Aquatic Biodiversity and Delineation Report

Bothaville Consolidated Prospecting, Free State.

Prepared for:

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DECLARATION OF INDEPENDENCE

I, Roy de Kock as duly authorized representative of BlueLeaf Environmental (Pty) Ltd, hereby confirm my independence (as well as that of BlueLeaf) as a specialist and declare that neither I nor BlueLeaf have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Blueleaf was appointed as aquatic specialist in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Bothaville Consolidated Prospecting, Free-State. I further declare that I am confident in the results of the studies undertaken and conclusions drawn because of it – as is described in this report.

Full Name: Roy de Kock

Title / Position: Ecologist
Qualification(s): BSc (Hons) Geology; MSc Botany; Candidate PhD Botany
Experience (years/ months): 17 years
Registration(s): SACNASP (400216/16)

EXPERTISE

Roy has over 17 years' experience in environmental consulting and specialist services in South Africa. Various projects throughout Africa have also been undertaken. Projects include baseline studies, impact assessments and compliance auditing for various large-scale projects including numerous wind farms, roads (National and Provincial), and infrastructure development projects. Blue Leaf also offers a wide range of in-house specialties including but not limited to Ecological and Botanical assessments, Biodiversity studies, Plant and Animal Search and Rescue, Fauna and Flora permits, Aquatic Assessments, Agricultural and Soil Assessments and Environmental and Venomous animals training workshops.

Roy holds a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela University in Port Elizabeth. He is currently busy with his PhD (Doctorate degree) in Botany and Soil Science. He has over 17 years' experience in the environmental consulting focusing on Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies.

This study complies with the requirements as listed in the Gazetted protocols for the specialist assessment (GN. R 320 of 2020) and minimum report content requirements for the following specialist environment:

- Environmental Impacts on Aquatic Biodiversity.

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1. Introduction

BlueLeaf Environmental (Pty) Ltd has been appointed by Enviroworks on behalf of Reef Exploration (Pty) Ltd, to undertake an Aquatic Biodiversity and Delineation Report as part of the Environmental Impact Assessment (EIA) process conducted by Enviroworks. This report also complies to the Department of Water and Sanitation's (DWS) requirements for a wetland delineation and assessment report to confirm the presence of wet conditions and the extent thereof on the proposed development.

This investigation has been undertaken to form part of the National Environmental Management Act (NEMA) (Act No 107 of 1998) as amended, as well as the Integrated Water Use License Application (IWULA) to be submitted to the Department of Water and Sanitation (DWS). The establishment of any type of development on the extent of the rivers, wetland systems and floodplains within the property poses detrimental environmental impacts based on the nature and magnitude of the development and legal requirements in the form of the NEMA, and the National Water Act. (NWA; Act 36 of 1998).

1.1. Project Description

Invasive prospecting will take the form of diamond drilling. The prospecting information will be integrated into a geological model to further define the orebodies, which when, combined with the assay information, will be utilized to define a resource. The minerals to be prospected for includes gold and silver ore, coal, diamonds (alluvial), platinum group metals, rare earths, sulfur and uranium ore.

Based on the initial geological model established, a diamond drilling programme, comprising of six boreholes will be undertaken. The drilling of the six boreholes will be to a depth of 700m. The extent of the area required for prospecting is 18 627, 1944 hectares (ha).

Drilling will be conducted in a competent and environmentally responsible manner including rehabilitation of the drill sites to their original site. Plastic lining will be placed underneath the rig motors to prevent oil seepage. It is noted that no drilling fluids other than water for dust suppression, will be utilized in the case of diamond drilling. Environmental rehabilitation measures will be included in the contract with the drilling company and environmental rehabilitation costs will be included in the drilling costs.

The drilling process will be managed in a competent manner and will involve the following actions:

- Call for drill tenders
- Review the registration, incorporation, employment equity and BEE of the drilling company
- Confirm the good financial standing of the drilling company
- Establishment of confidentiality agreements and management of conflicts of interest that the drilling company may have
- Review the drilling company's approach to Mines, Health and Safety issues
- Compile a preliminary analysis report
- Select drilling company
- Award of the drilling contract
- Obtain permission to access the property
- Submit information of planned drilling to Mines, Health and Safety at DMR
- Forward special instructions to the drilling company regarding power, water, environmental, safety and security
- Preliminary analysis report on notifications e.g. Eskom, Telkom, etc.

- Finalise the initial borehole positions
- Plan access roads, crew accommodation and site security
- Environmental assessment of drill sites
- Preparation of drilling sites
- Establish water source for drilling
- Plan health and safety issues and establish a safe working code specific to the area
- Perform the necessary risk assessments and Planned Task Observations (PTO)
- Monitor and control the drilling process
- Ensure secure core storage and sampling facilities
- Set QA/QC sampling procedures in place and insert proper reference material as samples
- Undertake site rehabilitation
- Take pictures before and after rehabilitation
- Compile preliminary analysis report on the start date of the drilling programme
- Plan additional infill borehole sites

A strict QA/QC programme will be conducted by the internal Qualified Person (QP)/Exploration Manager:

- Quality of drilling programme
- Survey of borehole collars utilising a GPS
- Sample management (weighing, splitting, transport)
- Logging and mineralisation/reef identification
- Sampling procedures
- Chain of custody of transport of samples to laboratory
- Laboratories utilised
- Quality control of standards, blanks and duplicates to ensure accurate assay methods and grades from laboratory
- Applicable assay method utilised for style of mineralisation
- QA/QC on lab results including check assaying at an umpire laboratory
- Database management
- External audits by Qualified Persons

Permanent footprints

There is no permanent footprint.

Temporary footprints

Temporary footprint includes the areas directly affected/disturbed by prospecting and clearing of land. The temporary footprint present on site is listed as follows:

- Clearing of vegetation (approx. 25m^2 at each borehole)
- Laydown areas for materials and equipment
- Prospecting machinery

1.2. Locality

The site is situated 30 kms East of Bothaville in the Free State Province (Figure 1.1). The registered description of the land to which the application relates includes the following:

FARM	DISTRICT
1.Portion 1 and the Remainder of the Farm Damplaats No. 220	Bothaville
2. Portion 1, 2 and the Remainder of the Farm Roode Rand No. 35	Bothaville
3. Portion 1 and the Remainder of the Farm Weestevreden No. 269	Bothaville
4. Portion 1 and the Remainder of the Farm Tarantaaldraai No. 156	Bothaville
5. Portion 1 and the Remainder of the Farm Eureka No. 761	Bothaville
6. Portion 1, 2 and the Remainder of the Farm Concord No. 392	Bothaville
7. Portion 1, 2 and the Remainder of the Farm Zoetlaagte No. 194	Bothaville
8. Portion 1 and the Remainder of the Farm Lekkerleven No. 308	Bothaville
9. Portion 1, 2, 3, 4 and the Remainder of the Farm Blesboklaagte No. 250	Bothaville
10. Portion 2, 3, 8, the Remainder of the Portion 1 and the Remainder of the Farm Rustpan No. 1174	Bothaville
11. Portion 1, 2 and the Remainder of the Farm Hebron No. 107	Bothaville
12. Portion 1 of the Farm Stukpan No. 435	Bothaville
13. Remainder of the Farm Gelukskraal No. 56	Bothaville
14. Remainder of the Farm Eden No. 454	Bothaville
15. The Farms : Brak-spruit No. 222, Mealie Bult No. 20, Beestkraal-Noord No. 186, Lyden No. 264, Spitshoek No. 868, Uitkijk No. 147, Doorndraai West No. 154, Doorndraai East No. 235, Doornheuvel No. 242, Kaalplaats No. 51, Diepwater No. 50, Annasville No. 1196, Taljaard No. 300, Vergenoeg No. 89 and Vlakpan No. 541	Bothaville

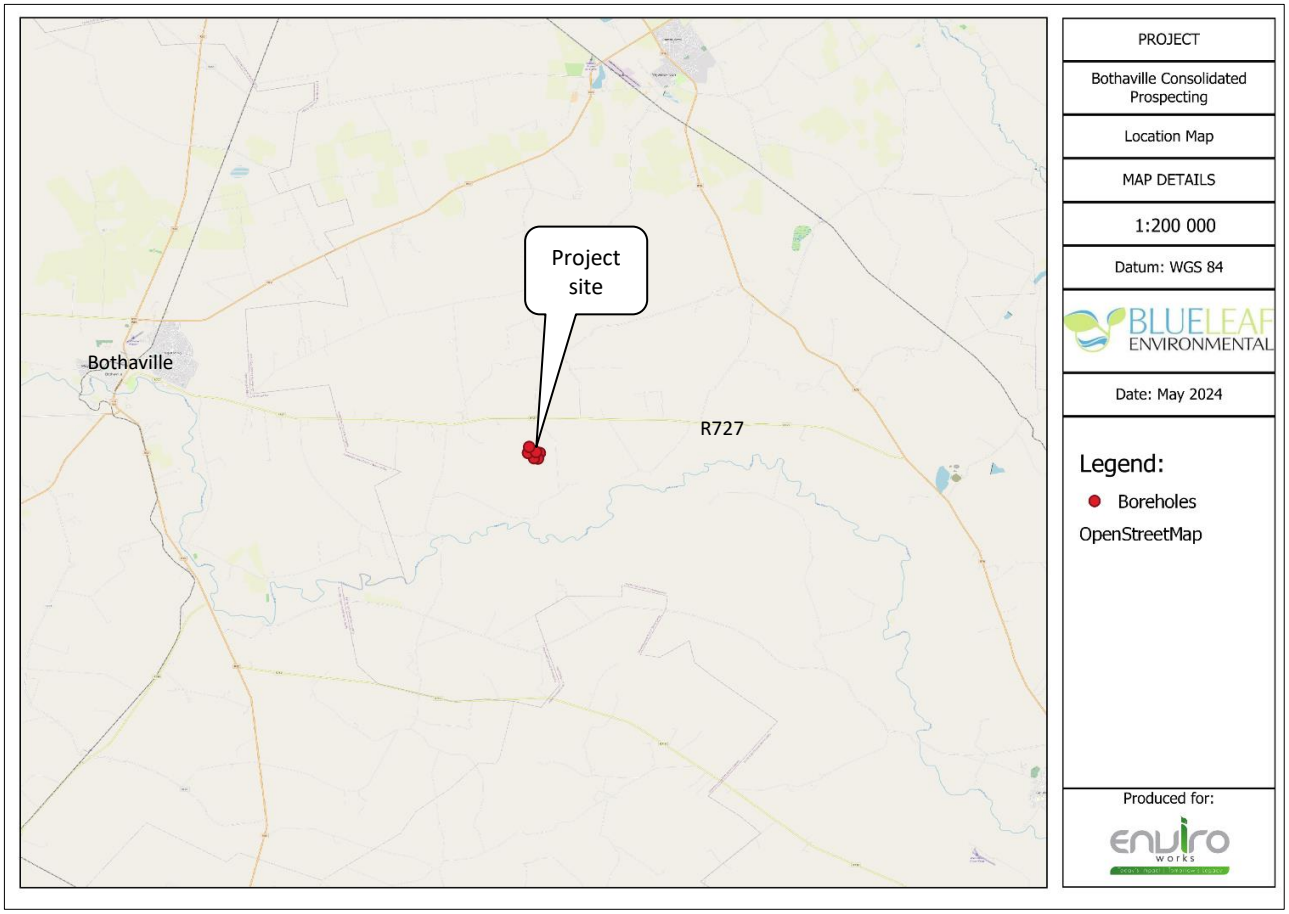

Figure 1.1 Locality map of the project located near Bothaville, Free-State.

1.3. Legislative context

The following legislation is directly relevant when assessing the aquatic environment relating to the Bothaville Consolidated Prospecting, Free-State.

National Web based Environmental Screening Tool

The National Web based Environmental Screening Tool (https://screening.environment.gov.za/screeningtool/) is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorization in terms of the Environmental Impact Assessment (EIA) Regulations 2014 (as amended), to screen their proposed site for any environmental sensitivity.

The Screening Tool also provides site specific EIA process and review information, for example, the Screening Tool may identify if an industrial development zone, minimum information requirement, Environmental Management Framework or bio-regional plan applies to a specific area.

Further to this, the Screening Tool identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site.

Finally, the Screening Tool allows for the generating of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report is required to accompany any application for Environmental Authorization and as such the tool has been developed in a manner that is user friendly and no specific software or specialized GIS skills are required to operate this system.

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 have been Gazetted (GN. R 320 of 20 March 2020). In terms of sections 24(5)(a), (h) and 44 of the National Environmental Management Act, 1998. These procedures prescribe general requirements for undertaking site sensitivity verification and for protocols for the assessment and minimum report content requirements of environmental impacts for environmental themes for activities requiring environmental authorization, as contained in the Schedule therein. When the requirements of a protocol apply, the requirements of Appendix 6 of the Environmental Impact Assessment Regulations, as amended, (EIA Regulations), promulgated under sections 24(5) and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), are replaced by these requirements.

The contents of this specialist report comply with the legislated requirements as described in the following environmental theme and associated specialist assessment protocols as listed in the projects' Screening Tool Report:

- ***Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity.***

National Environmental Management Act (NEMA) (107 of 1998; as amended), and the EIA regulations (as amended):

Although the Specialist Assessment Protocols (as listed above) supersedes this legislative requirement, the contents of this specialist report still comply with the legislated requirements as described in Appendix 6 of the National Environmental Management Act (No 107 of 1998; NEMA) Regulations of 2014 and updated in 2017 (GN R. 326 of 2017).

Other national legislation

Articles of legislation applicable to this proposed development includes:

Title of legislation or guideline	Administering authority	Applicability to the project
National Environmental Management Act (NEMA) Environmental Impact Assessment (EIA) Regulations 2014 as amended *(Act No. 107 of 1998)*	Department of Economic, Small Business Development, Tourism and Environmental Affairs (DESTEA)	The activity triggers activities listed in NEMA EIA Regulations
National Water Act, 1998 (Act No. 36 of 1998)	Department of Water & Sanitation (DWS)	Infrastructure may impact on existing surface water systems. Requirement for a Water Use License/ General Authorization is required.
Section 21 (i) of the National Water Act: Altering the bed, banks or characteristics of a water course	DWS	This form allows the applicant to provide information about their water use in respect of altering beds. Physical changes that are made to a water course, for example to widen or straighten the channel of a river. Alteration of the bed and banks is usually needed for construction and infrastructure development near or across a river. Sand mining is another common example of this water use. Alteration of the course of a watercourse refers to the diversion of the water course. The river channel is usually reconstructed or replaced with a canal which may extend for several kilometres from the original course.
Section 21 (c) of the National Water Act: Impeding or diverting the flow of water in a watercourse	DWS	Impeding or diverting flow does not cause any loss.
Government Notice 509 as published in the Government Gazette 40229 of 2016	DESTEA/DWS	Defines the area of a watercourse as: • the outer edge of the 1 in 100-year flood line and/or delineated riparian habitat, whichever is the greatest distance, measured from the middle of the watercourse of a river, spring, natural channel, lake or dam; • in the absence of a determined 1 in 100-year flood line or riparian area the area within 100 m from the edge of a watercourse where the edge of the watercourse is the first

		identifiable annual bank fill flood bench; or • a 500m radius from the delineated boundary (extent) of any wetland or pan in terms of this regulation.

Relevant Provincial and Metropolitan legislation include:

Title of legislation or guideline	Administering authority	Applicability to the project
Free-State Biodiversity Plan (FSBP; 2015)	DESTEA	Listing of freshwater CBAs and ESAs within the study site.
The National Freshwater Ecosystem Priority Areas (NFEPA) Project	DWS	Identification and classification of any sensitive river of wetland system within 500 m of the study site boundary.

1.4. Alternatives

No site or layout alternatives are proposed.

1.5. Public consultation

No consultation requirements were identified during the drafting of this specialist report. The findings of this report can be presented to stakeholders and I&APs as part of the BAR Public Participation Process (PPP).

No comments have been received to date on this report.

1.6. Objectives

The objectives of the project are listed below. These objectives are based on the requirements of each specialist protocol as listed in the DFFE Screening Report:

- Describe both the existing area as well as the area prior to construction in terms of its current ecological characteristics and the general sensitivity of these components to change.
- Confirm if there are any outright fatal flaws to the establishment of the proposal at its current location from a biodiversity perspective.
- Map all existing areas to be directly affected by the proposals in terms of its current and previous biodiversity sensitivity (constraints).
- Map all 'No-Go' areas.
- Describe the likely scope, scale, and significance of impacts (positive and negative) on biodiversity components of the area associated with the construction of the proposals.
- Make recommendations on the scope of any mitigation measures that may be applied during construction to avoid/reduce the significance of the identified construction-related impacts.
- Describe the likely scope, scale, and significance of impacts (positive or negative) on the biodiversity components associated with the operation or use of the proposals.
- Make recommendations on the scope of any mitigation measures that may be applied to avoid/reduce the significance of the operations-related impacts. These mitigation measures could also be design recommendations as well as operational controls, monitoring programmes, management procedures and the like.
- It will be particularly important to identify any rehabilitation measures that can be reasonably applied on the completion of the construction works.

- Broadly comment on the cumulative ecological impacts (positive or negative) associated with the construction and/or operation of the proposals.

It should be noted that only datasets and base data relevant to the study area and affected environmental features are discussed below.

1.7. Assumptions and limitations

- The report is based on currently available information and, as a result, limited by the information provided by the Client.
- The report is limited by seasonality as the presented data will be based on a single site survey ofthe site characteristics conducted within a single season (early spring) of a single year (2024).

1.8. Project Areas of Influence

The Project Area of Influence (PAOI) is defined according to important ecosystem processes and functions that may be plausibly affected by the proposed development and its associated activities. The PAOI sets the minimum spatial extent of the study area, and the assessment will be focused within this area. The following site descriptors were used to delineate each PAOI (Figure 1.2).

PAOI	Area (ha)	Description	Probability of impact occurring
Primary PAOI	6 (5m x 5m) boreholes = 150 square metres	The Primary PAOI includes all boreholes within the boundary of the development site. This is the area directly impacted by prospecting.	Definite
Secondary PAOI	500m buffer (228. 985 ha)	The secondary PAOI includes all areas within a 500 m buffer of the proposed development. These areas are not directly impacted by the development unless temporary footprints like site camps, laydown areas and stockpiles are placed in them. Assessing this PAOI will not only result in identifying potential indirect and cumulative impacts but will also allow for micro-movement of infrastructure.	Likely
Total PAOI	**229 ha**	**The Primary and Secondary PAOI's are collectively referred to as the Total PAOI (or just the PAOI) or Study Site in this report and demarcate the extent of the study site that will be assessed.**	**Likely**

Figure 1.2: Site map showing the project area of influence (PAOI) of the project

2. Approach and Methodology

The aim of this assessment is to identify areas of aquatic importance and to evaluate these in terms of their conservation importance. To do so, the aquatic sensitivity of the area is assessed. To a large extent, the condition and sensitivity of the vegetation will also determine areas with high biodiversity.

The study site and surrounding areas were assessed using a two-phased approach. Firstly, a desktop assessment of the site was conducted in terms of current biodiversity programmes and plans (listed further below).

Further to the above, a site visit was conducted on the 3rd - 4th May 2024. The site visit served to inform potential impacts associated with the proposed project and how significantly it would impact on the surrounding environment.

The aim of this study is to identify areas of high sensitivity and those that may be subject to significant impacts from the project. Aspects that would increase impact significance include:

- Riparian vegetation
- The presence of freshwater process areas.
- Aquatic corridors.
- Aquatic classification

2.1. Vegetation mapping

Mucina and Rutherford (2006) developed the National Vegetation Map (VegMap). The latest update of the VegMap took place in 2018. This map describes each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important. This is the most comprehensive data for vegetation types in South Africa. The conservation status of ecosystems was further extracted from the 2018 National Biodiversity Assessment Synthesis Report (South African National Biodiversity Institute (SANBI), 2019) and the National List of Ecosystems that are Threatened and in Need of Protection (GN 1002 of 9 December 2012).

2.2. Classification of Freshwater systems

The following datasets were used to identify, delineate, and classify any surface water bodies found within the study site or within 500 m of the study site:

Table 2.1: Legislation relevant to the identification, delineation, and classification of surface water bodies

Relevant legislation	Discussion
Department of Water Affairs and Forestry (DWAF) (2008): A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones.	Describing and delineating all watercourses with the study site.
GN 509 as published in the Government Gazette 40229 of 2016 as it relates to activities as stipulated in Section 21(c) and (i) of the National Water Act, 1998 (Act No. 36 of 1998)	Delineation of watercourses within 500 m of the study area.
Classification System for Wetlands and other Aquatic Ecosystems in South Africa. User Manual: Inland systems (Ollis et al., 2013)	Classification of all identified watercourses
Technical Report for the National Freshwater Ecosystem	Identification of FEPAs freshwater ecosystems.

Relevant legislation	Discussion
Priority Areas project (Nel et al., 2011)	

Wetland Assessments

The following definitions, as per the National Water Act, 1998 (Act No. 36 of 1998) are of relevance to this study:

Watercourse means:
(a) A river or spring;
(b) A natural channel in which water flows regularly or intermittently;
(c) A wetland, lake or dam into which, or from which water flows; and
(d) Any collection of water, which the Minister may, by notice of the Gazette, declare a watercourse.

Wetland means:
"*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*."

Riparian habitat includes:
"*The physical structure and associated vegetation of areas associated with a watercourse which are commonly characterised by alluvial soil, and which are inundated or flooded to an extent and with a frequency sufficient to support vegetation of species with a composition and physical structure distinct from those of adjacent land areas*".

There are many different types of wetlands; and a number of classification systems have been developed to try to describe these different types. The system used in this report has been developed for inland wetland systems, and is based on the hydrogeomorphic (HGM) characteristics of wetlands (Marneweck and Batchelor, 2002; Kotze et al., 2005)

This approach follows that used by the US Environmental Protection Agency, and this classification system has been included as part of a proposed wetland classification system for South African wetlands by Ewart-Smith et al (2006).

Wetlands can be classified by methods that range from the use of commonly recognized vegetation or cover types to systems based on hydrology, geomorphology, or some combination of the two. The classification presented here is based on the hydrogeomorphic functions of wetlands.

There are three basic properties that are used to provide insight into wetland functions. This hydrogeomorphic classification system classifies wetlands according to their form (geomorph-characteristics) and the way in which water moves in, through and out of the wetland system (hydro-characteristics). The classification system recognises 5 generic palustrine wetland types:

- Pans and depressions (incl. lakes);
- Seepage wetlands;
- Un-channelled valley bottoms;
- Channelled valley bottoms; and
- Floodplains.

Different wetlands perform different functions in the landscape.

Wetland delineation

The DWS (2005) guidelines for "a practical field procedure for delineation of wetlands and riparian areas" are recommended in Gazette No. 19182, Notice No. 1091 of the National Water Act, 1998. This guideline explains the field indicators and methods for determining whether an area is a wetland or a riparian area, and how to find its boundaries. Although the primary driver of a wetland is water, due to its dynamic nature water is not a very useful parameter for identifying the outer boundary of a wetland. What is needed is a method of identifying the indirect indicators of prolonged saturation by water. This includes wetland plants (hydrophytes) and wetland (hydromorphic) soils. Their presence or absence implies the frequency and duration of saturation and is a satisfactory indicator to classify the area as a wetland (DWAF, 2005).

In wetland delineation there are three zones which are distinguished according to a changing frequency of saturation. These are the permanent, seasonal and temporary zone. The primary objective of wetland delineation is usually to define the outer edge of the temporary zone as it marks the boundary between the wetland and the adjacent terrestrial zone. There are four important indicators that are used to define the boundaries of a wetland. The most important one is the soil wetness indicator with terrain unit, soil form and vegetation acting as confirmation. The point where wetland indicators are not present is regarded as the edge of the wetland.

The permanently wet zone is characterized by dark grey, clay soil, caused by a lack of oxygen required for the oxidation of minerals such as iron in the soil. The seasonally wet zone is characterized by grey soils with lots of orange and black mottles. It is generally recommended that there should be a 100m buffer zone between the edge of the delineated temporary zone and any development. Important indicators of each zone are as follows:

1. *Wetland vegetation*

To tolerate the anaerobic conditions of seasonal or permanent flooding, hydrophytes (water loving plants) have evolved several adaptations. Their presence can therefore indicate a moist soil habitat and thus provide a potential boundary of a wetland's seasonally flooded or permanent flooded zones (Macfarlane *et al*., 2007).

- The ***temporary zone*** of a wetland will show mainly grasses, some woody species and some sedges.
- The ***seasonal zone*** will begin to show more hydrophytic (or water loving) sedges with tall grasses (over 1m).
- The ***permanent zone*** will be noticeable by emergent reeds and sedges, bulrushes or floating and submerged plants. Woody species will have adaptations for permanent wetness such as prop roots (Mangroves).

2. *Wetland soils*

Low oxygen levels result in a reduced rate of organic matter decomposition within the soil, where sulphur tends to exist in its reduced form, hydrogen sulphide (H2S), noticeable by its tell-tale rotten-egg smell. These conditions also serve as a catalyst for the metals in the soil to become soluble and begin leaching (DWAF, 2005). The metals produce rich colours of yellow, orange and reds.

- The **temporary or seasonal zone** of a wetland, where there is more seasonal flooding, produces mottling of colours, as the metals are still in the process of precipitating. These mottles occur within a grey matrix where the metals have already leached.

- The **permanent zone** of a wetland, where there is more permanent flooding of the soil, produces leaching of metals, with soils remaining a grey ("gleyed") colour.
- It is recommended by DWS that soils be sampled on the surface (0-10cm) and between 40 and 50cm.

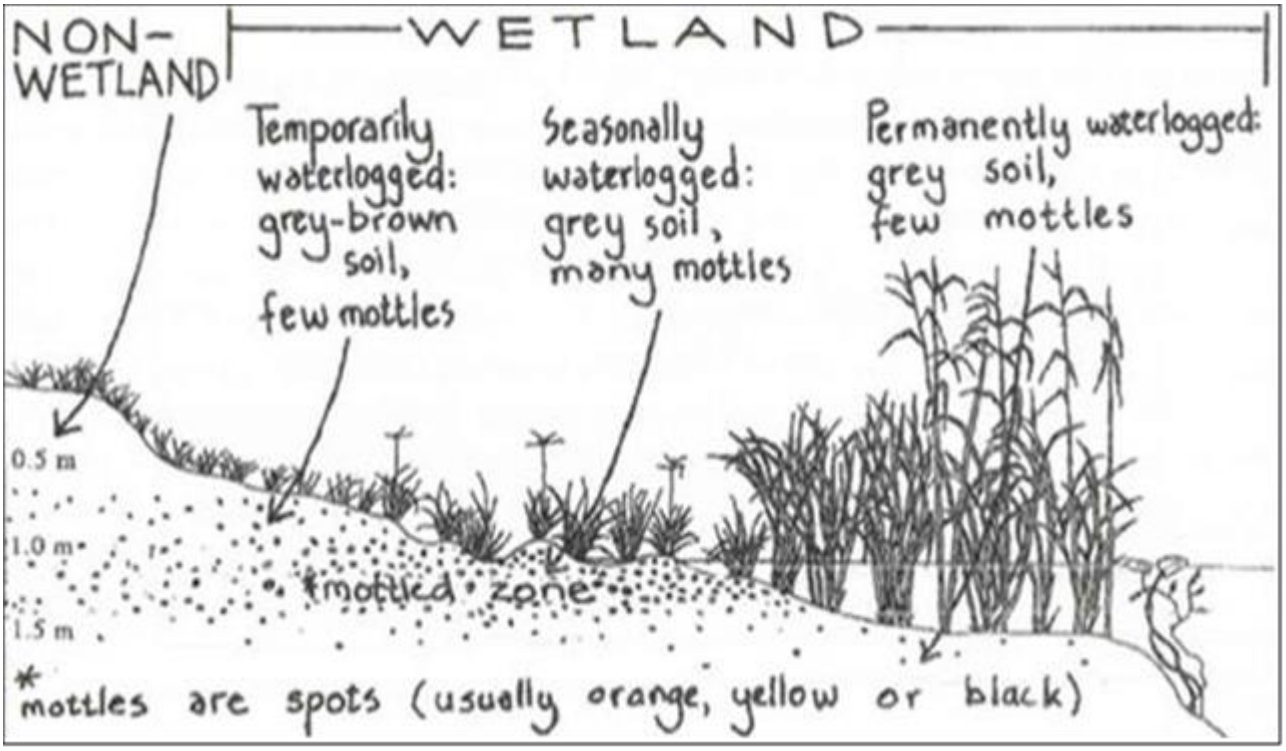

Figure 2.1: A cross-section through a wetland, indicating how the soil wetness and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (DWS, 2005).

Present Ecological Status

The Present Ecological State (PES) refers to the current state or condition of a watercourse in terms of all its characteristics and reflects the change to the watercourse from its reference condition. The results from such an assessment are compared to the standard DWAF A-F ecological categories (Table 2.2) from where the PES/Habitat integrity of the wetland can be determined. The values give an indication of the alterations that have occurred in the wetland system.

Table 2.2: Present Ecological Status categories of wetlands (adapted from Kleynhans, 1996 and 1999)

Ecological Category	Score	Description
A	90-100%	Unmodified, natural
B	80-90%	Largely natural with a few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged.
C	60-80%	Moderately modified. Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	40-60%	Largely modified. A large loss of natural habitat, biota and basic ecosystem functions is extensive.
E	20-40%	Seriously modified. The loss of natural habitat, biota and basic ecosystem functions is extensive.

Ecological Category	Score	Description
F	20-40%	Critically/ Extremely modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat and biota. In the worst instances the basic ecosystem functions have been destroyed and the changes are irreversible.

Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) of a watercourse is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration.

Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The ecological importance and sensitivity categories are indicated in Table 2.3.

Table 2.3: Ecological Importance and Sensitivity Categories of Wetlands.

EIS Categories	Description
Low/Marginal	Not ecologically important and sensitive at any scale. Biodiversity ubiquitous and not sensitive to flow and habitat modifications. (Wetlands: play an insignificant role in moderating water quality and quantity.
Moderate	Ecologically important and sensitive on provincial/local scale. Biodiversity not usually sensitive to flow and habitat modifications. (Wetlands: play a small role in moderating water quantity and quality)
High	Ecologically important and sensitive. Biodiversity maybe sensitive to flow and habitat modifications. (Wetlands: play a role in moderating water quantity and quality).
Very High	Ecologically important and sensitive on a national (or even international) level. Biodiversity usually very sensitive to flow and habitat modifications. (Wetlands: play a major role in moderating water quantity and quality.)

Aquatic ecosystem means: an ecosystem that is permanently or periodically inundated by flowing or standing water, or which has soils that are permanently or periodically saturated within 0.5 m of the soil surface.

Based on these definitions, for the purpose of the Classification System in this report, wetlands are considered to be a type of aquatic ecosystem because it is the presence of water at some stage (either permanently or periodically, sometimes rather ephemerally) that distinguishes a wetland ecosystem from a terrestrial ecosystem. Besides wetlands, as defined above, aquatic ecosystems are taken to also include rivers; lakes, ponds, dams and other open waterbodies; estuaries; and (shallow) marine systems. In terms of the legal definition (National Water Act, 1998), it is sometimes difficult to determine whether a particular aquatic ecosystem is a 'wetland'. This does not hamper the use of the Classification System in this report, because no such distinction is made in the application of the Classification System.

In essence, the ecosystems included in the Classification System (i.e. all aquatic ecosystems, including wetlands, except for deep marine systems) encompass those that the Ramsar Convention defines, rather broadly, as 'wetlands', namely, "areas of marsh, fen, peatland or water, whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six metres" (cited by Ramsar Convention Secretariat 2011).

South Africa is a geologically, geomorphologically, climatically, and ecologically complex country, and this has resulted in a diverse range of ecosystems, including rivers and wetland areas. To classify these aquatic ecosystems, this report used the Classification System for Wetlands and other Aquatic Ecosystems in South Africa User Manual (Olis *et al*; 2013).

This classification system is a hierarchical system that classifies al aquatic systems into levels as per Table 2.4:

Table 2.4: Aquatic system classification levels

Level 1: System setting	Inland systems		Estuarine systems		Marine systems		
Level 2: Regional setting	DWS Ecoregions		NFEPA Wetveg Groups		Other spatial frameworks		
Level 3: Landscape units	Valley floor		Slope		Plain		Bench
Level 4: Hydrogeomorphic (HGM) unit	River	Floodplain wetland	Channelled valley-bottom wetland	Unchanneled valley-bottom wetland	Depression	Seep	Wetland flat
Level 5: Hydrological regime	Perennially		Period and depth of inundation		Period of saturation		
Level 6: Descriptors	Natural vs Artificial	Salinity	pH	Substratum type	Vegetation cover type	Geology	

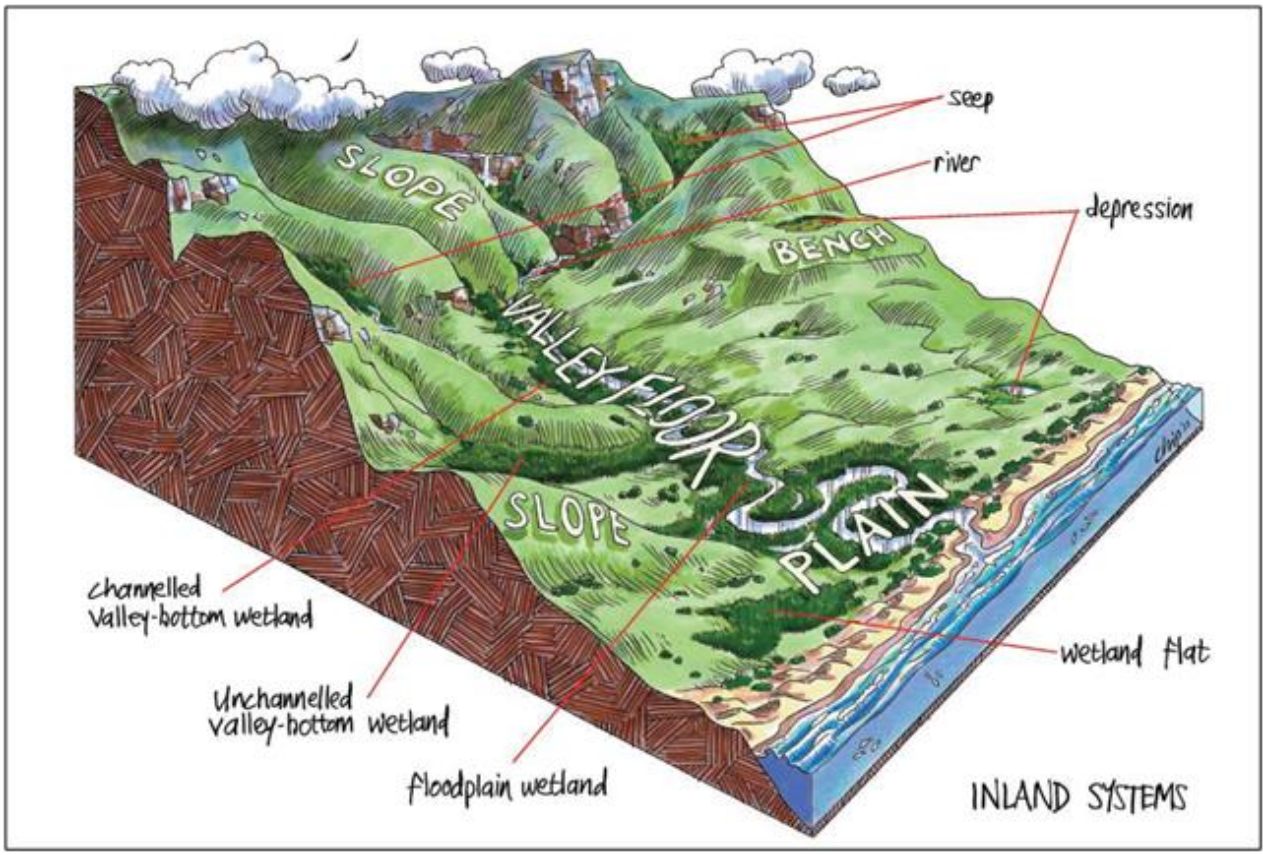

Figure 2.2: Illustration of the seven primary HGM units and their typical landscape settings (Ollis et.al, 2013).

2.3. Aquatic Biodiversity

The Free State Biodiversity Plan (FSBP; 2015) is a spatial planning tool that includes a map of biodiversity importance for the Free State Province. The plan delineates biodiversity priority features which require safeguarding to ensure the persistence of biodiversity, ecosystem functioning, and ecosystem services through a systematic conservation planning process. The FSBP (2015) identifies five broad categories including Protected Areas (PAs), Critical Biodiversity Area (CBAs) (including Irreplaceable and Optimal), Ecological Support Areas (ESAs), Other, and Degraded Areas. It is important to note that Biodiversity Sector Plans are developed at relatively coarse scales using the best available spatial data. These maps therefore need to be verified at project level and the appropriate land use recommendations applied.

All features were grouped into the following biodiversity categories as listed in the FSBP (2015):

Table 2.5: Biodiversity categories as per the FSBP (2015)

Mapping Category	Critical Biodiversity Area Name
Protected areas (PA)	Protected Areas are areas that have been formally declared or recognized in terms of NEMPAA. This refers to "*State owned*" reserves, which includes National PAs managed by SANParks, Provincial PAs managed by Eastern Cape Parks and Tourism Agency, municipal reserves, Private Nature Reserves, and Protected Environments. Several municipal and provincial reserves have not been formally proclaimed under any legislation but are zoned accordingly in relevant Spatial Development Frameworks and are recognized as de facto Protected Areas.
Critical Biodiversity Area (CBA)	CBA's are areas of high biodiversity value. They are categorised into two groups namely "CBA Irreplaceable" and "CBA Optimal". **CBA Irreplaceable:** A site that is irreplaceable or near-irreplaceable for meeting biodiversity targets. There are no or very few other options for meeting biodiversity targets for the features associated with the project area. Such sites are therefore critical, and they need to be maintained to ensure that features targets are achieved and that such features persist. **CBA Optimal:** A site that has been selected based on its complementarity for meeting biodiversity targets. CBA Optimal sites are therefore important, but their maintenance is not critical to ensure that features targets are achieved and that such features persist.
Ecological Support Area (ESA)	ESAs play an important role in supporting the ecological functioning of a protected area or Critical Biodiversity Area, or in delivering ecosystem services. In most cases ESAs are currently in at least fair ecological condition and should remain in at least fair functioning condition. ESA's are categorised into two Categories namely **ESA 1** (sites with minimal degradation) and **ESA 2** (sites that have been degraded but not totally transformed)
Other areas	Other areas are areas of natural habitat not required to meet biodiversity targets for ecosystem types, species or ecological processes, i.e. natural areas not selected as CBA or ESA.
Degraded areas	Degraded areas are portions of land that are not in climax condition due to factors other than physical disturbance.

2.4. Environmental Screening Tool

The National Web based Environmental Screening Tool is a geographically based web-enabled application which allows a proponent intending to apply for environmental authorization in terms of the Environmental Impact Assessment (EIA) Regulations 2014, as amended to screen their proposed site for any environmental sensitivity.

The Screening Tool also provides site specific EIA process and review information, for example, the Screening Tool may identify if an industrial development zone, minimum information requirement, Environmental Management Framework or bio-regional plan applies to a specific area.

Some of these documents can then be accessed through the Screening Tool via links, for consideration during screening.

Further to this, the Screening Tool identifies related exclusions and/ or specific requirements including specialist studies applicable to the proposed site and/or development, based on the national sector classification and the environmental sensitivity of the site.

Finally, the Screening Tool allows for the generating of a Screening Report referred to in Regulation 16(1)(v) of the Environmental Impact Assessment Regulations 2014, as amended whereby a Screening Report is required to accompany any application for Environmental Authorization and as such the tool has been developed in a manner that is user friendly and no specific software or specialized GIS skills are required to operate this system.

2.5. Site sensitivity

The screening tool has identified species and ecosystem spatial triggers likely to indicate environmental sensitivity associated with a particular proposed development site, which in turn determined the necessity and requirements for conducting a Terrestrial Biodiversity Assessment.

Section 5 of this report identified and mapped zones of Site Ecological Sensitivity (SEI) within each PAOI. These zones are based on initial sensitivity identification in the Screening Report, followed by a site inspection of the entire PAOI and a detailed assessment of the area.

2.6. Impact assessment

The impacts that may result from the planning and design phase, construction phase, operation phase of the proposed broiler facility was assessed according to several criteria to arrive at an overall significance rating. The criteria used were as follows (based on DEAT 2002 - Impact Significance, IEM Information Series 5; and DEAT 2006 - Assessment of Alternatives and Impacts in support of the EIA Regulations, IEM Guideline Series 5):

Table 2.15: Criteria used in determining significance ratings to potential impacts

ASPECT	IMPACT RATING
Status of the Impact	A statement of whether the impact is positive (a benefit), negative (a cost), or neutral
Direct impact	Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
Indirect Impacts	Indirect impacts are not a direct result of the project but are often produced away from or because of a complex impact pathway related to the project.
Cumulative Impacts	Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of the past, present, or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

<table>
<tr><th>ASPECT</th><th>IMPACT RATING</th></tr>
<tr><td>Nature of the Impact</td><td>The evaluation of the nature is impact specific. Most negative impacts will remain negative, however, after mitigation, significance should reduce to:
➢ Positive
➢ Negative</td></tr>
<tr><td>Extent</td><td>A description of whether the impact would occur on a scale limited to within the study area (local), limited to within 5 km of the study area (area) on a regional scale. i.e. the Nelson Mandela Metro & Eastern Cape (Region); or would occur on a national or international scale.
<table>
<tr><td>Local</td><td>1</td></tr>
<tr><td>Area</td><td>2</td></tr>
<tr><td>Regional</td><td>3</td></tr>
<tr><td>National</td><td>4</td></tr>
<tr><td>International</td><td>5</td></tr>
</table></td></tr>
<tr><td>Duration</td><td>A prediction of whether the duration of the impact would be immediate and once-off (less than one month), more than once, but short term (less than one year), regular, medium term (1 to 5 years), long term (6 to 15 years), project life/permanent (> 15 years, with the impact ceasing after the operational life of the development or should be considered as permanent).
<table>
<tr><td>Immediate</td><td>1</td></tr>
<tr><td>Short term</td><td>2</td></tr>
<tr><td>Medium term</td><td>3</td></tr>
<tr><td>Long term</td><td>4</td></tr>
<tr><td>Project life/permanent</td><td>5</td></tr>
</table></td></tr>
<tr><td>Intensity</td><td>This provides an order of magnitude of whether or not the intensity (magnitude/size/frequency) of the impact would be negligible, low, medium, high or very high. This is based on the following aspects:
➢ An assessment of the reversibility of the impact (permanent loss of resources, or impact is reversible after project life;
➢ Whether or not the aspect is controversial;
➢ An assessment of the irreplaceability of the resource loss cause by the activity (whether the project will destroy the resources which are easily replaceable, or the project will destroy the resources which are irreplaceable and cannot be replaced;
➢ The level of alteration to the natural system, processes or systems.
<table>
<tr><td>Negligible</td><td>The impact does not affect physical, biophysical or socio-economic functions and processes.</td><td>1</td></tr>
<tr><td>Low/potential harmful</td><td>The impact has limited impacts on physical, biophysical or socio-economic functions and processes.</td><td>2</td></tr>
<tr><td>Medium/slightly harmful</td><td>The impact has an effect on physical, biophysical or socio-economic functions and processes, but in such a way that these processes can still continue to function albeit in a modified fashion.</td><td>3</td></tr>
<tr><td>High/harmful</td><td>Where the physical, biophysical or socio-economic functions and processes are impacted on in such a way as to cause them to temporarily or permanently cease.</td><td>4</td></tr>
<tr><td>Very high/disastrous</td><td>Where the physical, biophysical or socio-economic functions and processes are highly impacted on in such a way as to cause them to permanently cease.</td><td>5</td></tr>
</table></td></tr>
</table>

Based on a synthesis or combination of the information contained in the above-described criteria; and drawing on legal policies and guidelines as well as the status of the impacts and potential risks, the overall significance were determined as follows:

Table 2.4: Definition of significance ratings (positive and negative)

Significance	Description
Very high (VH)	An impact of very high significance will mean that the project cannot proceed, and that impacts are irreversible, regardless of available mitigation options.
High (H)	An impact of high significance which could influence a decision about whether to proceed with the proposed project, regardless of available mitigation options.
Medium-high (MH)	If left unmanaged, an impact of medium-high significance could influence a decision about whether to proceed with a proposed project. Mitigation options should be re-evaluated at.
Medium (M)	If left unmanaged, an impact of medium significance could influence a decision about whether to proceed with a proposed project.
Low-Medium (LM)	An impact of Low-medium significance would have some effect during decision making about whether to proceed with a proposed project, however, mitigation for this type of impact would be minimal.
Low (L)	An impact of low significance would have little effect on decision making and only a small influence on project design or alternative motivation.
Very low (VL)	An impact of very low significance is likely to contribute to positive decisions about whether to proceed with the project. It will have little effect and is unlikely to have an influence on project design or alternative motivation.
Negligible / zero impact	There will be no impact, or any impact identified can be viewed as negligible. This rating will be unlikely to have an influence on project design or alternative motivation.
Positive impact (+)	A positive impact is likely to result in a positive consequence/effect and is likely to contribute to positive decisions about whether to proceed with the project.

3. Site assessment

This chapter compares baseline information with field survey data collected. A site visit was conducted on the 3rd and 4th May 2024. Data collected during the site visit was then compared to existing literature for the site which included vegetation classifications and biodiversity programs and plans.

3.1. Topography

The landscape within the project site is relatively flat but elevation does increase slightly from the south to north through the Total PAOI. The highest point of elevation is found north of the project site at 1345 meters above sea level (m.a.s.l.) while the lowest point of elevation can be observed south of the project site at 1340 m.a.s.l (Fig 3.1).

Figure 3.1: Contour map of the proposed project site and surrounding areas

3.2. Local climate

Bothaville, the nearest town with climate data, has an average daily high temperature above 28.3 °C. The hottest month of the year is January, with an average high of 30 °C and low of 17 °C. The average daily high temperature during winter is below 22°C. The coldest month of the year is June, with an average low of 2°C and high of 19°C.

3.3. Geology and Soils

Rocks found within the study site are dominated by Vryheid Formation. This formation has been subdivided into three different lithofacies arrangements. They are dominated by fine-grained mudstone, carbonaceous shale with alternating layers of bituminous coal seams, and coarse-grained, bioturbated immature sandstones respectively. The rock sediments are predominantly arranged in upward-coarsening cycles, although some fining-upward cycles are found in this formation's easternmost deposits. The alternating rock types observed in the Vryheid Formation indicate seasonal variations of storms and fairer weather in a pro-delta setting. The carbonaceous shales were formed below the water surface in anoxic conditions and the coal formed from compacted plant matter deposited at the bottom of peat swamps.

3.4. Land-Use

Current land use has been determined and the entire study area consists of cultivated land as well as grassland. The land is currently being used for cattle grazing and agriculture (maize farming). Wetlands can be observed north-west as well as south of the study site. No signs of alien vegetation can be observed on site with some vegetation been degraded due to grazing. Signs of high impact grazing is evident.

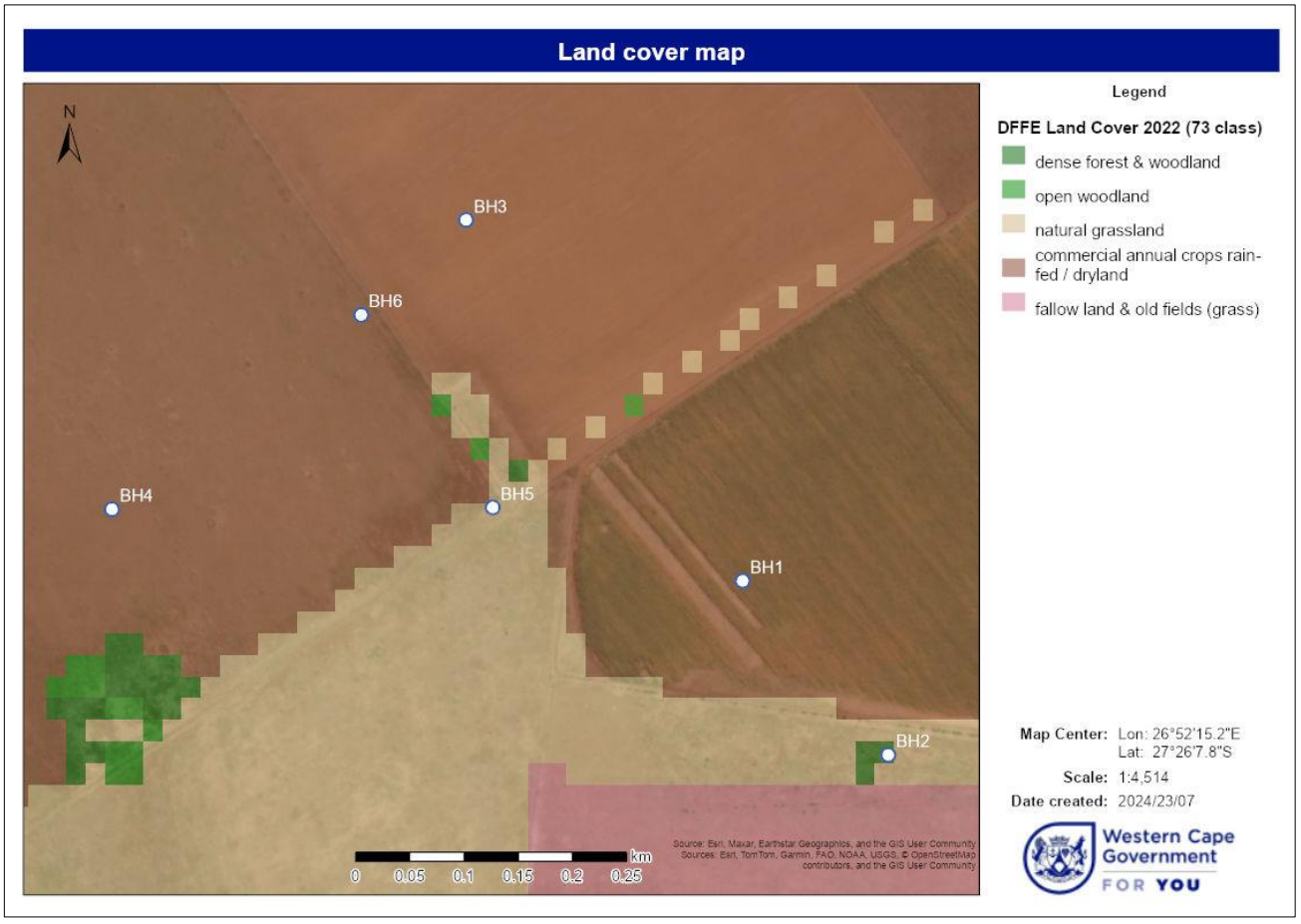

Figure 3.3: Land cover map of the proposed project site and surrounding areas.

Below are photographs illustrating the land cover and land uses for the study site and surrounding areas.

Landscape where boreholes are to be drilled is flat grassland.	Cattle can be observed on site.
	
A wet area signifying a drainage which can be observed on site, with one of the wetlands found further north.	The landscape is also being used for maize farming.
	

3.5. Vegetation

The South African National Biodiversity Institute (SANBI) vegetation map (called the VegMap, 2022) lists the proposed activity within a single vegetation unit (Figure 3.2) namely **Vaal-Vet Sandy Grassland.**

Vaal-Vet Sandy Grassland occurs within the North-West and Free-State Provinces: South of Lichtenburg and Ventersdorp, stretching southwards to Klerksdorp, Leeudoringstad, Bothavilleand to the Brandfort area north of Bloemfontein. Altitude 1220 – 1560m, generally 1260 – 1360m. Vegetation and landscape features are characterized by Plains-dominated landscape with some scattered, slightly irregular undulating plains and hills. Mainly low-tussock grasslands with an abundant karroid element. Dominance of *Themeda triandra* is an important feature of this vegetation unit. Locally low cover of *T. triandra* and the associated increase in *Elionurus muticus*, *Cymbopogon pospischilii* and *Aristida congesta* is attributed to heavy grazing and/or erratic rainfall. SANBI considers this vegetation type as **Endangered** with about 0.3% statutorily conserved in the Bloemhof Dam, Schoonspruit, Sandveld, Faan Meintjies, Wolwespruit and Soetdoring Nature Reserves. More than 63% transformed for cultivation (ploughed for commercial crops) and the rest under strong grazing pressure from cattle and sheep. Erosion very low.

3.6. Aquatic biodiversity

According to the Free-State Biodiversity Plan (2015) areas south-east of the study site occurs within a CBA1. The rest of the study site occurs within an Ecological Support Area (ESA1) (Figure 3.5). Two wetlands and one non-perennial drainage were found within this ESA1 in the Total PAOI.

ESA's are important in supporting the functioning of CBAs and are often vital for delivering ecosystem services. ESA 1 are areas in a natural condition that are required to meet biodiversity targets, for species, ecosystems or ecological processes and infrastructure. ESA 2 are areas that are not essential for meeting biodiversity targets but are targeted for restoration and play an important role in supporting the functioning of protected areas (PAs) or CBAs and are often vital for delivering ecosystem services.

The vegetation on site has been transformed due to grazing and agricultural crops. Wet vegetation can be observed at the non-perennial drainage which is situated west of borehole four. Wetland one had riparian vegetation present such as rushes, with wetland two absent of any wet vegetation. Due to borehole four being near the non-perennial drainage with the chance of it being impacted high, it is recommended that borehole four be moved to outside the river regulated area. Because the wetlands are found within the Secondary PAOI, it will not be directly impacted upon due to its proximity (500m of) the development footprint. The impact on biodiversity will be low, posing no threat to the ecological functioning of the drainage systems or associated wetlands.

If development occurs within 100m of a river or 500m of a wetland, it will trigger an approval requirement from DWS.

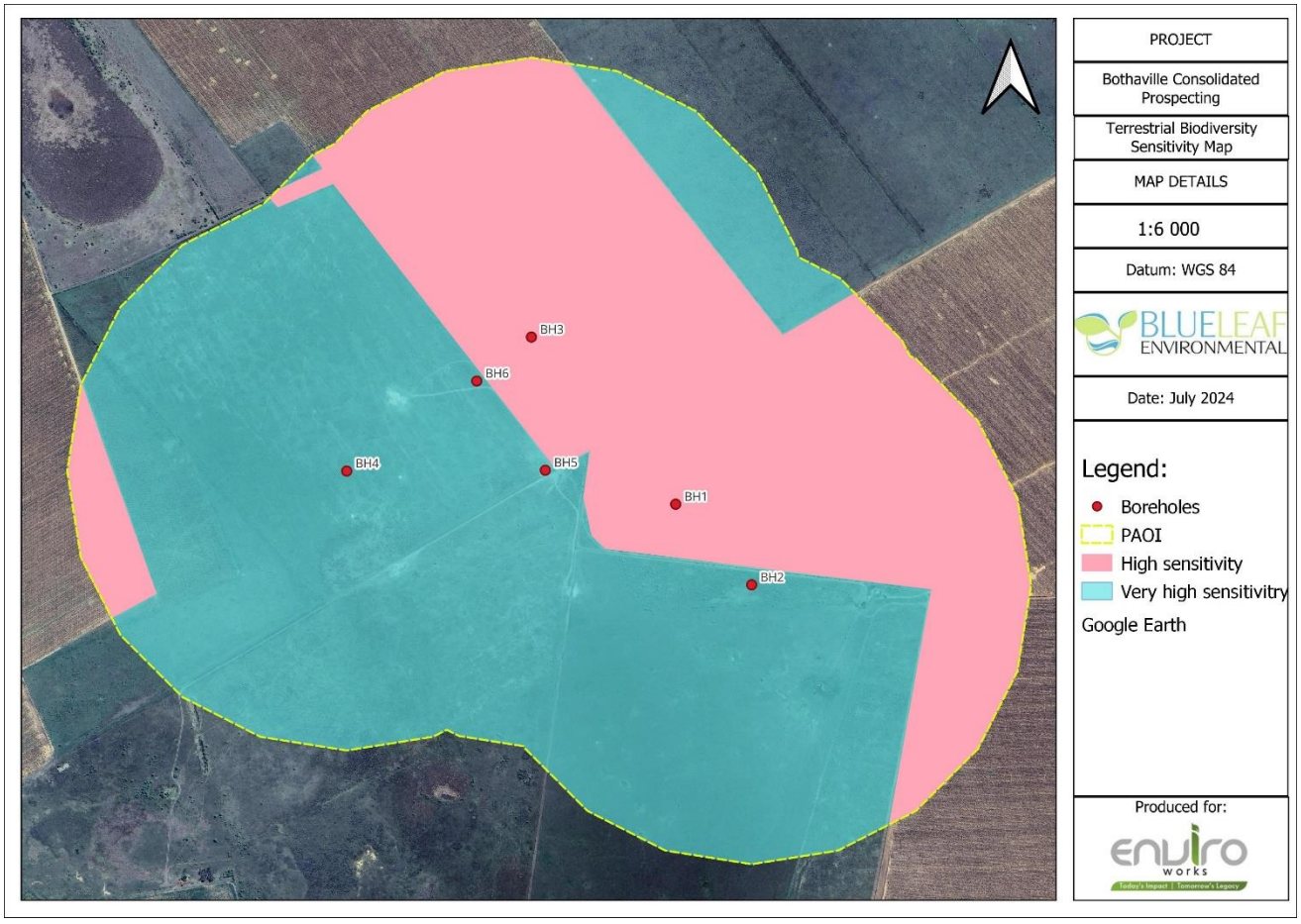

Figure 3.4: Biodiversity map of the study area (Free-State Biodiversity Plan, 2015)

3.7. Freshwater classification

South Africa is a geologically, geomorphologically, climatically, and ecologically complex country, and this has resulted in a diverse range of ecosystems, including rivers. The area investigated included the study site and a 500 m buffer area around the study site. No wetlands and one non-perennial drainage were observed within the Secondary PAOI (Figure 3.5.). The drainage system is considered ephemeral and is classified as a non-perennial drainage. The two wetlands that were observed are considered artificial and natural wetlands.

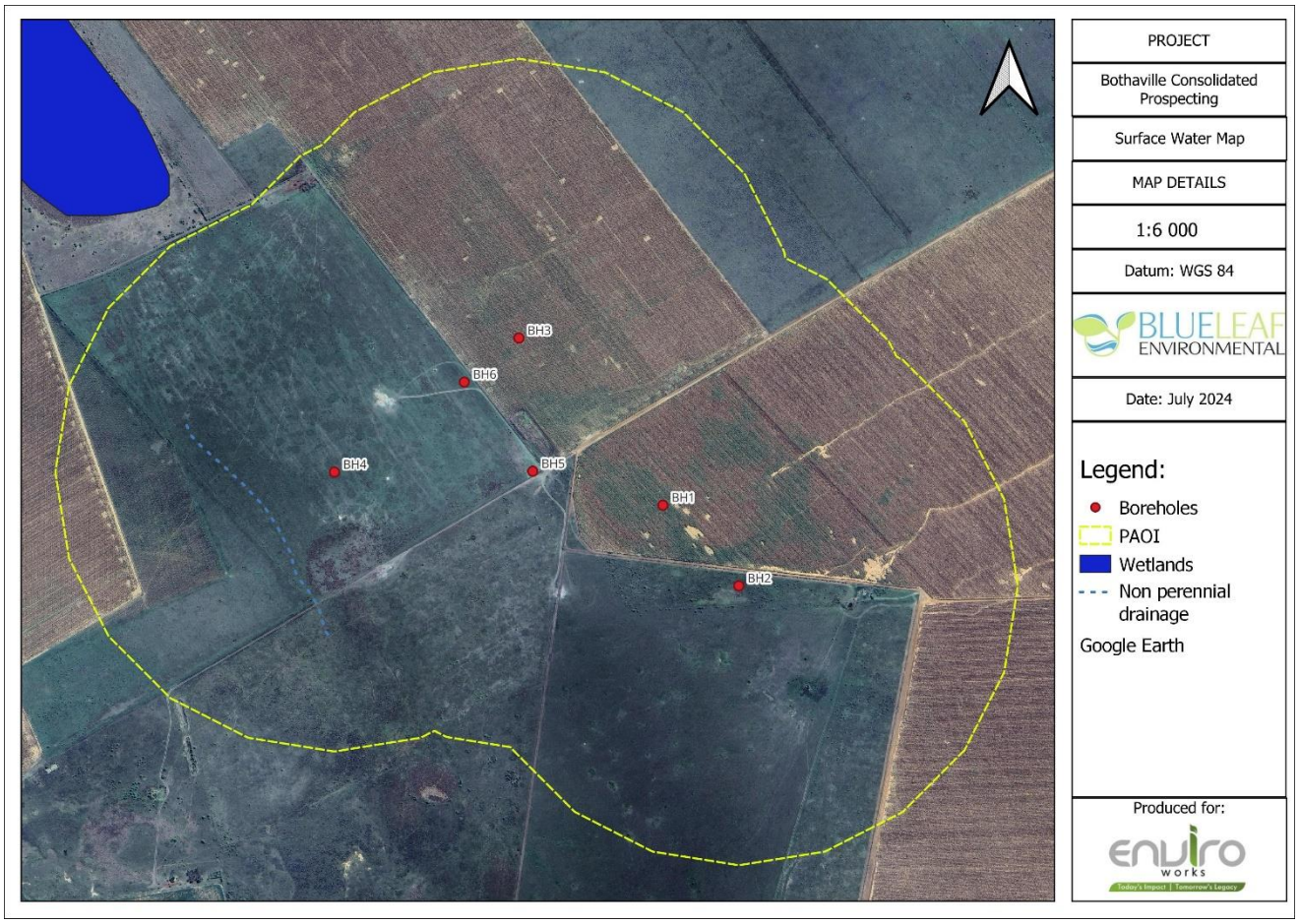

Figure 3.5: Wetlands and non-perennial drainage identified within the Secondary PAOI.

3.7.1. Level 1: System setting

Aquatic features within the PAOI are all classified as Inland Systems. An Inland System is defined as an aquatic ecosystem with no existing connection to the ocean. These ecosystems are characterized by the complete absence of marine exchange and/or tidal influence.

Two types of Inland Systems have been identified on site:

1. **Rivers**, which are 'lotic' aquatic ecosystems with flowing water concentrated within a distinct channel, either permanently or periodically. One distinctive system was identified, namely: one unnamed non-perennial drainage found within the Secondary PAOI.

2. **Wetlands,** which are transitional between aquatic and terrestrial systems, and are generally characterized by (permanently to temporarily) saturated soils and hydrophytic vegetation. These

areas are, in some cases, periodically covered by shallow water and/or may lack vegetation. No wetlands were found within the Secondary PAOI.

3.7.2. Level 2: Regional setting

Various spatial frameworks can be used to categorize the regional setting of an Inland System. Both the DWS Ecoregions as well as the NFEPA WetVeg groups will be used in this report. Ecoregions describes aquatic systems in the context of national water resource management while the NFEPA WetVeg, as a provincial vegetation map are appropriate for fine-scale wetland conservation planning.

Ecoregions

River ecoregional classification or typing allows the grouping of rivers according to similarities based on a top-down nested hierarchy. The principle of river typing is that rivers grouped together at a particular level of the typing hierarchy will be more like one another than rivers in other groups. Ecological regions are regions within which there is relative similarity in the mosaic of ecosystems and ecosystem components (biotic and abiotic, aquatic, and terrestrial). According to the DWS Level 1 River Ecoregional Classification System (DWS; 2005), the study area falls within **Ecoregion 11: Highveld**. This region has plains with a moderate to low relief, as well as various grassland vegetation types (with moist types present towards the east and drier types towards the west and south). This is a high lying region.

Several large rivers have their sources in the region, e.g. Vet, Modder, Riet, Vaal, Olifants, Steelpoort, Marico, Crocodile (west), Crocodile (east) and the Great Usutu.

This ecoregion has the following characteristics:

- ***Mean annual precipitation:*** Rainfall varies from low to moderately high, with an increase from west to east.
- ***Coefficient of variation of annual precipitation:*** Moderately high in the west, decreasing to low in the east.
- ***Drainage density:*** Mostly low, but medium in some areas.
- ***Stream frequency:*** Low to medium
- ***Slopes:*** <5%: >80%, but 20-50% in a few hilly areas.
- ***Median annual simulated runoff:*** Moderately low to moderate.
- ***Mean annual temperature:*** Hot in the west and moderate in the east.

Quaternary Catchment

The project area is located within the C60J quaternary catchment. The main aquatic feature within this catchment is the one unnamed non-perennial drainage and two wetlands all situated within the Secondary PAOI.

This quaternary catchment forms part of the Vaal-Orange Water Management Area (WMA2023) that is considered to be important as a freshwater ecosystem priority area. Combined with the Vaal River system, the Orange drains almost two thirds of the interior plateau of the country. Major rivers found in the Orange River system include the Modder, Riet, Kraai and Caledon Rivers. The Orange River is also an international resource shared by four countries i.e. Lesotho, South Africa, Botswana and Namibia.

NFEPA WetVeg

The Vegetation Map of South Africa, Swaziland and Lesotho (Mucina & Rutherford; 2018) groups vegetation types across the country according to Biomes (for example, Grassland or Savanna), which are then divided into Bioregions. To categorise the regional setting for the wetland component of the NFEPA project, wetland vegetation groups (referred to as WetVeg Groups) were derived by further splitting Bioregions into smaller groups through expert input. There are currently 133 NFEPA WetVeg Groups in South Africa.

The entire study area is located within the **Dry Highveld Grassland Bioregion** which is classified as Poorly Protected. The conservation value of the vegetation types is as per Mbona et al. (2015).

Wetlands
No wetlands occur within the Secondary PAOI.

Rivers
As per the NFEPA database (2011), there are no rivers within the study site, although an unnamed non-perennial drainage can be observed west of borehole four. The unnamed non-perennial drainage is located within the Secondary PAOI. The unnamed non-perennial drainage is in a moderately modified **(Class C)** ecological condition according to the PES 1999 and the NFEPA Dataset (2011).

3.7.3. Landscape Setting

Landscape settings are included because hydrological and hydrodynamic processes acting within a specific Inland System are strongly influenced by their topographical positions within the landscape, and by the geomorphological processes that have brought about and drive those topographical contexts. The following regional landscape units were determined for each of the freshwater features founds within the PAOI:

Water feature (as in Figure 3.7)	Level 3: Landscape setting
Unnamed non-perennial drainage	Plain

3.7.4. Level 4: HGM Unit

Level 4 of the Classification System allows you to identify the Hydrogeomorphic (HGM) Units within an inland aquatic ecosystem. HGM Units are distinguished primarily on the basis of:

1. Landform, which defines the shape and localised setting of the aquatic ecosystem.
2. Hydrological characteristics, which describe the nature of water movement into, through and out of the aquatic ecosystem.
3. Hydrodynamics, which describe the direction and strength of flow through the aquatic ecosystem.

Of the seven primary HGM Types, only rivers and wetlands are recognized within the Secondary PAOI and are categorized as follows:

HGM TYPE	Longitudinal Zonation/Landform/ Outflow Drainage	Landform/Inflow Drainage	Diagnostic channel characteristics
A	B	C	
One unnamed non-perennial drainage (Fig 3.5.)	Lowland River	N/A	Low-gradient, alluvial sand-bed channel, typically regime reach type. Often confined, but fully developed meandering pattern within a distinct floodplain develops in unconfined reaches where there is an increase in silt content in bed or banks.

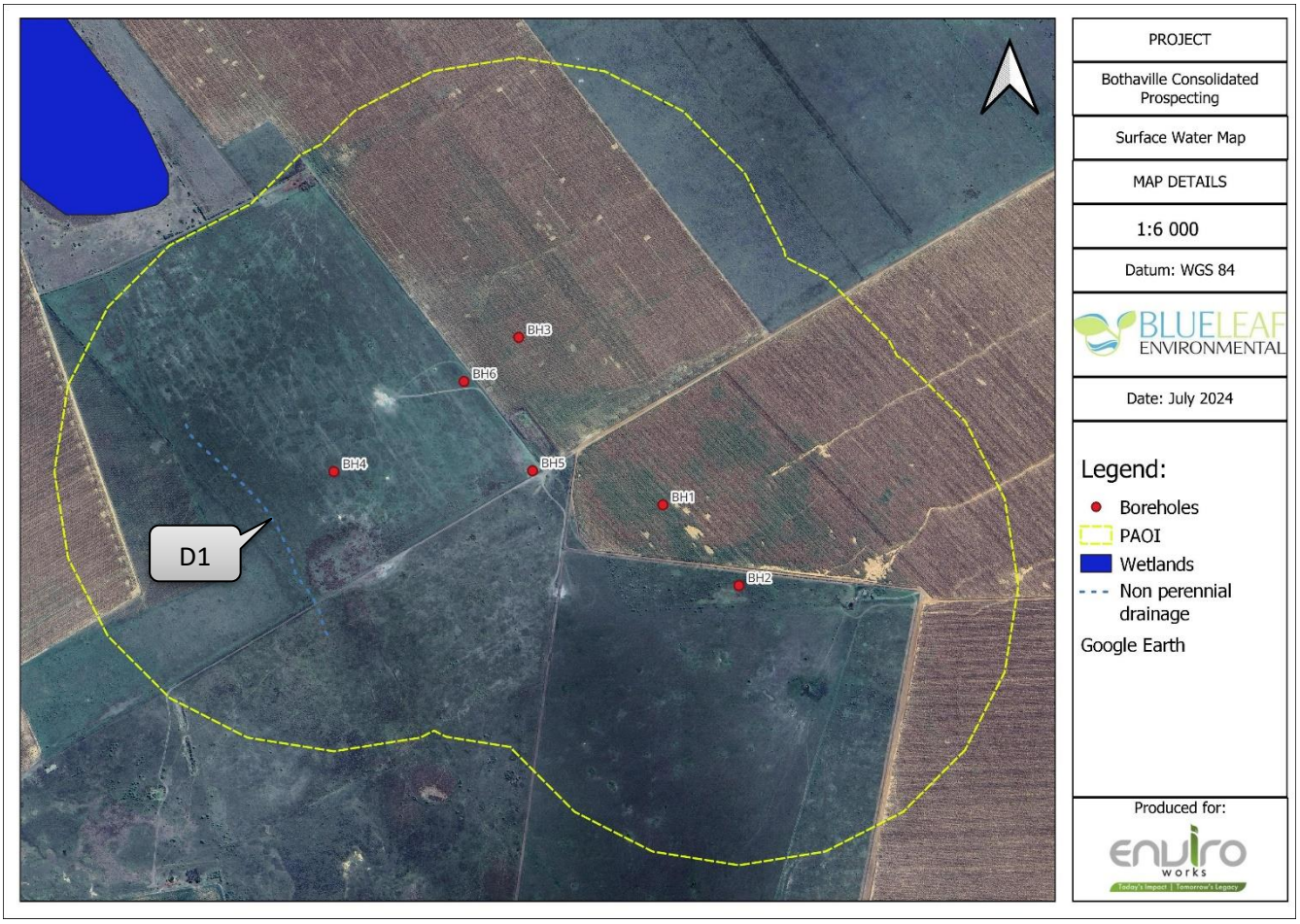

Figure 3.6: All surface water features and their classification within the Total PAOI.

3.7.5. Level 5: Hydrological regime

While the HGM Unit is influenced by the source of water and how it moves into, through and out of an Inland System, the hydrological regime describes the behavior of that water within the system and, for wetlands, in the underlying soil.

River flow-types (flow regimes)	Description
Perennial	Flows continuously throughout the year, in most years
Non-Perennial	Does not flow continuously throughout the year, although pools may persist. Flow regime is unpredictable.

One unnamed non-perennial drainage was identified west of the Secondary PAOI (Fig 3.6). This non-perennial drainage does not flow in any particular direction but merely becomes wet/inundated with

water during periods of heavy rainfall.

3.7.5.1. Hydroperiod categories (for non-river inland systems)

No wetlands occur within the PAOI

3.7.6 Level 6: Descriptors

Descriptors describe the structural/chemical/biological characteristics. The following table defines the relevant descriptors within the Total PAOI:

Descriptors	Description	Classification
Natural vs Artificial	➢ One natural unnamed non-perennial drainage was identified (Fig 3.6)	Natural river (drainage)
Geology	Refer to section 3.3	Aeolian and colluvial sand overlying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group) as well as older Ventersdorp Supergroup andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh and Clovelly. Dominant land type Bd, closely followed by Bc, Ae and Ba.
Vegetation cover	Refer to section 3.5	According to the 2018 SANBI Vegetation map the site is covered by one vegetation unit (Figure 3.4) namely: ➢ Vaal-Vet Sandy Grassland.

Below table is a summary of all the freshwater classification levels identified in the PAOI for the site:

Table 3.1 Summary of the freshwater environment

Water feature (as in Figure 3.6)	Level 1: System Setting	Level 2: Regional setting	Level 3: Landscape setting	Level 4: HGM Unit	Level 5: Hydrological regime (inundation periodicity)	Level 6: Descriptors
One Unnamed non-perennial drainage	Inland system: River	**Ecoregion:** Ecoregion 11: Highveld **Quaternary Catchment:** C60J **Veg:** Vaal-Vet Sandy Grassland	Plain			Natural

3.8 Riverine Assessment

Below follows a further assessment of the riverine systems identified on site.

3.8.1 Ecological Importance and Sensitivity (EIS)

The Ecological Importance and Sensitivity (EIS) of a watercourse is an expression of its importance to the maintenance of ecological diversity and functioning on local and wider scales, and both abiotic and biotic components of the system are taken into consideration. Sensitivity refers to the system's ability to resist disturbance and its capability to recover from disturbance once it has occurred. The drainage found within the Secondary PAOI, is categorized as **Moderate**, which is ecologically important and sensitive on provincial/local scale. Biodiversity not usually sensitive to flow and habitat modifications.

3.8.2. Present Ecological States (PES)

The Present Ecological State (PES) refers to the current state or condition of a watercourse in terms of all its characteristics and reflects the change to the watercourse from its reference condition. The PES for the unnamed non-perennial drainage (NOT NFEPA Classified) has been determined and is classified as **Class C – Moderately modified** which means a loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.

Indicators	Descriptions
Landscape	
Topography	The landscape within the project site is relatively flat but elevation does increase slightly from the south to north through the Primary PAOI. The highest point of elevation is found north of the project site at 1345 meters above sea level (m.a.s.l.) while the lowest point of elevation can be observed south of the project site at 1340 m.a.s.l (Fig 3.1).
Soils	Aeolian and colluvial sand overlying sandstone, mudstone and shale of the Karoo Supergroup (mostly the Ecca Group) as well as older Ventersdorp Supergroup andesite and basement gneiss in the north. Soil forms are mostly Avalon, Westleigh and Clovelly. Dominant land type Bd, closely followed by Bc, Ae and Ba.
Wetlands	No wetlands were found within the Secondary PAOI which will not be directly impacted upon.
Rivers	One unnamed non-perennial drainage was found west within the Secondary PAOI. Surface water was not present.
Ecological corridors	There were no ecological corridors associated with the unnamed non-perennial drainage found within the Secondary PAOI.
Transformed areas	Most of the site has been transformed due to grazing and maize farming.
Degraded areas	Land has been degraded due to grazing and agricultural crops.
Land use	
Habitat fragmentation	No fragmentation within site and none anticipated
Human impacts	Only from drilling of boreholes/minimal impacts
Alien vegetation	None
Vegetation	
Vegetation units	Vaal-Vet Sandy Grassland can be observed on site.
Forest	None
Fynbos	None
Thicket	None
Grassland	Vaal-Vet Sandy Grassland can be observed on site.
Riparian vegetation	Rushes can be observed in wetland one
Ecotones	No ecotones present.
Aquatic Biodiversity	
Plant SCC	None
Vegetation species	Dry Highveld Grassland Bioregion
Faunal habitats	Grassland

Indicators	Descriptions
Conservation importance	Low
Rehabilitation potential	Low
Erosion	None

4. Riverine and Wetland Delineation

Each of the identified and classified surface water features (rivers, drainages, and wetlands from section 3 above) occurring within the PAOI were delineated during the site visit in February 2024. The updated manual for the identification and delineation of wetland and riparian areas (DWS; 2008) was used as a guideline during delineation.

The following freshwater features were identified within the Total PAOI (Figure 4.1). Delineation included the following water feature characteristics:

- All water courses (including rivers, springs, natural channels in which water flows regularly or intermittently).
- All wetlands (including lakes or dams into which, or from which, water flows).
- Any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse include, where relevant, its bed
- and banks.
- All riparian zones.
- Floodplains.
- 1:100 - year flood line (if any)

A 100 m DWS Regulated Buffer was placed around all riverine features and a 500 m DWS Regulated Buffer around all wetland features. Each freshwater feature is summarised below and shown in Figure 3.6 above:

#	Aquatic feature	Description and location
1.	Unnamed non-perennial drainage 1	One non-perennial drainage was found within the Secondary PAOI with riparian vegetation present. Vegetation within the total PAOI is made up of one vegetation unit namely the Vaal-Vet Sandy Grassland vegetation. Surface water was not present during the site assessment.

None of the freshwater features located within the secondary PAOI will be directly affected.

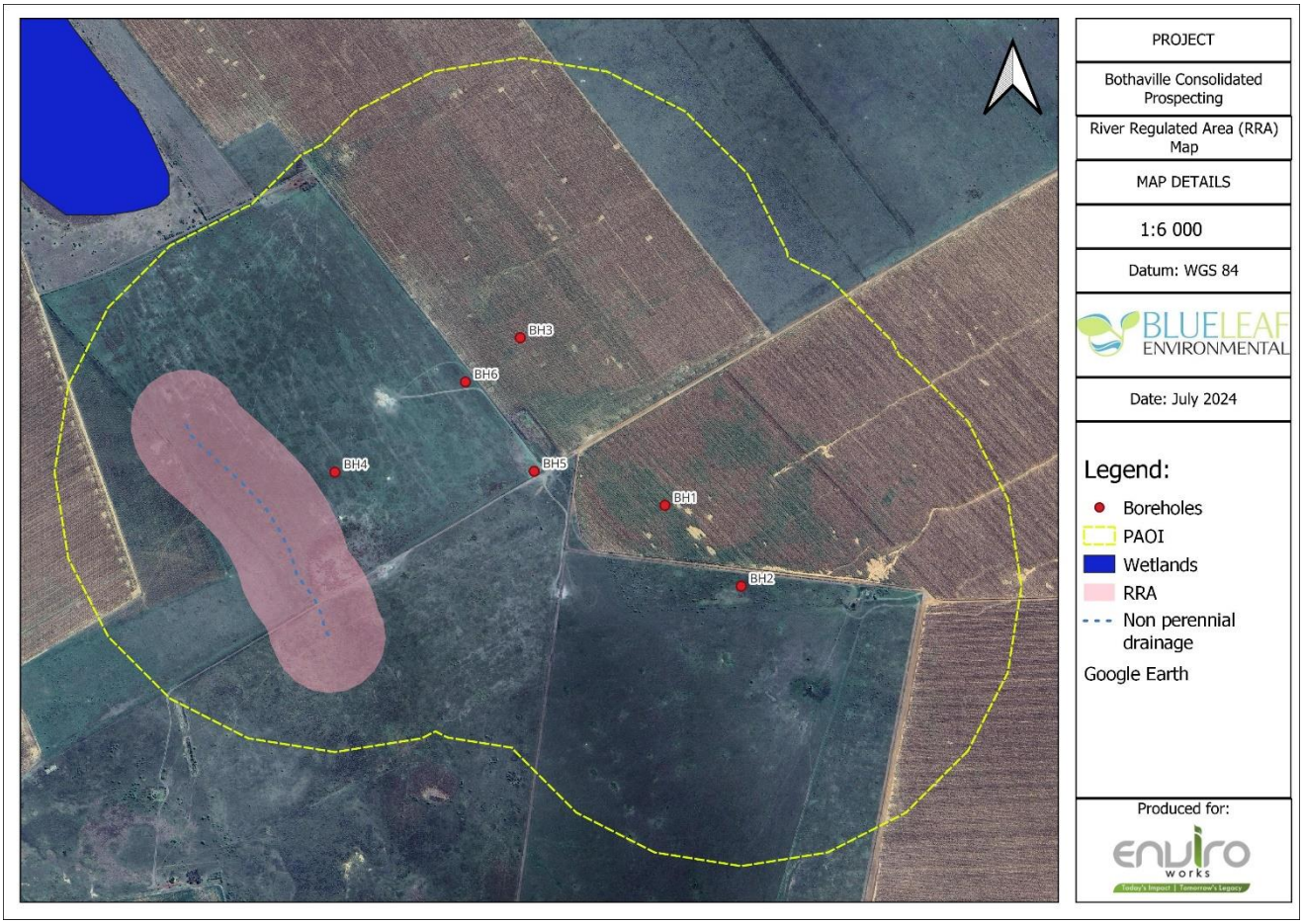

Figure 4.1: Delineation of the 100m DWS River Regulated Area within the PAOI

The 100m River Regulated Area was developed based on the following freshwater features:

- Unnamed non-perennial drainage (water body).
- Riparian zone (densely vegetated area bordering the wetlands).

A 100 m distance was then included from the widest edge of the freshwater features listed above (within the total PAOI). This is called the 100 m DWS River Regulated Area.

The non-perennial drainage located within the Secondary PAOI will not be directly impacted upon by the proposed development footprint due to its proximity to the proposed infrastructure (boreholes).

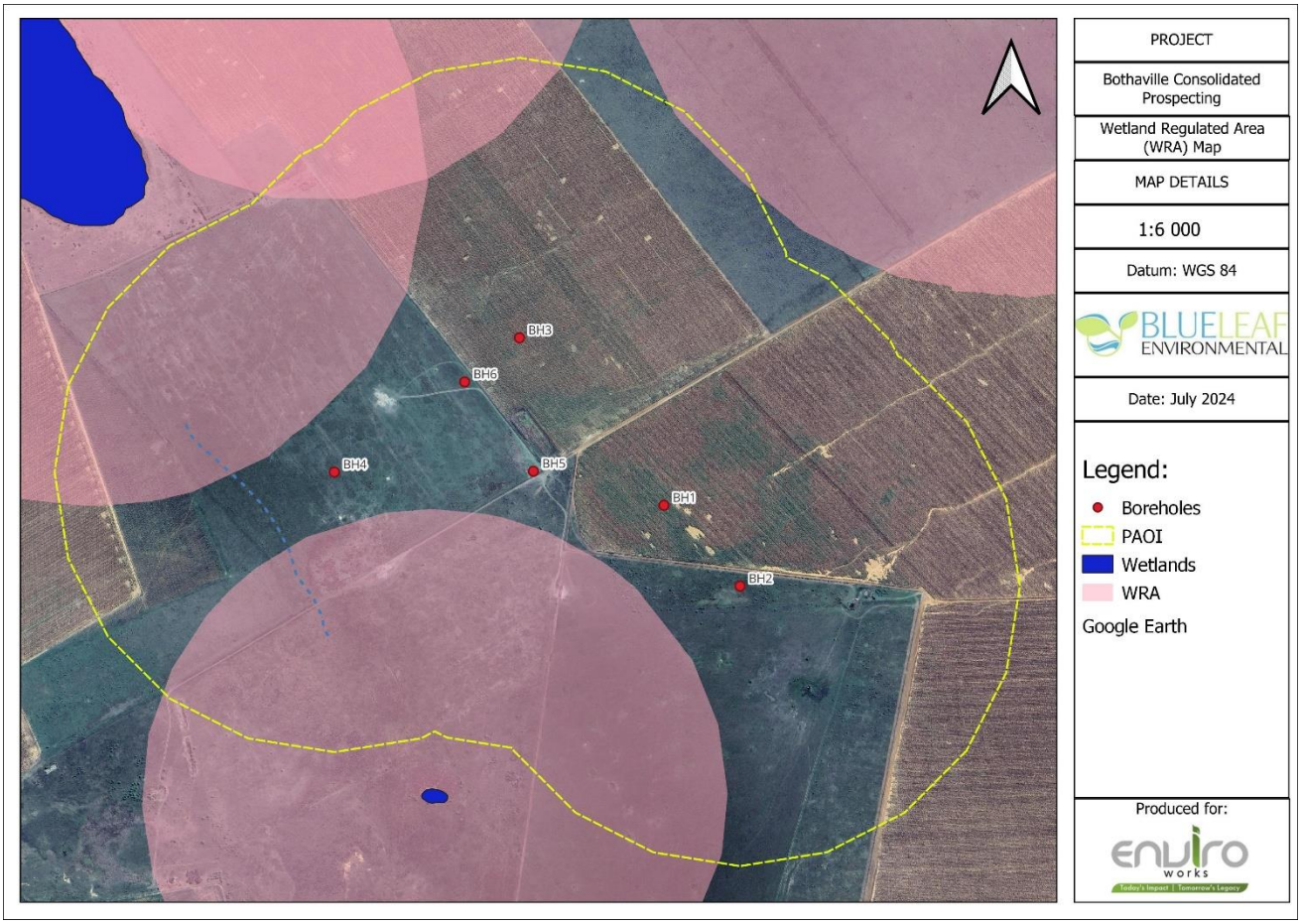

Figure 4.2: Delineation of the 500 m Wetland Regulated Area around each wetland system found in the PAOI

The 500m Wetland Regulated Area for each wetland was developed based on the following freshwater features:

- Wetland (water body)
- Floodplain
- 1:100-year floodline (received from the project engineers)
- Riparian zone (densely vegetated areas surrounding the wetlands

A 500 m distance was then included from the widest edge of the two freshwater features listed above. This is called the 500 m DWS Wetland Regulated Area.

None of the proposed boreholes are located within any wetland regulated area.

5. Site Sinsitivty

5.1.1. Screening report

The DFFE screening report has listed the Aquatic Biodiversity theme for the study area as **very high sensitive**. This is because the site is located where wetlands (NFEPA Classified) are in close proximity occurring within the Dry Highveld Grassland Bioregion. The purpose of the initial site investigation was to confirm this sensitivity allocation.

As per the Protocol for the Specialist Assessment and Minimum Report Content Requirements for Environmental Impacts on Aquatic Biodiversity, the aquatic biodiversity theme must be assessed as a full assessment (this report).

Figure 3.6: The DFFE Screening Tool map of the aquatic biodiversity theme sensitivities.

5.1.2. Site sensitivity

Site sensitivity was determined for Bothaville Consolidated Prospecting located in the Free State. Environmental constraints were identified and aligned with specific aquatic characteristics of the site. The following site characteristics contributed to determining an overall sensitivity:

Site characteristic	Description of characteristic	Sensitivity allocation	Feature
River systems	One unnamed non-perennial drainage	High	All rivers and drainage systems are classified as highly sensitive. The risk of impacts, indirect and cumulative impacts, are high.
	100m River Regulated Areas (RRA)	Moderate	A 100m buffer around all rivers is considered as moderate which means there is a moderate risk of indirectly impacting the rivers.
	All areas outside a river or RRA	Low	There are no surface water features in these areas and therefore there is a low risk of indirectly impacting the rivers.
Wetland systems	None	High	All Wetland features are protected and sensitive in South Africa as it presents a high risk of impacts.
	500m Wetland Regulated Areas (WRA)	Moderate	A 500m buffer around all wetlands is considered as moderate which means there is a moderate risk of indirectly impacting the wetlands.
	All areas outside a wetland or WRA	Low	There are no surface water features in these areas and therefore there is a low risk of indirectly impacting the rivers.
Vegetation	Riparian zone	High	Areas consisting of dense riparian vegetation is considered as high site ecological importance.

A detailed sensitivity map for the study area and immediate surroundings were developed based on the identified aquatic characteristics found within the site (Figure 5.1).

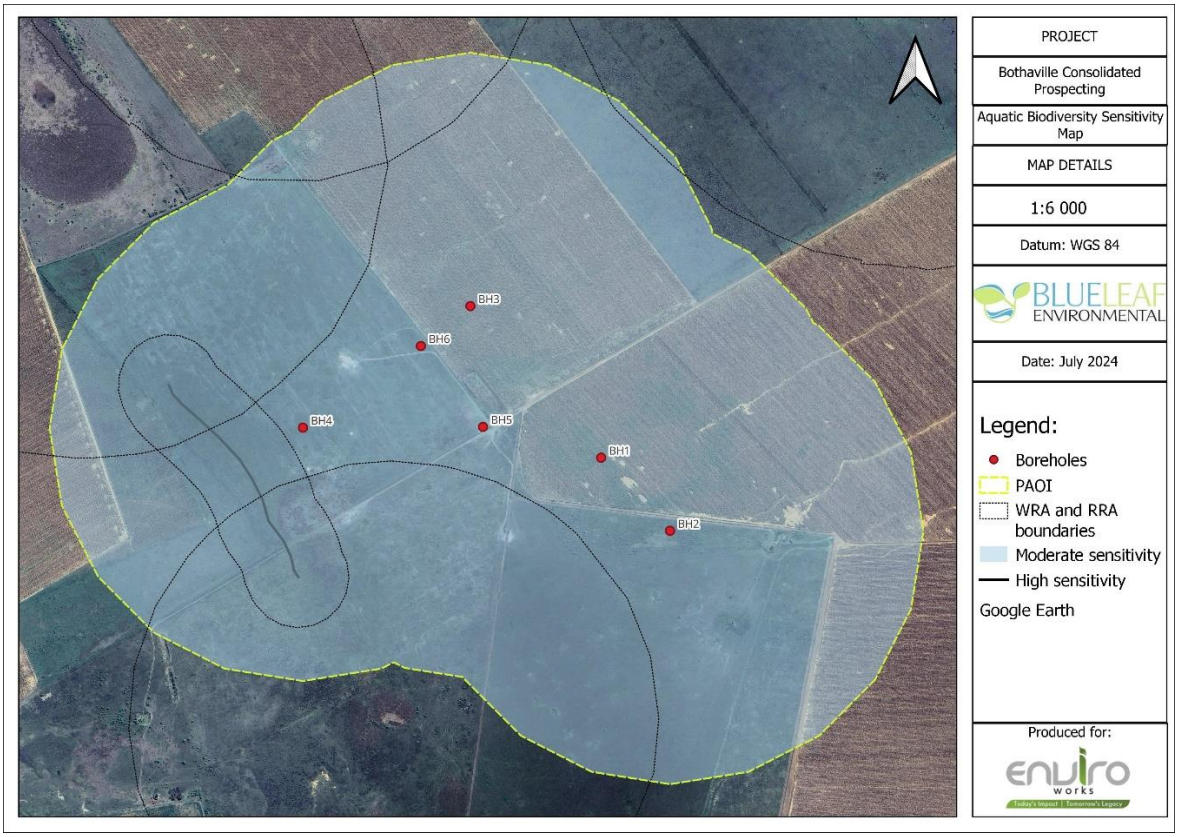

Figure 5.1: Aquatic sensitivity map for the proposed development area and surroundings.

6. Impact Assessment

The following issues were identified during the aquatic biodiversity assessment of the Bothaville Consolidated Prospecting project.

6.1 Identified impacts

The following aquatic issues were identified during the assessment of the development (borehole) area:

#	Activity causing impact (Issue)	Description of impact
1.	Non-compliance to existing legislation	***1.1. Legal compliance*** Non-compliance with ecological laws and policies of South Africa could lead to unnecessary delays in establishment activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.
2.	Operation of machinery and vehicles	***2.1. Hydrochemical pollution of surface waterbodies*** Hydrochemical spills from machines and vehicles may contaminate water quality in the wetlands and non-perennial drainage within the Secondary PAOI.
		2.2. Contamination of drilling fluid Surrounding environment may become comminated with drilling fluids (ensure drilling fluids do not spread
3.	Construction and clearing of vegetation	***3.1. Loss of vegetation*** Drilling and clearing of vegetation may lead to the regrowth of alien vegetation impacting ecological functioning of nearby wetlands and drainages.
		3.2. Increased risk of soil erosion Clearing of vegetation leads to the increased risk of soil erosion which may impact the ecological functioning of the nearby drainages and wetlands.

All impacts identified above were assessed as per the assessment methodology described in Chapter 2.8 of this report. Each impact was described on how it will impact within a specific phase of the project, namely Planning and Design, Construction and Operation.

Issue 1:	Non-compliance to existing legislation
Consequence of Issue	Non-compliance with aquatic laws and policies of South Africa could lead to unnecessary delays in establishment activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors. Permits will be required for all infrastructure within 500 m of a wetland and within 100 m of a river.
Number of impacts identified associated with this issue	Only 1 (Impact 1.1 only)

Impact 1.1: Legal compliance			
Phase of expansion: Planning and Design Phase			
Nature of impact	Non-compliance with aquatic laws and policies of South Africa could lead to unnecessary delays in establishment activities, and potentially criminal cases, based on the severity of the non-compliance, being brought against the proponent and his/her contractors.		
Cumulative impact	None		
Indirect impacts	None		
Residual impacts	None		
Classification of impact	Before mitigating	After mitigating	Consequence of Impact
Duration of impact	5	2	During all phases.
Extent of impact	5	1	DWS approval will be required.
Intensity of impact	5	2	Legislated approval is required for all infrastructure within 500 m of a wetland and within 100 m of a drainage system.
Severity	**15**	**5**	**Duration + extent + intensity**
Probability of impact occurring	5	2	Impact will occur on commencement of construction.
Frequency	5	1	Impact will occur once only.
Incidence	**10**	**3**	**Frequency + Probability**
Degree of reversibility	High		Permits will be required.
Irreplaceability	Low		No resource will be lost.
Mitigations	Mitigatory potential		Recommended mitigations
	High		- All relevant DWS permits (GA or full WUL) must be obtained from the competent authorities prior to commencement of any activity on site.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Very high negative (150)		Very low negative (15)

Issue 2:	Operation of machinery and vehicles
Consequence of issue	Hydro-chemical and chemical spills from machines and vehicles during construction (drilling) may leak (runoff) into the surrounding drainages and wetlands contaminating water quality.
Number of impacts	2 (Impact 3.1 and 3.2)

Impact 2.1: Hydro-chemical pollution of surface waterbodies			
Phase of expansion: Construction Phase			
Nature of impact	Leaks (oil, diesel, and petrol) from vehicles working or parked may contaminate water quality of drainages and wetlands within the Secondary PAOI.		
Cumulative impact	Increasing levels of contamination of drainages and wetlands within the Secondary PAOI.		
Indirect impacts	Soil contamination.		
Residual impacts	Pollution of waterbodies.		
Classification of impact	Before mitigating	After mitigating	Consequence of Impact
Duration of impact	3	2	Short term impact.
Extent of impact	1	1	Limited to project site and boundary of site.
Intensity of impact	2	2	Can lead to loss of vegetation.
Severity	**6**	**5**	**Duration + extent + intensity**
Probability of impact occurring	5	2	Impact would occur at construction phase
Frequency	5	1	
Incidence	**10**	**3**	**Frequency + Probability**
Degree of reversibility	Low negative		Impacts can be easily reversed.
Irreplaceability	Medium		
Mitigations	Mitigatory potential		Recommended mitigations
	High		– Do not park any construction machinery overnight within 50m of any surface waterbodies. – Parked vehicles must always have drip trays underneath it. These drip trays should be cleaned regularly, and the waste removed from site. – Stored hydro-chemicals must be kept off site or in bunds away from any surface waterbody. – All waste products must be stored at least 50m away from any surface waterbody and regularly removed from site to a registered landfill by a qualified contractor.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Medium high (60)		Very Low negative (15)

Impact 2.2: Contamination of surrounding environment			
Phase of expansion: Construction Phase			
Nature of impact	The surrounding environment may become contaminated with drilling fluid		
Cumulative impact	None		
Indirect impacts	Soil contamination.		
Residual impacts	Pollution of waterbodies.		
Classification of impact	Before mitigating	After mitigating	Consequence of Impact
Duration of impact	3	2	Would be ongoing during operations.
Extent of impact	2	1	Limited to project site and boundary of site.
Intensity of impact	3	1	Can lead to loss of vegetation and contamination of waterbodies.
Severity	**8**	**4**	**Duration + extent + intensity**
Probability of impact occurring	4	1	Impact may possibly occur on commencement of construction (drilling).
Frequency	5	1	Daily risk of impact occurring.
Incidence	**9**	**2**	**Frequency + Probability**
Degree of reversibility	Low negative		Impacts can be easily reversed.
Irreplaceability	Medium		Impact will contribute to existing contamination levels.
Mitigations	Mitigatory potential		Recommended mitigations
	High		- Ensure drilling fluids don't spread to surrounding environment and waterbodies.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Medium high (72)		Very low negative (8)

Issue 3:	Clearing of vegetation
Consequence of issue	Clearing of vegetation may lead to increase in alien vegetation and erosion.
Number of impacts	2 (Impact 3.1 and 3.2)

Impact 3.1: Loss of vegetation			
Phase of expansion: Construction Phase			
Nature of impact	Clearing of vegetation may lead to the regrowth of alien vegetation impacting ecological functioning of the surrounding wetlands and drainages.		
Cumulative impact	Loss of vegetation.		
Indirect impacts	Loss of habitats and connectivity and regrowth of alien vegetation.		
Residual impacts	Loss of ecological functioning of the drainages and wetlands within the Secondary PAOI.		
Classification of impact	Before mitigating	After mitigating	Consequence of Impact
Duration of impact	3	1	Clearing of vegetation only during construction phase (drilling of boreholes)
Extent of impact	4	1	Local area where drilling is to take place.
Intensity of impact	4	2	Lead to permanent loss of vegetation
Severity	**11**	**4**	**Duration + extent + intensity**
Probability of impact occurring	5	1	Impact will occur on commencement of construction.
Frequency	5	1	Daily risk of impact occurring (only during construction phase).
Incidence	**10**	**2**	**Frequency + Probability**
Degree of reversibility	High negative		Impacts can be reversed easily.
Irreplaceability	Medium		
Mitigations	Mitigatory potential		Recommended mitigations
	High		– Remove any alien vegetation found on site.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Medium High (110)		Very low negative (8)

Impact 3.2: Increased risk of soil erosion			
Phase of expansion: Construction Phase			
Nature of impact	Clearing of vegetation leads to the increased risk of soil erosion which may impact the ecological functioning of the surrounding drainage and wetlands.		
Cumulative impact	Increased risk of soil erosion.		
Indirect impacts	Sedimentation of river and wetlands.		
Residual impacts	Soil and bank erosion.		
Classification of impact	Before mitigating	After mitigating	Consequence of Impact
Duration of impact	5	2	Duration of cleared vegetation.
Extent of impact	3	2	Limited to project site and boundary of site.
Intensity of impact	4	2	Risk increases continuously when vegetation is cleared.
Severity	**12**	**6**	**Duration + extent + intensity**
Probability of impact occurring	5	2	Impact will occur on commencement of construction.
Frequency	2	1	Impact will only occur during the construction phase
Incidence	**7**	**3**	**Frequency + Probability**
Degree of reversibility	Low negative		Impacts can easily be reversed.
Irreplaceability	Medium		Low
Mitigations	Mitigatory potential		Recommended mitigations
	High		- Stabilise area, including soils so that natural vegetation can regrow. - Monitor site during drilling for erosion.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Medium high (84)		Very low negative (18)

7. Conclusion

7.1. Summary

Invasive prospecting in the form of diamond drilling will take place on various farms east of Bothaville in the Free State Province. The minerals to be prospected for includes gold ore, silver ore, coal, diamond (alluvial), platinum group metals, rare earths, sulphur and uranium ore. Drilling will comprise of six boreholes. The drilling of the six boreholes will be to a depth of 700m.

BlueLeaf Environmental (Pty) Ltd has been appointed by Enviroworks on behalf of Reef Exploration (Pty) Ltd, to undertake an Aquatic Biodiversity and Delineation Report as part of the EIA process conducted by Enviroworks. This report also complies with the DWS requirements for wetland delineation and assessment to confirm the presence of wet conditions and the extent thereof on the proposed development.

The Project Areas of Influence (PAOI) has been determined as follows:

PAOI	Area (ha)	Description	Probability of impact occurring
Primary PAOI	6 (5m x 5m) boreholes = 150 square metres	The Primary PAOI includes all boreholes within the boundary of the development site. This is the area directly impacted by the proposed boreholes.	Definite
Secondary PAOI	500m buffer (228 985 ha)	The secondary PAOI includes all areas within a 500 m buffer of the proposed development. These areas are not directly impacted by the development unless temporary footprints like site camps, laydown areas and stockpiles are placed in them. Assessing this PAOI will not only result in identifying potential indirect and cumulative impacts but will also allow for micro-movement of infrastructure.	Likely
Total PAOI	**229 ha**	**The Primary and Secondary PAOI's are collectively referred to as the Total PAOI (or just the PAOI) or Study Site in this report and demarcate the extent of the study site that will be assessed.**	**Likely**

Three surface freshwater features were identified within the Secondary PAOI and none within the Primary PAOI:

#	Aquatic feature	Description and location
1.	Unnamed non-perennial drainage 1	One non-perennial drainage was found within the Secondary PAOI with riparian vegetation present. Vegetation within the total PAOI is made up of one vegetation unit namely the Vaal-Vet Sandy Grassland vegetation. Surface water was not present during the site assessment.

According to the Free-State Biodiversity Plan (2016) a small area south-east of the study site occurs within a CBA1. The rest of the study site occurs within an ESA1. No wetlands and one non-perennial drainage were found within this ESA1.

The vegetation on site has been transformed due to grazing and agricultural crops. Wet vegetation can be observed at the non-perennial drainage which is situated near BH4. Wetland one has riparian vegetation present such as rushes, with wetland two absent of any wet vegetation. None of the water

features found within the Total PAOI, will be directly impacted on. The impact on biodiversity will be low, posing no threat to the ecological functioning of the drainage systems or associated wetlands.

7.2. Site sensitivity

Site sensitivity of sections within the study site allocated a high sensitivity to all water related structures (wetlands and rivers) and a moderate sensitivity to all wetland (500m) and riverine (100m) DWS Regulated Areas. Any activity occurring within 100m of a delineated river/stream and 500 m of a delineated wetland will requires a water use licence registration with DWS.

7.3. Alternatives

No site alternatives or layouts are proposed.

7.4. Cumulative impacts

In terms of Environmental Impact Assessment, Cumulative Impact is defined as:

"*Means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*".

The following cumulative impacts were identified:

1. Loss of surrounding vegetation.
2. Destruction of river/drainage and wetland habitat structures.

7.5. Levels of acceptable change

The proposed development is considered as an acceptable change to the environment provided all proposed mitigations are implemented.

7.6. Levels to be avoided

The proposed development may result in the negative impact on the natural wetlands and associated rivers/drainages. Provided that all mitigation measures proposed in this report are implemented, these risks will be reduced and therefore considered as an acceptable change to the local environment.

7.7. Mitigations

The following mitigations must be included into the EMPr:

Legal compliance:

- All relevant DWS permits (GA or full WUL) must be obtained from the competent authorities prior to commencement of any activity on site.
-

Hydro-chemical pollution of surface waterbodies:

- Do not park any construction machinery overnight within 50m of any surface waterbodies.

- Parked vehicles must always have drip trays underneath it. These drip trays should be cleaned regularly, and the waste removed from site.
- Stored hydro-chemicals must be kept off site or in bunds away from any surface waterbody.
- All waste products must be stored at least 50m away from any surface waterbody and regularly removed from site to a registered landfill by a qualified contractor.

Risk of drilling fluids contaminating surrounding environment and surface waterbodies:

- Ensure drilling fluids don't spread to surrounding environment and waterbodies.

Clearing/Loss of vegetation:

- Remove any alien vegetation on site.

Increased risk of soil erosion:

- Stabilise area, including soils so that natural vegetation can regrow.
- Monitor site during drilling for erosion.

7.8. General rehabilitation measures

- Develop and implement an Erosion Management Plan for construction (drilling) phase.
- Develop and implement an Alien Vegetation Management Plan for both construction (drilling) phase.

8. Specialist Opinion

The proposed development is NOT considered to be Fatally Flawed and no components of the project have been identified as flawed.

No development must be allowed within the DWS regulated areas for a wetland or drainage/river without the proper submission and approval of an application to DWS. All surface water features in the PAOI are indicated as high sensitivity in the Sensitivity Map. All areas indicated as moderate in the Sensitivity Map is classified DWS Regulated Areas. Prospecting in any of these areas will require the registration of a water use with DWS.

The aquatic impacts of all aspects for the Bothaville Consolidated Prospecting project were assessed and considered to be acceptable, provided that all mitigation measures provided in this report are implemented. This includes all impacts that have already occurred, are currently occurring or may still occur.

9. References

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