Appendix H.17

WETLAND ASSESSMENT

Enertrag

DALMANUTHA WIND ALT 1 AND ALT 2 - AQUATIC BIODIVERSITY SPECIALIST ASSESSMENT

Wetland Ecosystems

APRIL 2023

PUBLIC

Enertrag

DALMANUTHA WIND ALT 1 AND ALT 2 - AQUATIC BIODIVERSITY SPECIALIST ASSESSMENT

Wetland Ecosystems

TYPE OF DOCUMENT (VERSION) PUBLIC

PROJECT NO. 41104722

DATE: APRIL 2023

Enertrag

DALMANUTHA WIND ALT 1 AND ALT 2 - AQUATIC BIODIVERSITY SPECIALIST ASSESSMENT

Wetland Ecosystems

WSP

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

Phone: +27 11 254 4800

WSP.com

QUALITY CONTROL

Issue/revision	First issue
Remarks	Final Issue
Date	May 2023
Prepared by	Lufuno Nemakhavhani
Signature	
Checked by	Aisling Dower
Signature	
Authorised by	Aisling Dower
Signature	
Project number	41104722
Report number	
File reference	\\corp.pbwan.net\za\Central_Data\Projects\41100xxx\41103722 - Dalmanutha WEF\41 ES\01-Reports\04-Specialists\Biodiversity\Aquatic Report_EIA

CONTENTS

TABLES

FIGURES

EXECUTIVE SUMMARY

The proposed Dalmanutha WEF Project footprint is located in a greenfield area that is dominated by undeveloped agricultural land and semi-natural and natural grassland. Two alternative options- alternative 1 and alternative 2 are proposed for this Project, both covering an area of approximately 9 1790 ha, and includes the development of a wind energy facility with a capacity of up to 300MW, comprising up to 79 turbines for Alternative 1 and a hybrid facility with a capacity of 300mw, including a wind energy facility comprising up to 44 turbines and a solar field for alternative 2. The Project's alternative 1 and 2 intercept a number of wetland habitat, resulting in the loss of approximately 1.9 and 1.4 ha of wetland habitat respectively.

The majority of these wetlands are in a moderately low to moderate present ecological state which infers that there has been a moderate change in ecosystem processes and loss of natural habitat has taken place, but natural habitat remains predominately intact. Similarly, most wetlands have a moderate ecological importance and sensitivity, in the context of the surrounding cultivated landscape. However, some wetlands in the study area are considered to have a high EIS and a natural PES due the high or very high ecological importance or sensitivity – primarily as a result of their role in delivery of biodiversity-related ecosystem services, that is, support of threatened plant species or populations of unique species, migration/feeding/breeding sites for fauna, and the regional context of their ecological integrity given the extent of loss/modification of pan systems in the region.

The key Project impacts with respect to the proposed Dalmanutha WEF Development are direct loss of wetland habitat, and interruption in hydrological and hydropedological systems supporting those remaining wetlands, the impact to wetland soil erosion and the establishment and spread of alien invasive plant species. These impacts are expected to have high-moderate impact on wetlands prior to mitigation and can be reduced to moderate-low impact with the implementation of mitigation measures with the exception of the direct loss of wetland habitat which cannot be mitigated (i.e. avoided, minimised, rehabilitated).The implementation of a wetland rehabilitation and management plan for the Project as well as an approved wetland offset strategy is therefore necessary to address significant residual impacts and ensure that any areas specifically set aside for biodiversity conservation (including on-site wetland offsets, and any off-site mitigation / offset areas) are protected and managed accordingly. It is recommended that the alternative 2 option be the option of preference due to the smaller total footprint covered by this option as well as the reduced extent of wetland habitat expected to be lost to alternative 2 project.

Contact name Lufuno Nemakhavhani

Contact details +27 11 313-1121 | lufuno.nemakhavhani@wsp.com

1 INTRODUCTION

Dalmanutha Wind (Pty) Ltd is proposing the establishment of a Wind Energy Facility (WEF) or a combination of wind energy and solar energy facilities, and associated infrastructure at the Dalmanutha Complex in Dalmanutha, Mpumalanga Province (Figure 1-1).

WSP Africa was appointed by Dalmanutha Wind to undertake the necessary aquatic baseline studies and impact assessments, in support of the scoping, baseline and impact assessment phases of the environmental regulatory process required to authorise development-related activities and infrastructure.

1.1 PURPOSE OF THE REPORT

This report describes the baseline wetland ecology of the study area and documents the results of the assessment of the potential impacts of the proposed Project alternatives on wetland ecosystems.

The report also provides recommended measures for the mitigation of any negative impacts for inclusion in the EMPr for the Project, to ensure that the relevant South African biodiversity legislative and policy requirements are satisfactorily met.

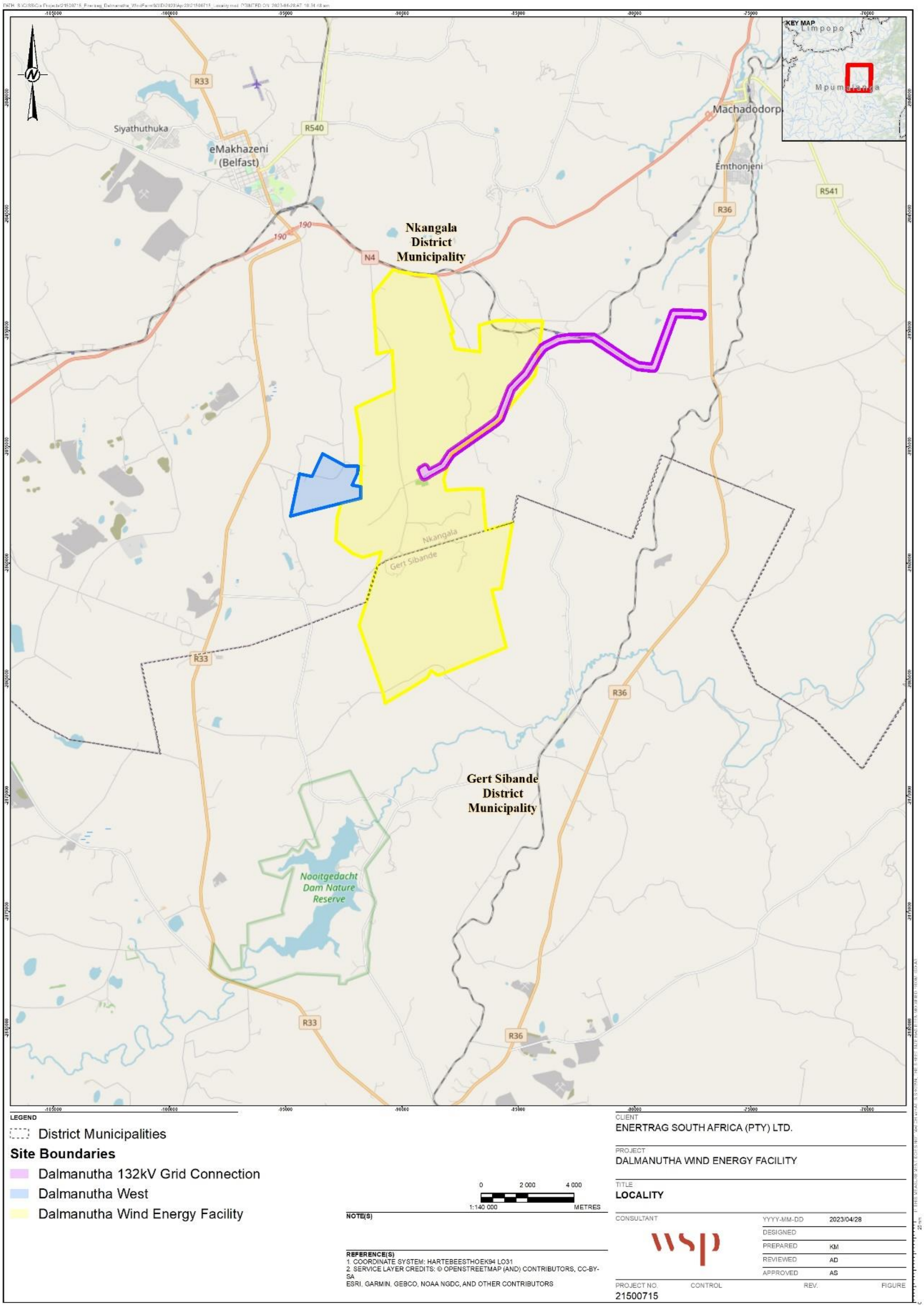

Figure 1-1 - Dalmanutha Complex location

2 PROJECT LOCATION AND EXTENT

The Dalmanutha Wind Energy Facility (Dalmanutha WEF) herein referred to as the 'Project' is located approximately 7km southeast of the Belfast town within the Emakhazeni Local Municipality, Mpumalanga Province.

Two alternative options, alternative 1 and alternative 2 have been proposed for the Dalmanutha WEF project. The Proposed Project extent is 9,197 ha for both alternative 1 and alternative 2 and is expected to have a capacity of up to 300 MW. These are described in full in the ESIA chapter xxx, illustrated in Figure 2-1 and Figure 2-2 and summarised in the sections that follow.

2.1 DALMANUTHA WIND FACILITY – ALTERNATIVE 1

The proposed Dalmanutha WEF will be developed with a capacity of up to 300 megawatts (MW), and will comprise the following key components:

- Up to 70 turbines[1], each with a foundation of approximately 25m^2 in diameter (500m^2 area and requiring ~2 500m^3 concrete each) and approximately 3m depth;
- Permanent hard standing area for each wind turbine (approximately 1ha).
- IPP portion onsite substation of up to 4ha. The substation will consist of a high voltage substation yard to allow for multiple up to 132kV feeder bays and transformers, control building, telecommunication infrastructure, access road, etc.;
- Battery Energy Storage System (BESS);
- 33kV cabling, to be laid underground, where practical;
- Over the fence 132kV cable to connect the onsite IPP substation to the Common Collector Switching Station;
- Operations and maintenance (O&M) building infrastructure will be near the onsite substation and will include:
- Operations building of approximately 200m^2;
- Workshop and stores area of approximately 150m^2 each;
- Stores area of approximately 150m^2; and
- Refuse area for temporary waste and septic/conservancy tanks with portable toilets to service ablution facilities.
- Construction Camp Laydown including:
  - Temporary laydown or staging area -Typical area 220m x 100m = 22000m^2.
  - Laydown area could increase to 30000m^2 for concrete towers, should they be required.
  - Sewage: septic and/or conservancy tanks and portable toilets.
  - Temporary cement batching plant, wind tower factory & yard of approximately 7ha.
- Internal and access roads with a width of between 8m and 10m, which can be increased to approximately 12m on bends. The roads will be positioned within a 20m wide corridor to

[1] An up to 77 turbine layout was considered during the scoping phase, however as a result of the avifauna specialist input the turbine layout has been optimised to include up to 70 turbines. The optimised up to 70 turbine layout will be assessed in the EIA phase

accommodate cable trenches, stormwater channels and bypass /circles of up to 20m during construction. Length of the internal roads will be approximately 60km.
- Associated infrastructure including offices, security buildings etc.

The proposed development footprint (buildable area) is approximately 400ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 9 197 ha. The development footprint includes the turbine positions and all associated infrastructure as outlined above.

2.2 DALMANUTHA WIND FACILITY – ALTERNATIVE 2

The key difference to alternative 1 is the reduction of the number of turbines from 70 to 44, and the inclusion of solar PV as well as the reduction of width of internal roads (4m) associated with the Solar PV as follows;

- PV panels will be up to a height of 6m (when the panel is horizontal) and will be mounted on fixed tilt, single axis tracking or dual axis tracking mounting structures. Monofacial or bifacial Solar PV Modules are both considered;
- Footprint: ~160 ha; and
- Inverters, transformers and other required associated electrical infrastructure and components

The proposed development footprint (buildable area) for the Dalmanutha Wind and Solar Energy Facility is approximately 400ha (subject to finalisation based on technical and environmental requirements), and the extent of the project area is approximately 9 197 ha. The development footprint includes the turbine positions and all associated infrastructure as outlined above.

Figure 2-1 - Dalmanutha WEF Study Area: Alternative 1

Figure 2-2 - Dalmanutha WEF Study Area: Alternative 2

3 APPLICABLE LEGISLATION, GUIDELINES AND STANDARDS

3.1 NATIONAL LEGISLATION

The national legislation governing watercourses in South Africa is the National Water Act, 1998 (Act No. 36 of 1998) (NWA). In terms of the NWA, wetlands are defined as "*land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil*".

The 'regulated zone' of a watercourse includes the area lying within 500 m of that watercourse, and this was the basis for the definition of the Study Area, i.e. any wetlands lying within 500 m of the proposed development footprint.

3.2 NATIONAL GUIDELINES

According to Government Notice No. 320, published in 2020 under the National Environmental Management Act (1998) concerning 'Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Theme in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act (1998), when applying for Environmental Authorisation' any work taking place in an area classified as 'high to very high' sensitivity in terms of environmental themes should be investigated to confirm its sensitivity and the outcome of the survey should be presented in Aquatic Biodiversity Specialist Assessment report or in an Aquatic Biodiversity Specialist Compliance Statement.

4 METHODOLOGY

In line with the assessment and reporting requirements set out in the protocol, this scoping-level assessment included two main study components; a desktop literature review, which was then supplemented by information gathered during field surveys undertaken on 11 to 17 April 2022 and 3 to 6 May 2022 to inform the baseline description of wetland habitat in the study area, in line with the NEMA protocols. The objectives and tasks associated with these components are described below.

The study area was defined as follows (Figure 4-1):

- Project Area: refers to the agricultural farms that will be affected by proposed Project activities and infrastructure. The proposed Project site forms part of the larger Dalmanutha Wind Energy Complex and;
- Study Area: refers to all farms associated with the Dalmanutha Wind Energy Complex (Figure 4-1). Apart from the Dalmanutha WEF alternative 1 and alternative 2, the study area also includes land planned for the proposed Dalmanutha West WEF project and the proposed Dalmanutha Collector Switching Station and Powerline project – these are subject to separate applications for environmental authorisation. The study area was the spatial scale at which data collection and field work associated with this specialist study were focused.

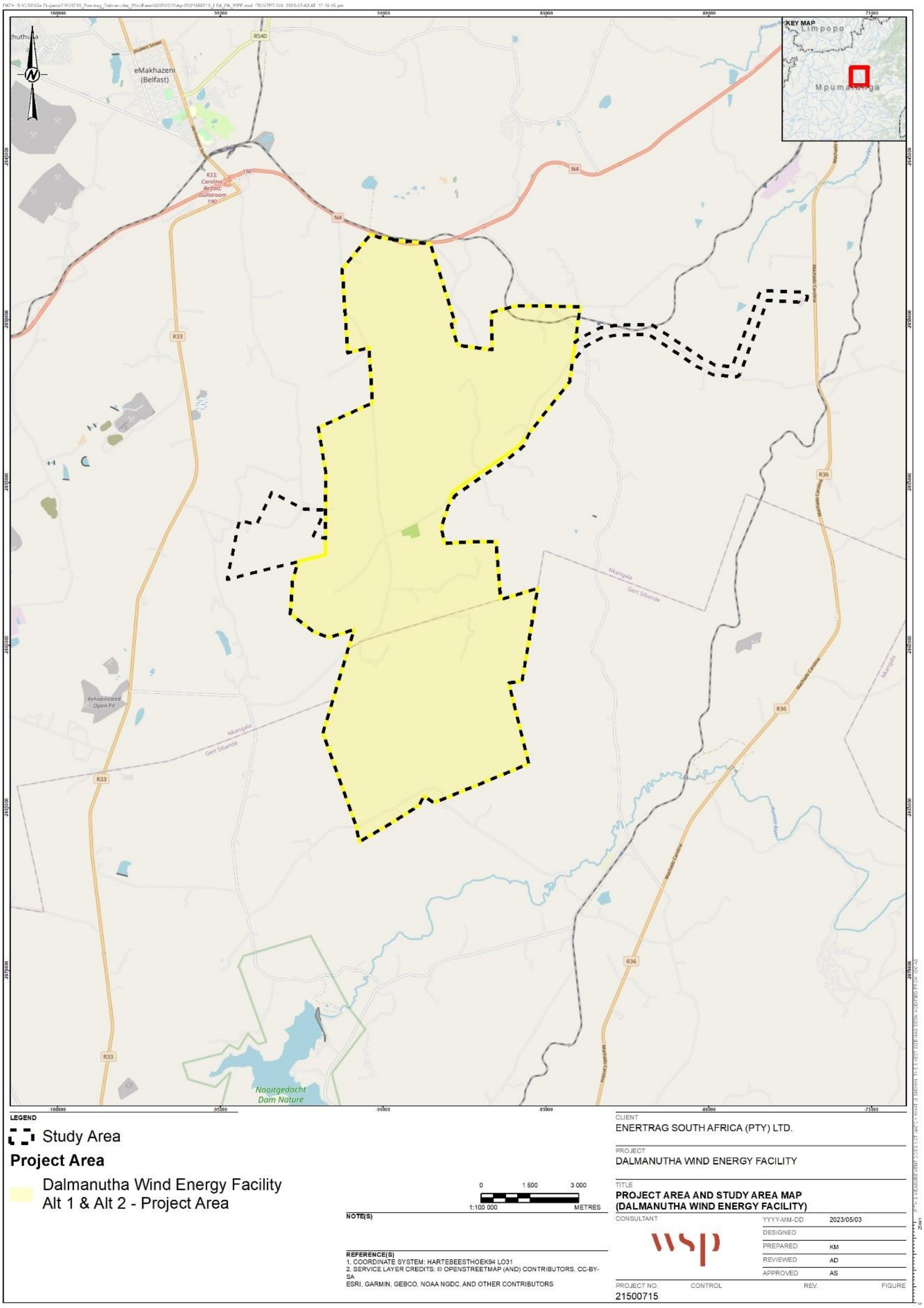

Figure 4-1 - Local and Regional Study Area

4.1 LITERATURE REVIEW

A literature review was conducted to gain an overview of the proposed project background, wetlands conditions (status quo) and associated impacts. The existing available datasets that were reviewed and consolidated to assess aquatic ecosystems include:

- A preliminary review of land cover and habitat types was undertaken at a desktop level using available satellite imagery and GeoTerraImage national land cover classifications (2020);
- Nationally-available datasets which were consulted to inform the site sensitivity verification for wetland and riparian habitat include the South African National Wetland Map version 5 (NWM5) (Van Deventer et al., 2019), and the National Freshwater Ecosystem Priority Area database.
- Department of Water and Sanitation datasets, including available information on surface water resources, water management areas, and quaternary catchments.

4.2 FIELD SURVEY

A field survey of wetlands in the LSA was conducted during the wet season from 11 - 14 April 2022, and from 03 - 06 May 2022. During the field visits, all wetlands within the LSA were visited and assessed.

The field survey included an identification of each wetland type and its assessment in terms of its Present Ecological Status (PES) and Ecological Importance and Sensitivity (EIS) and well as the identification of potential impacts using the methodology discussed below;

WETLAND ASSESSMENT

Wetland Delineation

The delineation procedure originally set out in “A Practical Field Procedure for the Identification and Delineation of Wetlands and Riparian Areas”, DWAF (2005) and updated by DWAF (2008), describes the following four indicators of wetland presence that can be used to define the boundary of a wetland:

1) The position in the landscape, which helps identify those parts of the landscape where wetlands are more likely to occur;
2) The type of soil form (i.e., the type of soil according to a standard soil classification system), since wetlands are associated with certain soil types;
3) The presence of wetland vegetation species, and
4) The presence of redoxymorphic soil features, which are morphological signatures that appear in soils with prolonged periods of saturation (due to the anaerobic conditions which result).

These indicators were used in the field to delineate the boundary of the temporary zone (outer boundary) as well as the seasonal and permanent zonal characteristics of the wetland systems encountered within the study area.

Wetland Classification

To allow for the differentiation between wetland systems and the prioritisation of systems either for conservation or management purposes, the wetlands were classified in accordance with each hydrogeomorphic (HGM) unit for assessment purposes according to (Kotze *et al*., 2008). Six major inland HGM types are recognised for the purposes of wetland classification (Table 4-1), and these criteria were applied to the current assessment.

Table 4-1 - Wetland Hydrogeomorphic Units (after Kotze *et al*., 2008)

Wetland Hydro-geomorphic type	Description	Source of water maintaining the wetland1	
		Surface	Sub-surface
Floodplain	Valley bottom areas with a well-defined stream channel, gently sloped and characterised by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Channelled valley bottom	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterised by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/***
Unchannelled valley bottom	Valley bottom areas with no clearly defined stream channel, usually gently sloped and characterised by alluvial sediment deposition, generally leading to a net accumulation of sediment. Water inputs mainly from channel entering the wetland and from adjacent slopes.	***	*/***
Hillslope seepage with channelled outflow	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Hillslope seepage without channelled outflow	Slopes on hillsides, which are characterized by the colluvial movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression (includes pans)	A basin shaped area with a closed elevation contour that allows for the accumulation of surface water (i.e., it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.	*/***	*/***

1 Precipitation is an important water source and evapotranspiration an important output in all the above settings.
*Water source: * Contribution usually small; *** Contribution usually large; **** Contribution may be small or important depending on the local circumstances*

Present Ecological Status (PES)

A PES assessment was conducted for all hydro-geomorphic wetland units in the Study Area in order to establish a baseline of the current state of the wetlands, and to provide an indication of the conservation value and sensitivity of the wetlands.

The Level 2 WET-Health assessment as described in Macfarlane *et al.* (2008) was applied for the determination of the PES score for each wetland unit. The PES score is reflected in the placement of each wetland unit into a PES category. A description of the PES scores and linked impact categories is provided in Table 4-2.

Table 4-2 - Impact scores and categories of Present Ecological State used by WET-Health for describing the integrity of wetlands (Macfarlane *et al*., 2008)

Impact Category	Description	Impact Score Range	Present Ecological State Category
None	Unmodified, or approximates natural condition	0 – 0.9	A
Small	Largely natural with few modifications, but with some loss of natural habitats	1 – 1.9	B
Moderate	Moderately modified, but with some loss of natural habitats	2 – 3.9	C
Large	Largely modified. A large loss of natural habitat and basic ecosystem function has occurred	4 – 5.9	D
Serious	Seriously modified. The losses of natural habitat and ecosystem functions are extensive	6 – 7.9	E
Critical	Critically modified. Modification has reached a critical level and the system has been modified completely with almost complete loss of natural habitat	8 – 10.0	F

Ecological Importance and Sensitivity

The EIS was determined using the methodology developed by Rountree *et al.* (2013). It is a rapid scoring system to evaluate:

- Ecological Importance and Sensitivity;
- Hydrological Functions; and
- Direct Human Benefits.

The scoring assessment incorporates:

- EIS score derived using aspects of the original Ecological Importance and Sensitivity assessments developed for riverine assessments (DWAF, 1999);

- Hydro-function importance score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2009); and
- Direct human benefits score derived from the WET-EcoServices tool for the assessment of wetland ecosystem services Kotze *et al.* (2009).

The highest score of the three derived scores (each with range 0 – 4) was then used to indicate the overall importance category of the wetland (Table 4-3).

Table 4-3 - Ecological importance and sensitivity categories

Ecological Importance and Sensitivity Category Description	Range of EIS score
Very high: Wetlands that are considered ecologically important and sensitive on a national or even international level. The biodiversity of these systems is usually very sensitive to flow and habitat modifications. They play a major role in moderating the quantity and quality of water of major rivers	> 3 and ≤ 4
High: Wetlands that are considered to be ecologically important and sensitive. The biodiversity of these systems may be sensitive to flow and habitat modifications. They play a role in moderating the quantity and quality of water of major rivers.	> 2 and ≤ 3
Moderate: Wetlands that are considered to be ecologically important and sensitive on a provincial or local scale. The biodiversity of these systems is not usually sensitive to flow and habitat modifications. They play a small role in moderating the quantity and quality of water of major rivers	> 1 and ≤ 2
Low/marginal: Wetlands that are not ecologically important and sensitive at any scale. The biodiversity of these systems is ubiquitous and not sensitive to flow and habitat modifications. They play an insignificant role in moderating the quantity and quality of water of major rivers.	> 0 and ≤ 1

IMPACT ASSESSMENT

The significance of identified impacts was determined using the approach outlined below (terminology from the Department of Environmental Affairs and Tourism Guideline document on EIA Regulations, April 1998). This approach incorporates looks at five impact criteria and indicated in Table 4-4 below:

Table 4-4 - Impact assessment scoring scales

Criteria	Number of Points to Score				
	Score 1	Score 2	Score 3	Score 4	Score 5
Impact Magnitude (M)	Very low	Low	Medium	High	Very high
Impact Extent (E)	Site only	Local	Regional	National	International
Impact Reversibility (R)	Reversible		Recoverable		Irreversible
Impact Duration (D)	Immediate	Short Term	Medium term	Long term	Permanent
Probability of Occurrence (P)	Improbable	Low	Medium	High	Definite

Table 4-5 – Impact Criteria Scores used for wetland impact assessment (Based on impact significance criteria determined by DEAT, 1998)

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**	**Low**	**Medium**	**High**	**Very high**
Impact Extent (E)	**Site:**	**Local:**	**Regional:**	**National:**	**International:** Across borders or boundaries
The geographical extent of the impact on a given environmental receptor	Site only	Inside activity area	Outside activity area	National scope or level	
Impact Reversibility (R)	**Reversible:**		**Recoverable:**		**Irreversible:**
The ability of the environmental receptor to rehabilitate or restore after the activity has caused environmental change	Recovery without rehabilitation		Recovery with rehabilitation		Not possible despite action
Impact Duration (D)	**Immediate:**	**Short term:**	**Medium term:**	**Long term:**	**Permanent:**
The length of permanence of the impact on the environmental receptor	On impact	0-5 years	5-15 years	Project life	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 Probably**	**Definite**
ENVIRONMENTAL SIGNIFICANCE = (MAGNITUDE + EXTENT + REVERSIBILITY + DURATION) x PROBABILITY					
TOTAL SCORE	**4 to 15**	**16 to 30**	**31 to 60**	**61 to 80**	**81 to 100**
ENVIRONMENTAL SIGNIFICANCE RATING	**Very low**	**Low**	**Moderate**	**High**	**Very High**

Table 4-6 – Environmental Significance Rating

Negative	Positive
Very Low	Very Low
Low	Low
Moderate	Moderate
High	High
Very High	Very High

4.3 STUDY ASSUMPTIONS AND LIMITATIONS

DATA USED FOR SPECIALIST ASSESSMENT

- The baseline description is based on available national datasets and published literature for the Dalmanutha/Dullstroom Plateau region, supplemented by field survey data (observations and photographs) gathered during April and May 2022, in the late rainy season.
- Comprehensive vegetation and fauna surveys, which are described in the terrestrial plant and animal specialist assessments accompanying this application, informed the determination of wetland ecological sensitivity.
- It is therefore considered that there are no sampling or information limitations pertaining to the baseline description of wetland ecosystems, the wetland impact assessment or the recommendations contained in this report.

ASSUMPTIONS, UNCERTAINTIES, OR GAPS IN KNOWLEDGE

- None identified.

5 BASELINE DESCRIPTION

5.1 REGIONAL WETLAND BIODIVERSITY CONTEXT

The Project Area falls within the upper reaches of the Inkomati Water Management Area (WMA), and the quaternary catchment X11D (Komati River) (Figure 5-1). The Mean Annual Runoff (MAR) for the X11D catchment is 88 mm (WR2012). This catchment receives 744 mm rainfall per year and experiences 1,413 mm of evaporation annually. Numerous non-perennial rivers drain in an easterly direction into the perennial Waalkraalloop river and in a westerly and southerly direction into the perennial Klein Komati River.

The Komati River catchment is ecologically severely stressed due to the water demands imposed by Eskom power stations and agricultural activities, with various abstraction weirs creating serious obstructions to fish migrations and return flows from irrigation affecting downstream water quality as a result of input of chemicals such as pesticides, fertilizers and salts (MPTA, 2015). Alien invasive fish species that have been introduced into the numerous dams are also present in the rivers (MPTA, 2015). Nevertheless, the ecological status of some sections of the upper Komati River catchment (within which the Project Area is situated) is still considered to be in a relatively good condition (MPTA, 2015).

AQUATIC CRITICAL BIODIVERSITY AREAS (CBAS) AND ECOLOGICAL SUPPORT AREAS

The Study Area was compared to relevant available spatial biodiversity planning datasets, i.e. the Mpumalanga Biodiversity Sector Plan freshwater assessment (2017) (Figure 5-2) in order to assess the local and regional biodiversity context of the site. Depression wetlands that occur throughout the LSA are mapped as CBAs, while the western extent of the Project Area, which coincides with the Klein-Komati River FEPA sub-catchment (Figure 5-2) is mapped as an ESA. The MBSP (2017) freshwater assessment spatial dataset also shows the majority of the eastern extent of the Project Area mapped as 'other natural areas'.

It is noted that the MBSP freshwater assessment was based largely on remotely-sensed satellite imagery, and thus some wetlands are not included (e.g. historic wetlands lost through drainage or ploughing), particularly hillslope seeps which can be difficult to distinguish from grasslands based on satellite imagery alone. Similarly, some features have been mapped as wetlands, which, once examined in the field, are not defined as wetlands. The most up-to-date spatial dataset at the national level is now considered to be the National Wetland Map 5 (see Figure 5-3 which displays a more accurate representation of actual wetland conditions on site; however hillslope seep wetlands are assumed to be under-represented, and are a focus point for the ongoing baseline data collection to inform the wetland delineation and classification of hydrogeomorphic units located within the LSA.

STRATEGIC WATER SOURCE AREAS (SWSAS)

No strategic water source areas occur in the RSA.

FRESHWATER ECOSYSTEM PRIORITY AREAS (FEPA) SUB-CATCHMENTS

The proposed development footprint in relation to FEPA sub-catchments is illustrated on Figure 5-5.

NATIONAL WETLAND MAP VERSION 5

The South African National Wetland Map version 5 (NWM5) portrays the most up-to-date spatial data for the extent and types of estuarine and inland aquatic (freshwater) ecosystems of South Africa (Van Deventer *et al.*, 2019). The proposed development footprint in relation to wetlands mapped as part of the National Wetland Map 5 project is illustrated on Figure 5-3. As mentioned, the extent of hillslope seep wetlands within the Project Area are likely to be under-represented in this dataset, as such the key objective of the wetland baseline data gathering studies was to define the extent and condition of this (and other) wetland habitat in the Project Area.

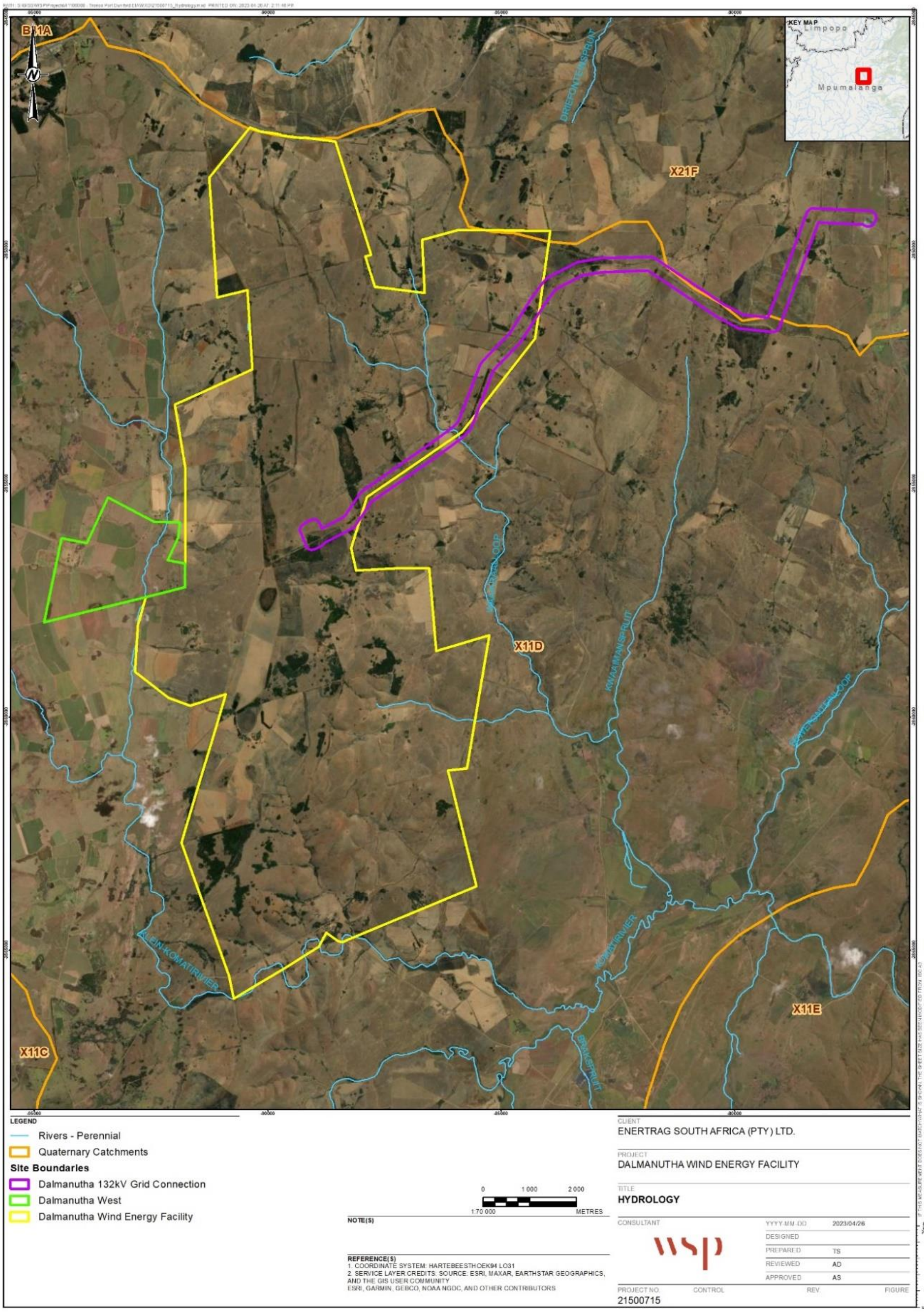

Figure 5-1 – Quaternary catchments

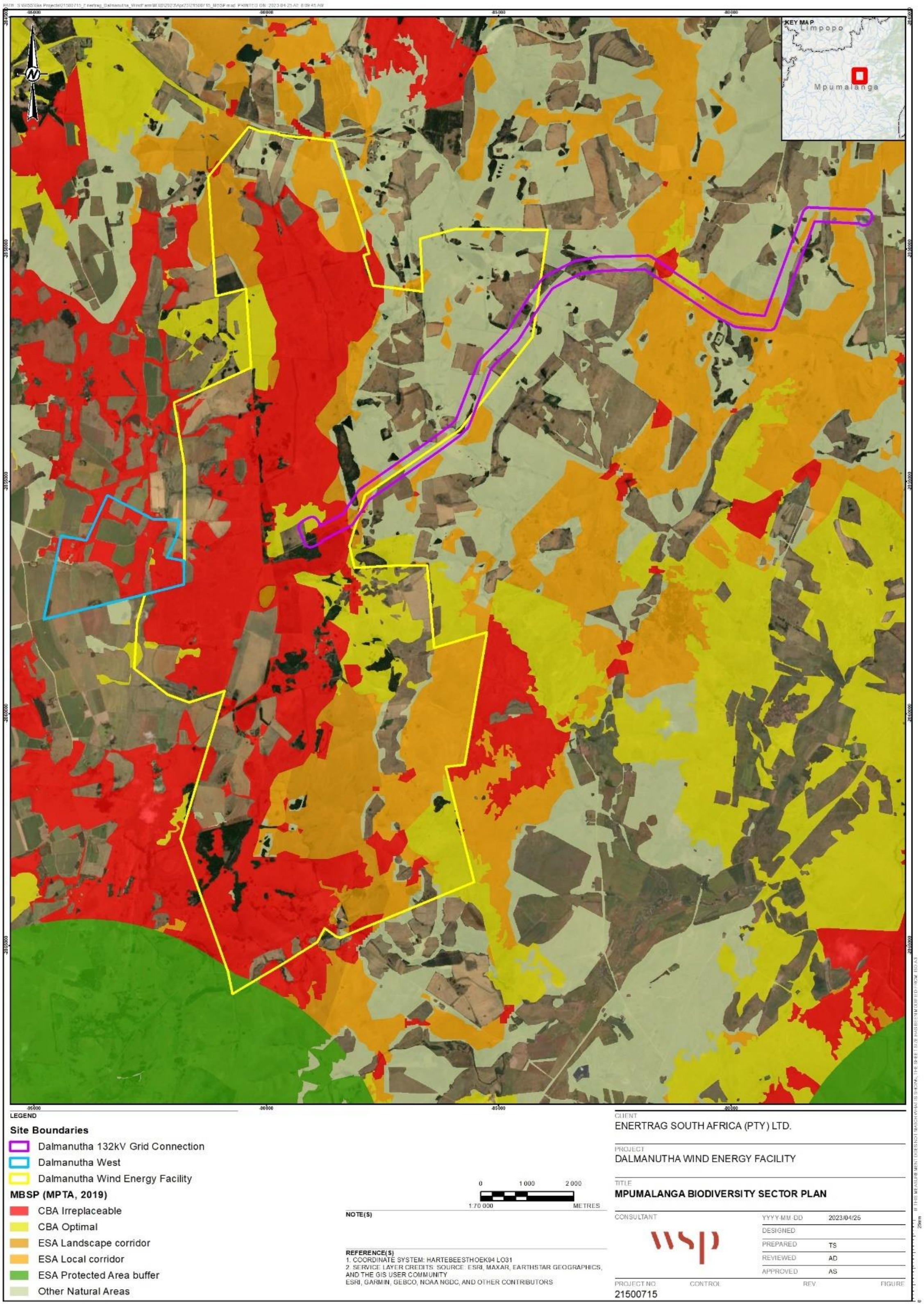

Figure 5-2 – MBSP conservation mapping in relation to the Dalmanutha WEF Project

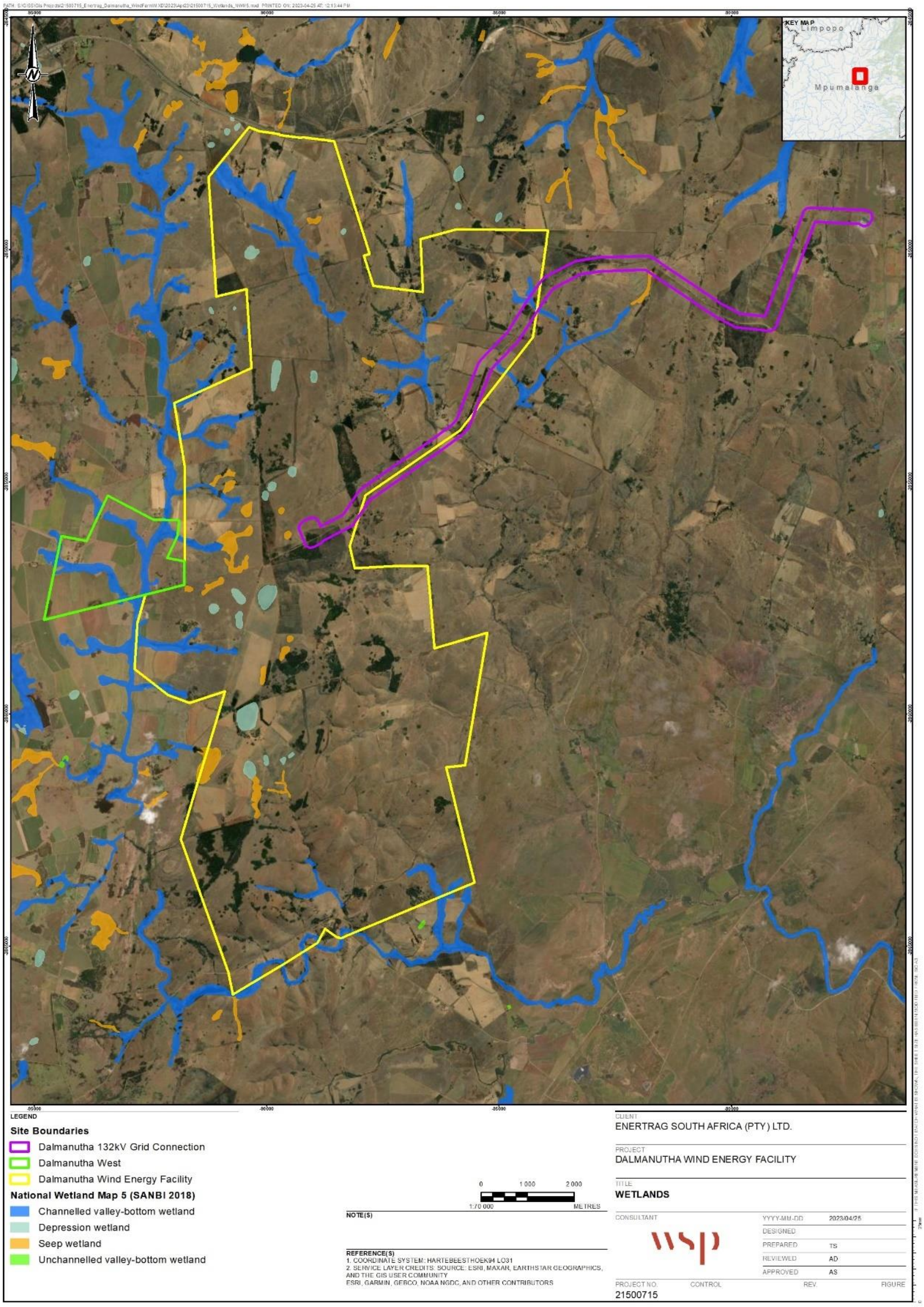

Figure 5-3 – Nationally-mapped wetlands in the Project Area (SANBI, 2018)

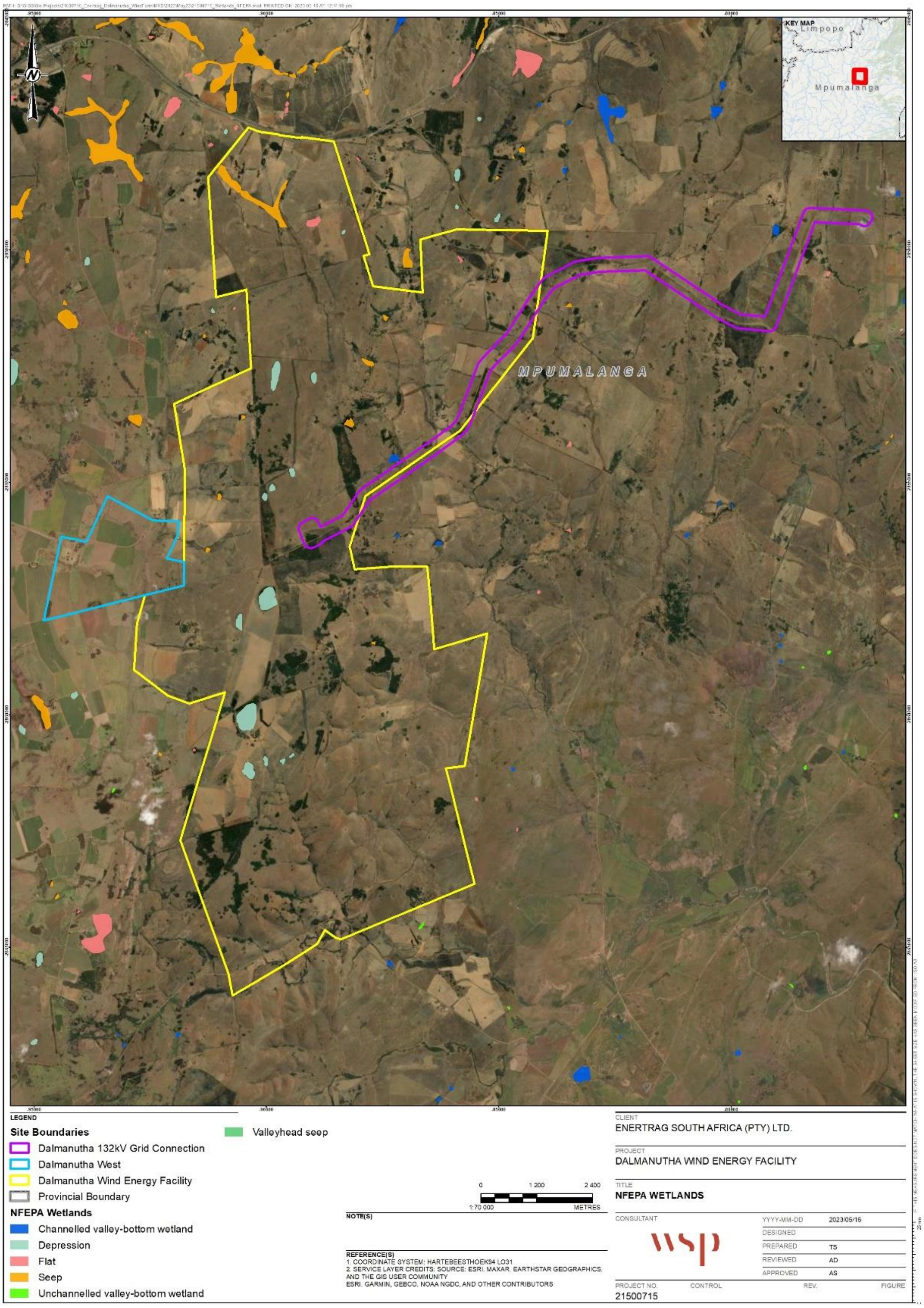

Figure 5-4 – NFEPA wetlands in relation to the Dalmanutha WEF Project

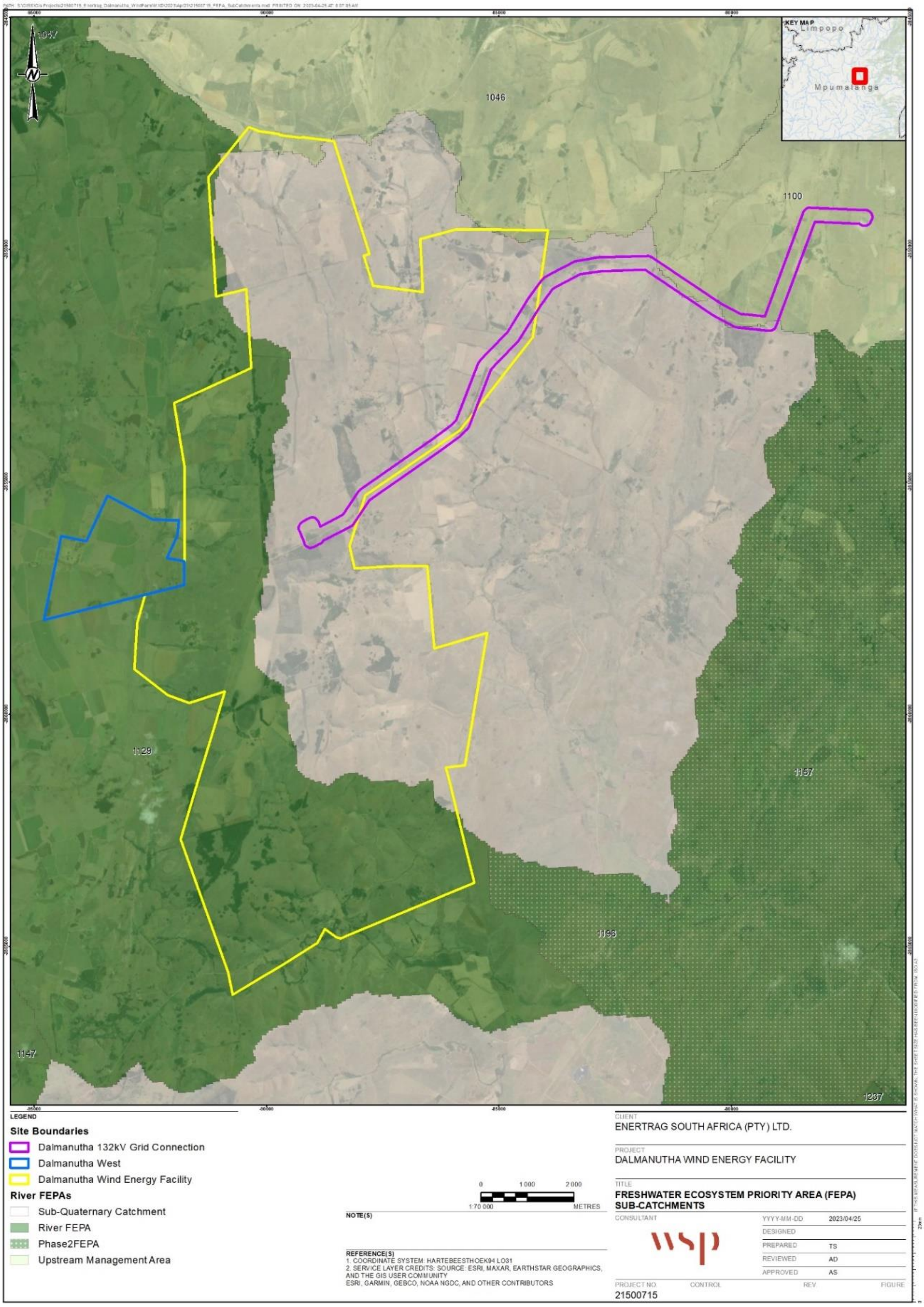

Figure 5-5 – River FEPA sub-catchments in relation to the Dalmanutha WEF Project

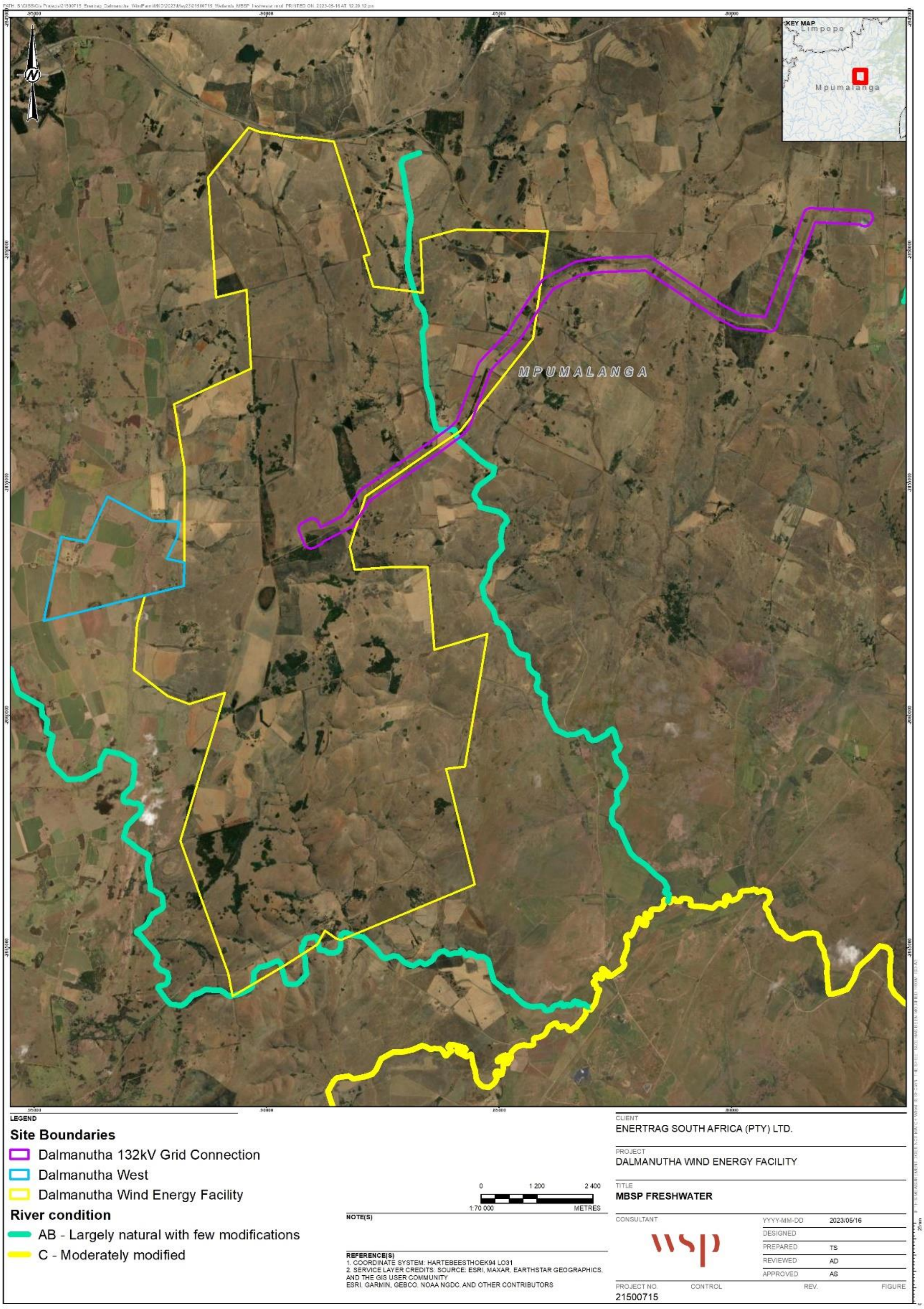

Figure 5-6 – MBSP Freshwater in relation to the Dalmanutha WEF Project

5.2 FIELD SURVEY RESULTS

WETLAND DELINEATION AND CLASSIFICATION

The extent (hectares) and classification of wetlands within the Project Area are shown on Table 5-1, Figure 5-7 and Figure 5-8. The majority consist of relatively steep-profiled valley bottom wetlands with linked hillslope seepages in their upper catchment; with a number of depression wetlands situated in the central area of the Dalmanutha Complex. Channelled Valley Bottom wetlands, Unchanneled Valley Bottom (UVB) wetlands and a Floodplain wetland also occur in the Project Area.

Table 5-1 - Wetland identified within the Project area

Wetland Type	Area (ha)
Channelled Valley Bottom	89.91
Channelled Valley Bottom	87.02
Channelled Valley Bottom	3.61
Channelled Valley Bottom	300.84
Channelled Valley Bottom	36.47
Channelled Valley Bottom	9.08
Depression	15.16
Depression	15.99
Depression	28.28
Depression	22.64
Floodplain	93.25
Hillslope Seepage	45.90
Hillslope Seepage	116.24
Hillslope Seepage	17.78
Hillslope Seepage	139.70
Hillslope Seepage	193.06
Hillslope Seepage	35.92
Hillslope Seepage	0.11
Unchanneled Valley Bottom	86.93
Unchanneled Valley Bottom	92.67
Unchanneled Valley Bottom	94.54
Unchanneled Valley Bottom	9.93
Unchanneled Valley Bottom	23.85

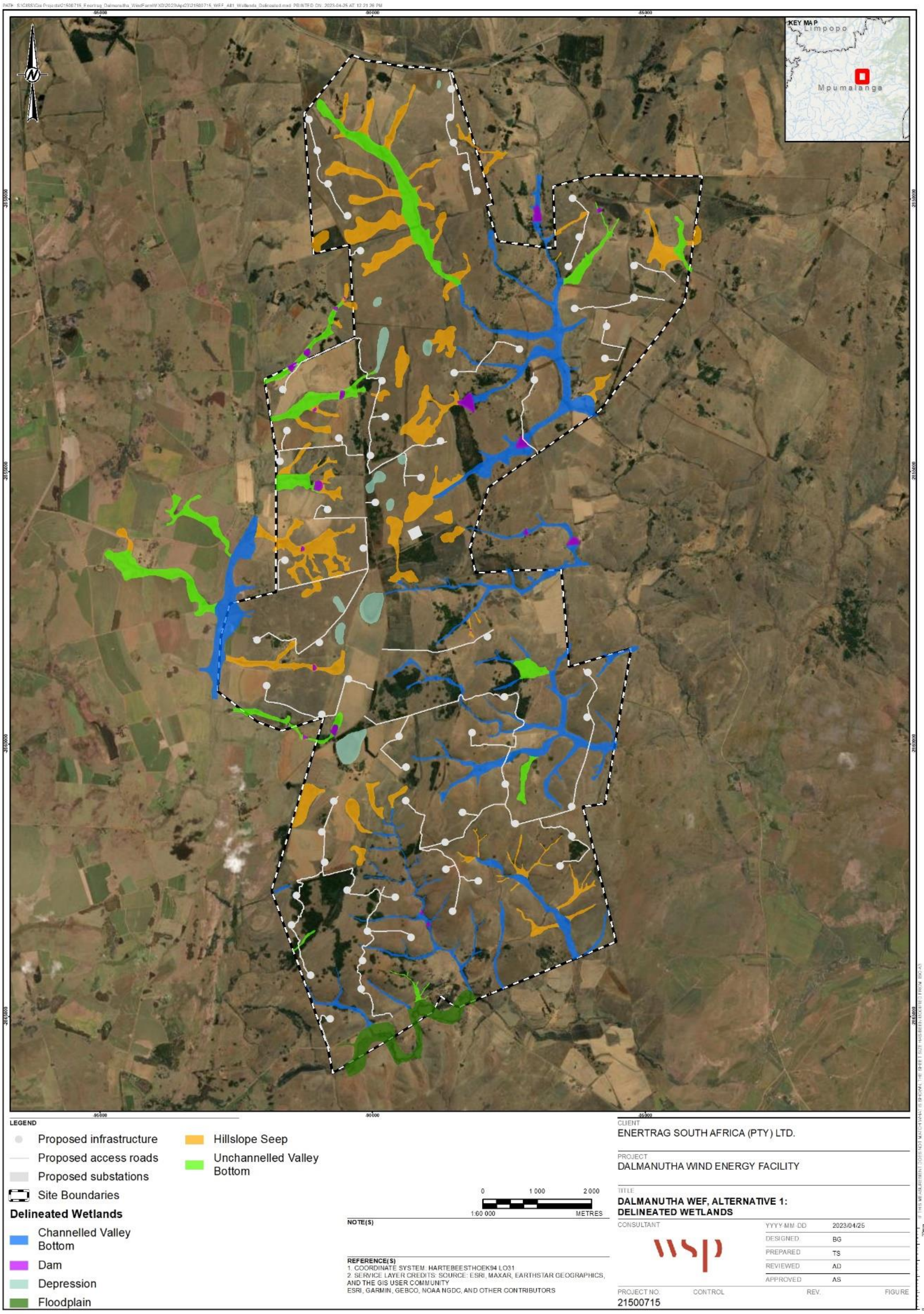

Figure 5-7 – Wetlands delineated within the Project Area - Alternative 1

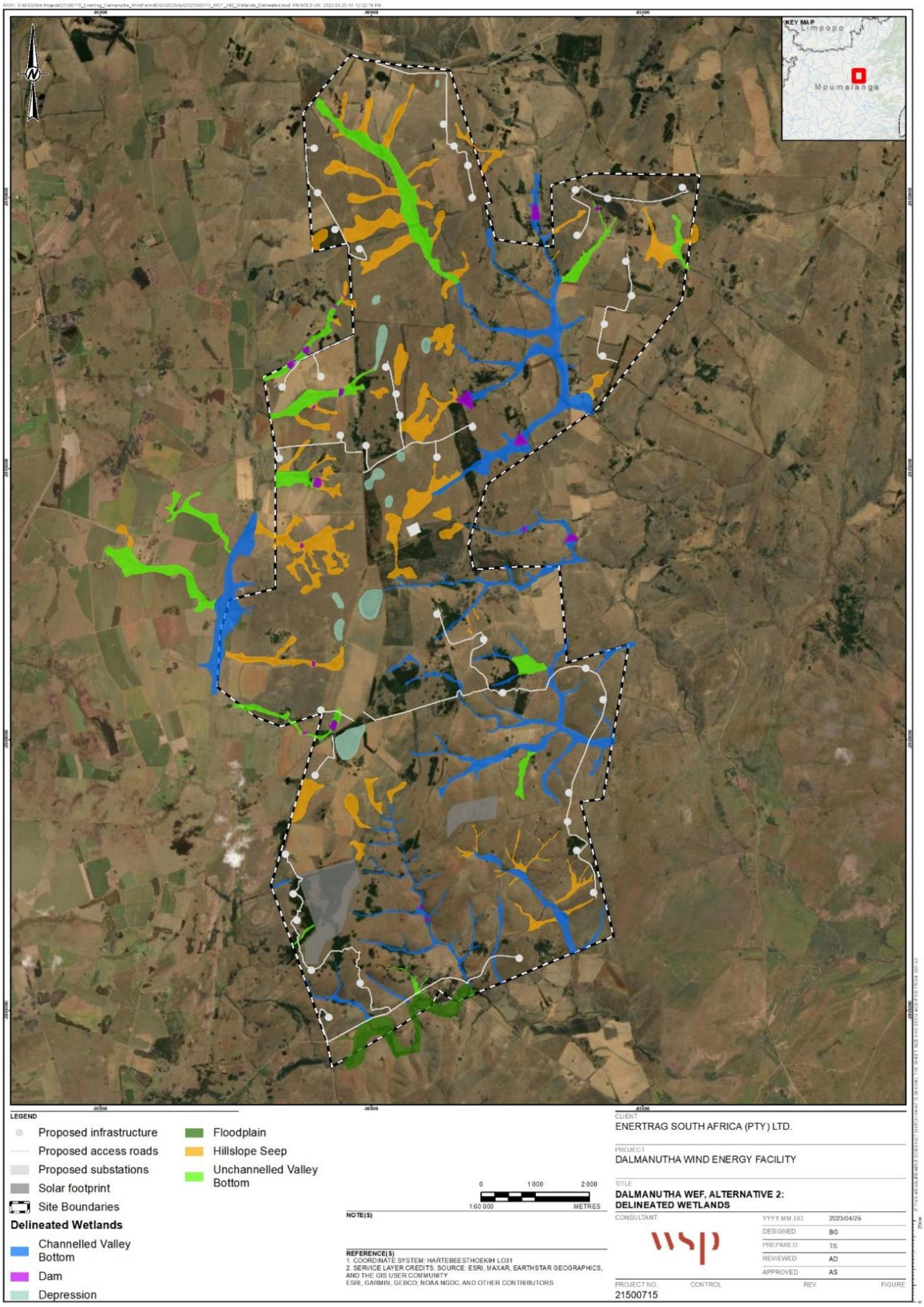

Figure 5-8 - Wetlands delineated within the Project Area - Alternative 2

PRESENT ECOLOGICAL IMPORTANCE

The wetlands within the LSA exist in a landscape that is characterised by agricultural activities – predominantly livestock grazing, with some intensive crop production. The bulk of the wetlands within the Project Area are in a Moderately Modified (PES C) to Largely Modified (PES D) condition, with just a few wetlands considered to be in Good (PES B) to Pristine (PES A/B) condition. In the south of the LSA, channelled valley bottom wetlands are considered to be in a Seriously/Critically Modified state (PES E). The distribution of the wetlands in the LSA, in relation to their PES score for both alternative 1 and 2 are, is shown in Figure 5-9 and Figure 5-10.

The degradation of wetland habitat that has occurred in these systems is mostly associated with the intensive cultivation practises in the catchments of the wetlands and in some instances in the wetlands themselves, large impoundments as a result of farm dams and less intense impoundments as a result of farm access tracks, drainage gullies and subsequent erosion, plantations of eucalyptus and wattle, and in-wetland infestations by alien and invasive weed species.

The relatively steep valley-side gradient of parts of the study area make the hillslope seep and unchannelled valley bottom wetlands susceptible to erosion, especially where those wetlands are also subject to grazing by livestock, partially dammed, or traversed by dirt tracks. These factors lead to the formation of preferential flow paths, resulting in desiccation of adjacent wetland habitat.

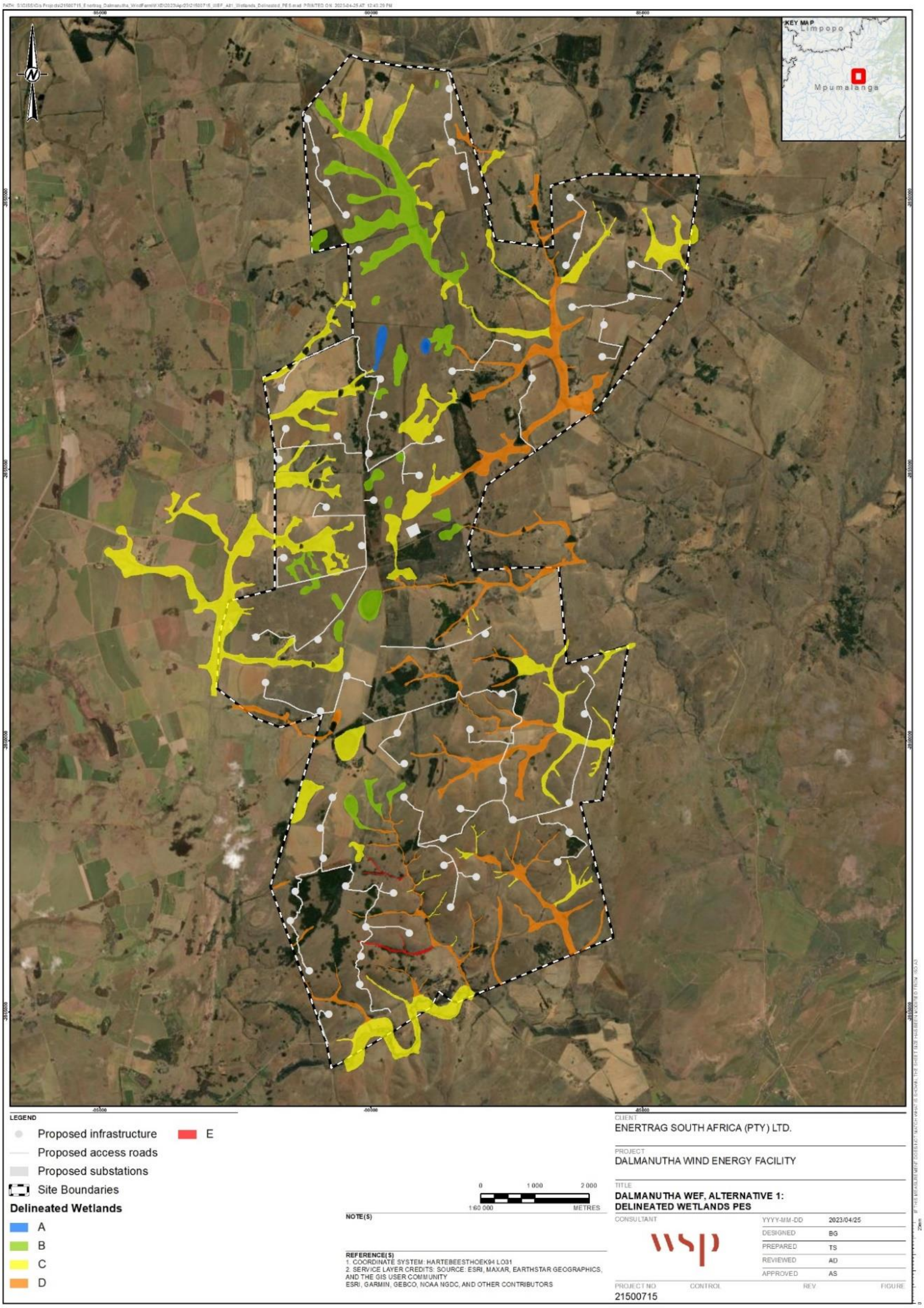

Figure 5-9 – Wetland PES Category- Alternative 1

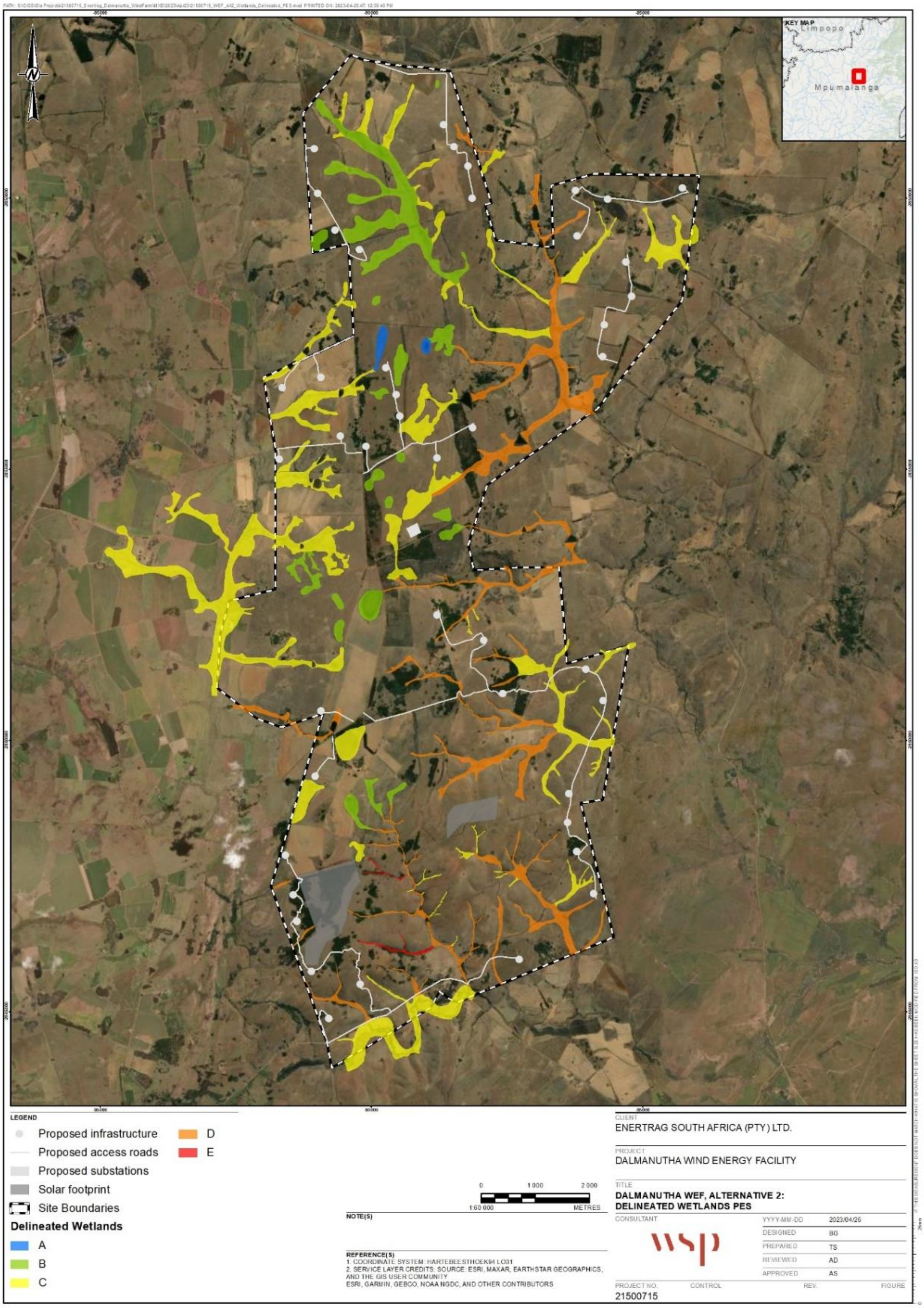

Figure 5-10 – Wetland PES Category- Alternative 2

ECOLOGICAL IMPORTANCE AND SENSITIVITY

The EIS of the wetlands in the Project area varies widely (Table 5-2), largely as a function of their size and ecological integrity, which affects their capacity to deliver biodiversity and water-related ecosystem services. The distribution of the wetlands in the LSA in relation to their EIS score for both alternative 1 and alternative 2, is shown in Figure 5-11 and Figure 5-12 respectively.

The bulk of the wetlands are considered to be of Moderately-Low to Moderate EIS. A few wetlands were considered to be in a moderately high EIS. There are also a few seepage wetlands in the centre of the Project area that area considered to have a very-high EIS.

The high to very high EIS of some of the wetlands in the Project area is largely due to the presence of red listed water birds species such as Wattled Crane and the Grey-crowned Crane (Taylor et al, 2015 as cited in WildSkies Ecological Services, 2022).

Table 5-2 – Wetland identified within the Project area with associated PES and EIS scores

Wetland Type	PES Class	EIS Class	Wetland Size (Area in ha)
Channelled Valley Bottom	C	Moderate	89.91
Channelled Valley Bottom	C	Moderately-High	87.02
Channelled Valley Bottom	C	Moderately-Low	3.61
Channelled Valley Bottom	D	Moderate	300.84
Channelled Valley Bottom	D	Moderately-Low	36.47
Channelled Valley Bottom	E	Moderately-Low	9.08
Depression	A	Very High	15.16
Depression	B	High	15.99
Depression	B	Very High	28.28
Depression	C	High	22.64
Floodplain	C	Moderately-High	93.25
Hillslope Seepage	B	High	45.90
Hillslope Seepage	B	Moderately-High	116.24
Hillslope Seepage	B	Very High	17.78
Hillslope Seepage	C	Moderate	139.70
Hillslope Seepage	C	Moderately-High	193.06
Hillslope Seepage	D	Moderate	35.92

Hillslope Seepage	D	Moderately-Low	0.11
Unchanneled Valley Bottom	B	High	86.93
Unchanneled Valley Bottom	C	Moderate	92.67
Unchanneled Valley Bottom	C	Moderately-High	94.54
Unchanneled Valley Bottom	D	Moderate	9.93
Unchanneled Valley Bottom	D	Moderately-Low	23.85

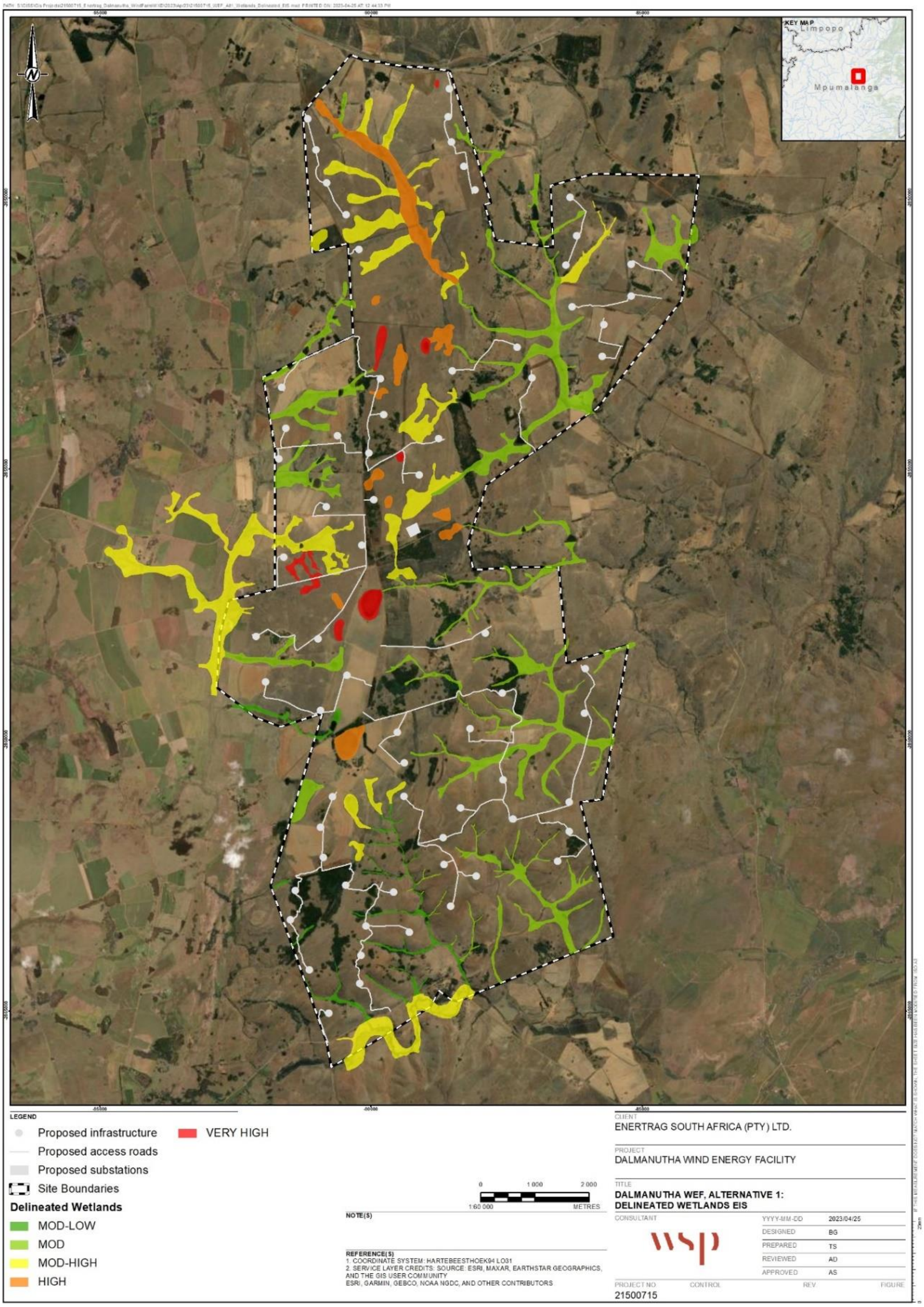

Figure 5-11 – Wetland EIS Category- Alternative 1

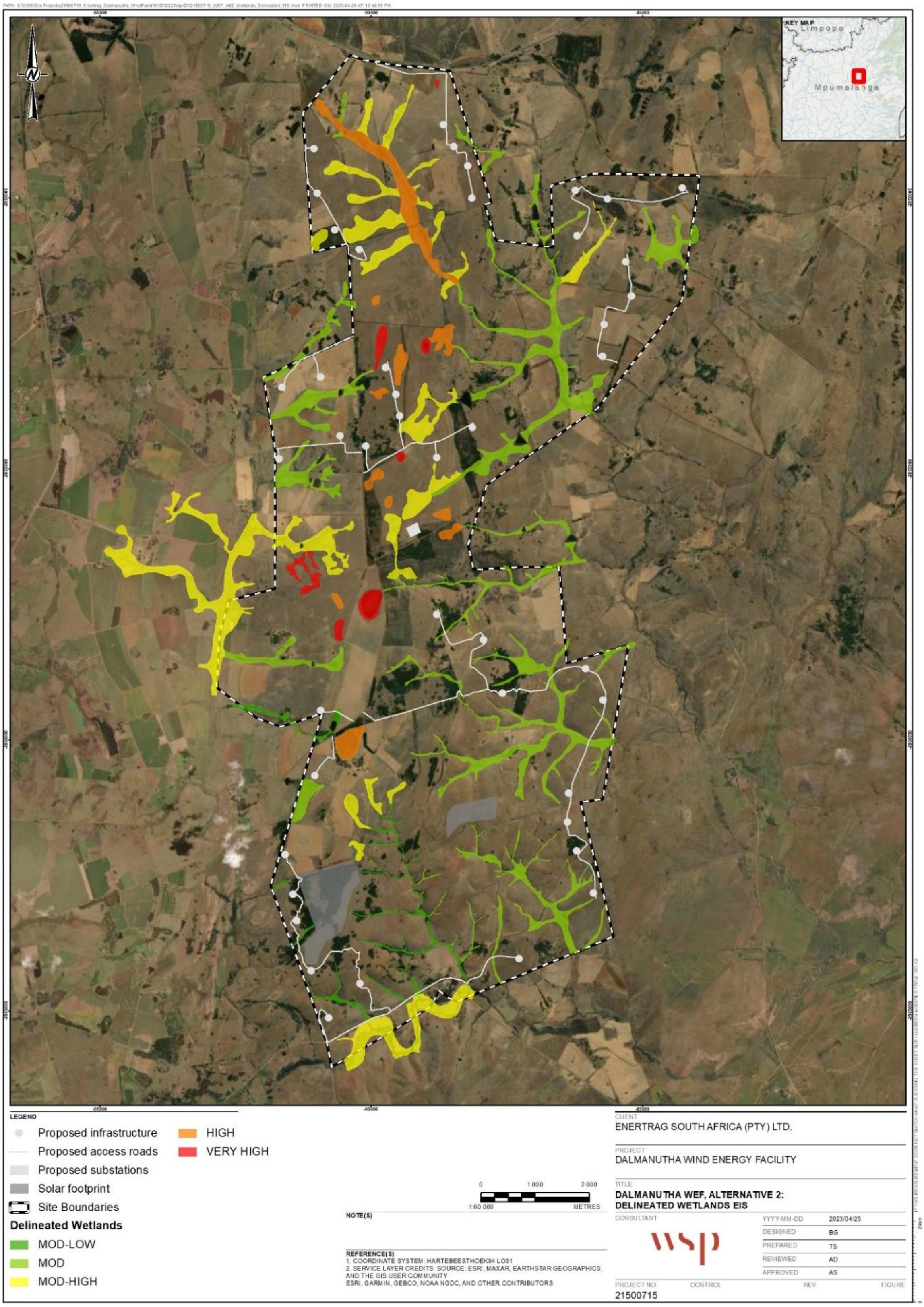

Figure 5-12 – Wetland EIS Category -Alternative 2

6 IMPACT ASSESSMENT

Construction of the proposed Dalmanutha WEF alternative 1 or alternative 2 will result in the direct loss of wetland habitat due to vegetation and topsoil removal during construction. Additional impacts include interruption in hydrology, effects on water quality in affected systems during construction, and wetland soil erosion.

The potential impacts of the two alternative options on wetlands are discussed separately.

6.1 CONSTRUCTION

LOSS OF WETLAND HABITAT

Alternative 1

The Dalmanutha WEF alternative 1 project intercepts channelled valley bottom, unchanneled valley bottom, depression and hillslope seepage wetlands. The location of these wetlands in relation to the proposed 70 turbines and access roads is shown in Figure 5-7.

While the direct loss of wetlands has been avoided/minimised in the Project design through the application of a 100 m buffer around wetland habitat and placement of turbines outside that area, the construction of the new access roads associated with the Dalmanutha WEF alternative 1 will result in the direct loss of approximately 1.9 ha of wetland habitat (

Table 6-1). Adjacent wetland habitat may also be affected by construction activities and machinery.

Table 6-1 – Direct wetland loss as a result of alternative 1 Project footprint

Wetland Type	PES CLASS	EIS CLASS	Area (ha) lost
Channelled Valley Bottom	C	Moderate	0.12
Channelled Valley Bottom	D	Moderate	0.22
Channelled Valley Bottom	D	Moderate	0.28
Channelled Valley Bottom	D	Moderate	0.00
Channelled Valley Bottom	D	Moderate	0.03
Channelled Valley Bottom	D	Moderately-Low	0.03
Channelled Valley Bottom	E	Moderately-Low	0.04
Depression	B	Very High	0.15
Hillslope Seepage	B	Very High	0.22
Hillslope Seepage	B	High	0.09
Hillslope Seepage	C	Moderate	0.10
Hillslope Seepage	C	Moderate	0.11
Hillslope Seepage	C	Moderately-High	0.27
Hillslope Seepage	C	Moderately-High	0.05
Hillslope Seepage	D	Moderate	0.01
Unchanneled Valley Bottom	C	Moderate	0.19
Unchanneled Valley Bottom	D	Moderately-Low	0.03
Total wetland loss			**1.95**

The significance of the direct loss of wetland habitat and disturbance of adjacent wetland habitats is **moderate** prior to mitigation, as although site based in extent, the duration of the impact is permanent, and outright loss cannot be mitigated.

Assuming that the predicted wetland loss cannot be avoided through changes in access road layout, the loss will remain as an impact of **moderate** significance post-mitigation. Additional measures will be required to address significant residual impacts i.e. compensate or offset the permanent loss of wetland habitat.

Alternative 2

As with alternative 1 of the Dalmanutha WEF, the construction of the proposed project will result in the loss of wetland habitat which will result mainly from the construction of access roads at alternative

2. The construction of alternative 2 will result in a slightly reduced direct loss of wetland habitat, at approximately 1.4 ha (Table 6-2).

Table 6-2 - Direct wetland loss as a result of alternative 2 Project footprint

Wetland Type	PES CLASS	EIS CLASS	Area (ha)
Channelled Valley Bottom	C	Moderate	0.29
Channelled Valley Bottom	C	Moderate	0.02
Channelled Valley Bottom	C	Moderately-Low	0.05
Channelled Valley Bottom	D	Moderate	0.03
Channelled Valley Bottom	D	Moderate	0.05
Channelled Valley Bottom	D	Moderately-Low	0.06
Channelled Valley Bottom	D	Moderate	0.04
Channelled Valley Bottom	D	Moderately-Low	0.17
Floodplain	C	Moderately-High	0.02
Hillslope Seepage	C	Moderate	0.11
Hillslope Seepage	C	Moderately-High	0.18
Unchanneled Valley Bottom	C	Moderate	0.14
Unchanneled Valley Bottom	D	Moderately-Low	0.12
Unchanneled Valley Bottom	D	Moderately-Low	0.03
Unchanneled Valley Bottom	D	Moderately-Low	0.13
Total wetland loss			**1.45**

As is the case for direct loss to alternative 1, additional measures will be required to address significant residual impacts i.e. compensate or offset the permanent loss of wetland habitat.

INTERRUPTION OF WETLAND HYDROLOGY/HYDROPEDOLOGY

The excavation of foundations for the turbines, solar PV in the case of alternative 2, as well as the access roads and subsequent presence of that infrastructure for the duration of operation will also interrupt surface and/or subsurface flows in wetlands being crossed, potentially leading to flow concentration (downstream of the crossings), changes in flow pathways, flow impoundment (upstream of the crossings), increased surface water runoff and increased risk of erosion within the wetland via gullies.

The potential significance of such impacts on the affected wetlands is determined to be moderate, as effects would be permanent, with a site-based impact extent and with a long term impact resulting in a **moderate** impact significance. Provided that the mitigation measures are implemented prior to commencement of construction and are maintained for the operational lifetime of the Project, the extent of impact and impact magnitude can be reduced, resulting in a residual impact of **low** significance post-mitigation.

WETLAND WATER QUALITY DETERIORATION

During construction, the water quality in affected wetlands may deteriorate as a consequence of vegetation removal, and increased risk of eroded soils and sediments being transported after rainfall events. Contaminants from machinery and materials being used for excavations and construction of access roads could enter the wetland and contribute to water quality changes.

Potential impacts on water quality in the wetlands have a **moderate** impact score without mitigation, as the effects will last for the duration of the construction phase. The implementation of the recommended mitigation measures is required to avoid and minimise adverse impacts on water quality of wetlands and associated downstream riparian systems. Provided that the mitigation measures are implemented, the extent of potential impacts can be reduced to a site-only scale; the impact can be reversible, and the probability of the impact occurring can be reduced to low. In this scenario, a post-mitigation impact of **very-low** significance is predicted.

EROSION OF WETLAND SOILS

Erosion of wetland soils could occur as a result of vegetation and topsoil removal during construction, which could result in additional loss of the remaining wetland habitat, particularly the remaining areas of wetlands that will be partially or mostly removed, as well as wetlands being intercepted by access roads. Vegetation clearance and removal will lead to reduced surface roughness within the remaining wetlands which could further exacerbate soil erosion.

Erosion of wetland soils will lead to habitat deterioration and changes in the natural wetland hydrology. These effects may be expressed as flow concentrations, lowering of the water table and possible desiccation in hillslope seepage and valley bottom wetlands.

The impact on soil erosion has a **moderate** impact significance before mitigation. With the application of the recommended mitigation measures, the magnitude of change in wetland health as a result of erosion can be reduced to low, effects can be restricted to the site only, and the duration of effects will be of short term, lasting for the duration of construction. The overall impact post-mitigation is predicted to be one of **low** significance.

6.2 OPERATION

SPREAD OF ALIEN AND INVASIVE SPECIES

The construction phase of the project could see an increase in the establishment and spread of alien invasive species into adjacent wetlands habitat, which would persist throughout the operational lifetime of the Project – particularly along new access roads. The magnitude of impact is high prior to the implementation of mitigation measures, with the impact extending beyond site to the local extent, resulting in a **moderate** impact significance.

The establishment of alien invasive species in, and immediately adjacent to, the proposed development footprint will continue to be an impact of concern during the operational phase. However, with the implementation of recommended mitigation measures such as the continued implementation of an active alien species control programme during the operational phase, the impact significance can be reduced to a **very-low** impact significance, due to the extent of impact reduced to site only and the impact lasting only for s short term and having a medium impact magnitude.

Table 6-3 - Wetland Impact Assessment table

Impact number	Aspect	Description	Stage	Character	Ease of Mitigation	Pre-Mitigation							Post-Mitigation						
						(M+	E+	R+	D)x	P=	S	Rating	(M+	E+	R+	D)x	P=	S	Rating
Impact 1:	Wetland habitat	Loss of wetland habitat	Construction	Negative	Moderate	3	2	5	5	4	**60**	**N3**						**0**	**#N/A**
					Significance	**N3 - Moderate**							**#N/A**						
Impact 2:	Wetland hydrology	Interruption of wetland hydrology	Construction	Negative	Moderate	3	1	5	4	4	**52**	**N3**	2	1	3	2	3	**24**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 3:	Water quality	Wetland water quality deterioration	Construction	Negative	Moderate	4	2	3	3	4	**48**	**N3**	3	1	1	2	2	**14**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						
Impact 4:	Soil Erosion	Wetland soil erosion	Construction	Negative	Moderate	3	2	5	4	4	**56**	**N3**	2	1	3	2	3	**24**	**N2**
					Significance	**N3 - Moderate**							**N2 - Low**						
Impact 5:	Alien invasive species	Spread of AIS	Construction	Negative	Moderate	4	2	3	4	4	**52**	**N3**	3	1	1	2	2	**14**	**N1**
					Significance	**N3 - Moderate**							**N1 - Very Low**						

7 RECOMMENDED MITIGATION MEASURES

7.1 AREAS TO BE AVOIDED (INCLUDING BUFFERS)

- Vegetation and soil clearing should be restricted to the immediate construction footprint only. A 100 m buffer around wetlands (other than those being crossed by access roads) must be clearly demarcated with semi-permanent fencing and maintained throughout the duration of the construction phase to enable construction workers to avoid the wetland areas outside the construction footprint, and minimise the risk of disturbance impacts on wetland ecosystems arising from construction activities as well as the physical presence of Project infrastructure (other than road or other infrastructure crossings) in the catchments.

7.2 MEASURES TO MINIMISE IDENTIFIED IMPACTS

- All construction roads and supporting infrastructure in or adjacent to the wetland habitat shall be minimised, and shall be aligned and managed to ensure uninterrupted flow both upstream and downstream of infrastructure which crosses the wetness zones and/or in-stream habitats. A construction method statement for wetland road crossings must be developed by a wetland ecologist and environmental engineer, and implemented on site during construction.
- Where possible, construction should be done in the dry season and completed by the wet season, so that appropriate water management systems are in place for stormwater management.
- As far as possible, use of existing access roads should be made.
- Pollution prevention measures for the protection of wetlands, rivers and streams from contamination with hydrocarbons, sediments and other chemicals to be implemented.
- Design and planning of all proposed activities in the wetlands or adjacent to or in the vicinity of rivers, streams and wetlands shall consider the following measures:
  - Erosion control and protection measures installed as part of the construction of the project will be adapted for the specific area and situation where signs of erosion appear.
  - Soil compacted in non-operational areas during construction activities should be ripped to break up the compacted soil surface and re-vegetated to aid infiltration and decrease run-off.
  - Topsoil stockpiles to be re-vegetated with non-invasive vegetation, in order to stabilise the soil, reduce run-off and minimise erosion into adjacent and downstream wetlands.
- No protected wetland plants to be disturbed without the necessary permits in place – plant search and rescue surveys of affected wetlands should be conducted in the wet season immediately prior to construction, in line with an agreed plant translocation plan.

7.3 REHABILITATION/RESTORATION RECOMMENDATIONS

- Develop a wetland rehabilitation and management plan for the remaining wetlands in the Study Area, to offset unavoidable losses of wetland habitat;
- Rehabilitation of disturbed wetlands should be implemented as soon as construction is completed.

- Vegetation establishment of bare soils after construction should be done using indigenous grass species found naturally in the area, which should be detailed as part of the wetland rehabilitation and management plan.
- The re-vegetation programme shall take cognisance of the climatic and seasonal conditions but should generally be undertaken annually starting in spring and early summer.
- Develop an alien and invasive plant management program to pro-actively strive towards the eradication and control of alien invasive species within the Project area. Alien and invasive species management in remaining wetland areas should be prioritised for the following areas:
  - Areas where wetland vegetation cover is disturbed.
  - Wetland areas where soils imported from external sources are applied.
  - All rehabilitated wetland areas.

8 MONITORING REQUIREMENTS

The following monitoring tasks are recommended to ensure the efficacy of the recommended mitigation measures and detect the necessity for additional measures as necessary.

- Regular inspection and maintenance of the wetland crossings at access roads to ensure that subsurface drains are in working order, and no confinement or impoundment of water is establishing.
- Annual on-site alien invasive species monitoring at wetland areas disturbed during construction should be conducted
- The efficiency of erosion control and protection measures installed as part of the construction of the project will be monitored specifically after high rainfall events.

9 CUMULATIVE IMPACTS

The loss and fragmentation of the wetland ecosystems as a result of access road construction will add to cumulative impacts on these ecosystems in the landscape, in combination with wetland loss as a result of agricultural and mining activities in the larger catchment. The direct losses of wetlands cannot be mitigated outright, and as such the Project will contribute to the cumulative rate of loss of wetlands in the Mpumalanga Highveld ecoregion.

The effective implementation of the recommended mitigation measures, and the implementation of the offsite offset to address the loss of wetlands in the catchment will be key in ensuring that the Project's contribution to cumulative effects on wetlands are minimised, through protecting and conserving currently unprotected wetland habitat in the study area, and rehabilitating targeted wetlands in the Project area to improve their condition and thus enhance their level of functioning; thereby offsetting the anticipated losses.

10 CONCLUSION

The proposed Dalmanutha WEF is located in landscape that is dominated by agricultural land and semi-natural and natural grassland. The proposed Project area covers an area of approximately 9 179 ha for both alternative 1 and alternative 2, and includes the development of wind energy facilities for alternative 1 and a hybrid development including wind energy facilities and solar PV for alternative 2.

Both Project alternatives intercept wetland habitat, resulting in the loss of approximately 1.9 and 1.4 ha of wetland habitat respectively. The majority of these wetlands have a Moderately Low to Moderate PES, which infers that while there has been a moderate change in ecosystem processes, the habitat remains predominately intact. Similarly, most wetlands have a moderate EIS in the context of the surrounding cultivated landscape. However, some wetlands in the study area are considered to have a high EIS – primarily as a result of their support of threatened plant species, migration/feeding/breeding sites for fauna (birds), and the regional context of their ecological integrity given the extent of loss/modification of wetland systems in the region.

The key Project impacts are direct loss of wetland habitat as a result of construction of new access tracks, interruption in the hydrology of wetlands downstream of road crossings, soil erosion in the vicinity of construction areas, and the establishment and spread of alien invasive plant species. These impacts are expected to have high-moderate impact on wetlands prior to mitigation and can generally be reduced to a low residual impact with the implementation of mitigation measures - with the exception of the direct loss of wetland habitat which cannot be mitigated (i.e. avoided, minimised, rehabilitated) and must be offset.

The implementation of a wetland rehabilitation and management plan for the Project as well as an approved wetland offset strategy is therefore necessary to address significant residual impacts and ensure that any areas specifically set aside for biodiversity conservation (including on-site wetland offsets, and any off-site mitigation / offset areas) are protected and managed accordingly.

It is recommended that the alternative 2 option be the option of preference due to slightly reduced extent of predicted direct loss of wetland habitat.

11 REFERENCES

DWAF (1999). Resource Directed Measures for Protection of Water Resources. Volume 4. Wetland Ecosystems.

DWAF (2008) Updated Manual for the Identification and Delineation of Wetlands and Riparian Areas, prepared by M. Rountree, A. L. Batchelor, J. MacKenzie and D. Hoare. Stream Flow Reduction Activities, Department of Water Affairs and Forestry, Pretoria, South Africa

Kotze D.C., Marneweck G.C., Batchelor A.L., Lindley D.S. & Collins N.B. (2020). WET-EcoServices: A technique for rapidly assessing ecosystem services supplied by wetlands. WRC Report No TT 339/08, Water Research Commission, Pretoria.

Macfarlane, D.M., Kotze, D.C., Ellery, W. N., Walters, D., Koopman, V., Goodman, P. and Goge, C. (2008). WET-Health: A technique for rapidly assessing wetland health. Water Research Commission. Report No. TT340/09

Macfarlane, D.M., Ollis, D.J., and Kotze, D.C. (2020). WET-Health Version 2.0: A refined suite of tools for assessing the present ecological state of wetland ecosystems- technical guide. Water Research Commission. Report No. TT820/20

Mpumalanga Parks and Tourism (MPTA) (2015). Ecostatus of the Komati River Catchment, Inkomati River System. Report submitted to Inkomati – Usuthu Catchment Management Agency (IUCMA) by MTPA – Scientific Services: Aquatic Systems.

Mpumalanga Parks and Tourism (MPTA) (2019) Mpumalanga Biodiversity Sector Plan (MBSP). Mpumalanga Tourism and Parks Agency.

Ollis, D.J., Snaddon, C.D., Job, N.M. & Mbona, N. (2013). Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland Systems. SANBI Biodiversity Series 22. South African National Biodiversity Institute, Pretoria.

Taylor, M. R, Peacock, F., & Wanless, R. 2015. The 2015 Eskom Red Data Book of Birds of South Africa, Lesotho & Swaziland.

van Deventer, H., van Niekerk, L., Adams, J., Dinala, M. K., Gangat, R., Lamberth, S.J., Lotter, M., Mbona, N., MacKay, F., Nel, J.L., Ramjukadh, C-L., Skowno, A. and Weerts, S. P. (2019). National Wetland Map 5 – An improved spatial extent and representation of inland aquatic and estuarine ecosystems in South Africa. bioRxiv preprint first posted online May. 17, 2019; doi: http://dx.doi.org/10.1101/6404.

WildSkies Ecological Services (2022). Proposed Dalmanutha Wind Energy Facility Avifaunal Impact Assessment – Scoping phase

Building 1, Maxwell Office Park
Magwa Crescent West, Waterfall City
Midrand, 1685
South Africa

wsp.com

PUBLIC