WETLAND ASSESSMENT

FOR PROPOSED TOWNSHIP ESTABLISHMENT ON THE REMAINDER OF PORTION 3 OF THE FARM NABOOMSPRUIT 348 KR , LIMPOPO PROVINCE

DOCUMENT CONTROL

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Authors	Mokgatla Molepo *Pr. Nat. Sci* (009509)

EXECUTIVE SUMMARY

MORA Ecological Services (Pty) Ltd was appointed as independent specialists to undertake a biodiversity impact assessment for the proposed township establishment on Remainder of Portion 3 of the Farm Naboomspruit 348 KR, in Limpopo Province.

A site visit was undertaken in April to investigate and report the status of wetlands that are present within 500 m radius of the site. According to the National Freshwater Ecosystem Priority Areas, and National Wetland Map there are wetlands within the 500 m radius.

This study is intended to provide detailed information on the aquatic constraints and impacts including recommended mitigation measures for the proposed township establishment.

From the desktop and site assessment, it was confirmed that the township establishment will have no direct impacts on the aquatic bodies in the area.

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DECLARATION OF INDEPENDENCE

I, Mokgatla Molepo, in my capacity as a specialist consultant, hereby declare that I:

- Act/acted as an independent specialist to Real Development Planning Company for this project.
- Do not have any personal, business or financial interest in the project expect for financial remuneration for specialist investigations completed in a professional capacity as specified by the Environmental Impact Assessment Regulations, 2017.
- Will not be affected by the outcome of the environmental process, of which this report forms part of.
- Do not have any influence over the decisions made by the governing authorities.
- Do not object to or endorse the proposed developments but aim to present facts and my best scientific and professional opinion with regard to the impacts of the development.
- Undertake to disclose to the relevant authorities any information that has or may have the potential to influence its decision or the objectivity of any report, plan or document required in terms of the Environmental Impact Assessment Regulations, 2017.

INDEMNITY

- This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken.
- This report is based on a desktop investigation using available information and data related to the site to be affected, *in situ* fieldwork, surveys and assessments and the specialists best scientific and professional knowledge.
- The Precautionary Principle has been applied throughout this investigation.
- The findings, results, observations, conclusions and recommendations given in this report are based on the specialist's best scientific and professional knowledge as well as information available at the time of study.
- Additional information may become known or available during a later stage of the process for which no allowance could have been made at the time of this report.
- The specialist reserves the right to modify this report, recommendations and conclusions at any stage should additional information become available.
- Information and recommendations in this report cannot be applied to any other area without proper investigation.
- This report, in its entirety or any portion thereof, may not be altered in any manner or form or for any purpose without the specific and written consent of the specialist as specified above.
- Acceptance of this report, in any physical or digital form, serves to confirm acknowledgement of these terms and liabilities.

Mokgatla Molepo *Pr. Nat. Sci.* (009509)

06 May 2022

1. INTRODUCTION

Leago Environmental Solutions has been appointed as the Environmental Assessment Practitioner undertake the required Basic Assessment application for the proposed township establishment on Remainder of Portion 3 of the Farm Naboomspruit 348 KR, in Limpopo Province (Figure 1). As part of the Environmental Authorisation process, Mora Ecological Services (Pty) Ltd was appointed to delineate and assess the existing wetland within the property.

The proposed development entails the following:

- 85 Residential 1 (dwelling house)
- 2 Institutional (orphanage and early childhood development centre)
- 1 Business 1 (shops and other business related uses)
- 1 Place of Public Worship
- 1 Municipal (municipal commonage)
- 1 Government (social services offices)

Figure 1: Locality map of the project area.

1.1. WETLAND DEFINITION

Wetlands are defined as those areas that have water on the surface or within the root zone for long periods during the year to allow for the development of anaerobic conditions. In terms of Section 1 of the National Water Act (NWA, Act 36 of 1998), wetlands are legally defined as: (1) 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.

Whereas RAMSAR Convention defines wetland as: (1.1) 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 meters.

Further says (2.1) may incorporate riparian and coastal zones adjacent to the wetlands, and islands or bodies of marine water deeper than six meters at low tide lying within the wetlands.

Wetlands are created from anaerobic conditions formed by unique soil conditions (i.e., hydric soils) and support vegetation (i.e., hydrophytes) that are adapted to these conditions. The hydric soils develop a grey or sometimes greenish or blue-grey colour as a result of the chemical reduction of iron (i.e., gleying). The hydric soils that are seasonally flooded are characterized by the formation of mottles, which are relatively insoluble, enabling them to remain in the soil long after it has been drained.

As a result, it is possible to identify wetland areas on the basis of soil colour using a standard colour chart such as Munsell Soil Colour Chart, 1994 to determine matrix hue and chroma levels. The mottle hue and chroma initially increase and then decrease the more saturated the soils are which helps to ascertain if the area is a wetland or not and the period of saturation.

Typically, indicators of soil wetness based on soil morphology correspond closely with vegetation distribution, since hydrology affects soils and vegetation in systematic and predictable ways. In systems where the hydrological regime has been modified due to human activities, vegetation distribution will vary systematically with soil morphology. The response of vegetation to alteration of hydrological conditions is rapid (i.e., months/years), whereas the response of soil morphology to such alteration is slow (i.e., centuries). Therefore, lowering of the water table or reduction of surface flows, may lead to rapid establishment of non-wetland related terrestrial vegetation, whereas the soil morphology will retain indicators of wetness for a lengthy period.

Soil morphology forms the basis of wetland delineation nationally, mainly because it provides a long-term indication of the “natural” hydrological regime. However, soil morphology cannot be considered to necessarily reflect the current hydrological conditions of the site where the hydrological regime has been altered, and in such circumstances, vegetation provides the best indication of the distribution of wetlands as it best reflects current hydrological conditions.

2. TERMS OF REFERENCE

This wetland assessment report is intended to provide detailed information on the aquatic constraints, potential impacts and recommended mitigation measures for the proposed township establishment.

The terms of reference for this study were as follows:

- Identify, assess, and delineate any waterbodies/wetlands within the study area;
- Identify and apply buffers to the outer edges of the wetlands within the area;
- Assess current impacts and suggest mitigation measures for minimising impacts on wetlands; and
- Compile report with maps.

3. ASSUMPTION AND LIMITATIONS

The following assumptions and limitations are applicable to this report:

- The wetland assessment is confined to 500 m buffer of the project boundary;
- The wetland delineation as presented in this report is regarded as a best estimate of the wetland boundary based on the site conditions present at the time of assessment. Global Positioning System (GPS) technology is inherently inaccurate and some inaccuracies due to the use of handheld GPS instrumentation may occur.

4. METHODOLOGY

Input into this report was informed by a combination of desktop assessments of existing aquatic ecosystem information for the study area and catchment, as well as by a more detailed assessment of the aquatic features on the site. The site was visited in April 2022. During the field visit, the characterisation and integrity assessments of the aquatic features and the site were undertaken. The SANBI Biodiversity GIS website was also consulted to identify any constraints in terms of fine-scale biodiversity conservation mapping as well as possible aquatic features mapped in the Freshwater Ecosystem Priority Areas maps.

The level of this assessment conducted was considered to be adequate for this project. This assessment was undertaken as a requirement in terms of National Environmental Management Act 107 of 1998 which manages and conserves natural resources; thus monitors and assess their sustainable use and compliance and the Environmental Impact Assessment Regulations of 2017 which indicates the listed activities that pose environmental threats anticipated during proposed development in order to attain sustainable environmental management and economic development prior to authorization.

4.1. WETLAND DEFINITION AND DELINEATION TECHNIQUE

For the purpose of this assessment, wetlands are considered as those ecosystems defined by the National Water Act as:

> "land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which land in normal circumstances supports or would support vegetation typically adapted to life in saturated soil."

These habitats are found where the topography and geological parameters impede the flow of water through the catchment, resulting in the soil profiles of these habitats becoming temporarily, seasonally or permanently wet. Further to this, wetlands occur in areas where groundwater discharges to the surface forming seeps and springs. Soil wetness and vegetation indicators change as the gradient of wetness changes (Figure 2)

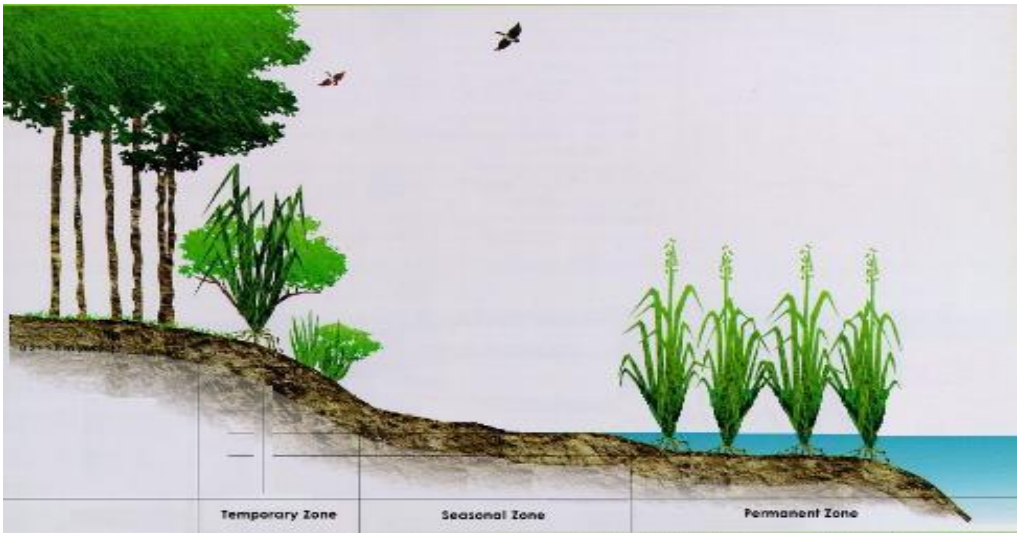

Figure 2: Increasing soil wetness zones.

Based on the definition of a wetland within the National Water Act, three vital concepts govern the presence of a wetland namely:

i. Hydrology- Land inundated by water or which displays saturated soils when these soils are biologically active (the growth season).
ii. Hydric soils- Soils that have been depleted of oxygen through reduction resulting in the presence of redoximorphic features.
iii. Hydrophytic vegetation- Plant species that are adapted to growing in saturated soils and subsequent anaerobic conditions (hydrophytes).

The conservation of wetland systems is vital as these habitats provide numerous functions that benefit not only biodiversity but provide an array of ecosystem services. These services are further divided into direct and indirect and are detailed in Table 1.

Table 1: Direct and indirect benefits of wetland systems (Kotze et al. 2005).

WETLANDS GOODS AND SERVICES	
DIRECT	**INDIRECT**
Hydrological Water purification Flood reduction Erosion control Groundwater discharge	Socio-economic Socio-cultural significance Tourism and recreation Education and research
Biodiversity conservation	Water supply
Chemical cycling	Provision of harvestable resources

The study site was assessed with regards to the determination of the presence of wetland areas according to the procedure described in “A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas” (DWAF, 2005).

4.2. WETLAND HEALTH AND FUNCTIONAL INTEGRITY ASSESSMENT TECHNIQUES

Out of the wetlands found around the study site, none is natural. A level 2 Wet-Health Assessment was used to determine the Present Ecological State (PES); a Level 2 Wet-EcoServices Assessment, and an Ecological Importance and Sensitivity (EIS) assessment of these wetlands was carried out. This was to understand if the artificial wetlands provide any ecological goods and services and/or contribute to conservation targets within the larger catchment.

4.3. ASSESSMENT OF IMPACT SIGNIFICANCE

Significance scoring both assesses and predicts the significance of environmental impacts through evaluation of the following factors; probability of the impact; duration of the impact; extent of the impact; and magnitude of the impact. The significance of environmental impacts is then assessed considering any proposed mitigations. The

significance of the impact “without mitigation” is the prime determinant of the nature and degree of mitigation required. Each of the above impact factors have been used to assess each potential impact using ranking scales (see Table 2).

Table 2: Significance scoring used for each potential impact.

PROBABILITY	**DURATION**
1-very improbable 2-improbable 3-probable 4-high probable 5-definite	1- very short duration (0-1years) 2- short duration (2-5 years) 3- medium term (5-15 years) 4- long term (>15 years) 5- permanent/unknown
EXTEND	**MAGNITUDE**
1- Limited to the site 2- Limited to the local area 3-Limited to the region 4-National 5-International	2- minor 4- low 6-moderate 8-high 10-very high

The following formula was used to calculate impact significance: Impact Significance: (Magnitude + Duration + Extent) x Probability.

The formula gives a maximum value of 100 points which are translated into 1 of 3 impact significance categories; Low, Moderate and High as per Table 3.

Table 3: Impact significance ratings

SIGNIFICANCE POINTS	**SIGNIFICANCE RATING**
0 - 30 points	Low environmental significance
31 - 59 points	Moderate environmental significance
60 -100 points	High environmental significance

4.4. DETERMINING BUFFER ZONES

The Water Research Commission report: *Buffer zone guidelines for wetlands, rivers and estuaries* (Macfarlane & Bredin, 2017) were used to aid in watercourse classification and determining the need and extent of buffer zones. These publications use the following definitions:

- Buffer zone: *A strip of land with a use, function or zoning specifically designed to protect one area of land against impacts from another.*
- Aquatic impact buffer zone:
  A zone of vegetated land designed and managed so that sediment and pollutant transport carried from source areas via diffuse surface runoff is reduced to acceptable levels.

According to this guideline, buffer widths should be tailored according to risk: This criterion recognizes the importance of using risk as a basis for establishing an appropriate buffer width. Where risk or uncertainty is high, ecologically conservative buffers should be established whereas less conservative buffers are appropriate for low-risk situations. Several key risk factors have been identified for possible inclusion in the approach. These include:

(i) Risks posed by adjacent land-uses or activities;
(ii) The importance and sensitivity of the water resource;
(iii) The conservation status (risk of extinction) of aquatic and semi-aquatic species;
(iv) Characteristics of the buffer that affects the functionality of the buffer; and
(v) Mitigation measures that may be applied to reduce risks.

The extent of the buffer zone is calculated from:

(i) Edge of the active channel (Rivers and streams);
(ii) Edge of the temporary zone (Wetlands).

This method of calculating the extent of the buffer is designed for site-based assessments and includes a more detailed evaluation of risks and consideration of site-specific factors that can affect buffer requirements. Such an approach is designed to inform any detailed development planning and provide an appropriate level of information for authorization purposes. In short, the following stepwise methodology is applied (Table 4):

Table 4: Stepwise tasks for buffer recommendation.

Step	Task	Scope
1	Define objectives and scope to determine the most appropriate level of assessment	**Desktop assessment:** This assessment is designed to characterize risks at a desktop level in order to red-flag land located adjacent to water resources that should potentially be set aside and managed to limit impacts on water resources. **Site-based assessment:** This assessment is designed for site-based assessments and includes a more detailed evaluation of risks and consideration of site-specific factors that can affect buffer requirements.
2	Map and categorize water resources	The assessor is required to generate a map delineating the boundaries of the water resources potentially affected by proposed developments within the study area.
2.1	Classify the watercourse	E.g., Wetland, spring or river and subcategories: Ephemeral drainage line and type of channel (albeit with or without active channel).
2.2	Map the line from which aquatic impact buffer zones will be delineated (Edge of active channel)	• Rivers and streams – the outer edge of the active channel; • Wetlands – the edge of the temporary zone.
2.3	Identify water resource type	Desktop: Level 3: Sub-system / landscape unit. Site based: Level 4: Hydromorphic unit.
3	Management objectives	Use appropriate references and methods (below) to formulate management objectives for the watercourse.
3.1	Determine the Present	Desktop or site based assessment depending on

	Ecological State	requirements from regulating authority.
3.2	Determine the Importance and sensitivity	In order to determine the overall importance and sensitivity of a water resource, the ecological, social and economic importance should be considered.
4	Risk assessment of water resources	Undertake a risk assessment to assess the potential impacts of planned activities on water resources.
5	Risk assessment for protection of biodiversity	Assess risks posed by proposed development on biodiversity and identify management zones
6	Delineate and demarcate recommended setback requirements	Finalize and delineate setback requirements on a layout plan and in the field. In doing so, it is also important to ensure that setback requirements also cater for a range of other potentially important management, functional and legal requirements.
7	Document management measures necessary to maintain the effectiveness of setback areas	Key aspects of the setback requirements will include: • An aquatic impact buffer zone; • Possible core habitat requirements; • Possible corridor requirements; • Any additional aspects requiring consideration to ensure effective management of setback areas.

5. DESCRIPTION OF THE STUDY AREA

5.1.1. Climate

The area is influenced by the local steppe climate. In Mookgophong, there is little rainfall throughout the year. The average temperature in Mookgophong is 19.5 °C. Precipitation here is about 599 mm per year.

5.1.2. Vegetation

The study area falls within the Savanna Biome. The vegetation type found on the study site Springbokvlakte Thornveld (Figure 3). This vegetation type is found in Limpopo, Mpumalanga, North-West and Gauteng Provinces: Flats from Zebediela in the northeast to Hammanskraal and Assen in the southwest as well as from Bela-Bela and Mookgophong in the northwest to Marble Hall and Rust de Winter in the southeast.

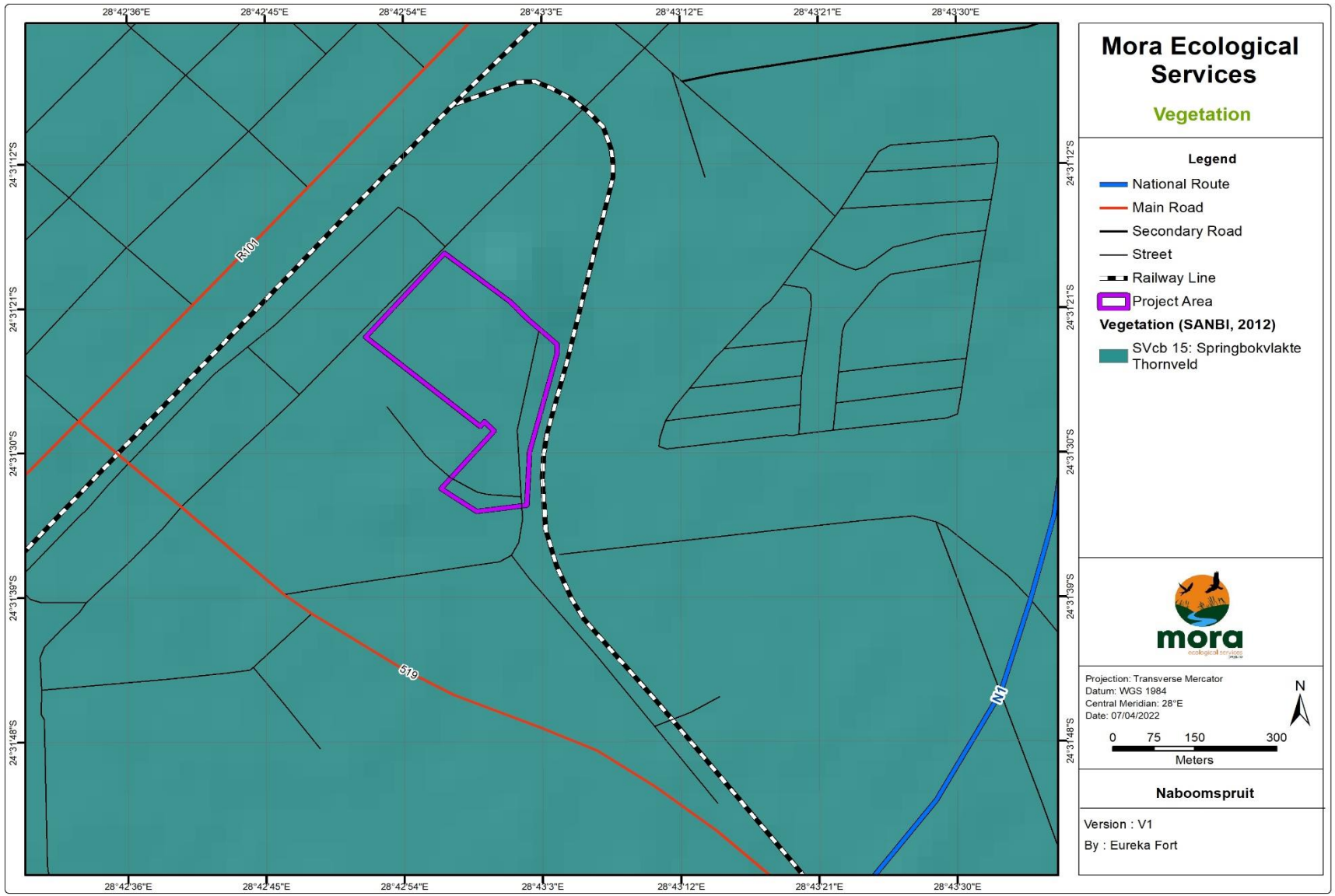

Figure 3: Vegetation map of the study site.

6. NATIONAL FRESHWATER ECOSYSTEM PRIORITY AREAS (NFEPA)

National Freshwater Ecosystem Priority Areas (NFEPA) aims to provide strategic spatial priorities for conserving South African freshwater ecosystems and support sustainable use of water resources. Therefore, implementing both the NWA and the RAMSAR Convention definition of wetland they map and prioritize these areas based on the criteria which look at their modification or alteration and ecosystem functionality.

South African National Biodiversity Institute (SANBI) developed a mapping and ranking system for wetlands. This system assigns a rank and condition of wetlands (Figure 4&5).

CRITERION	RANK
Wetlands that intersect with a **Ramsar** site	1
Wetlands within 500 m of a IUCN threatened **frog** point locality	2
Wetlands within 500 m of a threatened **waterbird** point locality	2
Wetlands (excluding dams) with the majority of its area within a sub-quaternary catchment that has sightings or breeding areas for threatened **Wattled Cranes, Grey Crowned Cranes and Blue Cranes**	2
Wetlands (excluding dams) within a sub-quaternary catchment **identified by experts** at the regional review workshops as containing wetlands of exceptional biodiversity importance, **with valid reasons documented**	2
Wetlands (excluding dams) within a sub-quaternary catchment **identified by experts** at the regional review workshops as containing wetlands that are good, intact examples from which to choose	2
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing wetlands of biodiversity importance, but with **no valid reasons documented**	3
Wetlands (excluding dams) in A or B condition AND associated with more than three other wetlands (both riverine or non-riverine wetlands were assessed for this criterion)	4
Wetlands in C condition AND associated with more than three other wetlands (both riverine or non-riverine wetlands were assessed for this criterion)	4
Wetlands (excluding dams) within a sub-quaternary catchment identified by experts at the regional review workshops as containing impacted Working for Wetland sites	5
Any other wetland (excluding dams)	6

Figure 4: NFEPA Rank (©SANBI).

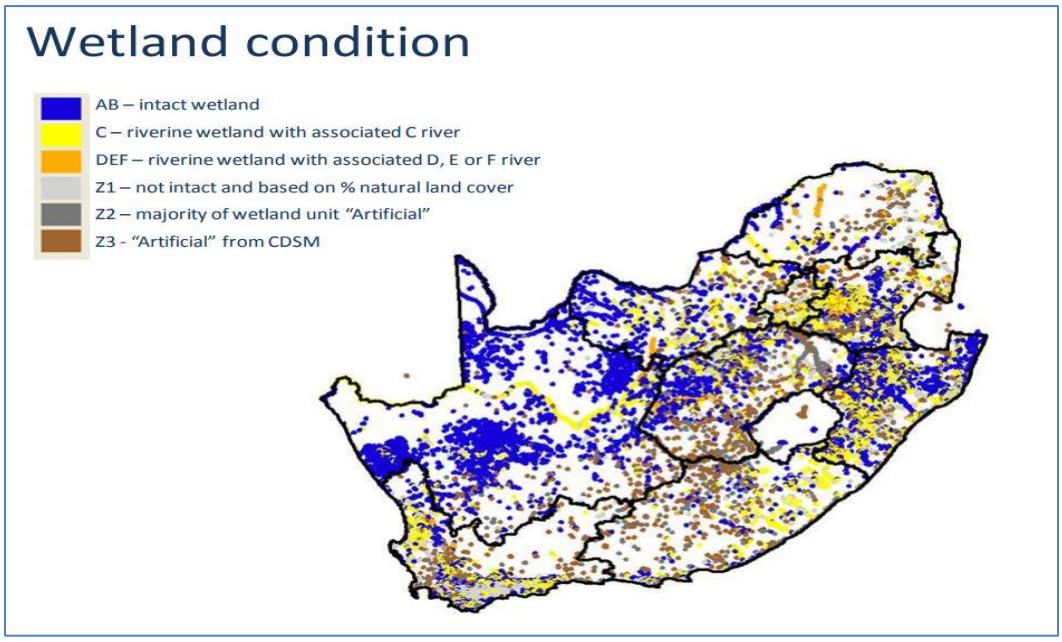

Figure 5: Wetland Condition (©SANBI).

6. RELEVANT LEGISLATION

The Constitution of the Republic of South Africa Act (Act No. 108 of 1996) – Section 24.

The Constitution is South Africa's overarching law. It prescribes minimum standards with which existing and new laws must comply. Chapter 2 of the Constitution contains the Bill of Rights in which basic human rights are enshrined. Government's commitment to give effect to the environmental rights enshrined in the Constitution is evident from the enactment of various pieces of environmental legislation since 1996, including the National Water Act, the National Environmental Management Act, etc.

National Environmental Management Act (Act No. 107 of 1998) (NEMA), as amended.

NEMA replaces a number of the provisions of the Environment Conservation Act, 1989 (Act No. 73 of 1989). The Act provides for cooperative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote cooperative governance and procedures for coordinating environmental functions. The principles enshrined in NEMA guide the interpretation, administration and implementation of the Act with regards to the protection and / or management of the environment. These principles serve as a framework within which environmental management must be formulated. Section 2(4) specifies that "sustainable development requires the consideration of all relevant factors including aspects specifically relevant to biodiversity":

National Environmental Management: Biodiversity Act (Act No. 10 of 2004) (NEMBA).

NEMBA provides for the management and conservation of biological diversity and components thereof; the use of indigenous biological resources in a sustainable manner; the fair and equitable sharing of benefits rising from bio-prospecting of biological resources; and cooperative governance in biodiversity management and conservation within the framework of NEMA.

National Water Act (Act No. 36 of 1998) (NWA).

The National Water Act (NWA) is a legal framework for the effective and sustainable management of water resources in South Africa. Central to the NWA is recognition that water is a scarce resource in the country which belongs to all the people of South Africa and needs to be managed in a sustainable manner to benefit all members of society. The NWA places a strong emphasis on the protection of water resources in South Africa, especially against its exploitation, and the insurance that there is water for social and economic development in the country for present and future generations.

The National Water Act, requires any development to secure Water Use Licences with the following activities:

Section 21 (a), abstractive use of water for construction (if possible and required).

Section 21 (c) and (i) use, i.e., river or wetland crossings, which includes any drainage lines by any infrastructure.

In terms of the definitions provided, activities included under Sections 21(c) and 21(i) are (amongst others) the construction of roads, bridges, pipelines, culverts and structures for slope stabilisation and erosion protection. DWS will however need to be approached to provide guidance on whether approval for Section 21 (c) and (i) water uses would be required.

GENERAL AUTHORISATION IN TERMS OF SECTION 39 OF THE NWA

According to the preamble to Part 6 of the NWA, "This Part established a procedure to enable a responsible authority, after public consultation, to permit the use of water by publishing general authorisations in the Gazette…" "The use of water under a general authorisation does not require a licence until the general authorisation is revoked, in which case licensing will be necessary…"

The General Authorisations for Section 21 (c) and (i) water uses (impeding or diverting flow or changing the bed, banks or characteristics of a watercourse) as defined under the NWA have recently been revised (Government Notice R509 of 2016). Determining if a water use licence is required for these water uses is now associated with the risk of degrading the ecological status of a watercourse. A low risk of impact could be authorised in terms of a General Authorisations (GA).

CMS

The Convention on the Conservation of Migratory Species of Wild Animals (also known as CMS or Bonn Convention) aims to conserve terrestrial, aquatic and avian migratory species throughout their range. It is an intergovernmental treaty, concluded under the aegis of the United Nations Environment Programme, concerned 22 with the conservation of wildlife and habitats on a global scale. Since the Convention's entry into force, its membership has grown steadily to include 117 (as of 1 June 2012) Parties from Africa, Central and South America, Asia, Europe and Oceania. South Africa is a signatory to this convention.

AEWA

The African-Eurasian Waterbird Agreement. The Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) is the largest of its kind developed so far under the CMS. The AEWA covers 255 species of birds ecologically dependent on wetlands for at least part of their annual cycle, including many species of divers, grebes, pelicans, cormorants, herons, storks, rails, ibises, spoonbills, flamingos, ducks, swans, geese, cranes, waders, gulls, terns, tropic birds, auks, frigate birds and even the South

African penguin. The agreement covers 119 countries and the European Union (EU) from Europe, parts of Asia and Canada, the Middle East and Africa.

Other Relevant Legislations and Guidelines:

- DWS Wetlands Delineation and Riparian area determination Guideline, 2005;
- Biodiversity management plans (BMP); and
- National biodiversity assessment (NBA).

The study site falls within Limpopo Water Management Area and there are no water resources within the site (Figure 6).

Figure 6: Aquatic resources map of the study site.

7. WETLAND ASSESSMENT FOR THE STUDY AREA

The purpose of the wetland assessment is to determine the relative importance, sensitivity, and current conditions of the significant aquatic features in order to assess the impact of the current activities on those aquatic resources. The assessment is also required to make recommendations in terms of mitigation measures that can be used to prevent or minimise the impact on the aquatic resources.

7.1. CLASSIFICATION OF WETLANDS

Wetlands are known to perform several important functions within ecosystems. These include flood attenuation, sediment trapping, improving water quality and being areas of rich biodiversity. However, most of the wetlands are disturbed and lost due to numerous natural disasters, human associated alteration and destruction and climate change effects both locally and globally.

It is important to note that, should one of these wetland functions be greatly affected, this does not necessarily mean that all the wetland functions are affected, but other functions can still be intact. For example, should the flood attenuation function of a wetland be greatly reduced through the cutting of vegetation across the site, this does not necessarily mean that the wetlands ability to purify water has also been lost. This obviously depends on the degree and nature of disturbance. Wetlands still maintain some degree of functionality regardless of the inflicted disturbance unless they are completely removed for infrastructure development.

Pressures arising from social and economic needs have resulted in widespread degradation of freshwater ecosystems. National Freshwater Ecosystem Priority Areas (NFEPA) aims to provide strategic spatial priorities for conserving South African freshwater ecosystems and support sustainable use of water resources. Therefore, implementing both the NWA and the RAMSAR Convention definition of wetland they map and prioritize these areas based on the criteria which look at their modification or alteration and ecosystem functionality. Under the NFEPA the assessed wetlands are categorized as natural or artificial and each wetland significance to the ecosystem functioning.

The wetland assessment consists of the following aspects: Wetland classification; Wetland integrity; and Ecosystem services supplied by the wetland.

The classification of the wetlands in the study area into different wetland types was based on the WET-EcoServices technique (Kotze et al, 2005). The WET-EcoServices technique identifies seven main types of wetlands based on hydro-geomorphic characteristics (Table 5).

Table 5 below defines the wetland types as seen in (Figure 7) as classified by Rand Water, 2011 and defined by Kotze et al., 2007 and Ollis et al, 2013.

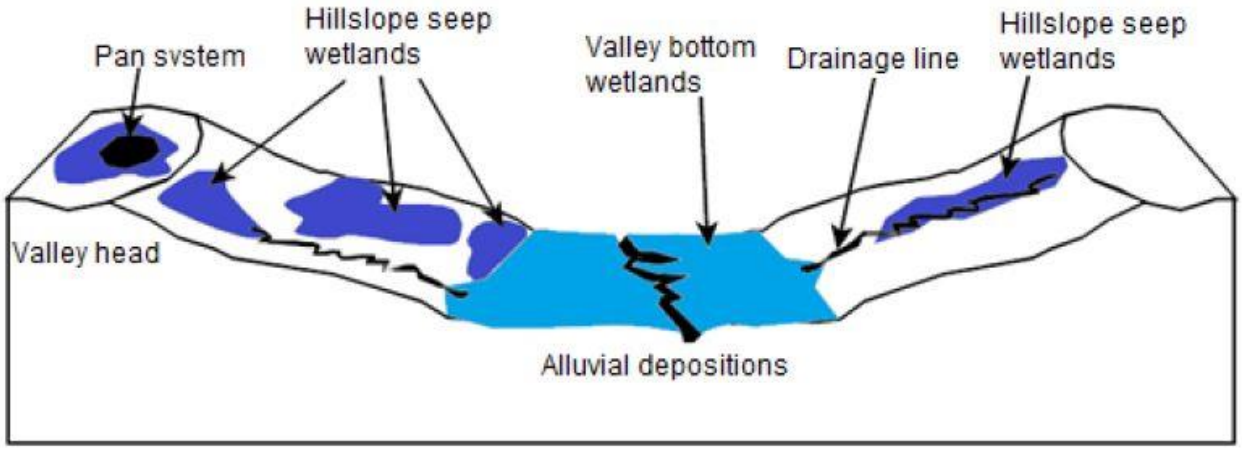

Figure 7: Wetland types as classified by Kotze et al, 2007 and Ollis et al, 2013.

Table 5: Wetland hydro-geomorphic types typically supporting inland wetlands in South Africa.

Hydro-geomorphic types	**Description**	**Source of water maintaining the wetland[1]**	
		Surface	**Sub-surface**
Floodplain	Valley bottom areas with a well-defined stream channel, gently sloped & characterized by floodplain features such as oxbow depressions and natural levees and the alluvial (by water) transport and deposition of sediment, usually leading to a net accumulation of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*
Valley bottom with a channel	Valley bottom areas with a well-defined stream channel but lacking characteristic floodplain features. May be gently sloped and characterized by the net accumulation of alluvial deposits or may have steeper slopes and be characterized by the net loss of sediment. Water inputs from main channel (when channel banks overspill) and from adjacent slopes.	***	*/***
Valley bottom without a channel	Valley bottom areas with no clearly defined stream channel usually gently sloped and characterized by alluvial sediment deposition, generally leading to accumulation of sediment. Water inputs mainly from channel entering the wetland and also from adjacent slopes.	***	*/***
Hillslope seep with stream channel	Slopes on hillsides, which are characterized by colluvial (transported by gravity) movement of materials. Water inputs are mainly from sub-surface flow and outflow is usually via a well-defined stream channel connecting the area directly to a stream channel.	*	***
Isolated hillslope seepage	Slopes on hillsides, which are characterized by the colluvial (transported by gravity) movement of materials. Water inputs mainly from sub-surface flow and outflow either very limited or through diffuse sub-surface and/or surface flow but with no direct surface water connection to a stream channel.	*	***
Depression	A basin shaped area with a closed elevation contour	*/***	*/***

(includes pans)	that allows for accumulation of surface water (i.e., it is inward draining). It may also receive sub-surface water. An outlet is usually absent, and therefore this type is usually isolated from the stream channel network.		

[1] Precipitation is an important water source and evapotranspiration an important output

Water source: * Contribution usually small

** Contribution usually large

*** Contribution may be small or important depending on local circumstances

7.2. WETLAND INTEGRITY

The Present Ecological Status (PES) Method (DWAF 2005) is used to establish the integrity of the wetlands in the study area and was based on the modified Habitat Integrity approach developed by Kleynhans (DWAF, 1999; Dickens et al, 2003). Table 6 shows the criteria and results from the assessment of the habitat integrity of the wetlands.

Table 6: Habitat integrity assessment criteria for palustrine wetlands (Dickens et al, 2003).

Criteria & Attributes	Relevance
Hydrologic	
Flow Modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime (timing, duration, frequency), volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to the wetland.
Permanent Inundation	Consequence of impoundment resulting in destruction of natural wetland habitat and cues for wetland biota.
Water Quality	
Water Quality Modification	From point or diffuse sources. Measure directly by laboratory analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities. Aggravated by volumetric decrease in flow delivered to the wetland.
Sediment Load Modification	Reduction due to entrapment by dams or increase due to land use practices such as overgrazing. Cause of unnatural rates of erosion, accretion or infilling of wetlands and change in habitats.
Hydraulic/Geomorphic	
Canalisation	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitats. River diversions or drainage.
Topographic Alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities that reduce or change wetland habitat directly in inundation patterns.
Biota	
Terrestrial Encroachment	Desiccation of wetland and encroachment of terrestrial plant species due to changes in hydrology or geomorphology. Change from wetland to terrestrial habitat and loss of wetland functions.
Indigenous Vegetation Removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat and flow attenuation functions, organic matter inputs and increases potential for erosion.
Invasive Plant Encroachment	Affects habitat characteristics through changes in community structure and water quality changes (oxygen reduction and shading).
Alien Fauna	Presence of alien fauna affecting faunal community structure.
Over use of Biota	Overgrazing, over fishing, etc.

Table 7: Relation between scores given and ecological categories.

Scoring Guidelines	Interpretation of Mean* of Scores: Rating of Present Ecological Status Category (PESC)
Natural, unmodified - score=5	Within general acceptable range. CATEGORY A >4; Unmodified or approximates natural condition.
Largely natural - score=4	CATEGORY B >3 and <4; Largely natural with few modifications, but with some loss of natural habitats
Moderately modified score=3.	CATEGORY C >2 and <3; moderately modified, but with some loss of natural habitats.
Largely modified - score=2.	CATEGORY D <2; largely modified. Large loss of natural habitat & basic ecosystem function has occurred. OUTSIDE GENERALLY ACCEPTABLE RANGE
Seriously modified - rating=1	CATEGORY E >0 and <2; seriously modified. Losses of natural habitat & ecosystem function are extensive.
Critically modified - rating=0.	CLASS F 0; critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

8. ASSESSMENT RESULTS

The desktop and groundtruthing revealed that there are no wetlands within the study area. There are diggings and vegetation clearance because of people doing small scale subsistence farming. No further assessments were conducted.

9. CONCLUSION AND RECOMMENDATIONS

Although there are aquatic resources on site, the following are recommended to protect the environment.

The following are recommended:

- All bare areas should be vegetated to prevent soil erosion into the wetland.
- The ECO/SEO must be notified of any spills or leakages near wetland areas. These spills/leaks should be treated with hydrocarbon degrading bacteria (products such as or similar to biologX or Oil Spill Gobbler^{TM}).
- Spillages of fuels, oils and other potentially harmful chemicals must be cleaned up immediately and contaminants properly drained and disposed of using proper solid/hazardous waste facilities. Any contaminated soil must be removed, and the affected area rehabilitated.

It is the opinion of the specialist that the proposed township establishment be considered, provided that mitigations and recommendations are adhered to.

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11. APPENDICES

APPENDIX A: GLOSSARY OF ACRONYMS

BGIS Biodiversity Geographic Information System

CR Critically Endangered

EIA Environmental Impact Assessment

EN Endangered

EW Extinct in the Wild

EX Extinct

EIS Ecological Important Services

IEM Integrated Environmental Management

IUCN International Union for Conservation of Nature

LC Least Concern

ME Mitigation Efficiency

NBA National Biodiversity Assessment

NEMBA National Environmental Management Biodiversity Act

NFEPA National Freshwater Ecosystem Priority Areas

NT Near Threatened

NWA National Water Act

PES Present Ecological State

QDS Quarter Degree Square

R Rare

RDL Red Data List

SANBI South African National Biodiversity Institute

SCC Species of Conservation Concern

ToR Terms of Reference

VU Vulnerable

WMA Water Management Areas