WETLAND BASELINE & IMPACT ASSESSMENT FOR THE PROPOSED MAINSTREAM STILFONTEIN SOLAR & GRID PROJECTS

Shrike Grid Infrastructure

Stilfontein, North West Province

March 2022 (Updated January 2023)

CLIENT

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Acronyms and Abbreviations

BAR	Basic Assessment Report
BESS	Battery Energy Storage Systems
CR	Critically Endangered
DEA	Department of Environmental Affairs (now known as the Department of Forestry and Fisheries and the Environment (DFFE))
DEM	Digital Elevation Model
DWS	Depart of Water and Sanitation
EA	Environmental Authorisation
EI	Ecological Importance
EAP	Environmental Assessment Practitioner
EIA	Environmental Impact Assessment
EN	Endangered
GIS	Geographic Information Systems
GN	General Notice
HGM	Hydrogeomorphic
MAP	Mean Annual Precipitation
MASL	Metres Above Sea Level
NBA	National Biodiversity Assessment
NEMA	National Environmental Management Act (Act No. 107 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NWCS	National Wetland classification System
PAOI	Project Area of Influence
PES	Present Ecological State
QDS	Quarter Degree Square
REDZ	Renewable Energy Development Zones
REIPPP	Renewable Independent Power Producer Programme
SAIIAE	South African Inventory of Inland Aquatic Ecosystems
SANBI	South African National Biodiversity Institute
STC	Strategic Transmission Corridor
SWSA	Strategic Water Source Areas
TBC	The Biodiversity Company
WMA	Water Management Area
WUL	Water Use Licence

Document Structure

The table below provides the NEMA (2014) Requirements for Ecological Assessments, and also the relevant sections in the reports where these requirements are addressed:

GNR 326	Description	Section in the Report
Specialist Report		
Appendix 6 (a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	Section 1.4
Appendix 6 (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Section 1.4
Appendix 6 (c)	An indication of the scope of, and the purpose for which, the report was prepared;	Section 2
Appendix 6 (cA)	An indication of the quality and age of base data used for the specialist report;	Section 4
Appendix 6 (cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	Section 7
Appendix 6 (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Section 4.8
Appendix 6 (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	Section 4
Appendix 6 (f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a, site plan identifying site alternatives;	Section 6
Appendix 6 (g)	An identification of any areas to be avoided, including buffers;	Section 6.8
Appendix 6 (h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Section 6.8
Appendix 6 (i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	Section 5
Appendix 6 (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity [including identified alternatives on the environment] or activities;	Section 6
Appendix 6 (k)	Any mitigation measures for inclusion in the EMPr;	Section 7
Appendix 6 (l)	Any conditions for inclusion in the environmental authorisation;	Section 7
Appendix 6 (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	None
Appendix 6 (n)	A reasoned opinion— i. [as to] whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	Appendix A
Appendix 6 (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	None
Appendix 6 (p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	None
Appendix 6 (q)	Any other information requested by the competent authority.	None

1 Introduction

1.1 Background

The Biodiversity Company was commissioned to conduct a wetland baseline and impact assessment for the Mainstream Stilfontein Solar Projects for the proposed Stilfontein Photovoltaic (PV) Cluster development. South Africa Mainstream Renewable Power Developments (Pty) Ltd (Mainstream) proposes the construction and operation of nine PV facilities with up to 150 MW generation capacity each, including grid connections, battery energy storage system (BESS) and associated infrastructure. The project is located in the Dr Kenneth Kaunda District Municipality in the North-West Province. The project assessment area is located approximately 6 km east of the town of Stilfontein along the N12 and forms part of the larger proposed Stilfontein PV Cluster (Figure 4-2).

One wetland site visit was conducted from the 21st to the 25th of February 2022, this constitutes a wet season survey. This report should inform and guide the Environmental Assessment Practitioner (EAP) and regulatory authorities, enabling informed decision making with regards to the proposed activity.

The approach was informed by the Environmental Impact Assessment Regulations. 2014 (GNR 326, 7 April 2017, including subsequent amendments) of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA) and relevant Government Notices, as applicable. The approach adopted for the assessments has taken cognisance of the recently published Government Notice 320 in terms of NEMA dated 20 March 2020: “Procedures for the Assessment and Minimum Criteria for Reporting on Identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for Environmental Authorisation”. The aquatic theme sensitivity for the area is predominantly rated as low, with limited areas of very high sensitivity due to the presence of critical biodiversity areas.

This assessment has also been completed in accordance with the requirements of the published General Notice (GN) 509 by the Department of Water and Sanitation (DWS). This notice was published in the Government Gazette (no. 40229) under Section 39 of the National Water Act (Act no. 36 of 1998) in August 2016, for a Water Use Licence (WUL) in terms of Section 21(c) & (i) water uses. The GN 509 process provides an allowance to apply for a WUL for Section 21(c) & (i) under a General Authorisation (GA), as opposed to a full Water Use Licence Application (WULA).

1.2 Overview

1.2.1 Stilfontein Cluster

The project forms part of the larger proposed Stilfontein PV Cluster, which comprises nine PV facilities each generating up to 150 MW, including grid connections, BESS and associated infrastructure. ***Separate Environmental Authorisations (EA) applications will be submitted for the individual PV facilities and grid connections through separate BA processes*** (see below). The Stilfontein Cluster is briefly described here.

The Stilfontein Cluster is entirely located within the Klerksdorp Renewable Energy Development Zones (REDZ) and the Central Strategic Transmission Corridor (STC).

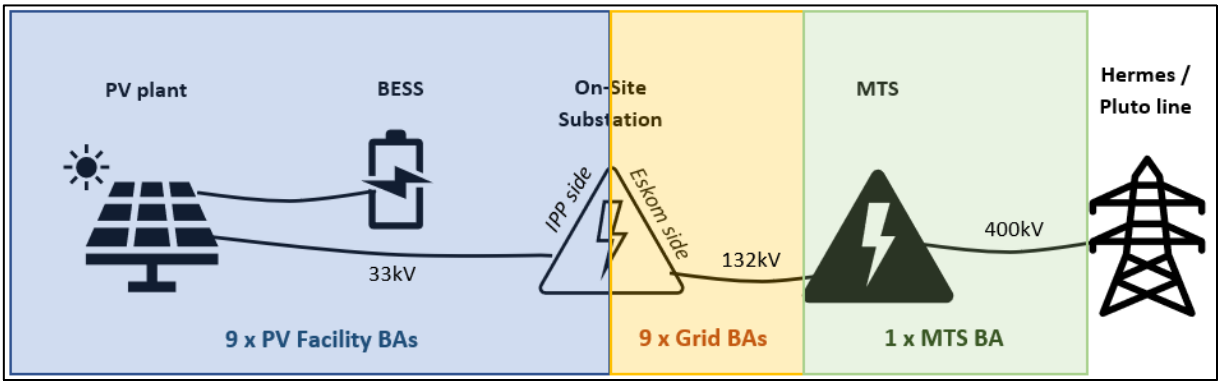

Figure 1-1 Components included in individual BA processes for the Stilfontein Cluster

1.2.2 Grid Connections

The Stilfontein Cluster, if fully developed, will include nine on-site substations, one (01) Main Transmission Substation (MTS) and associated powerlines (see Figure 1-2):

- Nine 11-33/132kV on-site substations, each serving one PV facility. The proposed step-up substation facility will have a development footprint of up to 4 ha, with a 100 m wide buffer around each on-site substation to accommodate powerline tie-ins at any point of the substation and other associated activities. The substation will consist of an IPP portion (100m x 200m) and an Eskom portion (100m x 200m) that will make up the total 4 hectares assigned for the substation as per the assessment area. This report will cover the Eskom portion, as the IPP portion is covered in the facility wetlands report as part of a separate environmental authorisation application. Two alternative locations are identified for each substation from which a preferred will be selected.
- 11-33kV underground cabling and overhead power lines between the PV facilities and the on-site substations;
- One 132/400kV Main Transmission Substation (MTS). The proposed step-up MTS will be developed within a ~36 ha development area that is buffered by a 100 m wide powerline buffer interconnection area around the MTS substation to accommodate 132 kV powerline tie-ins at any point of the MTS.
- 132kV above ground powerlines from the 11-33/132kV on-site substations to the 132/400kV MTS;
- 400kV Loop In / Loop Out powerlines from the MTS to connect to the existing 400kV PLUTO / HERMES 1 and 2 powerlines. A total area of ~215 ha, located between the two existing Hermes/Pluto 400 kV lines east and west of MTS, was assessed to allow flexibility for the proposed 400 kV Loop in – Loop out transmission line to the existing Hermes/Pluto 1 and Hermes/Pluto 2 lines. The exact point of the Loop in – Loop out will be advised by Eskom due to the highly technical nature of the interconnection.
- Offices, including ablutions with septic / conservancy tank sewage treatment infrastructure;
- Material laydown areas (temporary for construction phase and permanent for operation phase).

1.3 Report Structure

The entire proposed development area of the Stilfontein Cluster was collectively assessed and forms the Project area of Influence (PAOI) referred to as 'project area' from hereon. All baseline findings are presented for the project area, with a supporting Impact Assessment and EMPr for the project area.

A project-specific appendix (Appendix A) contains the information specific to the project that is subject of this application, notably:

- Project-specific baseline aspects;
- Project-specific baseline / sensitivity map;
- Project-specific impact rating; and
- Project-specific mitigation measures.
- Project-specific conclusion / specialist opinion.

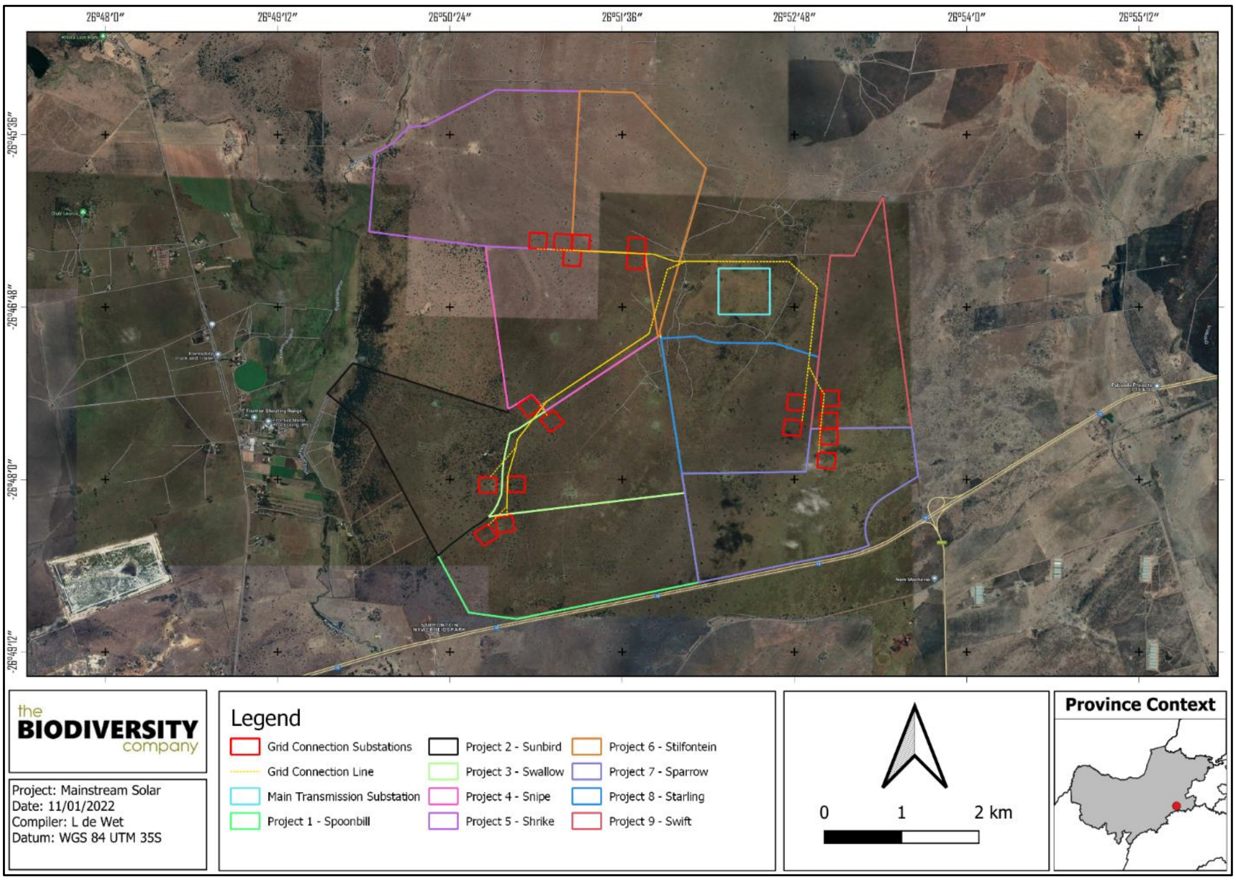

Figure 1-2 Layout of the different aspects of the Mainstream solar project

Note: Two alternative substation sites and corresponding powerlines corridors are considered per PV project.

1.4 Specialist Details

Report Name	**WETLAND BASELINE & IMPACT ASSESSMENT FOR THE PROPOSED MAINSTREAM STILFONTEIN SOLAR & GRID PROJECT**	
Reference	**Mainstream Stilfontein Solar & Grid Project**	
Submitted to	srk consulting	
Report Writer & Fieldwork	**Rian Pienaar**	
	Rian Pienaar is an aquatic ecologist (Cand. Sci. Nat. 135544) with experience in wetland identification and delineations. Rian completed his M.Sc. in environmental science at the North-West University Potchefstroom Campus. Rian have been part of wetland studies for road and culvert upgrades, power station and dam construction.	
Reviewer	**Andrew Husted**	
	Andrew Husted is Pr Sci Nat registered (400213/11) in the following fields of practice: Ecological Science, Environmental Science and Aquatic Science. Andrew is an Aquatic, Wetland and Biodiversity Specialist with more than 12 years' experience in the environmental consulting field. Andrew has completed numerous wetland training courses, and is an accredited wetland practitioner, recognised by the DWS, and also the Mondi Wetlands programme as a competent wetland consultant.	
Declaration	The Biodiversity Company and its associates operate as independent consultants under the auspice of the South African Council for Natural Scientific Professions. We declare that we have no affiliation with or vested financial interests in the proponent, other than for work performed under the Environmental Impact Assessment Regulations, 2017. We have no conflicting interests in the undertaking of this activity and have no interests in secondary developments resulting from the authorisation of this project. We have no vested interest in the project, other than to provide a professional service within the constraints of the project (timing, time and budget) based on the principals of science.	

2 Scope of Work

The following tasks were completed in fulfilment of the terms of reference for this assessment:

- The delineation, classification and assessment of wetlands within 500 m of the project area;
- Conduct risk assessments relevant to the proposed activity;
- Recommendations relevant to associated impacts; and
- Report compilation detailing the baseline findings.

3 Key Legislative Requirements

3.1 National Water Act (NWA, 1998)

The DWS is the custodian of South Africa's water resources and therefore assumes public trusteeship of water resources, which includes watercourses, surface water, estuaries and aquifers. The National Water Act (Act No. 36 of 1998) (NWA) allows for the protection of water resources, which includes:

- The maintenance of the quality of the water resource to the extent that the water resources may be used in an ecologically sustainable way;
- The prevention of the degradation of the water resource; and
- The rehabilitation of the water resource;

A watercourse means;

- A river or spring;
- A natural channel in which water flows regularly or intermittently;
- A wetland, lake or dam into which, or from which, water flows; and
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

The NWA recognises that the entire ecosystem and not just the water itself, and any given water resource constitutes the resource and as such needs to be conserved. No activity may therefore take place within a watercourse unless it is authorised by the DWS. Any area within a wetland or riparian zone is therefore excluded from development unless authorisation is obtained from the DWS in terms of Section 21 (c) and (i).

A water use (or potential) qualifies for a GA under GN 509 when the proposed water use/activity is subjected to analysis using the DWS Risk Assessment Matrix (RAM). This assessment has implemented the RAM and provides a specialist opinion on the appropriate water use authorisation.

3.2 National Environmental Management Act (NEMA, 1998)

The National Environmental Management Act (NEMA) (Act 107 of 1998) and the associated Regulations as amended in April 2017, states that prior to any development taking place within a wetland or riparian area, an environmental authorisation process needs to be followed. This could follow either the Basic Assessment Report (BAR) process or the Environmental Impact Assessment (EIA) process depending on the scale of the impact.

4 Methodology

4.1 Project Area

The proposed solar projects are located approximately 22 km south-west of Potchefstroom and approximately 13 km north-east of Stilfontein, North-West Province. The project area is situated in the C24A quaternary catchment within the Vaal Water Management Area (WMA) (see Figure 4-2).

4.2 Vegetation Types

According to Mucina & Rutherford (2006), the project site is located within the Carletonville Dolomite Grassland (Gh 15) and the Vaal Reefs Dolomite Sinkhole Woodland (Gh 12) vegetation types.

4.2.1 Carletonville Dolomite Grassland (Gh 15)

The Carletonville Dolomite Grassland (Gh 15) vegetation type is distributed predominantly in the North-West and Gauteng province with a small portion being distributed within the Free State. This vegetation type ranges from Ventersdorp in the west till as far east as Centurion and Bapsfontein. The altitude of this vegetation type ranges between 1 360 meters above sea level to 1 620 meters above sea level (Mucina & Rutherford, 2006).

The vegetation within the Gh 15 vegetation type occurs in slightly undulating plains which are dissected by rocky ridges consisting of chert. This vegetation is associated with species-rich grasslands which form complex patterns dominated by a variety of species (Mucina & Rutherford, 2006).

The conservation status of the Gh 15 vegetation type has been determined to be Vulnerable with a target percentage of 24. A small extent of this vegetation type is conserved in conservation areas which include the Sterkfontein Caves and Cradle of Humankind in general, the Oog Van Malmanie, Boskop Dam, Abe Bailey, Krugersdorp, Schoonspruit, Olifantsvlei and other private conservation areas. Approximately a quarter of this vegetation type has been transformed into cultivated lands, mining areas or built-up areas (Mucina & Rutherford, 2006).

4.2.2 Vaal Reefs Dolomite Sinkhole Woodland (Gh 12)

The distribution of this vegetation type in predominately in the North-West and Free State Provinces with small areas located in and around Stilfontein and Orkney. The Vaal River acts as the southern boundary of this vegetation type. Vaal reefs Dolomite Sinkhole Woodlands are found at an altitude ranging from 1280 to 1380 Metres Above Sea Level (MASL) (Mucina & Rutherford, 2006).

The vegetation within the Gh 12 vegetation type occurs in slightly undulating plains which are dissected by rocky ridges consisting of chert. This vegetation is associated with woodland clumps occurring around sinkholes (Mucina & Rutherford, 2006).

The conservation status of the Gh 12 vegetation type has been determined to be Vulnerable with a target percentage of 24. A small extent of this vegetation type is conserved in conservation areas which include the Sterkfontein Caves and Cradle of Humankind in general, the proposed Highveld National Park is supposed to conserve large areas of this vegetation unit. Approximately a quarter of this vegetation type has been transformed into cultivated lands, mining areas or built-up areas (Mucina & Rutherford, 2006).

4.3 Soils and Geology

According to the land type database (Land Type Survey Staff, 1972 - 2006), the project area is characterised by the Fa 14 and Fa 13 land types. The Fa land type is characterised by Glenrosa and/or Mispah soil forms which are common in this area, however, other soils may occur. Lime is rare or absent throughout the entire landscape.

The surrounding areas are underlain by Archaean gneiss and granite which is partially covered by Karoo Supergroup sediments and is intruded by sills and dykes from the Karoo Dolerite Suite. Yellow apedal soils are dominant on sedimentary parent material and is well drained, has more than 35% clay and is deeper than 800 mm. Hutton, Griffin and Clovelly soils are widely spread. Shortland soil forms are dominant on dolerite.

4.4 Climate

The project area is characterised by a warm-temperate summer rainfall with an overall mean annual precipitation of approximately 593 mm (Mucina & Rutherford, 2006). Some frost frequently occurs within winter months with high temperatures within the summer months (see Figure 4-1).

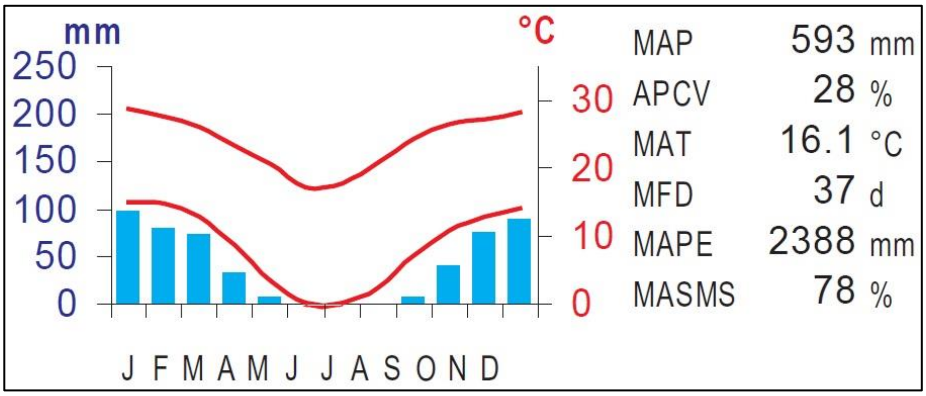

Figure 4-1 Climate diagram for the region (Mucina & Rutherford, 2006).

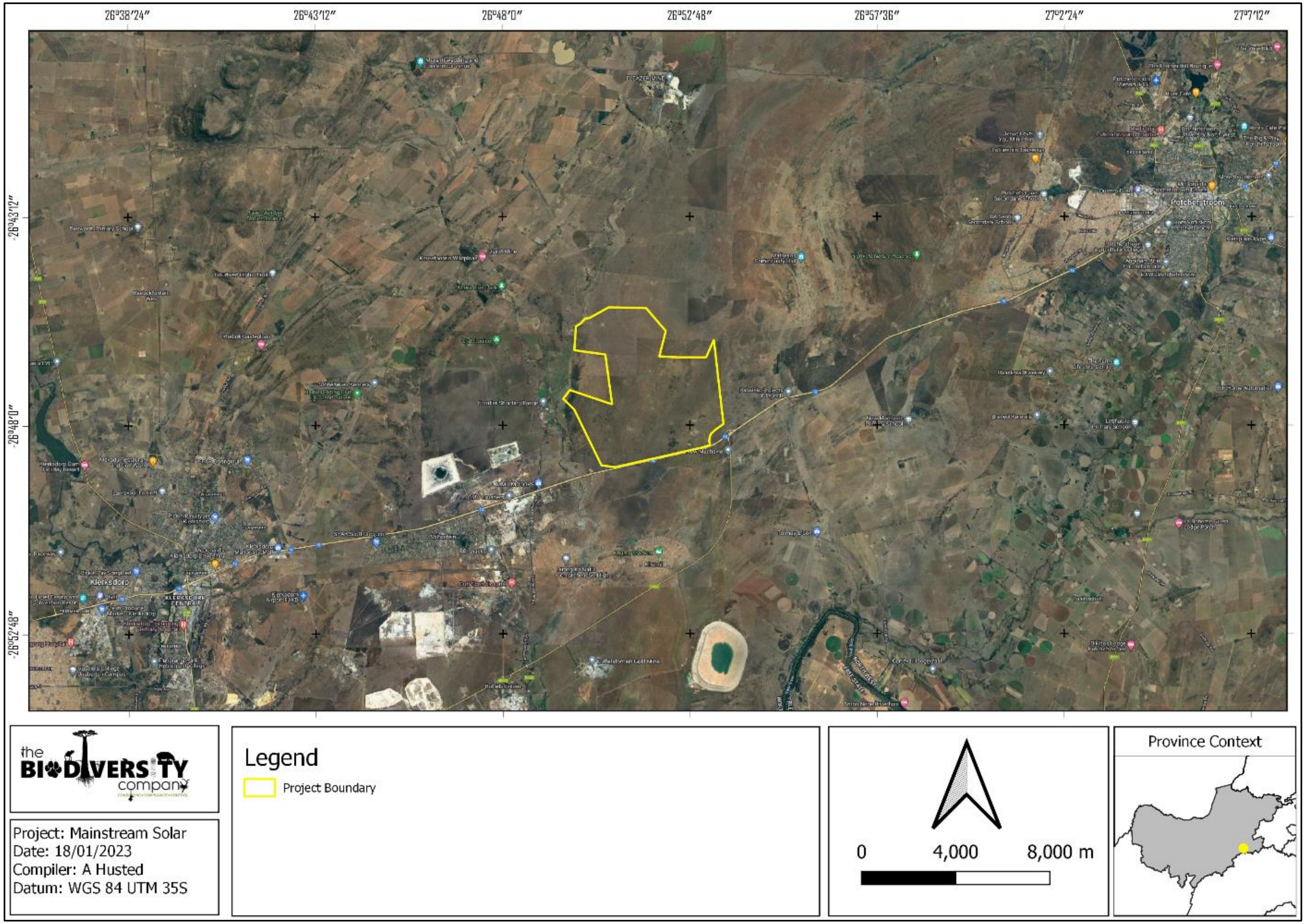

Figure 4-2 Location of the assessed project area (Stilfontein Cluster boundary)

4.5 South African Inventory of Inland Aquatic Ecosystems

This spatial dataset is part of the South African Inventory of Inland Aquatic Ecosystems (SAIIAE) which was released as part of the National Biodiversity Assessment (NBA 2018). National Wetland Map 5 includes inland wetlands and estuaries, associated with river line data and many other data sets within the South African Inventory of Inland Aquatic Ecosystems (SAIIAE, 2018).

One wetland type, a floodplain wetland, was identified by means of this data set (see Figure 4-3). This system is located on the western boundary of the project boundary. The conditions of this wetland are classified as being a "D/E/F" (critically modified).

4.6 Topographical Inland Water and River Lines

The topographical inland and river line data for "2629" quarter degree square was used. This dataset indicates a single dam as well as a perennial[1] and multiple non-perennial river lines located proximal to the project boundary. These areas indicate the potential wetland areas (see Figure 4-3).

[1] A perennial system is characterised by continuous flow, as opposed to intermittent flow for a non-perennial system.

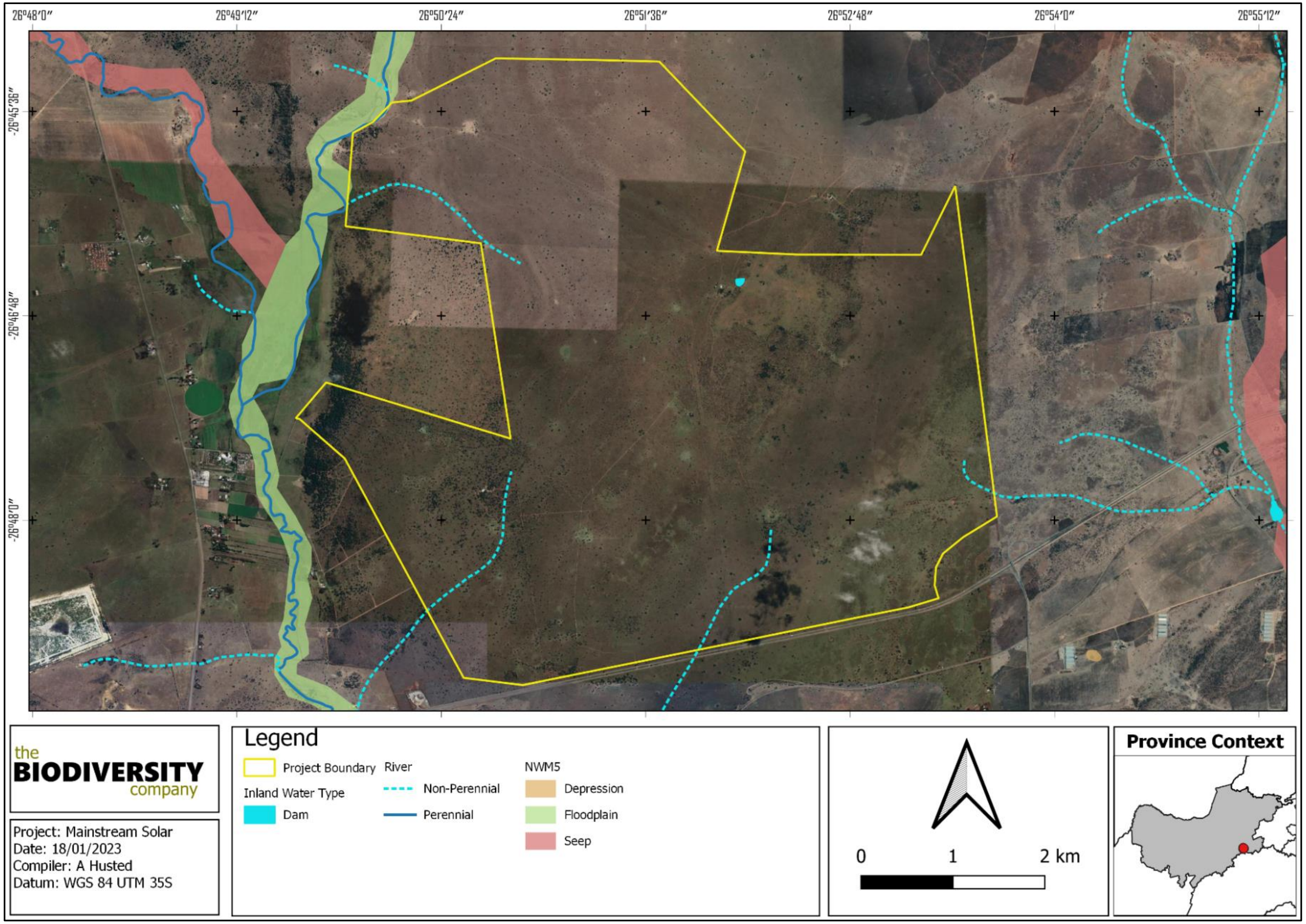

Figure 4-3 ***Desktop analysis of potential inland water bodies located proximal to the Stilfontein Cluster Boundary, based on SAIIAE, Topographical Riverlines and Inland water.***

4.7 Terrain

The terrain of the Stilfontein Cluster Boundary area has been analysed to determine potential areas where wetlands are more likely to accumulate (due to convex topographical features, preferential pathways or more gentle slopes).

4.7.1 Digital Elevation Model

A Digital Elevation Model (DEM) has been created to identify lower laying regions as well as potential convex topographical features which could point towards preferential flow paths. The 500 m regulated area ranges from 1339 to 1401 MASL. The lower laying areas (generally represented in dark blue) represent area that will have the highest potential to be characterised as wetlands (see Figure 4-4).

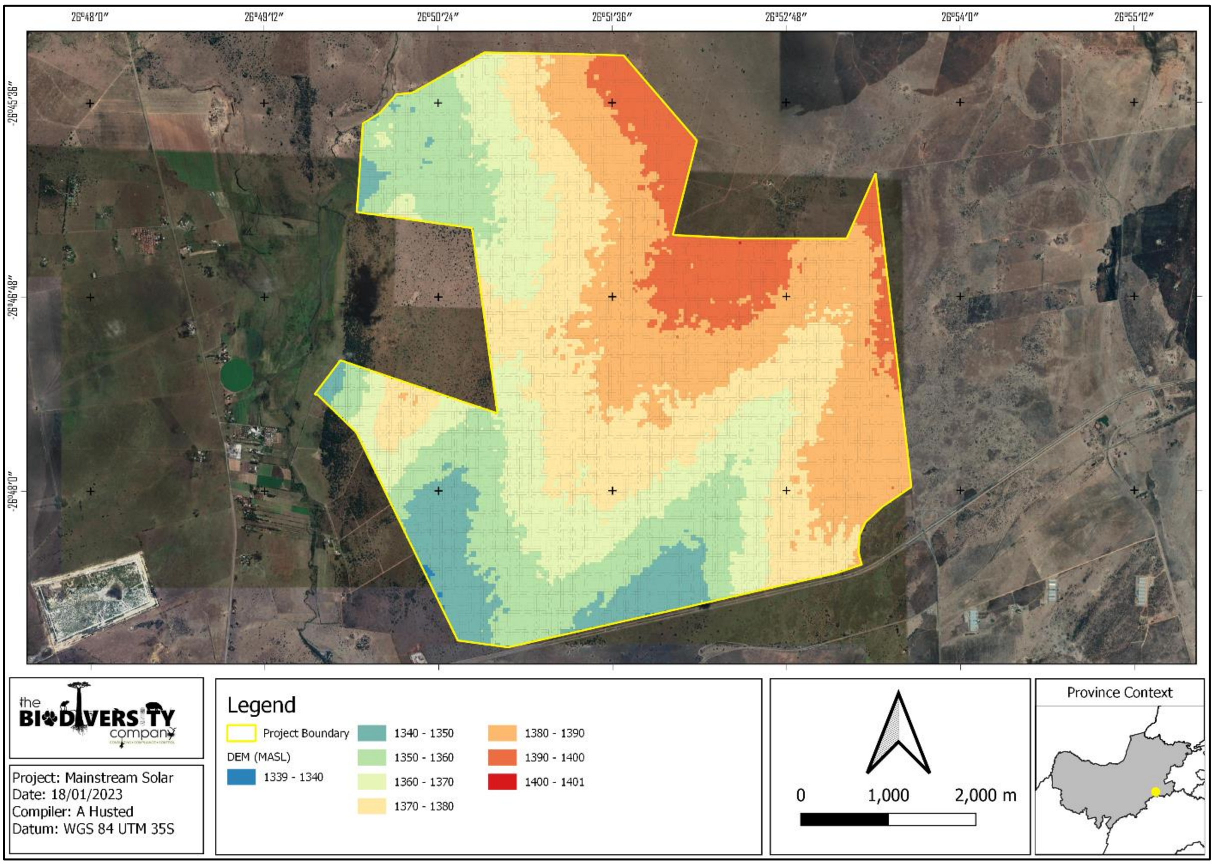

Figure 4-4 Digital Elevation Model of the Stilfontein Cluster

4.7.2 Slope Percentage

The slope percentage of the Stilfontein Cluster area is illustrated in Figure 4-5. Most of the project area is characterised by a slope percentage between 0 and 5%, with some smaller patches within the project area characterised by a slope percentage up to 17.5%. This illustration indicates a non-uniform topography throughout the project area.

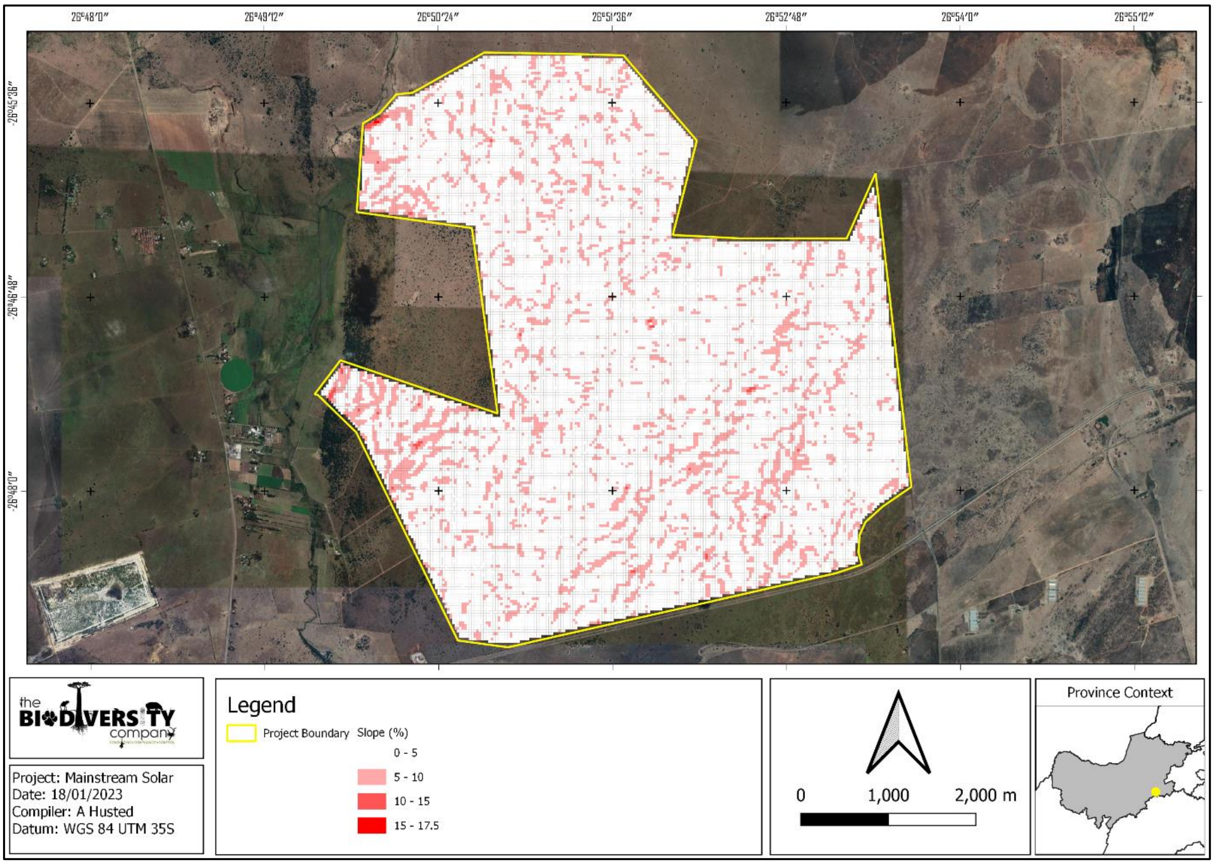

Figure 4-5 Slope percentage of the Stilfontein Cluster Boundary

4.8 Field Survey

One wetland site visit was conducted from the 21st to the 25th of February 2022, this constitutes a wet season survey.

The entire proposed Stilfontein Cluster area (including substation and grid connections) was considered in the assessment, which makes the assessment conservative and ensures that all possible watercourses applicable to each individual project were identified.

4.8.1 Identification and Mapping

The wetland areas in the project area were delineated in accordance with the DWAF (2005) guidelines, a cross section is presented in Figure 4-6. The outer edges of the wetland areas were identified by considering the following four specific indicators:

- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The Soil Forms (types of soil) found in the landscape were identified using the South African soil classification system namely, Soil Classification: A Taxonomic System for South Africa (Soil Classification Working Group, 1991);
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation; The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur; and
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.

Vegetation is used as the primary wetland indicator. However, in practice, the soil wetness indicator tends to be the most important, and the other three indicators are used in a confirmatory role.

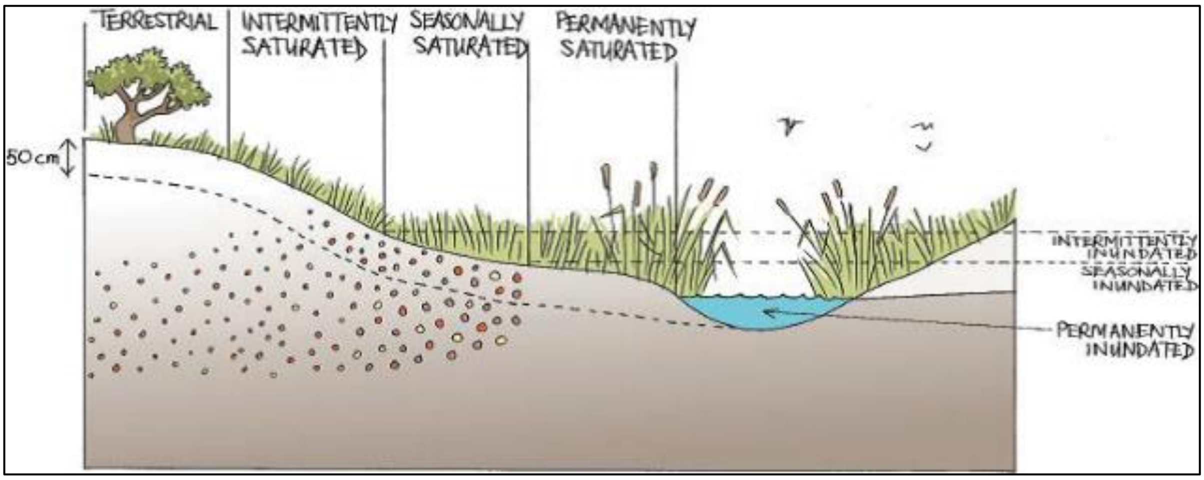

Figure 4-6 ***Cross section through a wetland, indicating how the soil wetness and vegetation indicators change (Ollis et al. 2013)***

4.8.2 Delineation

The wetland indicators described above are used to determine the boundaries of the wetlands within the project area. These delineations are then illustrated by means of maps accompanied by descriptions.

4.8.3 Functional Assessment

Wetland Functionality refers to the ability of wetlands to provide healthy conditions for the wide variety of organisms found in wetlands as well as for human use. The provision of ecosystem services is the main factor determining wetland functionality.

The assessment of the ecosystem services supplied by the identified wetlands was conducted per the guidelines in WET-EcoServices (Kotze *et al*. 2020). An assessment was undertaken that examines and rates the following services according to their degree of importance and the degree to which the services are provided below.

Table 4-1 Classes for determining the likely extent to which a benefit is being supplied

Score	Rating of likely extent to which a benefit is being supplied
< 0.5	Low
0.6 - 1.2	Moderately Low
1.3 - 2.0	Intermediate
2.1 - 3.0	Moderately High
> 3.0	High

4.8.4 Present Ecological State

The overall approach is to quantify the impacts of human activity or clearly visible impacts on wetland health, and then to convert the impact scores to a Present Ecological State (PES) score. This requires assessing the spatial extent of the impact of individual activities/occurrences and then separately assessing the intensity of the impact of each activity in the affected area. The extent and intensity are then combined to determine an overall magnitude of impact. The Present State categories are provided in Table 4-2.

Table 4-2 The Present Ecological State categories (Macfarlane, et al., 2020)

Impact Category	Description	Impact Score Range	PES
None	Unmodified, natural	0 to 0.9	A
Small	Largely Natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.0 to 1.9	B
Moderate	Moderately Modified. A moderate change in ecosystem processes and loss of natural habitats has taken place, but the natural habitat remains predominantly intact.	2.0 to 3.9	C
Large	Largely Modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred.	4.0 to 5.9	D
Serious	Seriously Modified. The change in ecosystem processes and loss of natural habitat and biota is great, but some remaining natural habitat features are still recognizable.	6.0 to 7.9	E
Critical	Critical Modification. The modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.0 to 10	F

4.8.5 Importance and Sensitivity

The importance and sensitivity of water resources is determined in order establish resources that provide higher than average ecosystem services, biodiversity support functions or are particularly sensitive to impacts. The mean of the determinants is used to assign the Importance and Sensitivity (IS) category as listed in Table 4-3.

Table 4-3 Description of Importance and Sensitivity categories

IS Category	Range of Mean	Recommended Ecological Management Class

Very High	3.1 to 4.0	**A**
High	2.1 to 3.0	**B**
Moderate	1.1 to 2.0	**C**
Low Marginal	< 1.0	**D**

4.8.6 Ecological Classification and Description

The National Wetland Classification Systems (NWCS) developed by the South African National Biodiversity Institute (SANBI) will be considered for this study. This system comprises a hierarchical classification process of defining a wetland based on the principles of the hydrogeomorphic (HGM) approach at higher levels, and then also includes structural features at the lower levels of classification (Ollis *et al.,* 2013).

4.8.7 Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity.

5 Knowledge Gaps

The following aspects were considered as limitations:

- It has been assumed that the extent of the project area provided to the specialist is accurate;
- Due to time constraints, only selected areas could be accessed and groundtruthed, with the remaining areas primarily assessed at a desktop level. This is deemed acceptable and won't affect the report findings; and
- The GPS used for water resource delineations is accurate to within five meters. Therefore, the wetland delineation plotted digitally may be offset by at most five meters.

6 Results & Discussion

The discussion below relates to the entire proposed Stilfontein Cluster Boundary area. Results and maps for the individual solar and grid projects are provided in Appendix A.

6.1 Delineation and Description

During the site visit, two HGM units were identified within the Stilfontein Cluster Boundary (see Figure 6-3). The wetland areas were delineated in accordance with the DWAF (2005) guidelines (see Figure 6-1 and Figure 6-3). The first HGM unit has been identified as a depression wetland and is located in close proximity to the MTS and portions of the grid lines. The second HGM unit has been classified a floodplain wetland and is located to the north-west of the Stilfontein Cluster Boundary. No other watercourses were identified within the project boundary area.

Figure 6-1 Photographical evidence of HGM 1 (Depression wetland) located within the project area A) Centre of the depression with open water. B) Outskirts of the depression with seasonal wetness covered in hydrophytes.

Figure 6-2 Photographs of the HGM 2 (Floodplain wetland) Left) Photo of the downstream area of the wetland. Right) Photo of the upstream area of the wetland.

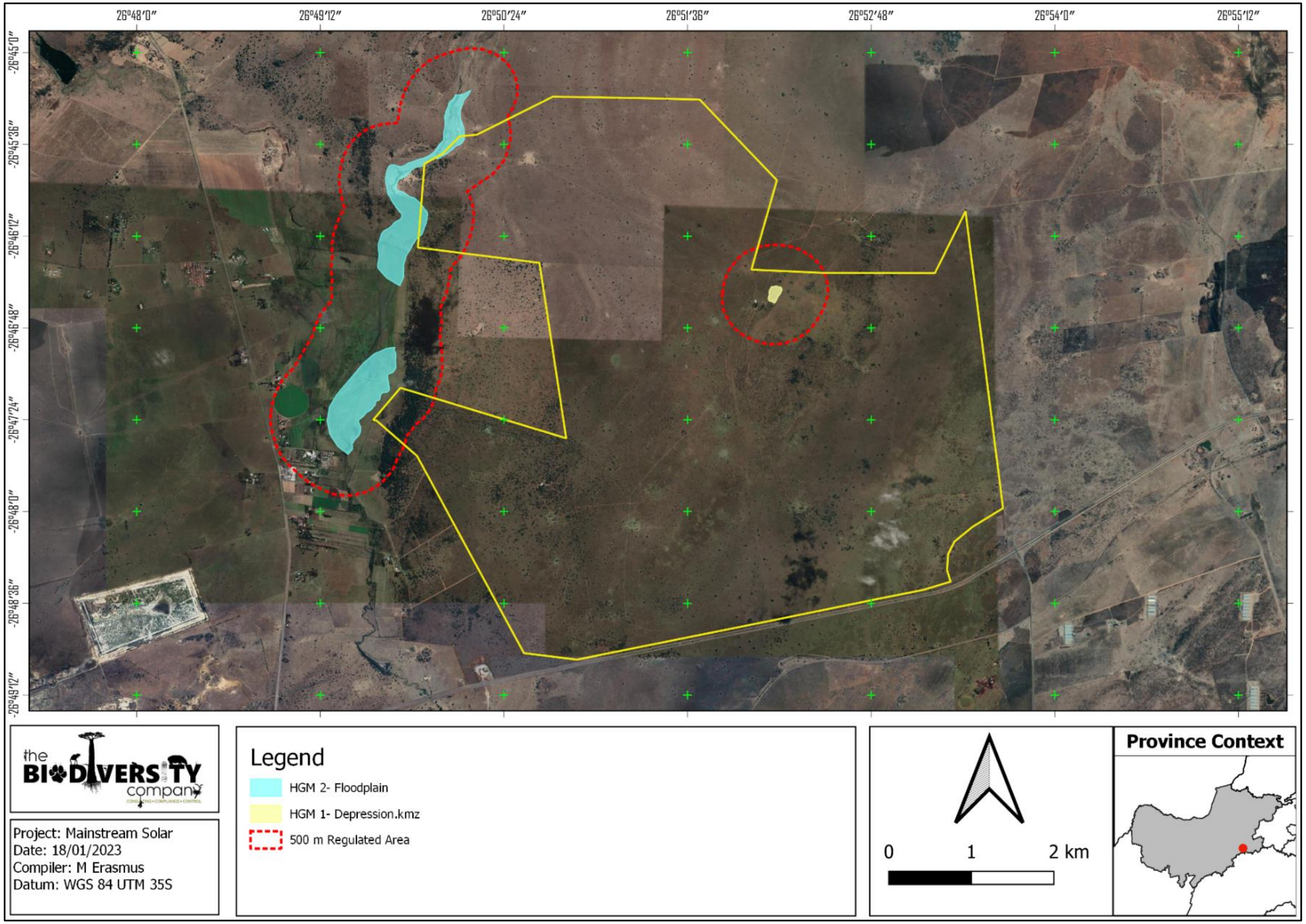

Figure 6-3 Delineation and location of the two HGM units identified within the Stilfontein Cluster Boundary)

6.2 Wetland Unit Setting

A **depression** wetland is located on the "slope" landscape unit. Depressions are inward draining basins with an enclosing topography which allows for water to accumulate within the system. Depressions, in some cases, are also fed by lateral sub-surface flows in cases where the dominant geology allows for these types of flows. Figure 6-4 presents a diagram of a typical depression wetland, showing the dominant movement of water into, through and out of the system.

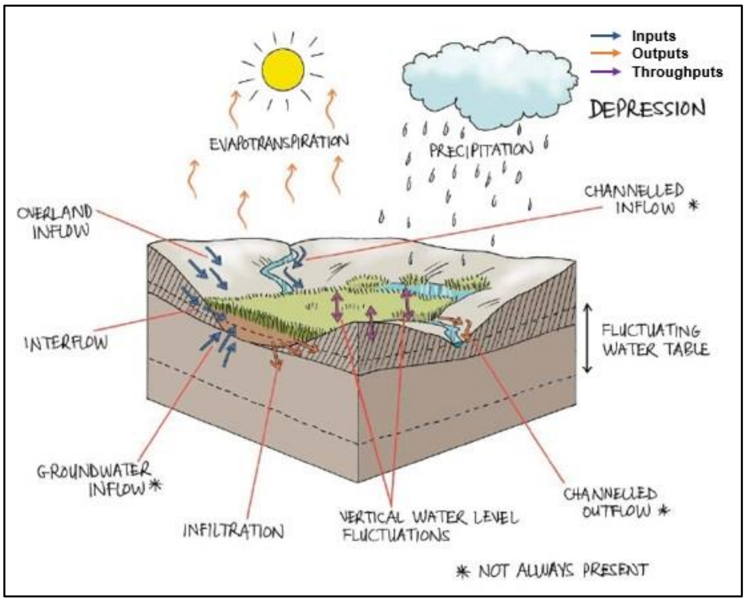

Figure 6-4 ***Amalgamated diagram of a typical depression, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

Floodplain wetlands are located on valley floors and are characterised by a well-defined stream channel with typical floodplain features, including levees, scroll bars and oxbows. The water inputs of this wetland are mainly from overspills from the stream channel's banks during flooding events. Figure 6-5 presents a diagram of the delineated floodplain, showing the dominant movement of water into, through and out of the system.

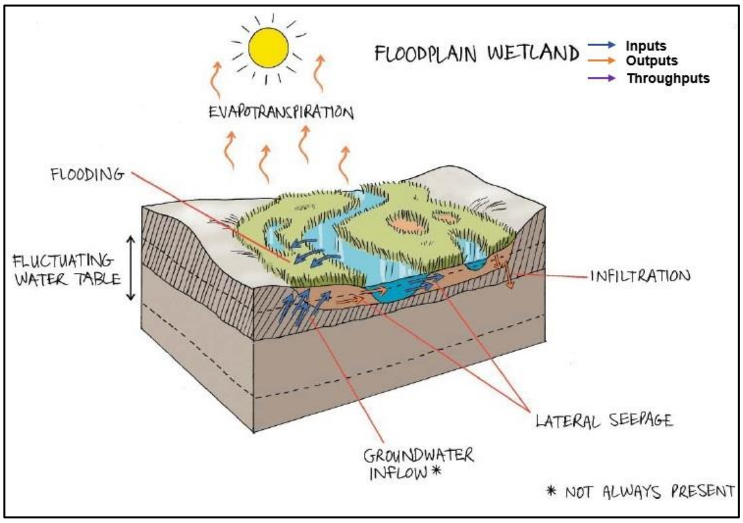

Figure 6-5 ***Amalgamated diagram of a typical floodplain system, highlighting the dominant water inputs, throughputs and outputs, SANBI guidelines (Ollis et al. 2013)***

6.3 Wetland Indicators

6.3.1 Hydromorphic Soil

According to (DWAF, 2005), soils are the most important characteristic of wetlands in order to accurately identify and delineate wetland areas. Two dominant soil forms were identified within the identified wetlands, namely the Katspruit (HGM 2) and Mispah (HGM 1) soil forms respectively (see Figure 6-6) (Soil Classification Working Group, 2018).

The Katspruit soil form consists of an orthic topsoil on top of a gleyic horizon. The "2210" family group is applicable to this soil form given the grey colours, the firm texture and structure of the soil form and the absence of lime.

The Mispah soil form consists of an orthic topsoil on top of a hard rock layer. The soil family group identified for the Mispah soil form on-site is that of "2120" due to the chromic properties of the topsoil, the absence of lime as well as the solid structure of the bedrock.

Orthic topsoils are mineral horizons that have been exposed to biological activities and varying intensities of mineral weathering. The climatic conditions and parent material ensure a wide range of properties differing from one orthic topsoil to another (i.e., colouration, structure etc) (Soil Classification Working Group, 2018).

Gley horizons that are well developed have homogenous dark to light grey colours with smooth transitions. Stagnant and reduced water over long periods is the main factor responsible for the formation of a gley horizon and could be characterised by green or blue tinges due to the presence of a mineral called Fougerite which includes sulphate and carbonate complexes. Even though grey colours are dominant, yellow and/or red striations can be noticed throughout a gley horizon. The structure of a gley horizon mostly is characterised as strong pedal, with low hydraulic conductivities and a clay texture, although sandy gley horizons are known to occur. The gley soil form commonly occurs at the toe of hillslopes (or benches) where lateral water inputs (sub-surface) are dominant and the underlaying geology is characterised by a low hydraulic conductivity. The gley horizon usually is second in diagnostic sequence in shallow profiles yet is known to be lower down in sequence and at greater depths (Soil Classification Working Group, 2018).

The hard rock layer associated with the abovementioned soil forms disallows infiltration of water or root systems, and also occur in shallow profiles. These layers are characterised by horizontally layered, hard sediments without evidence of vertical seams.

Figure 6-6 ***Mispah soil form identified within HGM 1- Depression wetland. The soil form consists of an orthic topsoil with signs of wetness on top of hard rock.***

Figure 6-7 ***Katspruit soil form identified within the HGM 2- Floodplain wetland. The soil form consists of an orthic topsoil over a gley subsoil.***

6.3.2 Hydrophytes

Vegetation plays a considerable role in identifying, classifying and accurately delineating wetlands (DWAF, 2005). During the site visit, various hydrophytic species were identified (including facultative species). Examples include *Cyperus dives, Schoenoplectus spp.* and *Cyperus spp.* (See Figure 6-8).

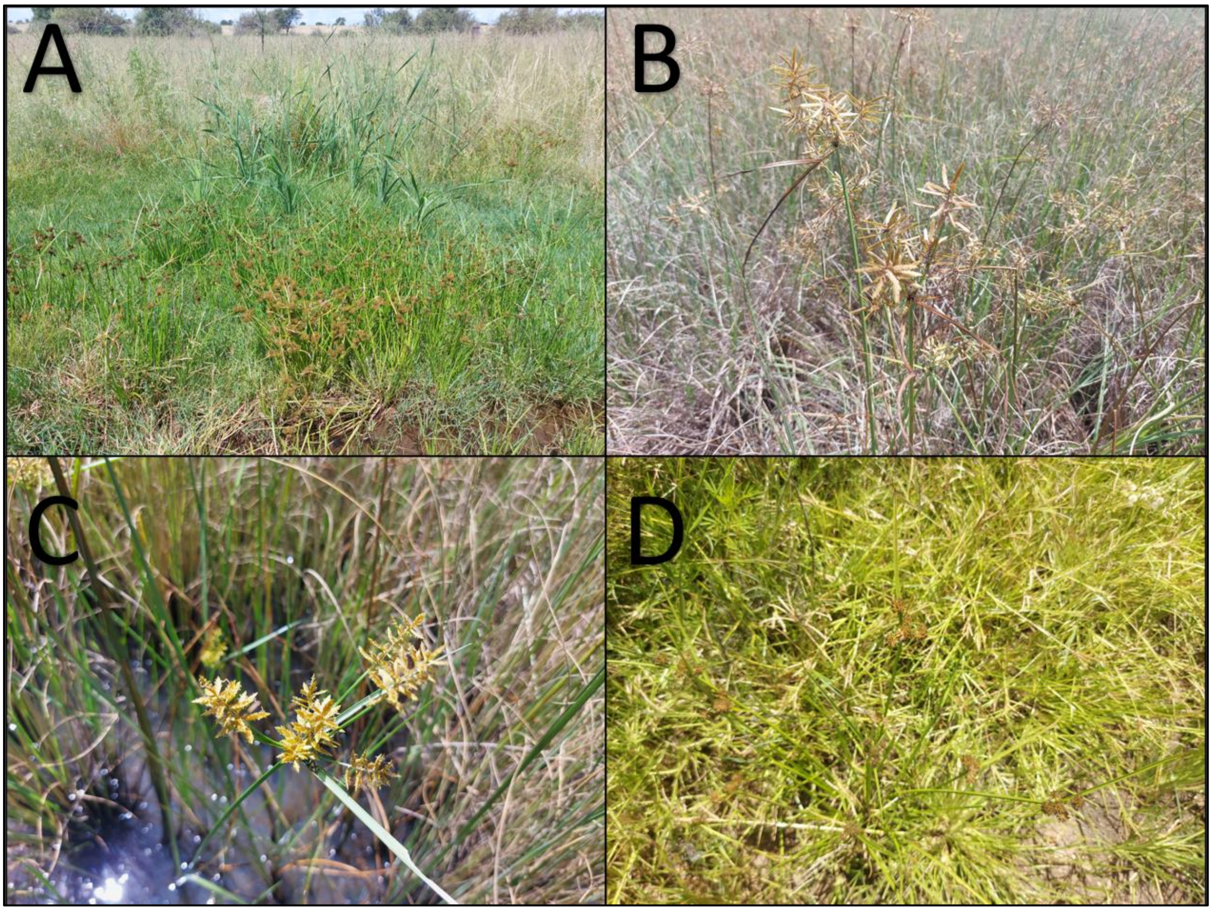

Figure 6-8 ***Hydrophytic vegetation identified within delineated watercourses. A) Cyperus dives B) Schoenoplectus spp. C) Schoenoplectus spp. D) Cyperus spp.***

6.4 General Functional Description

The generally impermeable nature of **depressions** and their inward draining features are the main reasons why the streamflow regulation ability of these systems is mediocre. Regardless of the nature of depressions in regard to trapping all sediments entering the system, sediment trapping is another ecological service that is not deemed one of the essential services provided by depressions, even though some systems might contribute to a lesser extent. The reason for this phenomenon is due to winds picking up sediments within pans during dry seasons which ultimately leads to the removal of these sediments and the deposition thereof elsewhere. The assimilation of nitrates, toxicants and sulphates are some of the higher rated services for depressions due to the continuous precipitation and dissolving of minerals and other contaminants during dry and wet seasons respectively, (Kotze et al., 2009).

Floodplains generally are formed during high flow events which subsequently cause water to overspill its banks. Due to the topographic setting of floodplains, flood attenuation for these systems is very high, especially during seasons where the soil within the wetland is not yet saturated and before the oxbows are filled. Seeing that floodplains usually are characterised by clayey soils which retain water for long periods and are susceptible to vast amounts of evapotranspiration, very little streamflow regulation is expected for floodplains, though floodplains with coarse soil types are ideal in regulating streamflow. Floodplains are excellent in assimilating phosphates due to the decrease in velocity during the overspill of banks. During this process, lateral deposition of sediment is prone to happen. Phosphorus tends to bind strongly to mineral particles which ensures that the phosphorus is retained on the floodplain after the deposition of these particles. Denitrification occurs to a lesser extent due to little exposure of large amounts of water seeing that these water masses are dependent on floods. Additionally, sub-surface flows are rare for floodplains which decreases the possibility of denitrification even more so.

It is however important to note that the descriptions of the above-mentioned functions are merely typical expectations. All wetland systems are unique and therefore, the ecosystem services rated high for these systems on site might differ slightly to those expectations.

6.5 Ecological Functional Assessment

The ecosystem services provided by the wetland units identified on site were assessed and rated using the WET-EcoServices method (Kotze *et al.,* 2008). The summarised results for HGM 1 (depression wetland) are shown in Table 6-1 and Figure 6-9 with HGM 2 (floodplain wetland) illustrated in Table 6-2 and Figure 6-10. The supply and demand for both the wetlands are provided in Figure 6-9 and Figure 6-10. The supply indicates the capacity of an ecosystem (wetland) to deliver a service where the demand societal demand for an ecosystem service. The integration of supply and demand to provide a rating of importance relative to the case ecosystem services provision.

The average ecosystem service score has been determined to be “Low” for HGM 1. Two ecosystem services have been rated “Moderate”, namely the carbon storage and biodiversity maintenance due to the high volumes of hydrophyte vegetation present inside the wetland. The vegetation provides different habitats for different ecologically important species.

In terms of the provisioning services, both the harvestable resources and food for livestock score “Low” ecosystem services scores due to the vegetation cover which can be used as resources as well as food for livestock to a limited extent. The rest of the provisioning services scored very low due to the fact that the wetland is isolated with little to no human interactions.

The average ecosystem services score for HGM 2 have been determined to be “Moderate” to “Moderately High” due to its ability to regulate stream flow as well as to trap sediment. The HGM unit had high volumes of hydromorphic vegetation cover which help with the assimilation of toxicants in the aquatic ecosystem to ensure cleaner water downstream. The HGM 2 scored a “Very High” score for the biodiversity maintenance due to the different habitats provided within the wetland (see Table 6-2).

Table 6-1 The ecosystem services being provided by the HGM 1 Depression.

	ECOSYSTEM SERVICE	Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	0,0	0,0	0,0	Very Low
	Stream flow regulation	0,0	0,0	0,0	Very Low
	Sediment trapping	0,9	0,5	0,0	Very Low
	Erosion control	0,6	1,1	0,0	Very Low
	Phosphate assimilation	0,9	0,5	0,0	Very Low
	Nitrate assimilation	0,9	0,5	0,0	Very Low
	Toxicant assimilation	0,9	0,3	0,0	Very Low
	Carbon storage	2,1	2,7	1,9	Moderate
	Biodiversity maintenance	3,7	0,0	2,2	Moderate
PROVISIONING SERVICES	Water for human use	1,5	0,3	0,2	Very Low
	Harvestable resources	2,5	0,3	1,2	Low
	Food for livestock	2,3	0,3	0,9	Low
	Cultivated foods	2,1	0,3	0,8	Very Low
CUL TUR AL SER	Tourism and Recreation	2,2	1,3	1,4	Moderately Low

	Education and Research	1,3	0,3	0,0	Very Low
	Cultural and Spiritual	2,0	0,0	0,5	Very Low

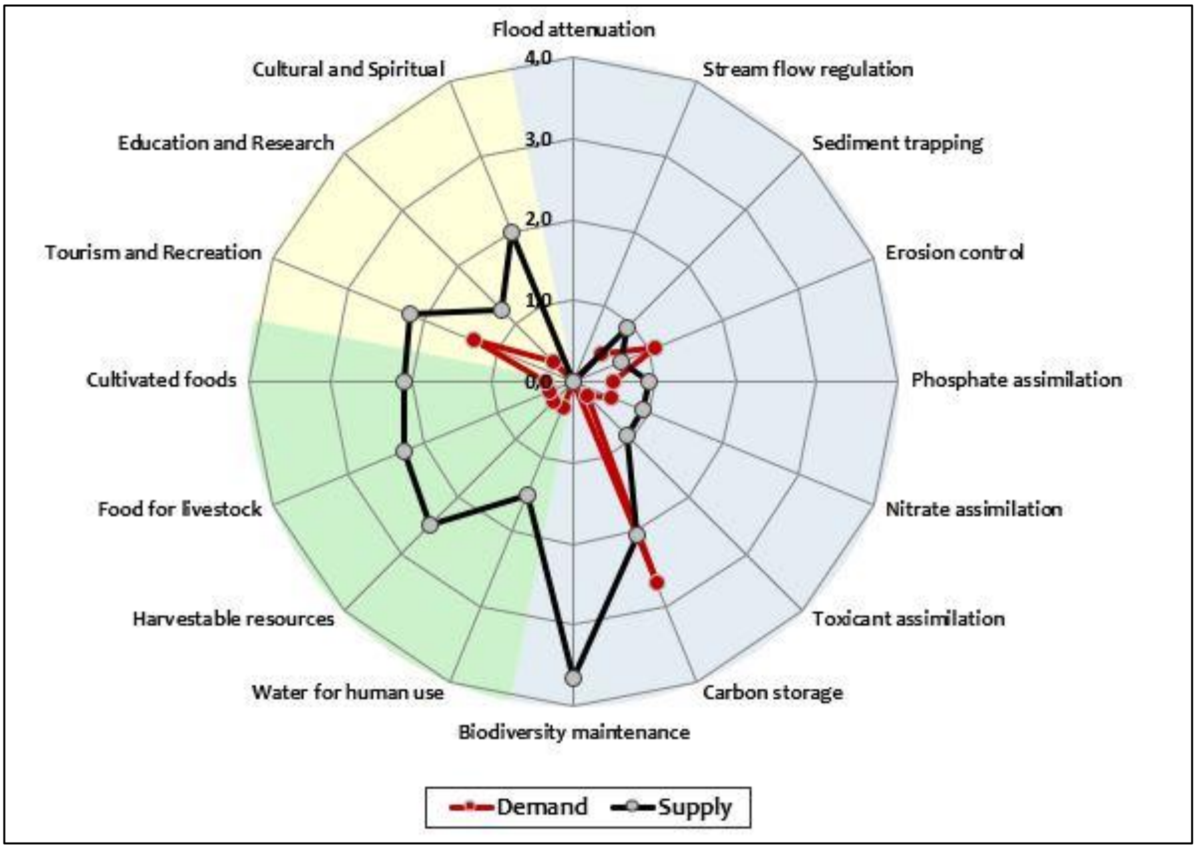

Figure 6-9 ***Radar map showing the demand and supply[2] of the different ecosystem services in HGM 1.***

Table 6-2 ***The ecosystem services being provided by the HGM 2 Floodplain.***

	ECOSYSTEM SERVICE	Supply	Demand	Importance Score	Importance
REGULATING AND SUPPORTING SERVICES	Flood attenuation	2,3	0,3	1,0	Low
	Stream flow regulation	3,7	1,3	2,8	High
	Sediment trapping	2,8	2,0	2,3	Moderate
	Erosion control	1,3	1,9	0,8	Very Low
	Phosphate assimilation	2,6	2,0	2,1	Moderate
	Nitrate assimilation	2,8	2,0	2,3	Moderately High
	Toxicant assimilation	2,6	2,0	2,1	Moderate
	Carbon storage	2,6	2,7	2,4	Moderately High
	Biodiversity maintenance	3,9	3,0	3,9	Very High
PROVISIONING SERVICES	Water for human use	3,2	2,0	2,7	High
	Harvestable resources	2,5	1,3	1,7	Moderately Low
	Food for livestock	1,5	1,3	0,7	Very Low

[2] Demand and supply scores are based on a conceptual understanding of the relative importance of different indicators in influencing the supply of and demand for each ecosystem service.

	Cultivated foods	1,7	0,7	0,5	Very Low
CULTURAL SERVICES	Tourism and Recreation	1,8	1,3	0,9	Low
	Education and Research	1,5	0,3	0,2	Very Low
	Cultural and Spiritual	3,0	0,3	1,7	Moderately Low

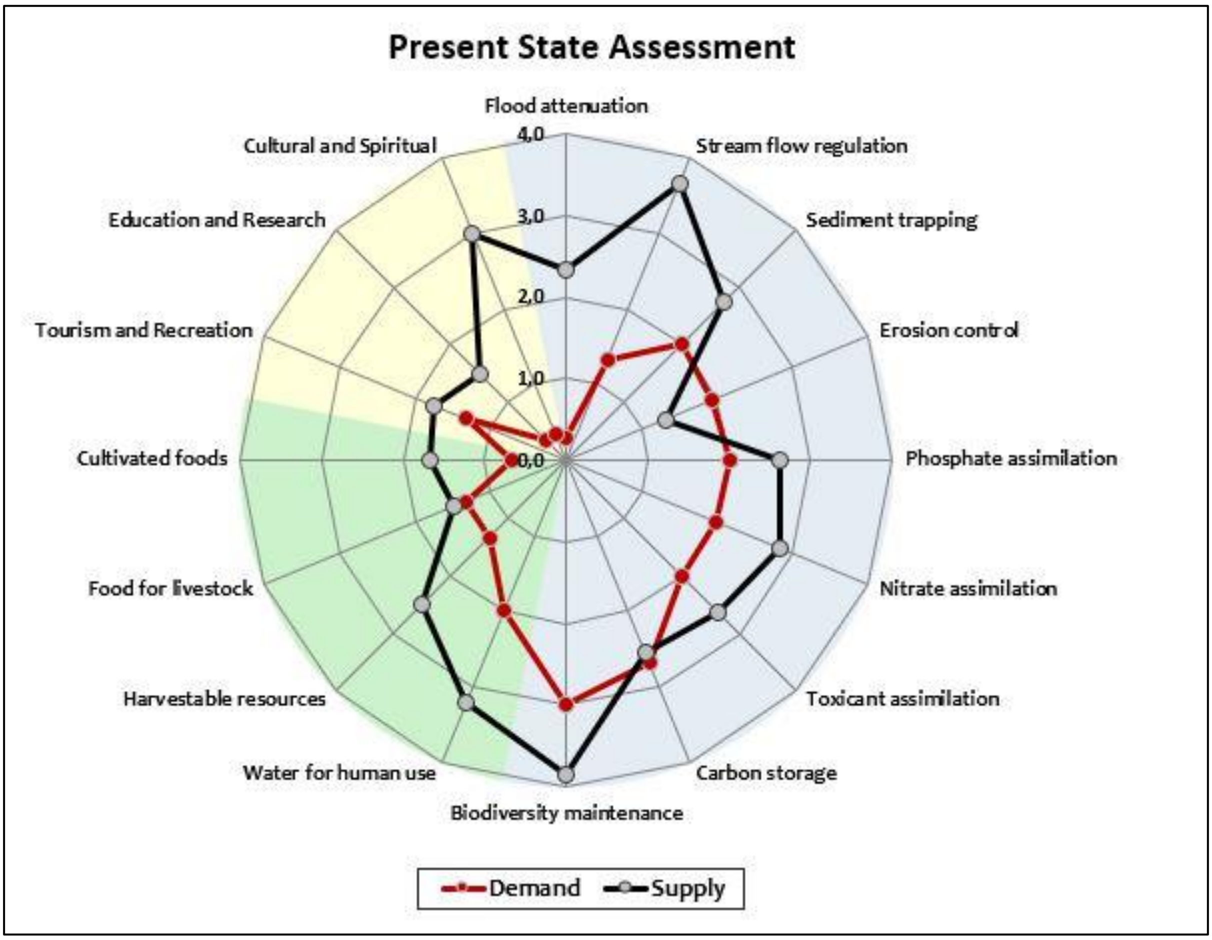

Figure 6-10 Radar map showing the demand and supply of the different ecosystem services in HGM 2.

6.6 The Present Ecological State Assessment

The PES for the assessed HGM types is presented in Table 6-3 and Table 6-4.

The hydrology of HGM 1 has predominantly been affected by alien invasive plants as well as grazing by livestock which limits the effectiveness of the hydrophytes in erosion control as well as water retention. Additionally, the wetland catchment consists of historic agricultural fields that have contributed to the level of modification. As such, the hydrology of the depression wetland is deemed "Moderately Modified".

The geomorphology of the wetland is rated as being "Moderately Modified" due to the fact that a part of the wetland was converted into a dam by building a dam wall.

The vegetation of HGM 1 was rated as being "Moderately Modified" due to multiple different species of alien invasives present within the wetland. At present, the alien invasives does not pose a major threat to the wetland but if left unattended they will begin to outcom6.6pete the endemic hydrophytes which will lead to a decrease in wetland function in the future. The vegetation is also under threat by grazing of livestock within the wetland.

The overall Present Ecological State (PES) for HGM 1 has been determined to be "Moderately Modified" which indicates that the wetland has been altered by anthropogenic activities but not yet to such an extent that the wetland is completely degraded.

Table 6-3 Summary of the scores for the HGM 1 depression wetland PES

Wetland	Hydrology		Geomorphology		Vegetation	
	Rating	Score	Rating	Score	Rating	Score
HGM 1	C: Moderately Modified	3.0	C: Moderately Modified	2.0	C: Moderately Modified	2.2
Overall PES Score		2.5		Overall PES Class		C: Moderately Modified

The hydrology of HGM 2 has been rated as being "Largely Modified" predominantly by grazing of livestock and channelization within the floodplain. The grazing and trampling by livestock inside the wetlands affect the natural draining and waterflow within the wetland as well as limits the effectiveness of the hydrophytes in erosion control and water retention. Additionally, the historical agricultural practices within the wetland's catchment have contributed to the level of modification. Channelization also causes an increase in flow rate within the wetland that will cause the outer parts of the floodplain to lose their function over time.

The occurrence of some alien invasive shrubs and weeds (*Opuntia ficus-indica, Cirsium vulgare, Eucalyptus camaldulensis*) inside HGM 2 contributes to the "Moderately Modified" rating. At present, the alien invasives do not pose a major threat to the wetland but if left unattended they will begin to out compete the endemic hydrophytes which will lead to a decrease in wetland function in the long haul. The vegetation is also under threat by grazing of livestock within the wetland.

The overall Present Ecological State (PES) for HGM 2 has been determined to be "Moderately Modified" which indicates that the wetland has been altered by anthropogenic activities but not yet to such an extent that the wetland is completely degraded.

Table 6-4 Summary of the scores for the HGM 2 floodplain wetland PES

Wetland	Hydrology		Geomorphology		Vegetation	
	Rating	Score	Rating	Score	Rating	Score
HGM 1	D: Largely Modified	4.0	C: Moderately Modified	2.2	C: Moderately Modified	3.4
Overall PES Score		3.8		Overall, PES Class		C: Moderately Modified

6.7 The Importance & Sensitivity Assessment

The results of the ecological IS assessment for the HGM units are shown in Table 6-5. Various components pertaining to the protection status of a wetland are considered for the IS, including Strategic Water Source Areas (SWSA), the NFEPA wet veg protection status and the protection status of the wetland itself considering the NBA wetland data set. The IS for all the HGM units have been calculated to be "Low", which combines the relatively low protection status of the wet veg type and the low protection status of the wetland itself.

Table 6-5 The IS results for the delineated HGM unit

HGM Type	Wet Veg			NBA Wetlands			SWSA (Y/N)	Calculated IS
	Type	Ecosystem Threat Status	Ecosystem Protection Level	Wetland Condition	Ecosystem Threat Status 2018	Ecosystem Protection Level		

HGM 1	Mesic Highveld Grassland Group 3	Critically Threatened	Not Protected	D/E/F Largely Modified	Critical	Poorly Protected	N	**Low**
HGM 2	Mesic Highveld Grassland Group 3	Critically Threatened	Not Protected	D/E/F Largely Modified	Critical	Not Protected	N	**Low**

6.8 Buffer Requirements

The "Preliminary Guideline for the Determination of Buffer Zones for Rivers, Wetlands and Estuaries" (Macfarlane *et al.,* 2014) was used to determine the appropriate buffer zone for the proposed activity. A pre-mitigation buffer zone of 30 m from identified wetlands is recommended for all project infrastructure, which can be decreased to 15 m if all prescribed mitigation measures are implemented (see Table 6-6).

Under normal circumstances the installation of powerline infrastructure has the potential to cause loss of vegetation (along route), an increase in sediment inputs & turbidity, alter flow volumes and increase inputs of toxic contaminants. This affords powerline infrastructure a (preliminary) desktop buffer of 35 m for the respective watercourses. However, the expected implementation of Eskom best practice protocols and the prescribed mitigation reduces the required buffer to 15 m for both construction and operational phases for the watercourse. It is preferred that pylons / towers be positioned beyond the watercourse, suspending cables between these systems. Should this not be feasible from an engineering (and safety) perspective, pylons / towers are permitted to be placed within the buffer area, but these must be kept to a minimum. No pylons / towers are permitted to be placed within the delineated watercourses.

The proposed PV facilities are also expected to pose similar risks i.e. increased turbidity, altered flows and contamination of resources, and the prescribed post-mitigation buffer widths is 15 m and 30 m for either the mono-facial or bifacial solar panels respectively. It is assumed that the vegetation will remain largely intact for mono-facial panels, requiring brush cutting beneath the panel.

Table 6-6 The post-mitigation buffer sizes

	Buffer Widths
PV Facility – Bifacial panels	30 m
PV Facility – Mono-facial panels	15m
Powerline	15 m

7 Impact Risk Assessment

Impacts pertaining to the wetland systems associated with the respective projects are summarised below. A general description of potential project impacts is provided below. **Project-specific impacts related to the project subject to this application are discussed in Appendix A.**

The impact assessment considered both direct and indirect impacts to the delineated systems, by the different proposed activities. The mitigation hierarchy as discussed by the Department of Environmental Affairs (2013) will be considered for this component of the assessment (Figure 7-1). In accordance with the mitigation hierarchy, the preferred mitigation measure is to avoid impacts by considering options in project location, sitting, scale, layout, technology, and phasing to avoid impacts. Section 6.8 - Buffer Requirements illustrates the extent of the recommended buffer zones for the identified wetland.

A number of mitigation measures are provided which would, if implemented effectively, reduce the significance of the anticipated impacts. Of these, perhaps the most significant mitigation measures are as follows:

- Clearly demarcate the construction footprint and restrict all construction activities to within the proposed infrastructure area;
- Educate staff and relevant contractors on the location and importance of the identified watercourses through toolbox talks and by including them in site inductions as well as the overall master plan;
- Promptly remove / control all alien and invasive plant species that may emerge during construction (i.e. weedy annuals and other alien forbs) must be removed;
- Appropriately stockpile topsoil cleared from the project area and ensure soil stockpiles and concrete / building sand are sufficiently safeguarded against rain wash;
- Do not situate any of the construction material laydown areas within any watercourse and associated buffers and do not park machinery in the systems or their buffers;
- Make sure all excess consumables and building materials / rubble is removed from site and deposited at an appropriate waste facility;
- Release only clean water into the environment;
- Stormwater leaving the site should not be concentrated in a single exit drain but spread across multiple drains around the site each fitted with energy dissipaters (e.g. slabs of concrete with rocks cemented in);
- Avoid excessively compacting the ground beneath the solar panels;
- Do not use detergents to clean solar panels nor herbicides to control vegetation beneath the panels. If surfactants and herbicides must be used do so well prior to any significant predicted rainfall events as far as practically possible; and
- Appropriately rehabilitate the project area by ripping, landscaping and re-vegetating with locally indigenous species.

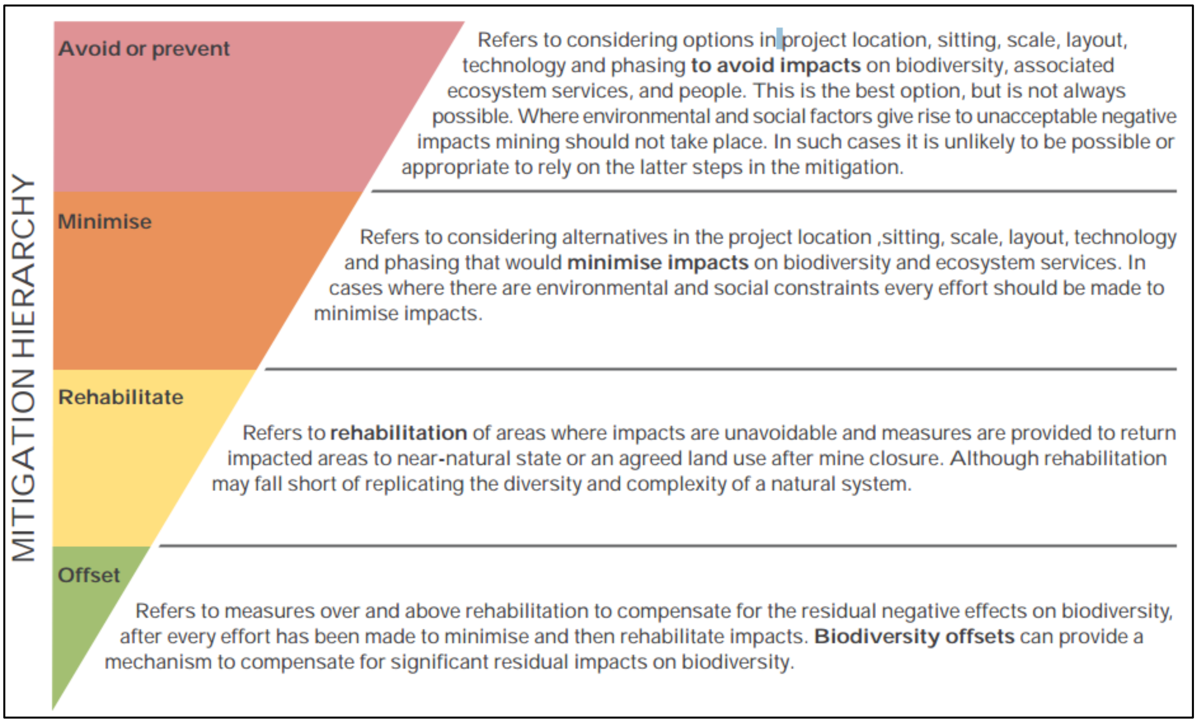

Figure 7-1 The mitigation hierarchy as described by the DEA (2013)

8 Conclusion and Recommendation

8.1 Baseline Ecology

During the site assessment, two HGM units were identified within 500 m of the Stilfontein Cluster boundary, namely a depression and a floodplain wetland. The two wetlands scored overall PES scores of C – “Moderately Modified” due to the modification to both the hydrology and vegetation of the wetlands through historical agricultural activities. Both the HGM units scored “Low” importance and sensitivity scores due to the low protection level of both the vegetation and wetland units. The average ecosystem service score has been determined to be “Low” for HGM 1 and HGM 2. A 30 m pre-mitigation buffer that will decrease to a 15 m post-mitigation buffer were assigned to the wetland systems.

8.2 Specialist Recommendation

No fatal flaws are expected for this project. Based on the results and conclusions presented in this report, it is expected that the proposed activities will have low to very low residual impacts on the wetlands. From a wetland perspective the project can be approved. Refer to the specialist recommendation in Appendix A for project-specific recommendation.

Both substation alternatives and the associated powerline corridors are equally acceptable from a wetland and freshwater perspective.

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10 Appendix A – Project Specific Results: Grid – Shrike PV

The project requires a grid connection that is located north of the delineated depression wetland HGM1. No substations are located within the 500 m regulated area for the delineated wetlands. The substations are located well away (> 600 m) from any delineated wetlands and the gridlines connecting the substation to the MTS will not pass through the recommended 15 m wetland buffer.

The grid connections do not pose a direct risk to the delineated wetlands, as water resources and accompanying buffer areas will be avoided. No indirect risks are expected as associated infrastructure is more than 85 m (north) from the wetland system.

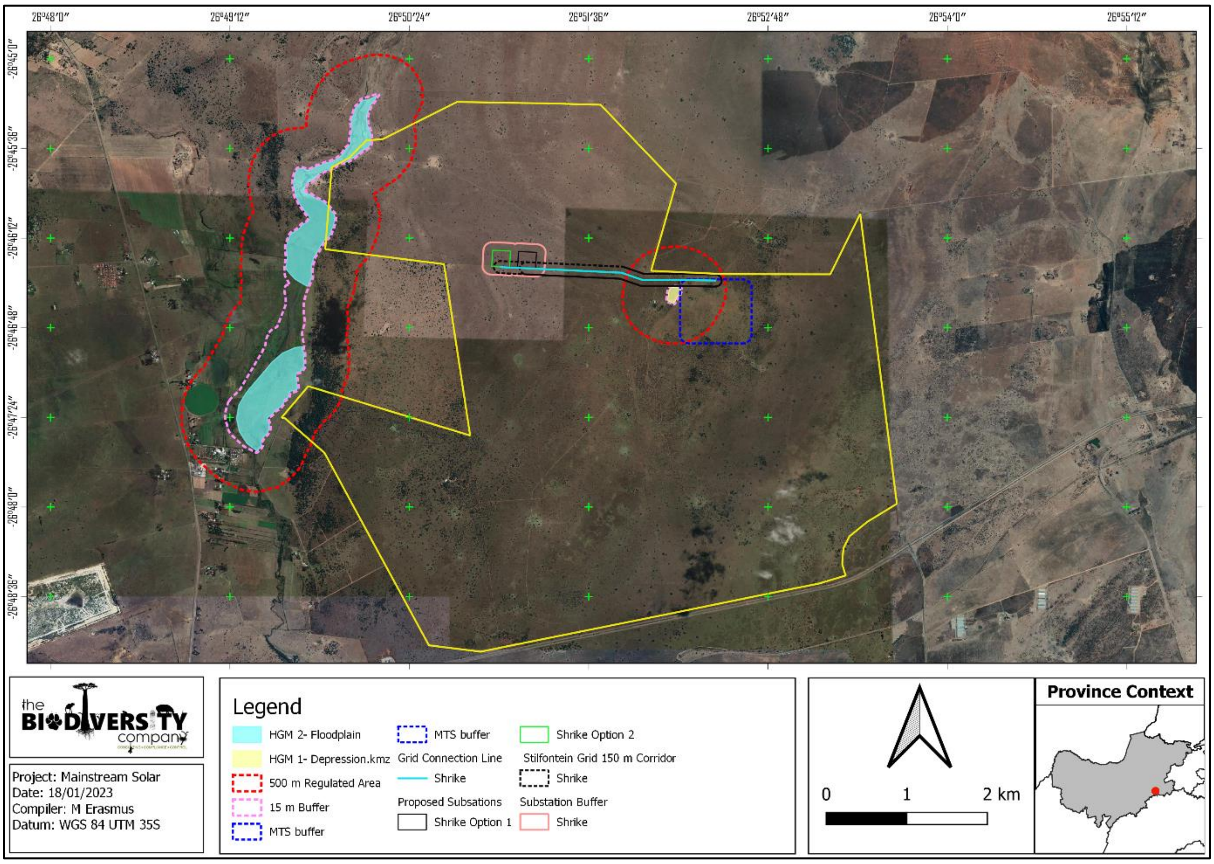

Figure 10-1 Location of the Shrike PV grid infrastructure with relation to the Stilfontein cluster project area as well as the delineated wetlands inside the cluster area.

10.1.1 Conclusion & Specialist Opinion

Based on the results and conclusions presented in this report, no impacts to wetlands are expected to occur because of the project. Based on this, no authorisation with regards to WUL in terms of Section 21(c) & (i) water uses is required.

11 Specialist Declaration

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

Proposed development the Stilfontein Cluster, North West Province, with separate EA applications for:
- Nine Photovoltaic (PV) facilities and associated infrastructure: Spoonbill, Sunbird, Swallow, Snipe, Shrike, Stilfontein, Sparrow, Starling and Swift;
- Three collector substations and associated infrastructure: Voelnessie A, Voelnessie B, Voelnessie C; and
- One Main Transmission Substation and associated infrastructure.

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at https://www.environment.gov.za/documents/forms.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:
Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

Details of Specialist, Declaration and Undertaking Under Oath

Page 1 of 3

1. SPECIALIST INFORMATION

Specialist Company Name:	The Biodiversity Company			
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	4	Percentage Procurement recognition	100%
Specialist name:	Andrew Husted			
Specialist Qualifications:	MSc			
Professional affiliation/registration:	SACNASP Pr Sci Nat 400213/11			
Physical address:	777 Peridot Street, Jukskei Park, 2158			
Postal address:	As above			
Postal code:	2158	Cell:	0813191225	
Telephone:		Fax:		
E-mail:	Info@thebiodiversitycompany.com			

2. DECLARATION BY THE SPECIALIST

I, Andrew Husted, declare that –

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

Signature of the Specialist

The Biodiversity Company

Name of Company:

16/05/2022

Date

Details of Specialist, Declaration and Undertaking Under Oath

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3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Andrew Husted, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

Signature of the Specialist

The Biodiversity Company

Name of Company

16/5/2022

Date

Signature of the Commissioner of Oaths

16/05/2022

Date

Stamp

Certified as a true copy of original

Farai Shadreck Mbirimi BD52805

Minister of Religion / Commissioner of Oaths

391 11th Road, Erand, Midrand 1685

Date 16/05/2022

Details of Specialist, Declaration and Undertaking Under Oath

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12 Specialist CV

Andrew Husted

M.Sc Aquatic Health (*Pr Sci Nat*)

Cell: +27 81 319 1225

Email: andrew@thebiodiversitycompany.com

Identity Number: 7904195054081

Date of birth: 19 April 1979

Profile Summary

Working experience throughout South Africa, West and Central Africa and also Armenia & Serbia.

Specialist experience in exploration, mining, engineering, hydropower, private sector and renewable energy.

Experience with project management for national and international multi-disciplinary projects.

Specialist guidance, support and facilitation for the compliance with legislative processes, for in-country requirements, and international lenders.

Specialist expertise include Instream Flow and Ecological Water Requirements, Freshwater Ecology, Terrestrial Ecology and also Ecosystem Services.

Areas of Interest

Sustainability and Conservation.

Instream Flow and Ecological Water Requirements.

Publication of scientific journals and articles.

Key Experience

- Familiar with World Bank, Equator Principles and the International Finance Corporation requirements
- Environmental, Social and Health Impact Assessments (ESHIA)
- Environmental Management Programmes (EMP)
- Ecological Water Requirement determination experience
- Wetland delineations and ecological assessments
- Rehabilitation Plans and Monitoring
- Fish population structure assessments
- The use of macroinvertebrates to determine water quality
- Aquatic Ecological Assessments
- Aquaculture

Country Experience

Botswana, Cameroon

Democratic Republic of Congo

Ghana, Ivory Coast, Lesotho

Liberia, Mali, Mozambique

Nigeria, Republic of Armenia,

Senegal, Serbia, Sierra Leone, South Africa

Tanzania

Nationality

South African

Languages

English – Proficient

Afrikaans – Conversational

German - Basic

Qualifications

- MSc (University of Johannesburg) – Aquatic Health.
- BSc Honours (Rand Afrikaans University) – Aquatic Health
- BSc Natural Science
- Pr Sci Nat (400213/11)
- Certificate of Competence: Mondi Wetland Assessments
- Certificate of Competence: Wetland WET-Management
- SASS 5 (Expired) – Department of Water Affairs and Forestry for the River Health Programme
- EcoStatus application for rivers and streams

OVERVIEW

An overview of the specialist technical expertise include the following:

- Aquatic ecological state and functional assessments of rivers and dams.
- Instream Flow Requirement or Ecological Water Requirement using PROBFLO studies for river systems.
- Ecological wetland assessment studies, including the integrity (health) and functioning of the wetland systems.
- Wetland offset strategy designs.
- Wetland rehabilitation plans.
- Monitoring plans for rivers and other wetland systems.
- Toxicity and metal analysis of water, sediment and biota.
- Bioaccumulation assessment of fish communities.
- Fish telemetry assessment that included the translocation of fish as well as the monitoring of fish in order to determine the suitability of the hosting system.
- Faunal surveys which includes mammals, birds, amphibians and reptiles.
- The design, compilation and implementation of Biodiversity and Land Management Plans and strategies.

TRAINING

Some of the more pertinent training undergone includes the following:

- Wetland and Riparian Delineation Course for Consultants (Certificate of Competence) – DWAF 2008
- The threats and impacts posed on wetlands by infrastructure and development: Mitigation and rehabilitation thereof – Gauteng Wetland Forum 2010
- Ecological State Assessment of Lentic Systems using Fish Population Dynamics – University of Johannesburg/Rivers of Life 2010
- Soil Classification and Wetland Delineation – Terra Soil Science 2010
- Wetland Rehabilitation Methods and Techniques - Gauteng Wetland Forum 2011
- Application of the Fish Response Assessment Index (FRAI) and Macroinvertebrate Response Assessment Index (MIRAI) for the River Health Programme 2011
- Tools for a Wetland Assessment (Certificate of Competence) – Rhodes University 2011
- PROBFLO for conducting Ecological Flow Assessments – 2018/19

EMPLOYMENT EXPERIENCE

The Biodiversity Company (January 2015 – Present)

Director / Ecologist.

Digby Wells Environmental (August 2008 – December 2014)

Freshwater & Terrestrial Ecologist

PREVIOUS EMPLOYMENT: Econ@UJ (University of Johannesburg)

Freshwater Ecologist

ACADEMIC QUALIFICATIONS

University of Johannesburg, Johannesburg, South Africa (2009): MAGISTER SCIENTIAE (MSc) - Aquatic Health:

Title: *Aspects of the biology of the Bushveld Smallscale Yellowfish (Labeobarbus polylepis): Feeding biology and metal bioaccumulation in five populations.*

Rand Afrikaans University (RAU), Johannesburg, South Africa (2004): BACCALAUREUS SCIENTIAE CUM HONORIBUS (Hons) – Zoology

Rand Afrikaans University (RAU), Johannesburg, South Africa (2001 - 2004): BACCALAUREUS SCIENTIAE IN NATURAL AND ENVIRONMENTAL SCIENCES. Majors: Zoology and Botany.

PUBLICATIONS

Desai M., Husted A., Fry C., Downs C.T., & O'Brien G.C. 2019. Spatial shifts and habitat partitioning of ichthyofauna within the middle–lower region of the Pungwe Basin, Mozambique. *Journal of Freshwater Ecology*, 34(1), 685–702. doi: 10.1080/02705060.2019.1673221

Tate R.B. and Husted, A. 2015. Aquatic Biomonitoring in the upper reaches of the Boesmanspruit, Carolina, Mpumalanga, South Africa. African Journal of Aquatic Science.

Tate R.B. and Husted A. 2013. Bioaccumulation of metals in *Tilapia zillii* (Gervai, 1848) from an impoundment on the Badeni River, Cote D'Iviore. African Journal of Aquatic Science.

O'Brien G.C., Bulfin J.B., Husted A. and Smit N.J. 2012. Comparative behavioural assessment of an established and new Tigerfish (*Hydrocynus vittatus*) population in two manmade lakes in the Limpopo catchment, Southern Africa. African Journal of Aquatic Science.

Tomschi H., Husted A., O'Brien G.C., Cloete Y., Van Dyk C., Pieterse G.M., Wepener V., Nel A. and Reisinger U. 2009. Environmental study to establish the baseline biological and physical conditions of the Letsibogo Dam near Selebi Phikwe, Botswana. EC Multiple Framework Contract Beneficiaries.8 ACP BT 13 – Mining Sector (EDMS). Specific Contract N° 2008/166788. Beneficiary Country: Botswana. By: HPC HARRESS PICKEL CONSULT AG

Husted A. 2009. Aspects of the biology of the Bushveld Smallscale Yellowfish (*Labeobarbus polylepis*): Feeding biology and metal bioaccumulation in five populations. The University of Johannesburg (Thesis).