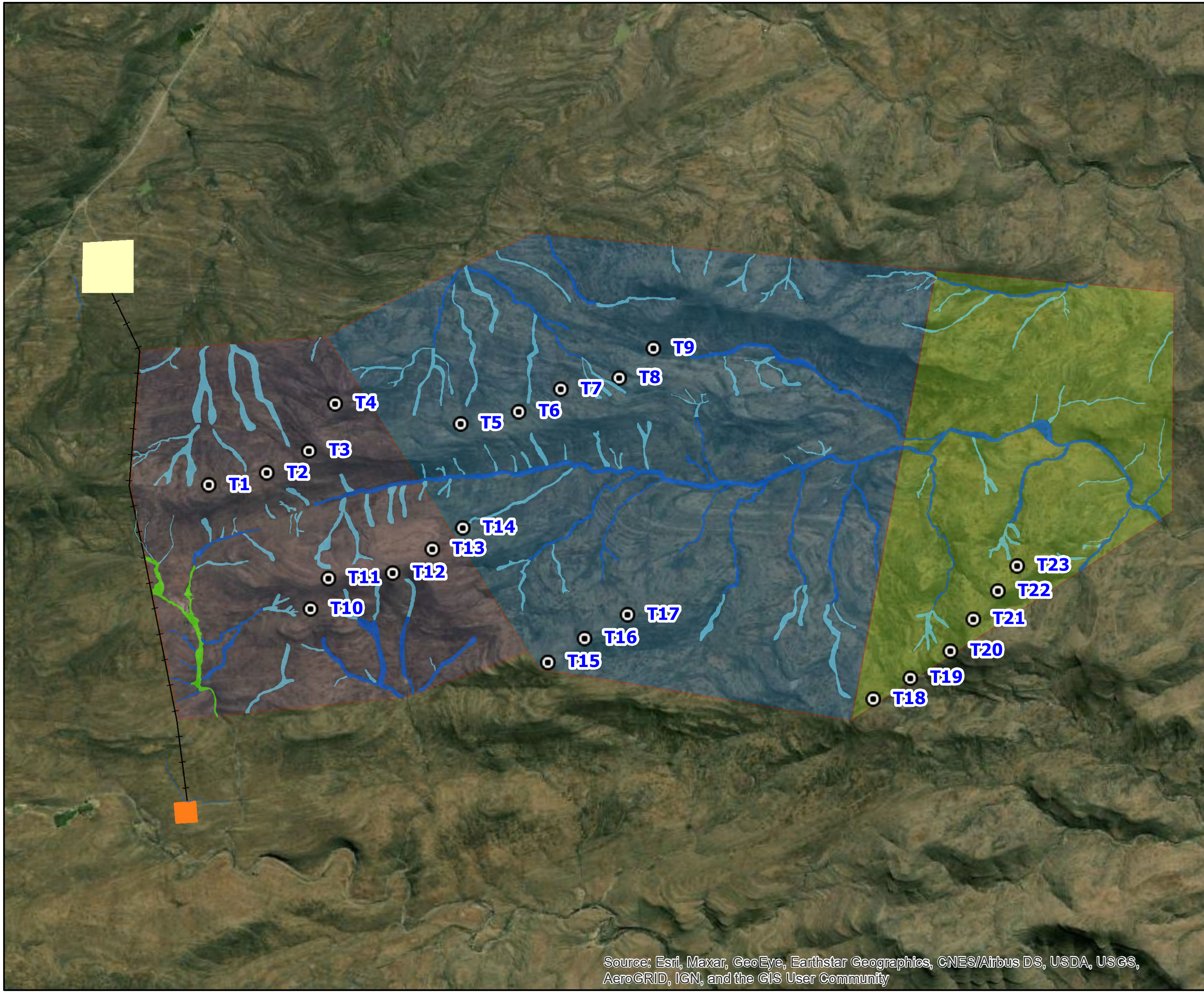
Photograph 5

Photograph 6

9 RESULTS

9.1 WETLAND DELINEATION

A desktop assessment, utilising aerial imagery (2004 – 2022) 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 March 2022. The desktop review and subsequent infield assessment (through soil sampling and an analysis of vegetation) identified three seasonal channelled valley-bottom (CVB) wetlands and riparian zones associated with the ephemeral headwaters and tributaries (**Figure 5**).



BTE RENEWABLES ESIZAYO WEF EXPANSION

IDENTIFIED WATERCOURSES

Legend

- Portion 1 of Farm Leeuwenfontein 71
- Remainder of Farm Leeuwenfontein 71
- Portion 2 of Farm Aanstoot Farm 72
- Turbines
- Esizayo Collector Substation
- Komsburg Substation
- Proposed 132kV Line Route

Name

- CVB (Seasonal)
- Riparian A (Ephemeral Headwaters)
- Riparian A (Ephemeral Tributary)

N

0 230 460 920 1 380 1 840

Meters

DISCLAIMER

The information on this figure was derived from various digital databases available to WSP Environmental (Pty) Ltd. All information is provided "as is" and it must be acknowledged that data, information, and maps are dynamic and in a constant state of maintenance, correction and update. WSP Environmental (Pty) Ltd cannot accept any responsibility for errors, omissions, or positional accuracy where it has not been directly responsible for the production of the data referenced. There are no warranties, expressed or implied, as to the use of this information, including the warranty of merchantability or fitness for a particular purpose. Notification of any errors will be appreciated.

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DATA SOURCE:

SOUTH AFRICAN DEPARTMENT OF RURAL DEVELOPMENT AND LAND REFORM- CHIEF DIRECTORATE: NATIONAL GEO SPATIAL INFORMATION

PROJECTION: GCS_WGS_1984

PROJECT TITLE:
DNG ENERGY - FEASIBILITY STUDY

SCALE: 1:60 000	DRAWN BY: TUMELO TSEPHE
DATE: 2021/05/19	REVIEWED BY: ZAKARIYA NAKHOODA
PROJECT NO: 41103063	REV: 0

9.1.1 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 6**.

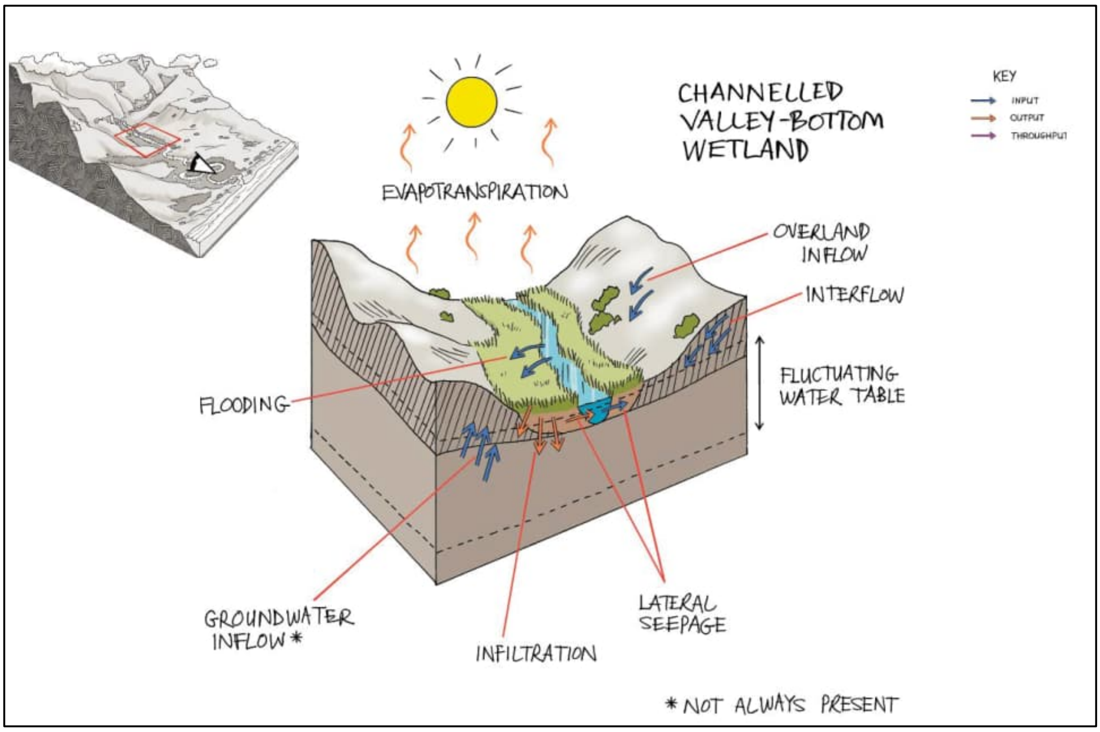

Figure 6: Conceptual Illustration of a Channelled Valley-Bottom Wetland (Ollis *et al.*, 2013)

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 7**). 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."

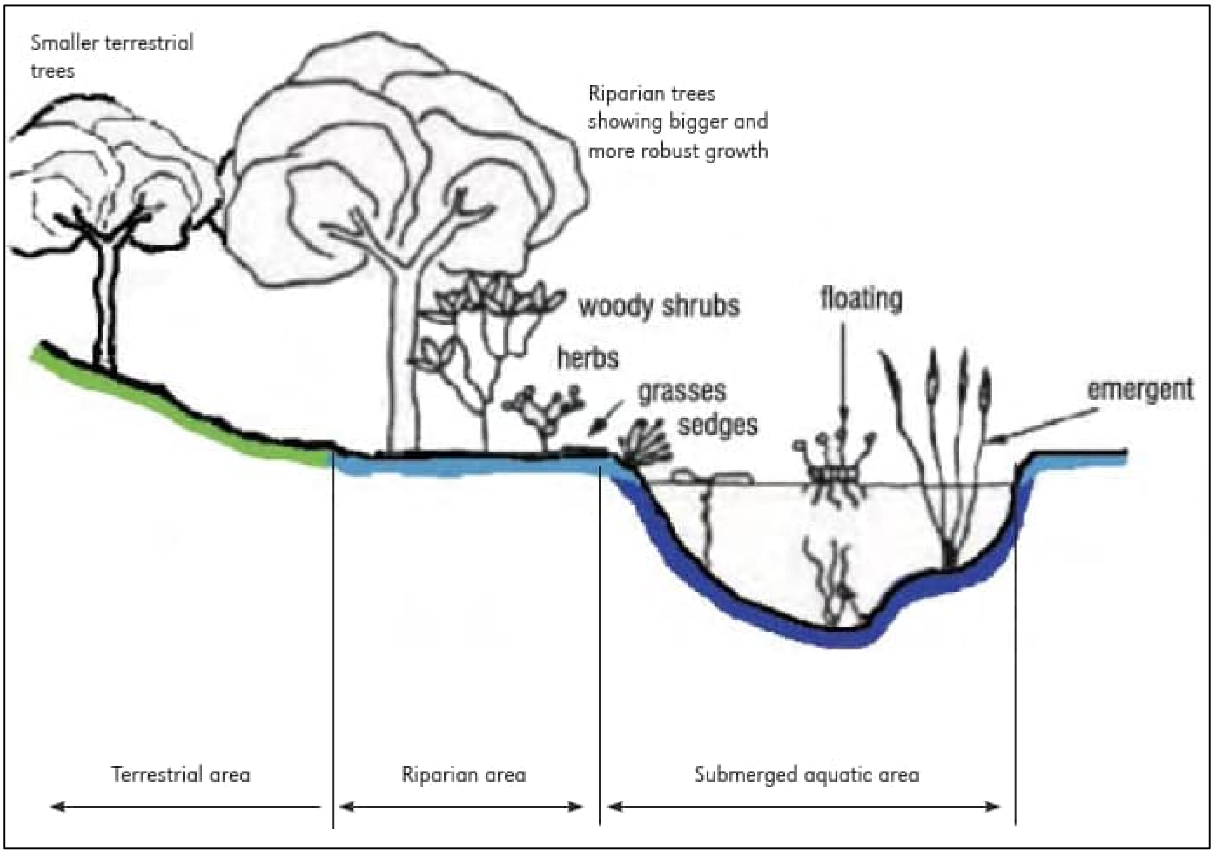

Figure 7: Typical Cross Section of a River Channel (DWAF, 2005)

9.2 WETLAND UNIT SETTING

The setting of the identified wetland was classified as per **Table 12** below.

Table 12: Wetland/Watercourse Unit Setting

Unit	Regional Setting (Level 2) (NFEPA WetVeg)	Landscape Setting (Level 3)	HGM Unit (Level 4)
CVB 1, 2 and 3	Karoo Shale Renosterveld	Valley Bottom	Channelled Valley Bottom
Riparian Zone (Headwaters)		Slope	Riparian Zone
Riparian Zone (Tributaries)		Slope	Riparian Zone

10 IMPACT ASSESSMENT

The impacts identified for the Project and associated activities are assessed in the sections that follows. The methodology for defining the significance of the respective impacts is described in **Section 7.3** of this report. The impacts have been assessed for the construction and operational phases of the project.

10.1 CONSTRUCTION PHASE

The following activities will be carried out during the construction of the Project.

- Vegetation clearing and construction of access roads/tracks (where required);
- Construction of tower structure foundations;
- Assembly and erection of infrastructure on site;
- Stringing of conductors; and
- Rehabilitation of disturbed areas and protection of erosion sensitive areas.

The anticipated impacts for the Project during the construction phase of the project are presented in **Table 13**, together with associated mitigative measures**.**

Table 13: 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. – The pole sites should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities. – 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
	5	2	3	2	3	36	2	2	2	2	3	24
	N3 - Moderate						**N1 – Low**					

<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>4</td><td>2</td><td>1</td><td>2</td><td>4</td><td>36</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">Loss of wetland and riparian functionality</td></tr>
<tr><td>Impact description</td><td colspan="12">Degradation of wetland/riparian habitat due to the positioning of the associated infrastructure</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.
– Stringing should make use of a running block and span, limiting intrusion into the freshwater habitat systems.
– The pole sites should be contoured to allow for surface water to readily drain away (as it would under natural conditions) and to prevent ponding of water within areas where it would not have ponded before the construction activities.
– The identified wetlands and riparian areas are to be designated as “highly sensitive”.
– 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 colspan="12">Moderate</td></tr>
</table>

<table>
<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>2</td><td>3</td><td>2</td><td>4</td><td>44</td><td>3</td><td>2</td><td>2</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>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>
<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>5</td><td>2</td><td>3</td><td>2</td><td>4</td><td>48</td><td>3</td><td>2</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>
<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.
– 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.
</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	4	44	2	2	1	2	3	21
	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	Pre-Mitigation						Post-Mitigation					
	(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
	4	2	1	2	3	27	2	2	1	2	2	14
	N2 - Low						**N1 – Very Low**					

10.2 OPERATIONAL PHASE

The anticipated impacts for the Project during the operational phase of the project are summarised in **Table 14**. The impacts summarised below are relevant to the freshwater habitats identified on the Project site.

Table 14: Operational Phase Impact Assessment

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.

<table>
<tr><td></td><td>– 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>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>2</td><td>1</td><td>2</td><td>3</td><td>27</td><td>2</td><td>2</td><td>1</td><td>2</td><td>1</td><td>7</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 habitat</td></tr>
<tr><td>Impact description</td><td>Degradation of wetland/riparian habitat when undertaking maintenance activities</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 should be utilised t o access the powerline infrastructure.</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>2</td><td>3</td><td>2</td><td>2</td><td>22</td><td>2</td><td>2</td><td>1</td><td>2</td><td>1</td><td>7</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>Increased soil erosion and sedimentation.</td></tr>
<tr><td>Impact description</td><td>Increased soil erosion due to vegetation clearance, soil disturbance during maintenance activities. Subsequent potential sedimentation of watercourses.</td></tr>
<tr><td>Mitigation</td><td>– 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 maintenance 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>Moderate</td></tr>
</table>

Significance rating	Pre-Mitigation						Post-Mitigation					
	(M+	E+	R+	D)x	P=	S	(M+	E+	R+	D)x	P=	S
	3	2	3	2	2	20	2	2	1	2	2	14
	N2 - Low						**N1 – Very Low**					

11 CONCLUSION

Numerous wetland and riparian habitats have been identified across the Project site as identified in **Section 9**. The development of the Project does have the potential to negatively impact the surrounding surface water environment, however, the impacts identified are largely associated with ancillary processes and not the establishment of the turbine infrastructure as these will likely be placed on the crest of the hilltops.

Given that the possibility of the Project to negatively impact the surface water environment, adequate mitigation and management procedures are to be adhered to. Loss of wetland habitat, water quality, alteration of the natural flow regimes and, erosion and sedimentation have been identified as the predominant negative impacts associated with the proposed Project. Should the recommended mitigative measure be implemented during and after construction, the risk to the surface watercourses 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.

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.