Aquatic Biodiversity and Delineation Report

Kroonstad North Prospecting, Free-State.

Prepared for:

Ms Nicolene Cloete
Environmental Consultant
Enviroworks
E-mail: nicolene@enviroworks.co.za
Mobile: 083 377 5419

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Mr Roy de Kock M.Sc (*Pr.Sci.Nat*)
Ecologist and Biodiversity specialist
Blue Leaf Environmental (Pty) Ltd.
Cell: +27 76 281 9660
Email: roy@blueleafenviro.co.za

Port Elizabeth:
38 Tulip Avenue
Sunridge Park
Port Elizabeth
6045

East London:
163 Cowrie Crescent
Cove Rock Country Estate
East London
5213

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 Kroonstad North Prospecting in the 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 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

The project involves invasive prospecting that will take the form of diamond drilling. This information will be integrated into the 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 Ore, Silver Ore, Coal, Cobalt, Copper Ore, Diamond (Alluvial), Iron Ore, Manganese Ore, Molybdenum Ore, Nickel Ore, Lead, Platinum Group Metals, Rare Earths, Sulphur, Uranium Ore, Tungsten Ore and Zinc 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 18 350, 4536 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 (minimal)
- Laydown areas for materials and equipment
- Prospecting machinery

1.2. Locality

The site is situated on various farms between Koppies and Edenville and located 45km's east of Kroonstad in the Free-State (Fig 1.2). Farming consists of a mix of maize crop farming, game farms and cattle grazing. The proposed six boreholes are located at the following coordinates:

Borehole #	Coordinates	
1.	27° 22.303'S	27° 38.648'E
2.	27° 23.151'S	27° 37.704'E
3.	27° 27.707'S	27° 39.543'E
4.	27° 28.668'S	27° 39.072'E
5.	27° 29.497'S	27° 38.121'E
6.	27° 30.029'S	27° 39.129'E

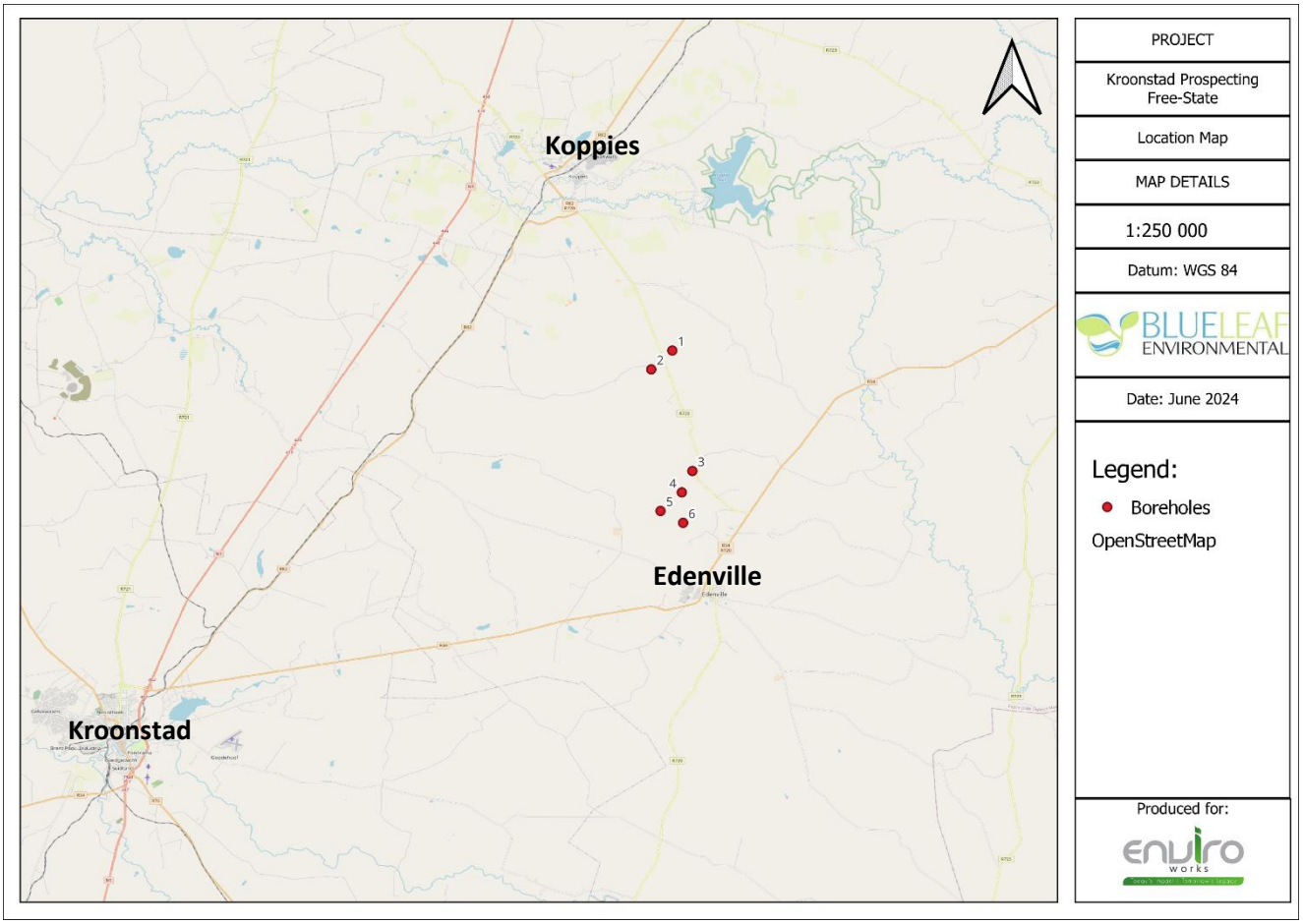


Figure 1.1 Locality map of the Kroonstad North Prospecting, Free-State.

1.3. Legislative context

The following legislation is directly relevant when assessing the aquatic environment relating to the Kroonstad North Prospecting project, 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)*	DEDEAT	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 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	DEDEAT/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 (BSP)	South African National Biodiversity Institute (SANBI)	Listing of freshwater CBAs and ESAs within the study site.
The National Freshwater Ecosystem Priority Areas (NFEPA) Project	South African National Biodiversity Institute (SANBI)	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 of the site characteristics conducted within a single season (early spring) of a single year (2024).

1.8. Project Area 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 the proposed boreholes.	Definite
Secondary PAOI	500m buffer (85ha x 6) = 510 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
Tertiary PAOI	18 350 ha	The tertiary PAOI includes all farm portions where prospecting will occur on. These areas are not directly impacted by the development. Assessing this PAOI will result in identifying potential indirect and cumulative impacts.	Unlikely
Tertiary/Total PAOI	**18 350 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)

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 24th and 25th 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.

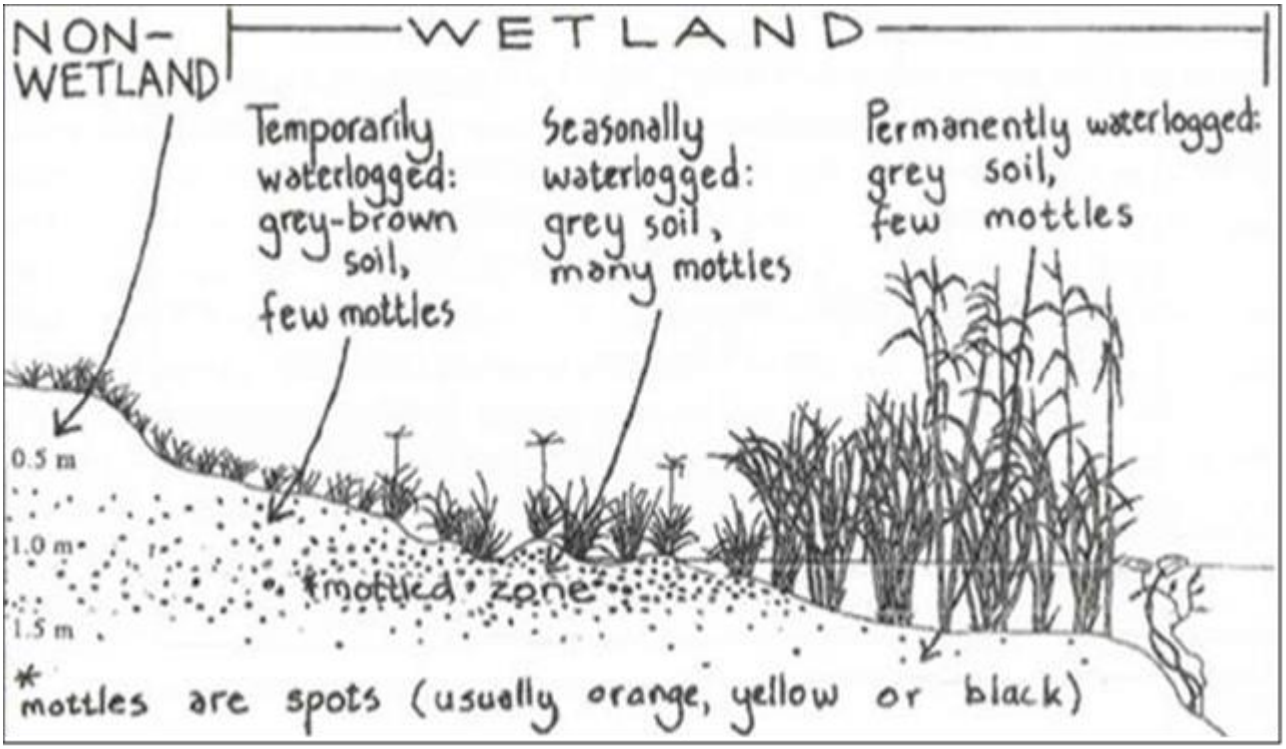


Figure 2.1: A cross-section through a wetland, indicating how the soil wetness and vegetation indicators change as one moves along a gradient of decreasing wetness, from the middle to the edge of the wetland (DWS, 2005).

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.
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	

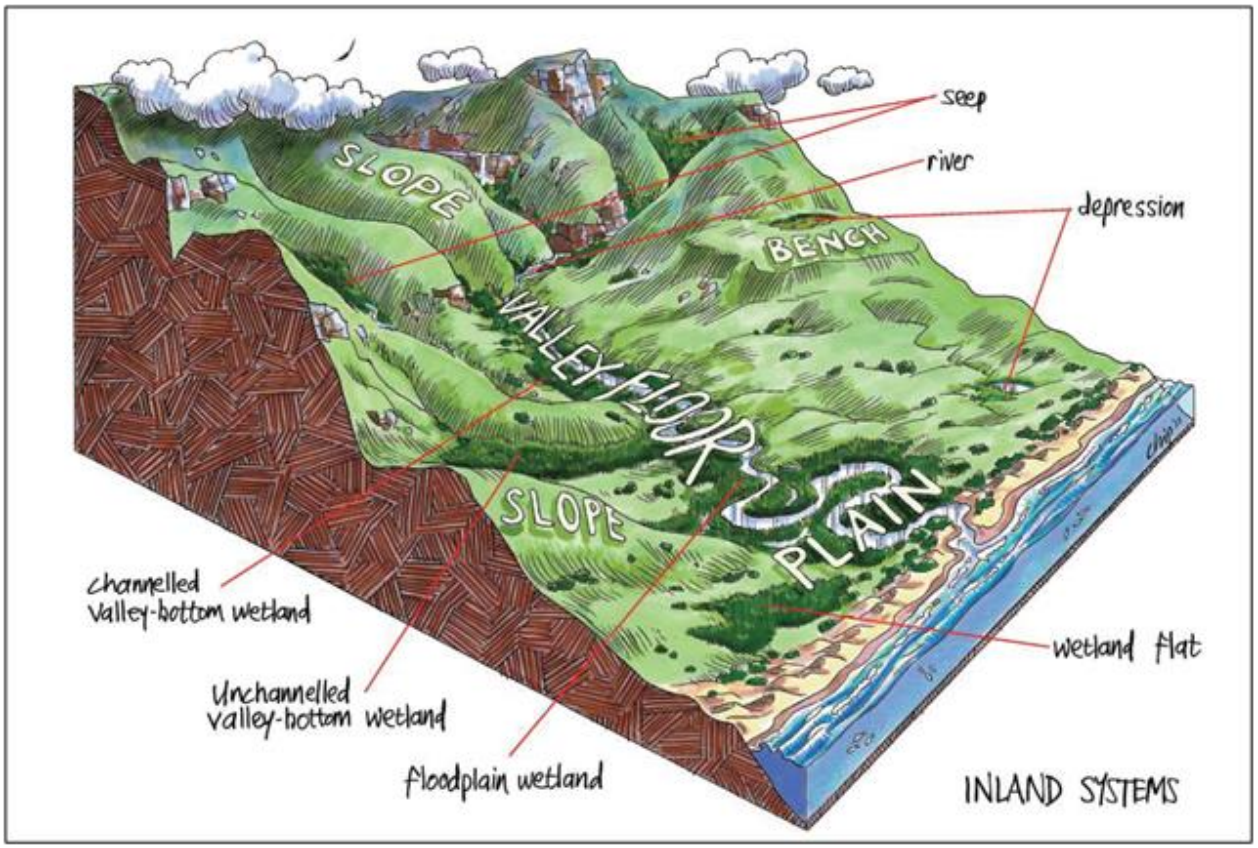


Figure 2.2: Illustration of the seven primary HGM units and their typical landscape settings (Ollis et.al, 2013).

2.3. Aquatic Biodiversity

Critical Biodiversity Areas (CBAs) are features critical for the conservation of biodiversity and

maintenance of ecosystem functioning and should remain in a natural state as far as possible. CBAs also include freshwater components.

To assist in the development of these CBAs, each planning unit was classified by C-plan and Marxan based on a combination of factors including connectivity, habitat condition and presence of Red List Threatened species.

All features were grouped into the following aquatic CBA categories as listed in the Eastern Cape Biodiversity Conservation Plan (2019):

Table 2.5: Critical biodiversity area categories as per the ECBCP (2019)

Mapping Category	Critical Biodiversity Area Name	Land management objective
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.	Protected Areas are managed through Protected Area Management Plans and are therefore not managed through the ECBCP2019.
Critical Biodiversity Area (CBA)	CBAs are selected to meet biodiversity targets for species, ecosystems, and ecological processes. These include: Critically Endangered and Endangered Ecosystems. Critical linkage points (bottlenecks or pinch-points) in the corridor network; and All areas required to meet biodiversity targets and to ensure future persistence of species, ecosystems, and special habitats. CBAs are areas of high biodiversity value and should therefore be maintained in a natural state, with no further loss of habitat.	Maintain in a natural state (or near-natural state if this is the current condition of the site) that secures the retention of biodiversity pattern and ecological processes: **For areas classified as CBA1, the following objectives must apply:** ➢ Ecosystem and species must remain intact and undisturbed. ➢ Since these areas demonstrate high irreplaceability, if disturbed or lost, biodiversity targets will not be met. ➢ Important: these biodiversity features are at, or beyond, their limits of acceptable change. If land use activities are unavoidable in these areas and depending on expert opinion of the condition of the site, a Biodiversity Offset must be designed and implemented.
		For areas classified as CBA2, the following objectives must apply: ➢ Ecosystem and species must remain intact and undisturbed. ➢ There is some flexibility in the landscape to achieve biodiversity targets in these areas. It must be noted that the loss of a CBA2 area may elevate

Mapping Category	Critical Biodiversity Area Name	Land management objective
		other CBA 2 areas to a CBA 1 category. ➢ These biodiversity features are at risk of reaching their limits of acceptable change. If land use activities are unavoidable in these areas, and depending on the condition of the site, set-aside areas must be designed in the layout and implemented. If site specific data confirms that biodiversity is significant, unique and/or highly threatened or that a Critically Endangered or Endangered species is present, Biodiversity Offsets must be implemented.
Ecological Support Area (ESA)	ESAs are areas NOT essential for meeting biodiversity targets, but are essential in terms of: Terrestrial landscape: Ensuring connectivity between CBAs, strengthening climate change resilience, and proper function of ecosystem infrastructure for delivery of ecosystem services. From a terrestrial perspective, ESAs may include riparian areas, coastal corridors, ridges, etc. Aquatic landscape: ESAs extend into catchments that are essential for the maintenance of CBA rivers and wetlands. ESAs need to be maintained in a semi-natural, if not natural, state.	Maintain ecological function within the localised and broader landscape. A functional state in this context means that the area must be maintained in a semi-natural state such that ecological function and ecosystem services are maintained. **For areas classified as ESA1, the following objectives apply:** ➢ These areas are not required to meet biodiversity targets, but they still perform essential roles in terms of connectivity, ecosystem service delivery and climate change resilience. ➢ These systems may vary in condition and maintaining function is the main objective, therefore: ○ Ecosystems still in natural, near natural state should be maintained. ○ Ecosystems that are moderately disturbed or degraded should be restored.
		Maintain current land use with no intensification. **For areas classified as ESA2, the following objectives apply:** ➢ These areas have already been subjected to severe and/or irreversible modification. ➢ These areas are not required to meet biodiversity targets, but

Mapping Category	Critical Biodiversity Area Name	Land management objective
		they may still perform some function with respect to connectivity, ecosystem service delivery and climate change resilience. ➢ Objective is to maintain remaining function, therefore: ○ Areas should not undergo any further deterioration in ecological function. ○ Opportunities to change land use practices to improve ecological function (i.e. cultivation agriculture to livestock grazing agriculture) are desirable in ESA2 areas.
Other Natural Areas (ONA)	ONAs are areas in a natural or near natural state that have not been identified as priority areas in the current plan. ONAs still support biodiversity and deliver ecosystem services.	No desired state or management objective is provided for ONA or NNR.
No Natural Areas Remaining (NNR)	NNR areas that are heavily, permanently, modified and are no longer considered natural. Although some biodiversity and ecological function may be retained, irreversible impacts on biodiversity mean that they cannot contribute towards targets	

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 Ecological importance

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

<table>
<tr><th>ASPECT</th><th>IMPACT RATING</th></tr>
<tr><td>Status of the Impact</td><td>A statement of whether the impact is positive (a benefit), negative (a cost), or neutral</td></tr>
<tr><td>Direct impact</td><td>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.</td></tr>
<tr><td>Indirect Impacts</td><td>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.</td></tr>
<tr><td>Cumulative Impacts</td><td>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.</td></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>
</table>

<table>
<tr><th>ASPECT</th><th>IMPACT RATING</th></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 24th to 25th 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 with a incision running through the site where elevation decreases as a result of a perennial stream cutting through the landscape (Fig 3.1). Average elevations at the borehole sites are 1470 m.a.s.l (meters above sea level). The highest point of elevation is at borehole 1 (1490 m.a.s.l) and lowest at various borehole points at 1445 m.a.s.l.

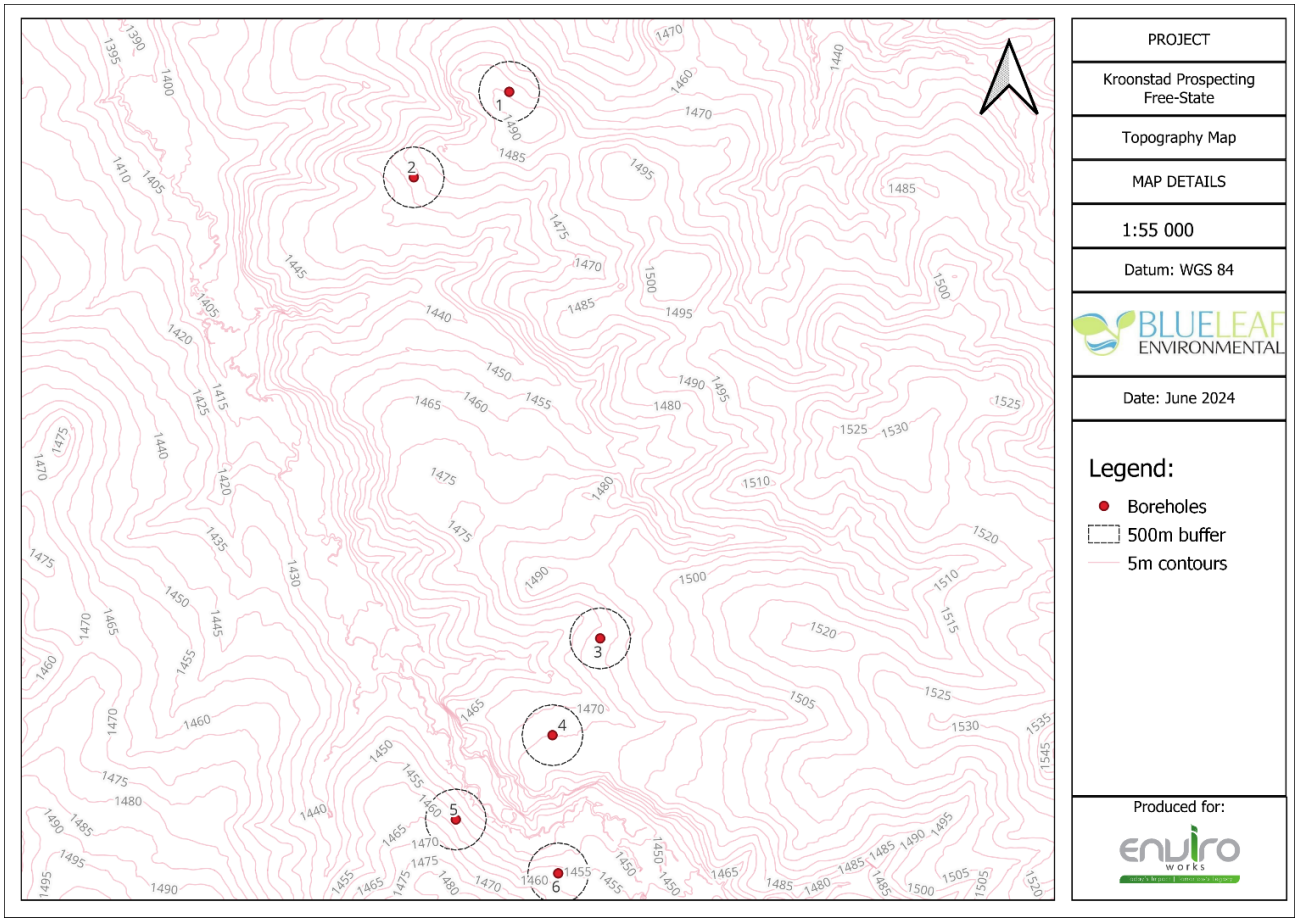


Figure 3.1: Contour map of the proposed project site and surrounding areas.

3.2. Local climate

The prevailing climatic conditions in this region are classified as a regional steppe climate. The amount of rainfall remains low during the entire year. The temperature here averages 17.4 °C. In a year, the rainfall is 615 mm. The onset of summer commences towards the conclusion of January and culminates by December. The months that constitute this season are referred to as December, January, February, March. The month with the least amount of precipitation is July exhibiting a mere 7 mm. On average, the highest amount of rainfall occurs during December with a mean value of 107

mm. The month of January boasts the highest average temperature, with a recorded maximum of 22.6 °C. On average, the month of July is considered to be the coldest time of the year with temperatures averaging at around 9.7 °C. The month with the highest amount of rainfall is January (13.30 days), whereas the one with the lowest precipitation level is July (1.03) (en.climate-data.org).

3.3. Geology and Soils

Central Free-State Grassland: Sedimentary mudstones and sandstone mainly of the Adelaide subgroup (Beaufort Group, Karoo Supergroup), as well as those of the Ecca Group (Karoo Supergroup found in the extreme northern section of this grassland, giving rise to vertic, melanic and red soils (typical forms are Arcadia, Bonheim, Kroonstad, Valsrivier and Rensburg) – typical of Dc land type (dominating the landscape). The less common intrusive dolerites of the Jurassic Karoo Dolerite Suit support dry clayey soils typical of the Ea land type.

Vaal-Vet Sandy Grassland: 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.

3.4. Land use

Current land use has been determined and the entire study area consists of grassland, barren land as well as cultivated land. The land is currently being used for cattle grazing, maize crop farming as well as game farming. 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. Wetlands can be observed throughout the site.

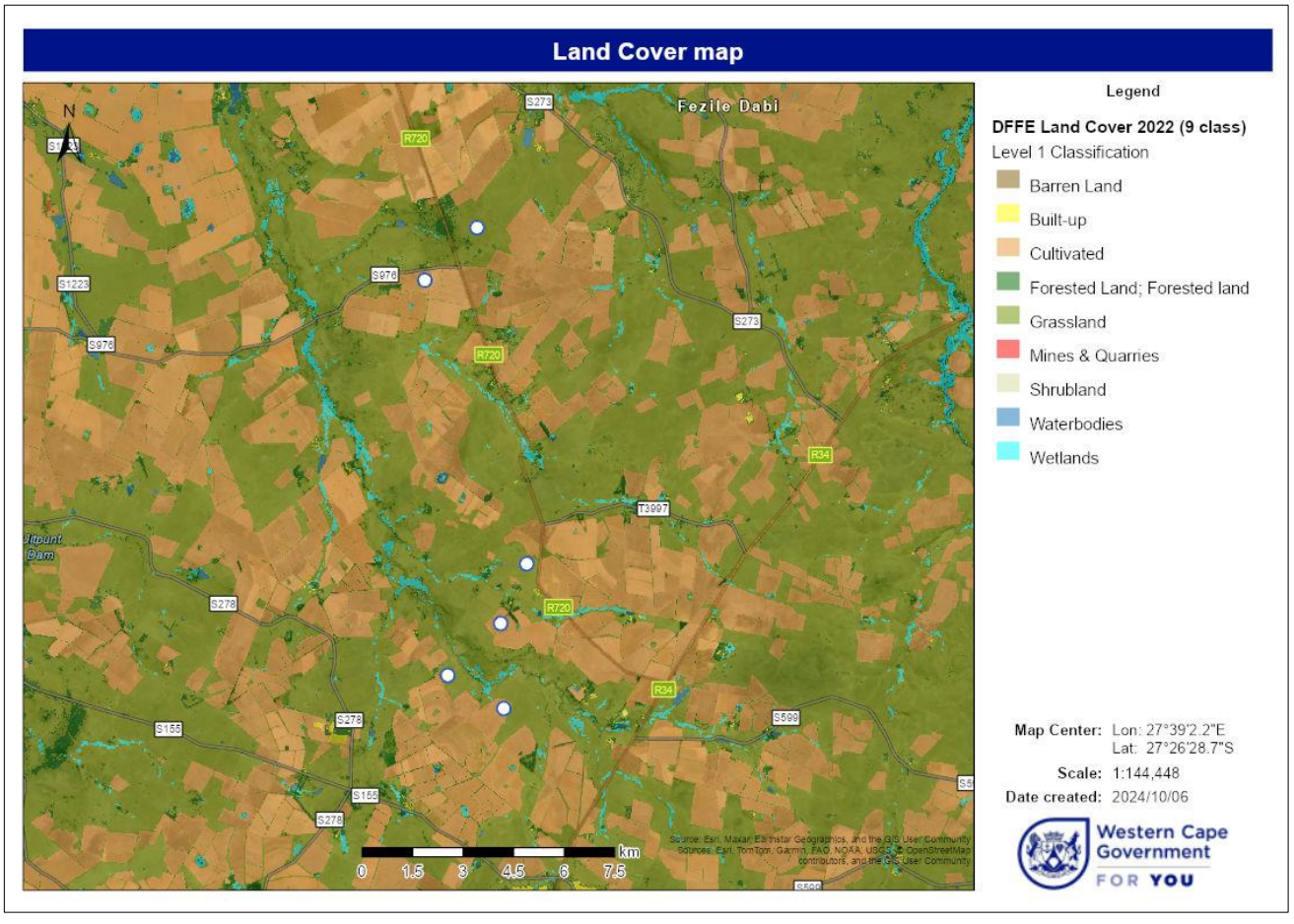


Figure 3.3: Land cover map of the proposed project site and surrounding areas.

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

Landscape is mostly flat with barren land.	Dam wall can be observed on site.
	
The landscape is also being used for maize crop farming.	Doringspruit can be observed within the study site.
	

3.5. Vegetation

The South African National Biodiversity Institute (SANBI) vegetation map (called the VegMap, 2022) lists the proposed activity within a single vegetation units (Figure 3.2) **Central Free-State Grassland.**

Central Free-State Grassland occurs within the Free-State Province and marginally into Gauteng Province: A broad zone from around Sasolburg in the north to Dewetsdorp in the south. Other major settlements located within this unit include Kroonstad, Ventersburg, Steynsrus, Winburg, Lindley and Edenville. Altitude 1300 – 1640m, most of the area at 1400 – 1460m. Vegetation and landscape features are characterized by undulating plains supporting short grassland, in natural condition dominated by *Themeda Triandra* while *Eragrostis curvula* and *E. chloromelas* become dominant in degraded habitats. Dwarf karoo bushes establish in severely degraded clayey bottomlands. Overgrazed and trampled low-lying areas with heavy clayey soils are prone to *Acacia karroo* encroachment. SANBI considers this vegetation type as Vulnerable with only small portions enjoying

statutory conservation (Willem Pretorius, Rustfontein, and Koppies Dam Nature Reserve) as well as some protection in private nature reserves. Almost a quarter of the area has been transformed either for cultivation or by building of dams (Allemanskraal, Erfenis, Groothoek, Koppies, Kroonstad, Lace Mine, Rustfontein and Weltevrede). Erosion low (45%), moderate (30%) or very low (20%).

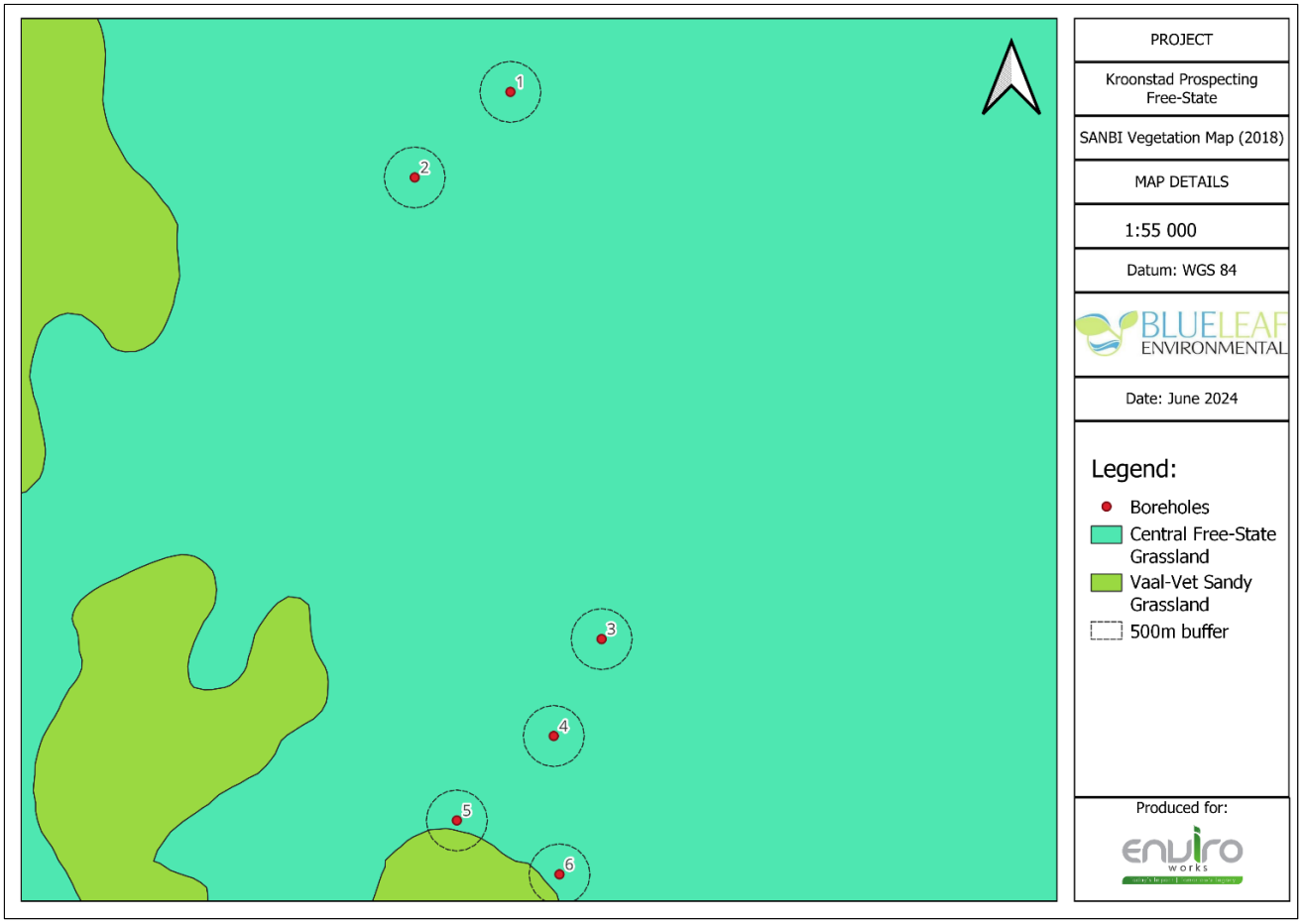


Figure 3.4: SANBI Vegetation map of the proposed project site and surrounding areas.

3.6. Aquatic biodiversity

According to the Free-State Biodiversity Plan (2016) none of the proposed borehole site occurs within a CBA or ESA.

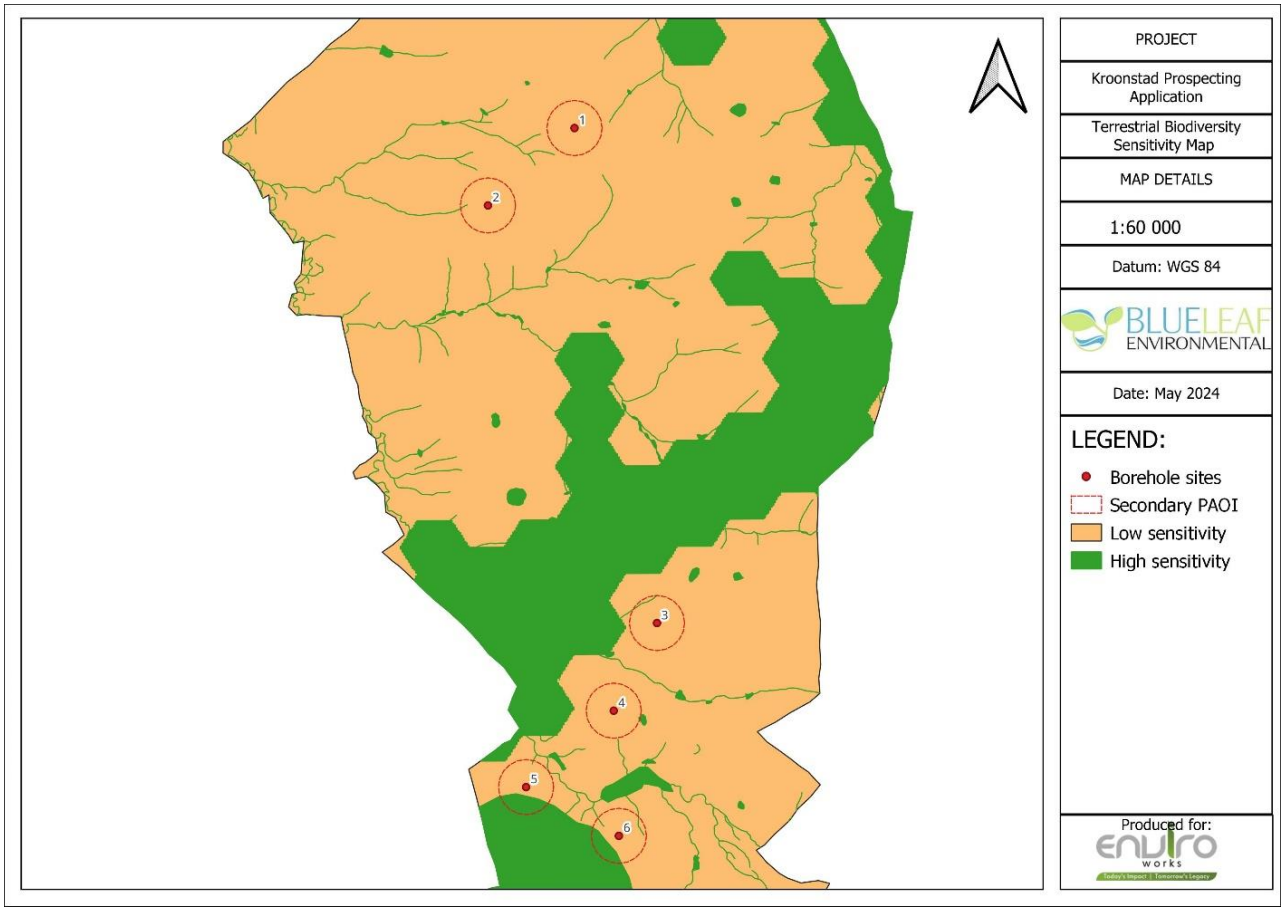


Figure 3.4: Biodiversity map of the study area (Free-State Biodiversity Plan, 2016)

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 Primary PAOI (boreholes) and a 500 m buffer area around each borehole (Secondary PAOI). Only rivers were observed within the Secondary PAOI with many wetlands and rivers identified within the Tertiary PAOI, but none of them will be impacted provided that the borehole positions remain unchanged. (Figure 3.5.). Only water features in the Primary and Secondary PAOI will be classified and discussed. Large systems in the Tertiary PAOI will only be made mention of and not assessed.

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: the Doringspruit perennial river which was found within the Tertiary PAOI. Eight non-perennial streams found within the Secondary PAOI will be discussed as they have a risk of being impacted upon.

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. Five wetlands were found within the Tertiary PAOI which will specifically be assessed as they have a risk of being impacted upon.

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 C60D quaternary catchment. The main aquatic feature within this catchment is the Doringspruit perennial river and many wetlands found within the Tertiary PAOI.

This quaternary catchment forms part of the Vaal-Orange Water Management Area (WMA2023) that is 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
According to the NFEPA database (2011), three artificial and two natural wetlands were identified within the Tertiary PAOI which have a high risk of being impacted upon due to its proximity to the boreholes. These five wetlands include two channeled valley-bottom wetlands, two depressions and one unchanneled valley-bottom wetland which are all classified as NFEPA wetlands.

Rivers
As per the NFEPA database (2011), one perennial river (Doringspruit River) can be found within the Tertiary PAOI. Six non-perennial streams can be seen within the Secondary PAOI and will be assessed further in this report. These non-perennial streams are not NFEPA classified. The Doringspruit perennial river is in a moderately modified **(Class C)** ecological condition according to the PES 1999 and the NFEPA Dataset (2011). Various unnamed non-perennial streams occur in the Tertiary PAOI but only eight will be discussed as they are the only ones with a risk of being impacted by prospecting.

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 each of the borehole points in the PAOI:

Borehole No:	Water features with their Level 3: Landscape settings (as in Fig 3.7)	
	Wetlands	Rivers
Borehole 1	None	None
Borehole 2	None	Non-perennial stream 1: Plain
Borehole 3	Wetland 1: Valley floor Wetland 2: Valley floor	Non-perennial stream 2: Plain
Borehole 4	Wetland 3: Bench	Non-perennial stream 3: Plain
Borehole 5	Wetland 4: Valley floor Wetland 5: Valley floor	Non-perennial stream 4: Plain
Borehole 6	None	Non-perennial stream 5: Plain Non-perennial stream 6: 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	
Six unnamed non-perennial streams (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.
Wetland 1 (Channeled valley-bottom) (Fig 3.5.)	N/A	N/A	
Wetland 2 (Unchanneled valley-bottom) (Fig 3.5.)	N/A	N/A	
Wetland 3 (Depression) (Fig3.5)	Dammed	With channeled inflow	
Wetland 4 (Depression)(Fig3.5)	Exoreic (Outwards draining)	Without channeled inflow	
Wetland 5 (Channeled valley-bottom)	N/A	N/A	

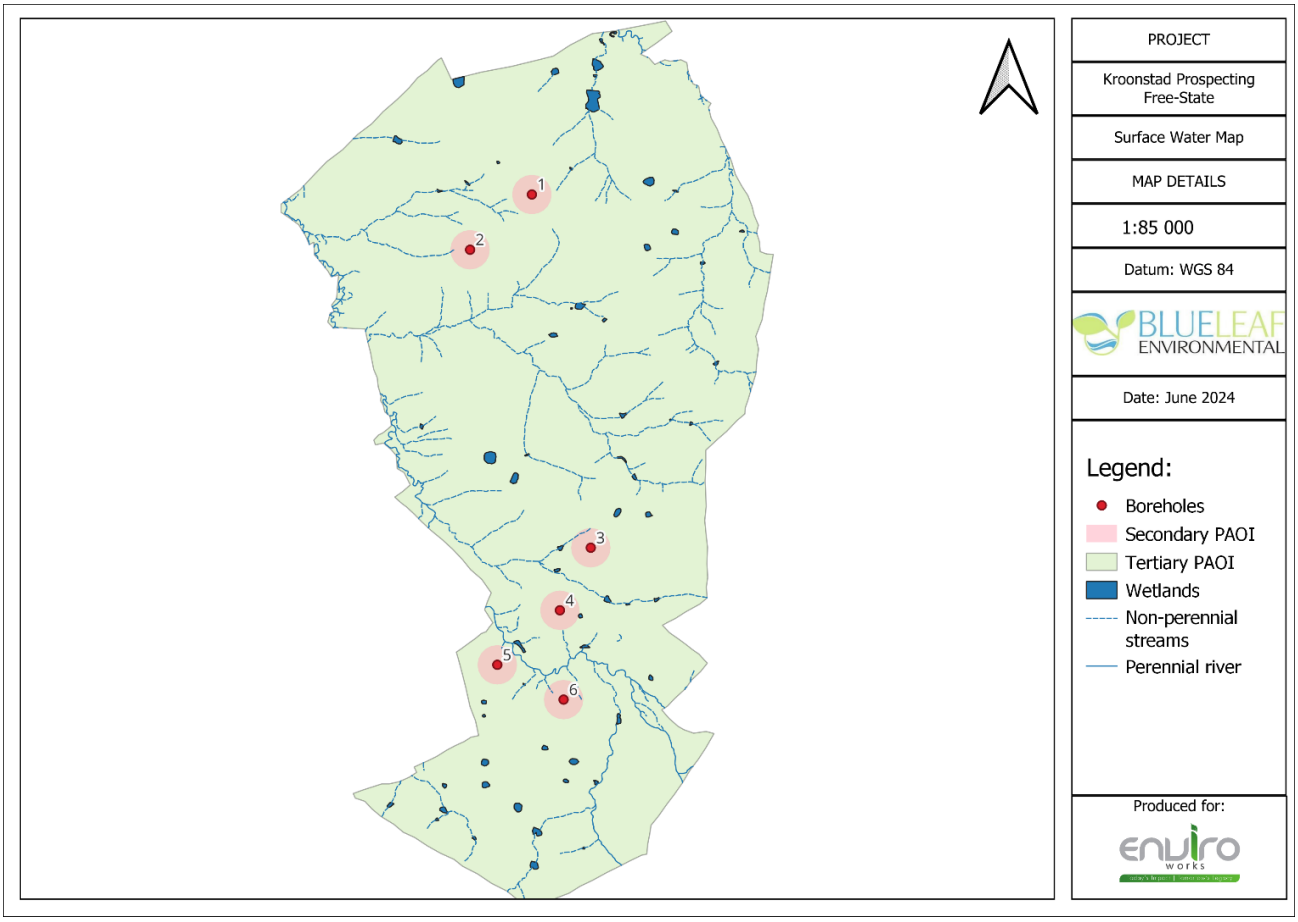


Figure 3.6: All surface water features and their classification within the Secondary PAOI.

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.

Eight non-perennial streams were identified within the Tertiary PAOI which has a risk of being impacted upon (Fig 3.6). These non-perennial streams do not flow in any particular direction but merely become wet/inundated with water during periods of heavy rainfall.

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

For all Inland Systems that are not rivers (i.e. wetlands and open waterbodies), you should classify the hydrological regime according to the period of inundation (at Level 5A), and saturation (At Level 5B), together with the inundation depth class (at Level 5C) in the case of permanently inundated open waterbodies. (Table 3).

Table 3: Hydroperiod categories for non-river inland systems

Level 5: Hydroperiod and depth of inundation			
	A	**B**	**C**
	Inundation periodicity	**Saturation periodicity (within 0.5m of soil surface)**	**Inundation-depth class**
Wetland 1	Seasonally inundated	Seasonally saturated	Not-applicable
Wetland 2	Seasonally inundated	Seasonally saturated	Not-applicable
Wetland 3	Seasonally inundated	Seasonally saturated	Not-applicable
Wetland 4	Seasonally inundated	Seasonally saturated	Not applicable
Wetland 5	Seasonally inundated	Seasonally saturated	Not applicable

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	➢ Six unnamed non-perennial drainage were identified (Fig 3.6)	Natural river
	➢ Five wetlands were identified (Figure 3.6).	One artificial channelled valley bottom, one artificial unchanneled valley bottom wetland, one natural depression, one natural depression and one artificial channelled valley bottom.
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
Six Unnamed non-perennial drainages	Inland system: River	**Ecoregion:** Ecoregion 11: Highveld **Quaternary Catchment:** C60D **Veg:** Central Free State Grassland	Plain	Lowland rivers	Non-perennial	Natural
Wetland 1	Inland system: Wetland		Valley floor	Channelled Valley Bottom	Seasonally inundated	Artificial system
Wetland 2			Valley floor	Unchanneled Valley Bottom	Seasonally inundated	Artificial system
Wetland 3			Bench	Depression	Seasonally inundated	Natural system
Wetland 4			Valley floor	Depression	Seasonally inundated	Natural system
Wetland 5			Valley floor	Channelled Valley Bottom	Seasonally inundated	Artificial system

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 two wetlands found within the Secondary PAOI, are categorized as **Moderate**, which is 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)

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.)

Indicators	Descriptions
	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	5 x wetlands can be found within the Secondary PAOI which will not be directly impacted upon. Surface water was present at all wetlands.
Rivers	Six unnamed non-perennial drainage was found west within the Secondary PAOI. Surface water was not present in any of them.
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	Central Free State Grassland can be observed on site.
Forest	None
Fynbos	None
Thicket	None
Grassland	Central Free State Grassland can be observed on site.
Riparian vegetation	Typically grasses and karoo shrubs
Ecotones	No ecotones present.
Aquatic Biodiversity	
Plant SCC	None
Vegetation species	Dry Highveld Grassland Bioregion
Faunal habitats	Grassland and Karoo scrubs
Conservation importance	Low
Rehabilitation potential	High
Community structure	Grassland
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 Primary 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.

Numerous streams, rivers and wetlands were observed in the Total PAOI. As most of these systems are located too far from any of the boreholes (> 500m from the borehole site) and will therefore NOT be impacted (directly or indirectly) by prospecting, they are excluded from assessment. Only systems that were located within 500 m of any of the borehole sites were delineated and assessed. This included wetlands, rivers/streams and delineated regulated areas (as per DWS guidelines) for rivers and wetlands.

Six non-perennial drainages, and five wetlands were found within the Secondary PAOI of each borehole point. None of the drainages found within the Secondary PAOI are classified as National Freshwater Ecosystem Priority Area (NFEPA) systems by SANBI. These systems have been classified in terms of their hydrogeomorphic characteristics, as non-perennial drainages that do not flow continuously throughout the year, although pools may persist. Flow regime is unpredictable. They are found within Central Free State Grassland vegetation with little to no alien species present.

The following freshwater features were identified within the Secondary PAOI (Figure 4.1 for rivers and 4.2 for wetlands). 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 (called the River Regulated Area or RRA) was placed around all delineated riverine features and a 500 m DWS Regulated Buffer (called the Wetland Regulated Area or WRA) around all delineated wetland features. Each freshwater feature is summarised below and shown in Figures 4.1 and 4.2 below:

Borehole #	Aquatic feature	Description and location
Borehole 1	None	Not water features occur within borehole 1.
Borehole 2	– Unnamed non-perennial drainage 1	One non-perennial drainage was found within the Secondary PAOI of borehole 2. The drainage is completely transformed as it is in a maize field. Drainage of surface water still occur. Surface water was not present during the site assessment. The borehole is not located within the RRA.
Borehole 3	– Unnamed non-perennial drainage 2 – Artificial Valley Floor channelled-valley-bottom Wetland 1	One non-perennial drainage was found within the Secondary PAOI of borehole3. The drainage is found in natural highveld grassland. Drainage of surface water still occur. Surface water was not present during the site assessment. Wetlands are artificial and contains dammed water. Only the

Borehole #	Aquatic feature	Description and location
	– Artificial valley floor unchanneled-valley-bottom Wetland 2	wetland regulated areas are in the Secondary PAOI. The borehole is not located within the RRA or WRA.
Borehole 4	– Unnamed non-perennial drainage 3 – Natural bench depression Wetland 3	The unnamed non-perennial drainage is not located in the Secondary PAOI of borehole 4 but its RRA is. The drainage is completely transformed as it is in a maize field. Drainage of surface water still occur. Surface water was not present during the site assessment. The borehole is located within the WRA.
Borehole 5	– Unnamed non-perennial drainage 4 – Natural valley floor depression Wetland 4 – Artificial valley floor channelled-valley-bottom Wetland 5	One non-perennial drainage was found within the Secondary PAOI of borehole 5. The drainage is found in natural highveld grassland. Drainage of surface water still occur. Surface water was not present during the site assessment. Wetlands contains dammed water. Only the wetland regulated areas are in the Secondary PAOI. The borehole is not located within the RRA or WRA.
Borehole 6	– Unnamed non-perennial drainage 5 – Unnamed non-perennial drainage 6	No wetlands or WRA's occur within the Secondary PAOI of borehole 6. Two non-perennial drainage were found within the Secondary PAOI of borehole 6. The borehole is not located within the RRA.

None of the rivers and wetlands located within the secondary PAOI will be directly affected. No borehole is in an RRA. Borehole 4 is near a WRA boundary (within 3.5 m; Figure 4.1). No impacts must occur within the WRA as it may trigger the requirement of a water use license application.

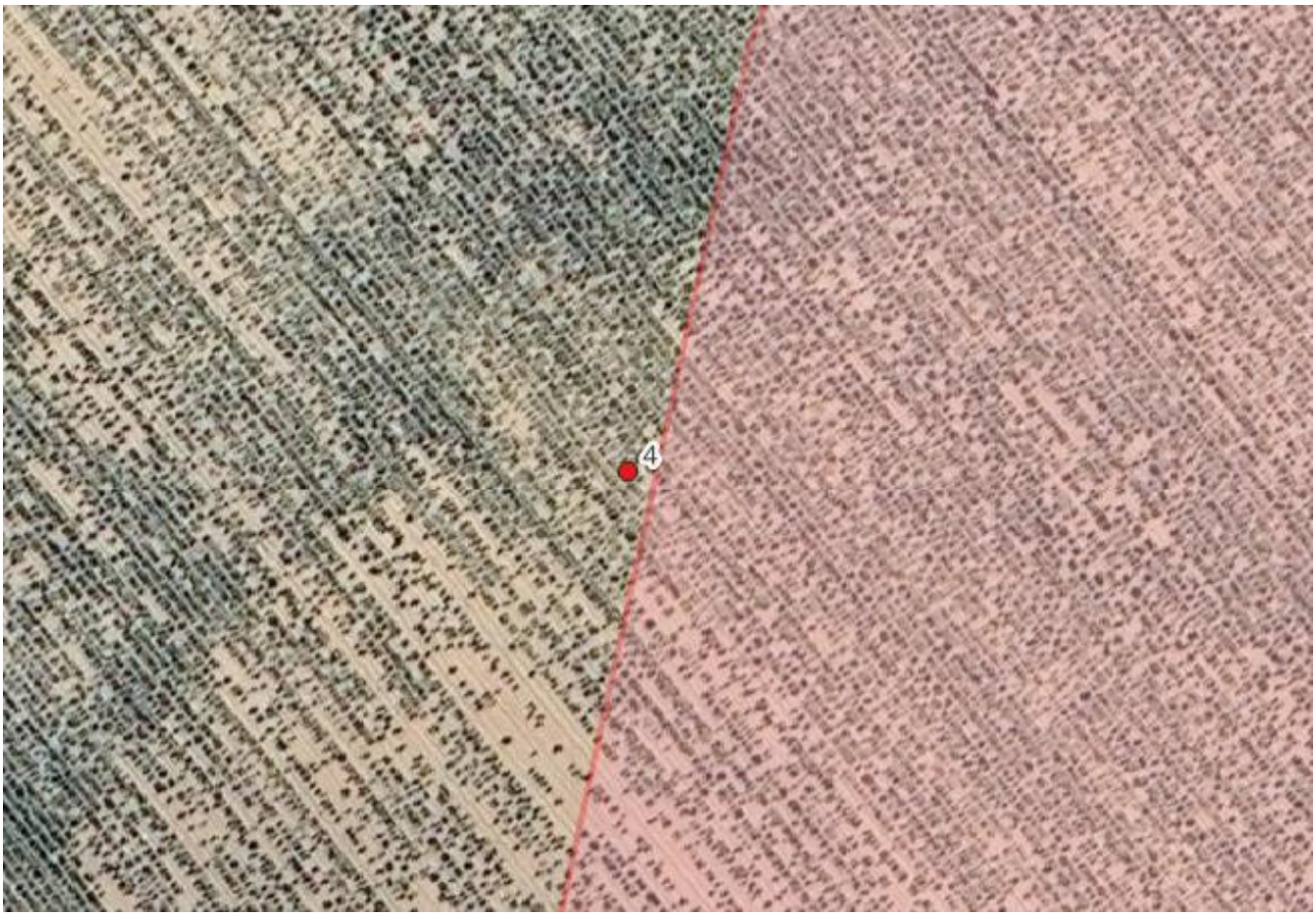


Figure 4.1: BH4 is located within 3.5m of a WRA

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

- Unnamed non-perennial drainage (water body).
- Riparian zone (in any).

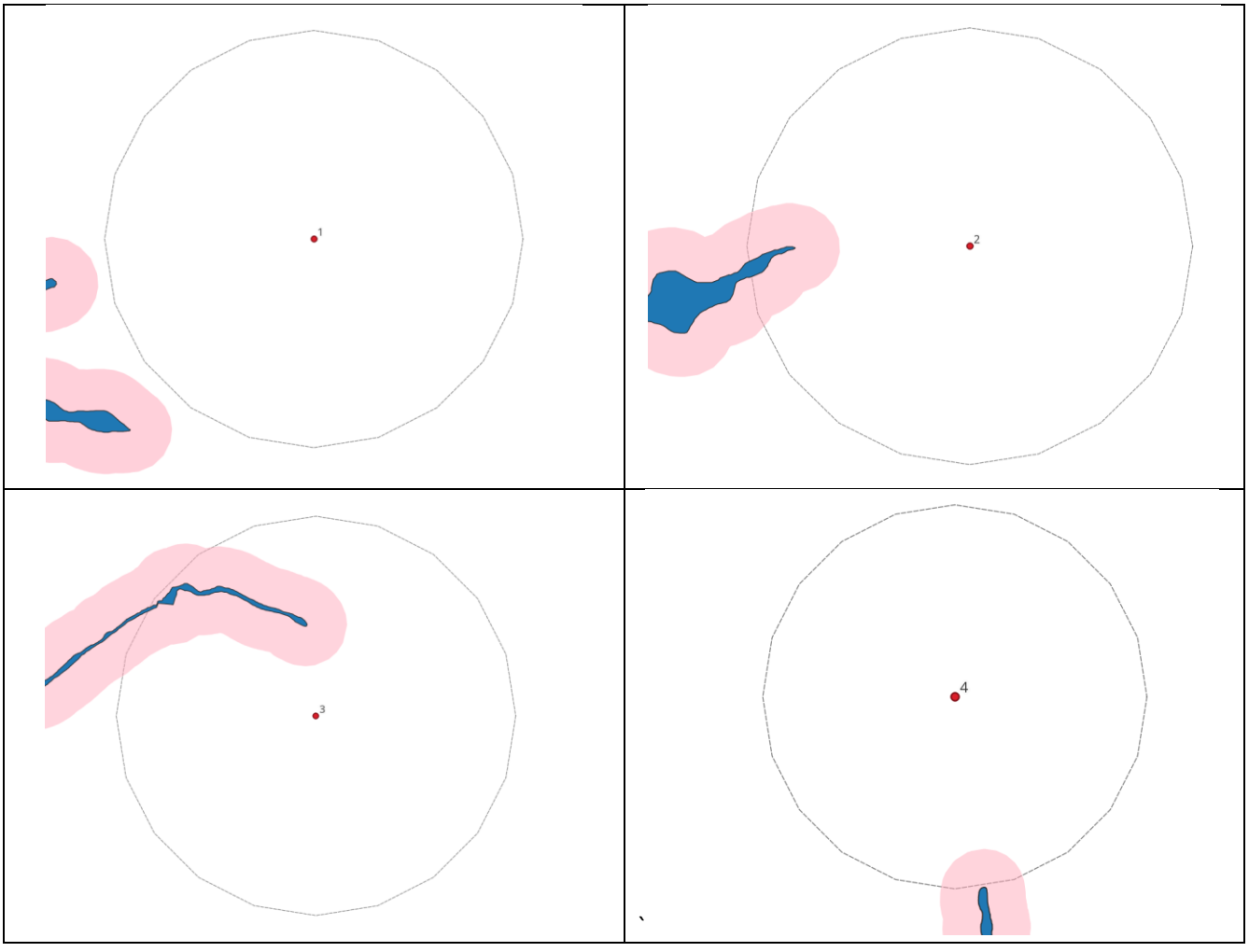
A 100 m distance was then included from the widest edge of the freshwater features listed above (within the total PAOI). This is called the 100 m RRA.

The 500m WRA 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 (if any)

A 500 m distance was then included from the widest edge of the wetland features as listed above. This is called the 500 m WRA.

The proximity of the proposed prospecting borehole points to both the DWS River-and Wetland Regulated Areas will trigger an approval requirement from DWS.



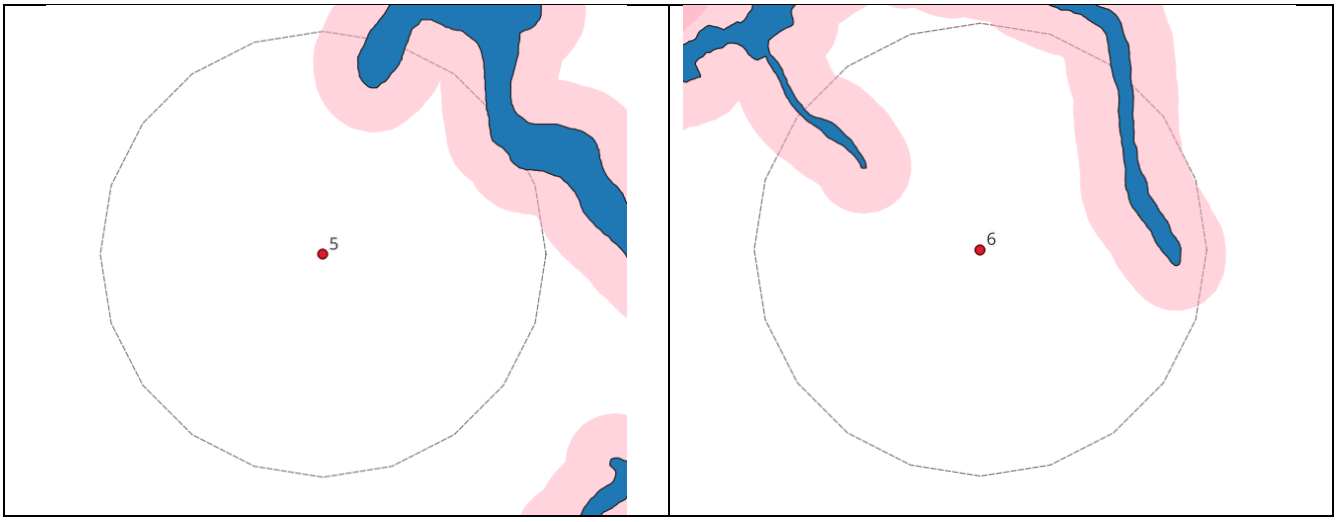
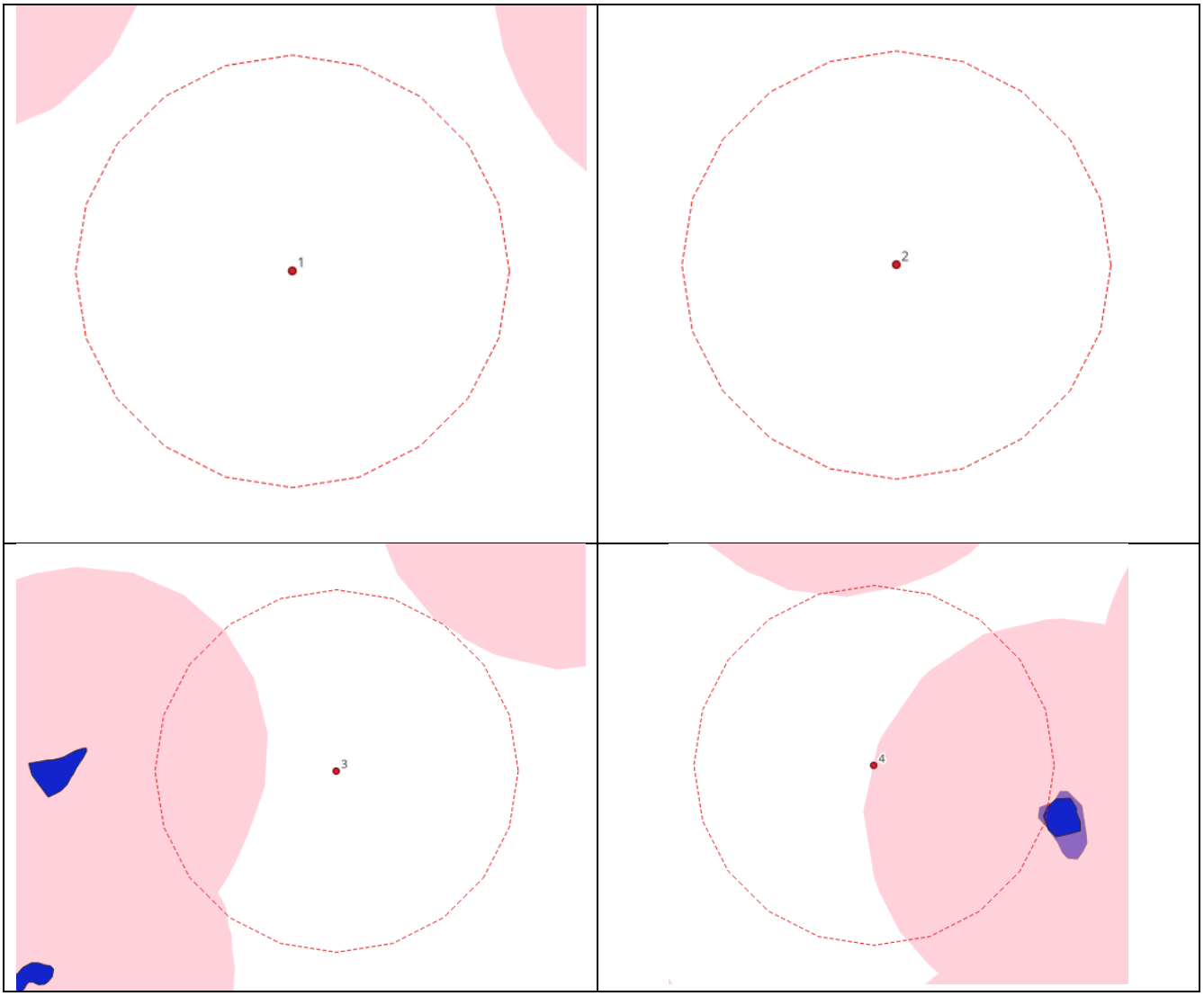


Figure 4.2: Delineation of the 100m DWS River Regulated Area within the Secondary PAOI of each of the borehole points (Blue = Rivers; Pink = RRA)



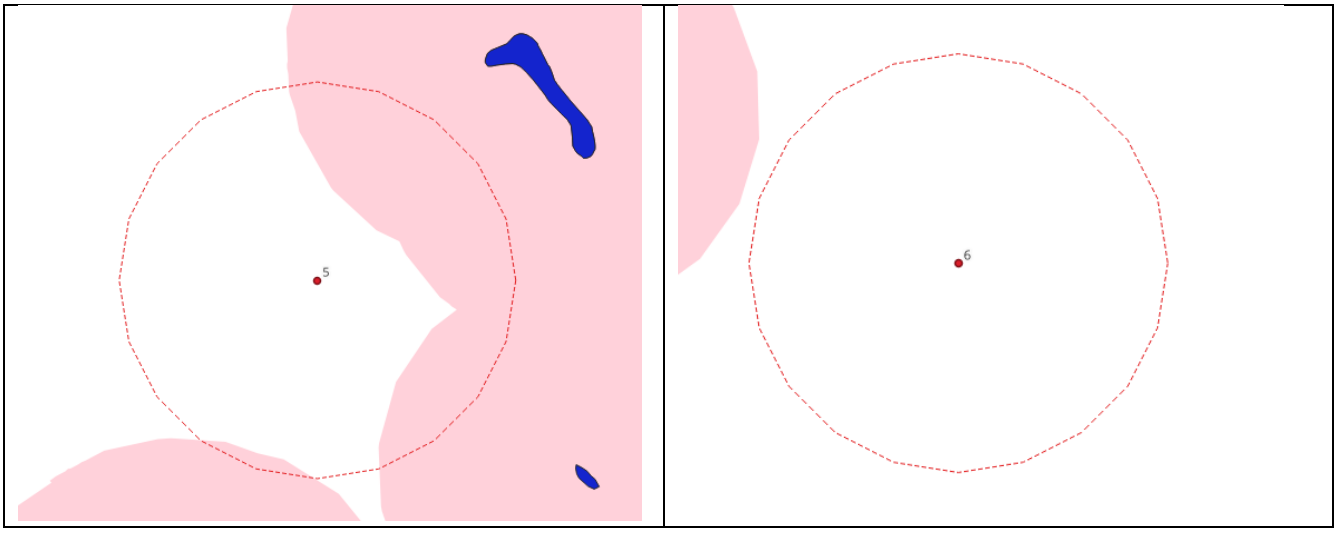


Figure 4.3: Delineation of the 500 m Wetland Regulated Area around each wetland system found in the Secondary PAOI of each of the borehole points (Blue = Wetlands; Pink = WRA)

5. Site sensitivity

5.1. 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 proximity within the Dry Highveld Grassland Bioregion. A perennial river (Doringspruit) also flows through the site. 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).

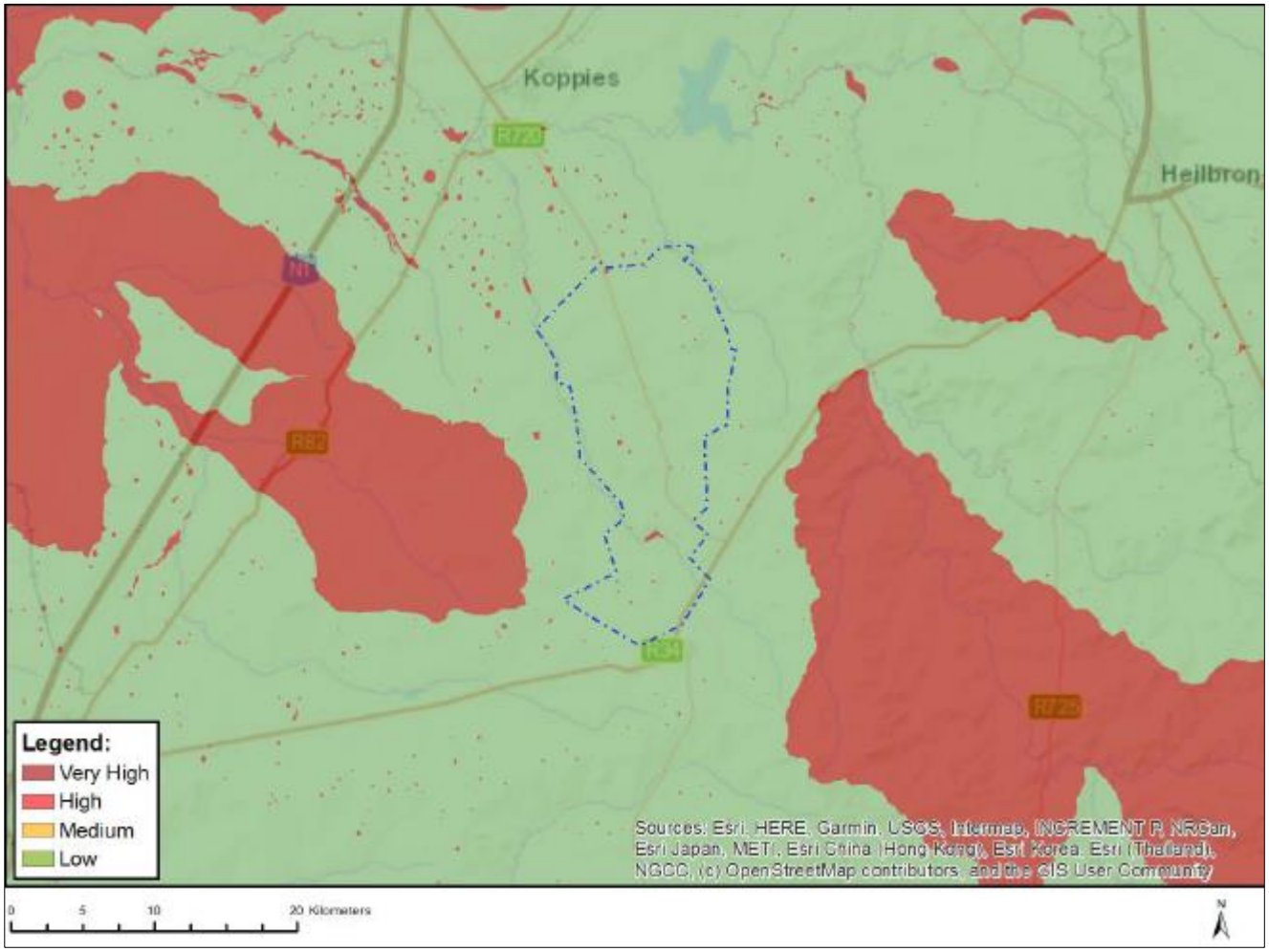


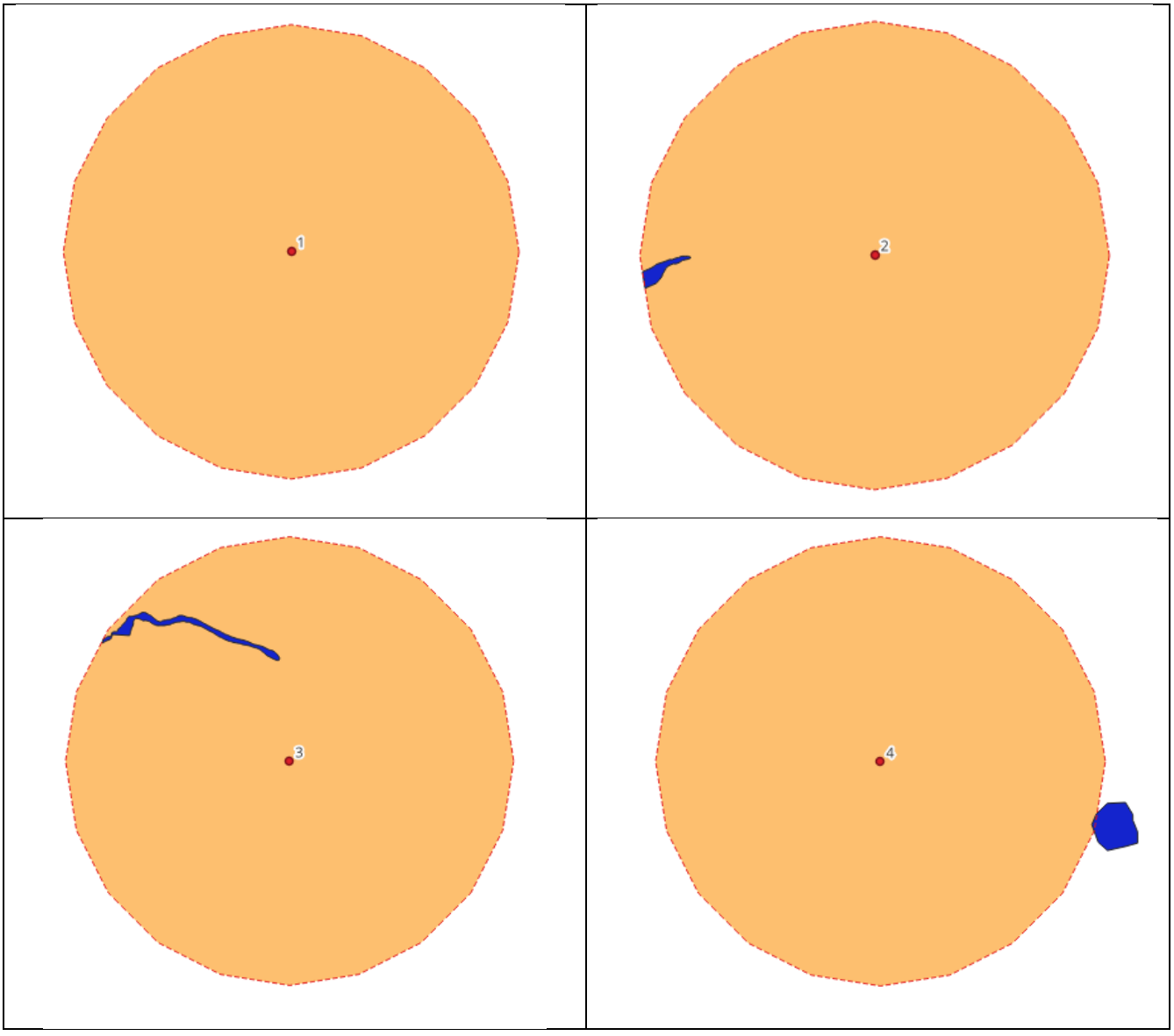
Figure 3.6: The DFFE Screening Tool map of the aquatic biodiversity theme sensitivity.

5.2. Site sensitivity

Site sensitivity was determined for Kroonstad North Prospecting 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	Six unnamed non-perennial drainage occur within the Secondary PAOI	High	All rivers and drainage systems are classified as highly sensitive. The risk of impacts, indirect and cumulative impacts, are high.
Wetland systems	Wetlands (x 5)	High	All Wetland features are protected and sensitive in South Africa as it presents a high risk of impacts.
Terrestrial landscapes	Areas with no freshwater features	Low	N/A

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).



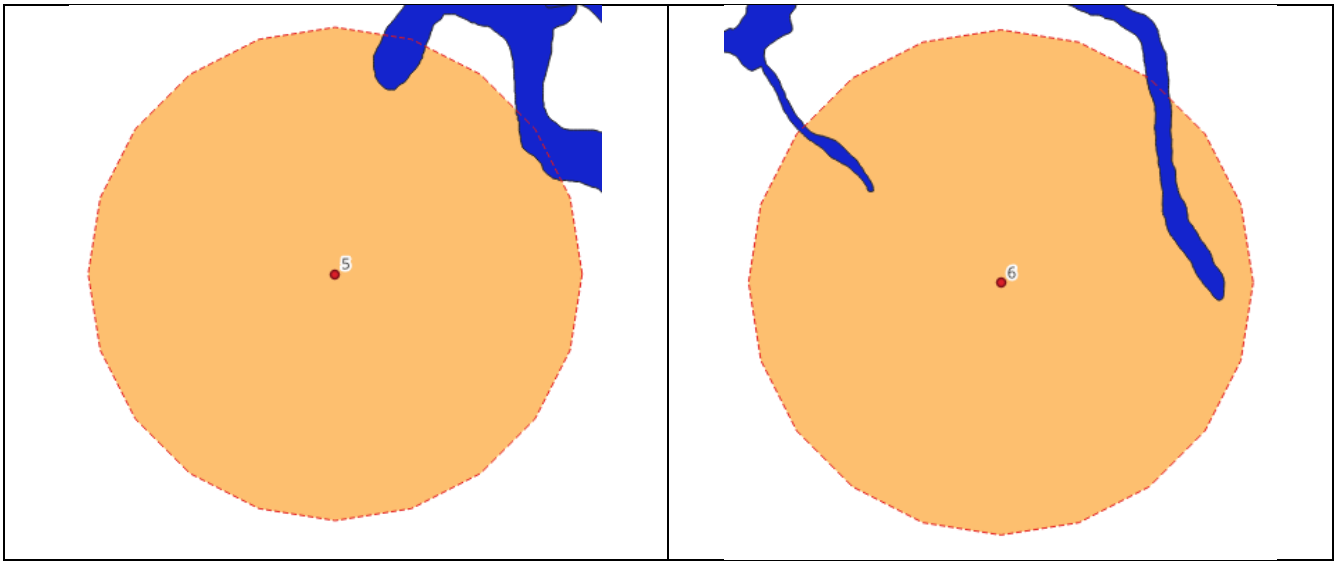


Figure 5.1: Sensitivity Map for the proposed six prospecting borehole sites and surrounding Secondary PAOI (Blue = High sensitivity; Orange = Low sensitivity)

6. Impact Assessment

The following issues were identified during the aquatic biodiversity assessment of Kroonstad North Prospecting, Free-State.

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 wetlands and drainages in the Secondary PAOI.
		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 drainages and wetlands within the Secondary PAOI.

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		- Borehole 4 is located within 3.5 m of a WRA. Impacting within the WRA must be avoided. - The relevant DWS permit (GA or full WUL) must be obtained from the competent authorities prior to commencement for any activity within an RRA or WRA.
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 close to 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 5m 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 wetlands and drainages in the Primary and Secondary PAOI.		
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 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 (minimally) the ecological functioning of the drainage and wetlands within the Secondary PAOI.		
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		- Revegetate cleared areas as soon as possible.
Significance of impact **(Severity x Incidence)**	Pre-mitigation significance		Post-mitigation significance
	Medium high (84)		Very low negative (18)

7. Conclusion

7.1. Summary

BlueLeaf Environmental (Pty) Ltd has been appointed by Enviroworks 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.

The site is situated on various farms between Koppies and Edenville and located 45km's east of Kroonstad in the Free-State (Fig 1.2). Farming consists of a mix of maize crop farming, game farms and cattle grazing. The proposed six boreholes are located at the following coordinates:

Borehole #	Coordinates	
1.	27° 22.303'S	27° 38.648'E
2.	27° 23.151'S	27° 37.704'E
3.	27° 27.707'S	27° 39.543'E
4.	27° 28.668'S	27° 39.072'E
5.	27° 29.497'S	27° 38.121'E
6.	27° 30.029'S	27° 39.129'E

The project involves invasive prospecting that will take the form of diamond drilling. This information will be integrated into the 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 Ore, Silver Ore, Coal, Cobalt, Copper Ore, Diamond (Alluvial), Iron Ore, Manganese Ore, Molybdenum Ore, Nickel Ore, Lead, Platinum Group Metals, Rare Earths, Sulphur, Uranium Ore, Tungsten Ore and Zinc Ore.

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 the proposed boreholes.	Definite
Secondary PAOI	500m buffer (85ha x 6) = 510 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
Tertiary PAOI	18 350 ha	The tertiary PAOI includes all farm portions where prospecting will occur on. These areas are not directly impacted by the development. Assessing this PAOI will result in identifying potential indirect and cumulative impacts.	Unlikely
Tertiary/Total PAOI	**18 350 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**

A site visit was conducted on the 24th to 25th 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.

The landscape within the project site is relatively flat with a incision running through the site where elevation decreases as a result of a perennial stream cutting through the landscape (Fig 3.1). Average elevations at the borehole sites are 1470 m.a.s.l (meters above sea level). The highest point of elevation is at borehole 1 (1490 m.a.s.l) and lowest at various borehole points at 1445 m.a.s.l.

Current land use has been determined and the entire study area consists of grassland, barren land as well as cultivated land. The land is currently being used for cattle grazing, maize crop farming as well as game farming. 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. Wetlands can be observed throughout the site.

The South African National Biodiversity Institute (SANBI) vegetation map (called the VegMap, 2022) lists the proposed activity within two vegetation units (Figure 3.2) namely **Vaal-Vet Sandy Grassland and Central Free-State Grassland.** All 6 borehole points will be located on Central Free-State Grassland. SANBI considers this vegetation type as least concerned with only small portions enjoying statutory conservation

According to the Free-State Biodiversity Plan (2016) none of the proposed borehole site occurs within a CBA or ESA.

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

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
Six Unnamed non-perennial drainages	Inland system: River	**Ecoregion:** Ecoregion 11: Highveld **Quaternary Catchment:** C60D **Veg:** Central Free State Grassland	Plain	Lowland rivers	Non-perennial	Natural
Wetland 1	Inland system: Wetland		Valley floor	Channelled Valley Bottom	Seasonally inundated	Artificial system
Wetland 2			Valley floor	Unchanneled Valley Bottom	Seasonally inundated	Artificial system
Wetland 3			Bench	Depression	Seasonally inundated	Natural system
Wetland 4			Valley floor	Depression	Seasonally inundated	Natural system
Wetland 5			Valley floor	Channelled Valley Bottom	Seasonally inundated	Artificial system

Numerous streams, rivers and wetlands were observed in the Total PAOI. As most of these systems are located too far from any of the boreholes (> 500m from the borehole site) and will therefore NOT be

impacted (directly or indirectly) by prospecting, they are excluded from assessment. Only systems that were located within 500 m of any of the borehole sites were delineated and assessed. This included wetlands, rivers/streams and delineated regulated areas (as per DWS guidelines) for rivers and wetlands.

Six non-perennial drainages, and five wetlands were found within the Secondary PAOI of each borehole point. None of the drainages found within the Secondary PAOI are classified as National Freshwater Ecosystem Priority Area (NFEPA) systems by SANBI. These systems have been classified in terms of their hydrogeomorphic characteristics, as non-perennial drainages that do not flow continuously throughout the year, although pools may persist. Flow regime is unpredictable. They are found within Central Free State Grassland vegetation with little to no alien species present.

A 100 m DWS Regulated Buffer (called the River Regulated Area or RRA) was placed around all delineated riverine features and a 500 m DWS Regulated Buffer (called the Wetland Regulated Area or WRA) around all delineated wetland features. Each freshwater feature is summarised below:

Borehole #	Aquatic feature	Description and location
Borehole 1	None	Not water features occur within borehole 1.
Borehole 2	– Unnamed non-perennial drainage 1	One non-perennial drainage was found within the Secondary PAOI of borehole 2. The drainage is completely transformed as it is in a maize field. Drainage of surface water still occur. Surface water was not present during the site assessment. The borehole is not located within the RRA.
Borehole 3	– Unnamed non-perennial drainage 2 – Artificial Valley Floor channelled-valley-bottom Wetland 1 – Artificial valley floor unchanneled-valley-bottom Wetland 2	One non-perennial drainage was found within the Secondary PAOI of borehole3. The drainage is found in natural highveld grassland. Drainage of surface water still occur. Surface water was not present during the site assessment. Wetlands are artificial and contains dammed water. Only the wetland regulated areas are in the Secondary PAOI. The borehole is not located within the RRA or WRA.
Borehole 4	– Unnamed non-perennial drainage 3 – Natural bench depression Wetland 3	The unnamed non-perennial drainage is not located in the Secondary PAOI of borehole 4 but its RRA is. The drainage is completely transformed as it is in a maize field. Drainage of surface water still occur. Surface water was not present during the site assessment. The borehole is located within the WRA.
Borehole 5	– Unnamed non-perennial drainage 4 – Natural valley floor depression Wetland 4 – Artificial valley floor channelled-valley-bottom Wetland 5	One non-perennial drainage was found within the Secondary PAOI of borehole 5. The drainage is found in natural highveld grassland. Drainage of surface water still occur. Surface water was not present during the site assessment. Wetlands contains dammed water. Only the wetland regulated areas are in the Secondary PAOI. The borehole is not located within the RRA or WRA.
Borehole 6	– Unnamed non-perennial drainage 5 – Unnamed non-perennial drainage 6	No wetlands or WRA's occur within the Secondary PAOI of borehole 6. Two non-perennial drainage were found within the Secondary PAOI of borehole 6. The borehole is not located within the RRA.

None of the rivers and wetlands located within the secondary PAOI will be directly affected. No borehole is in a RRA or WRA. Borehole 4 is located within 3.5 m of a WRA. Impacting within the WRA must be avoided.

7.2. Site sensitivity

Site sensitivity of sections within the study site allocated a high sensitivity to all water related structures (wetlands and rivers). The remainder of the Secondary PAOI has a low sensitivity due to the absence of any water related features. Any activity occurring within 100m of a river/stream and 500 m of a wetland will requires a water use licence application 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:

- Borehole 4 is located within 3.5 m of a WRA. Impacting within the WRA must be avoided.
- The relevant DWS permit (GA or full WUL) must be obtained from the competent authorities prior to commencement for any activity within an RRA or WRA.

Hydro-chemical pollution of surface waterbodies:

- Do not park construction machinery overnight close to any surface waterbody.
- Parked vehicles must always have drip trays underneath it. These drip trays must 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 5m 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:

- If borehole four remains, a General Authorization would need to be obtained from DWS.
- Ensure that drilling fluids do not spread to surrounding environment including surface waterbodies.

Clearing/Loss of vegetation:

- Clearing of vegetation to be done at least 5m away from surface waterbodies.
- Remove any alien vegetation on site.

Increased risk of soil erosion:

- Revegetate cleared areas as soon as possible.

7.8. General rehabilitation measures

- Apply for a Section 21 c&i Water Use Application with DWS for developing within 500m of a wetland and 100 m of a river.

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 prospecting must be allowed within or near any wetland or drainage without the proper submission and approval of an application to DWS. Borehole 4 is located within 3.5 m of a WRA. Impacting within the WRA must be avoided. The relevant DWS permit (GA or full WUL) must be obtained from the competent authorities prior to commencement for any activity within an RRA or WRA. There is however no impact anticipated on the wetland. No infrastructure or activities will take place within 100m of any river or stream.

The aquatic impacts of all aspects for Kroonstad North Prospecting in the Free State Province 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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