WETLAND DELINEATION AND IMPACT ASSESSMENT REPORT: FOR THE PROPOSED MINING RIGHT APPLICATION FOR THE PROPOSED MINING OF COAL ON THE REMAINING EXTENTS OF PORTIONS 18, 21, 55, 64, 69, 85, 213 OF FARM TENBOSCH 162 JU, PORTIONS 2, 5 AND 6 OF FARM TURFBELT 593 JU AND FARM TECKLENBURG 548 JU BARBERTON MANAGERIAL DISTRICT OF THE MPUMALANGA PROVINCE.

CLIENT:	COMPLIED BY:	EAP
TENBOSCH MINING (PTY) LTD	The Pivot, Block E, First Floor Montecasino Boulevard, Johannesburg, 2191, Johannesburg, South Africa Cell: +27 712082364 Tel: +27 11 052 6711	546 16th Road | Building 3 | Constantia Office Park | Midrand | Gauteng | 1685

April 2023

CONDITIONS RELATING TO THIS REPORT

DECLARATION OF INTEREST

Mawenje Consulting Africa (MCA) Pty (Ltd) has no vested interest in the property studied nor is it affiliated with any other person/body involved with the property and/or proposed development. MCA is not a subsidiary, legally or financially of the proponent. The study was undertaken by Mr Tshuxekani Maluleke, he is a registered Natural Scientists with the following details:

QUALIFICATIONS

SPECIALIST	QUALIFICATION
Mr Tshuxekani Maluleke (SACNASP Reg. No. 120501)	MSc Environmental Sciences (Wits University) BSc Hons Zoology (University of Limpopo) BSc Hons Animal, Plant and Environmental Sciences (Wits University)

APPROVAL

PREPARED BY:

Mr Tshuxekani Maluleke

Wetland and Biodiversity Specialist

Msc. Environmental Sciences

06 April 2023

PEER REVIEWED BY:

Dr Gabriel Ngorima

Professional Environmental Scientist

INDEMNITY

Although Mawenje Consulting Africa (MCA) Pty (Ltd) exercises due care and diligence in rendering services and preparing documents, the client takes full responsibility for this report and its implementation in terms of the National Environmental Management Act of 1998, and exempt Mawenje Consulting Pty (Ltd) and its associates and their sub-contractors from any legal responsibility based on the timing of the assessment, the result and the duration thereof, which has an influence on the credibility and accuracy of this report. MCA accepts no liability, and the client indemnifies MCA and its directors, managers, agents, and employees against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with services rendered, directly or indirectly, by MCA and by the use of this document.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACCRONYMS

BGIS: Biodiversity Geographic Information System

DEM: Digital Elevation Model

DWAF: Department of Water Affairs and Forestry

DWS: Department of Water Affairs and Sanitation

EA: Environmental Authorisation

EIS: Ecological Importance and Sensitivity

EMPr: Environmental Management Program

GIS: Geographic Information System

HGM: Hydrogeomorphic

NFEPA: National Freshwater Priority Area

NWA: National Water Act (Act no 36 of 1998)

PES: Present Ecological Status

QDS: Quarter Degree Square

SANBI: South African National Biodiversity Institute

TWQRs: Target Water Quality Ranges

WMA: Water Management Areas

WUL: Water Use Licence

TERMS OF REFERENCE

Mawenje Consulting Africa Pty (Ltd) was requested to conduct a wetland delineation of the wetland/s present on the study sites. This report includes the delineation and provides an assessment on the ecological state of these areas.

1. INTRODUCTION

Mawenje Consulting Africa (MCA) (Pty) Ltd has been appointed by Kimopax Group (Pty) Ltd on behalf of Tenbosch Mining (Pty) Ltd to conduct a wetland delineation for the application of a mining right for coal On The Remaining Extents Of Portions 18, 21, 55, 64, 69, 85, 213 Of Farm Tenbosch 162 JU, Portions 2, 5 And 6 Of Farm Turfbelt 593 JU And Farm Tecklenburg 548 JU Barberton Managerial District Of The Mpumalanga Province. The project is located within the boundaries of the Nkomazi Local Municipality, which forms part of the Ehlanzeni District Municipality located in the Mpumalanga Province, South Africa. The investigation has been undertaken to form part of the Environmental Impact assessment (EIA), and associated management plan (EMP). This report presents the findings of the wetland assessment and delineation of which the fieldwork was conducted on the **23-24 March 2023** (**Figures 1**).

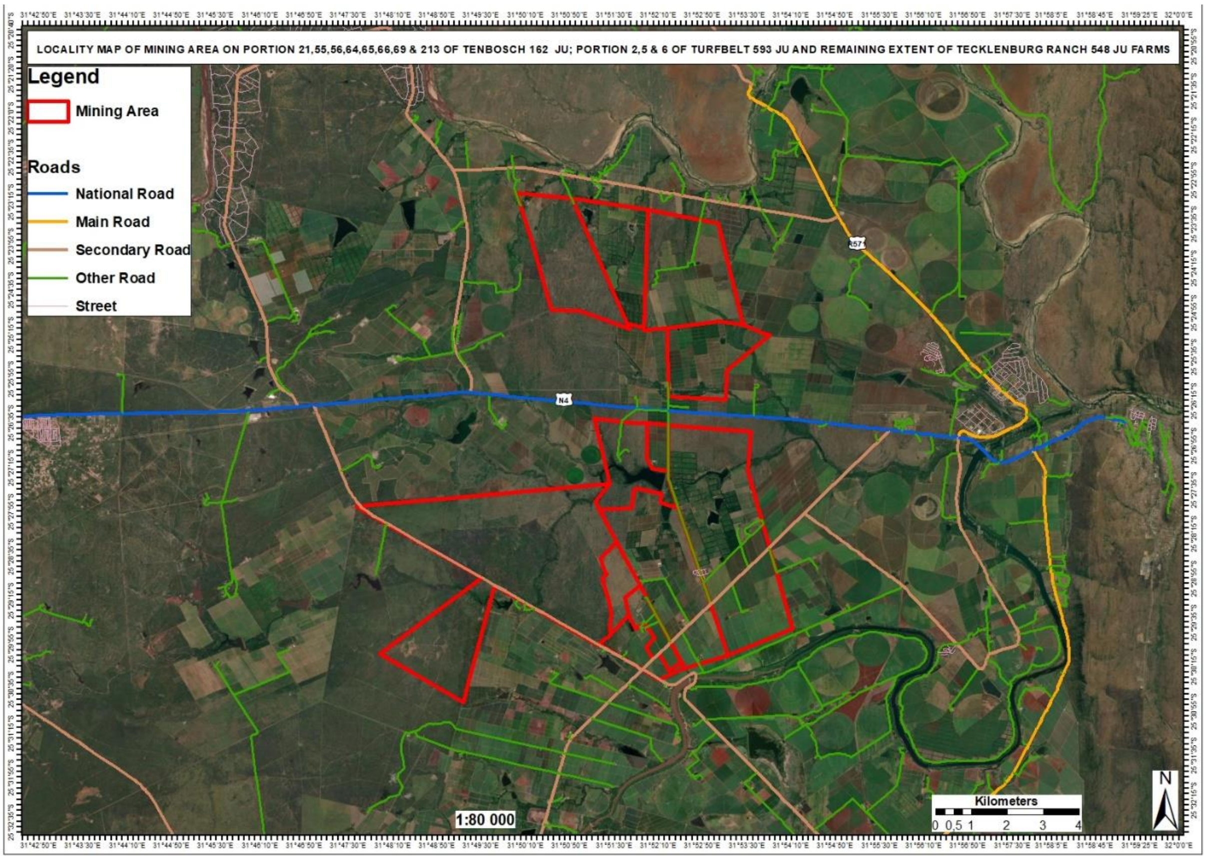

Figure 1: Locality Map (Study Site)

2. BACKGROUND

The mine will be developed as follows:

- Tenbosch Mining will be an underground mining operation. The approximate extent of the underground mining area is 6 521 ha, and the proposed coal mining will be by decline method. There is an alternative to use a single or twin decline shafts which will comprise of two parallel shafts, one dedicated to personnel and material movement and one dedicated to coal conveying.
- These will be the up and down cast ventilation tunnels for the mine, but up-cast raise bore ventilation shafts will be developed once required and these two declines will both be downcast. Raise bore ventilation holes will be developed as part of on-going capital as mining progresses.
- Bord-and-pillar mining method is proposed for dipping coal seams. This entails the mining of rooms (bords) leaving pillars intact as a primary support to support the immediate roof.
- Secondary support will be used in the form of roof bolts and any other support means as and when required into the immediate roof of the bords mined.

The infrastructures that will be required are the following:

- The shaft bank area (for the main and ventilation shafts and the immediate infrastructure associated therewith including the winder houses, the ventilation fans, materials handling equipment etc.);
- The ROM ore storage areas and underground development waste rock areas;
- Crushing and screening plant;
- Sales product storage areas and load out areas;
- Tailings storage facility;
- Surface substations and the like;
- Main access road from the N4 to the mine site,
- Stormwater management infrastructure;
- A pollution control dam;

- Buildings including workshops, change house-lamp room, offices, stores;
- Contractors' laydown area and parking;
- Power Supply infrastructure including a switching yard and electrical powerlines;
- Sewerage treatment package plant;
- Water Treatment Plant;
- Fuel storage; and
- Water Infrastructures including portable water tanker etc.

The Life of Mine (LOM) for Tenbosch Mining is approximately 35 years.

The potential environmental impacts associated with the mining activities will be identified through the EIA Report of the EIA Study, assessed and significance of impacts determined through the Environmental Impact Report (EIR) and managed through a detailed Environmental Management Programme (EMPr).

3. LEGAL FRAMEWORK

3.1 National Environmental Management Act (Act No. 107 of 1998)

The EIA Regulations, promulgated under NEMA, focus primarily on creating a framework for co-operative environmental governance. NEMA provides for co-operative environmental governance by establishing principles for decision-making on matters affecting the environment, institutions that will promote co-operative governance and procedures for co-ordinating environmental functions exercised by State Departments and to provide for matters connected therewith.

3.2 National Waste Act, 2008 (Act No. 59 of 2008)

The NEMWA aims at promoting sustainable waste management practices through the implementation of "Integrated Waste Management Planning", where "Integrated Waste Management Planning is viewed as a holistic approach of managing waste, aimed at optimising waste management practises to ensure that the implementation thereof yields practical solutions that are environmentally, economically and socially sustainable and acceptable to the public and all relevant spheres of government".

3.3 National Water Act, 1998 (Act No. 36 of 1998)

The National Water Act, 1998 (Act No. 36 of 1998) (NWA) aims to provide management of the national water resources to achieve sustainable use of water for the benefit of all water users. This requires that the quality of water resources is protected as well as integrated management of water resources with the delegation of powers to institutions at the regional or catchment level. The purpose of the Act is to ensure that the nation's water resources are protected, used, developed, conserved, managed and controlled in responsible ways. Of specific importance to this application is Section 19 of the NWA, which states that an owner of land, a person in control of land or a person who occupies or uses the land which thereby causes, has caused or is likely to cause pollution of a water resource must take all reasonable measures to prevent any such pollution from occurring, continuing or recurring and must therefore comply with any prescribed waste standard or management practices.

Regulations GN 704 dated June 1999 under the NWA, 1998 (Act 36 of 1998) stipulates that no development activities may take place within the 1:100 year floodline of a watercourse, or within 100 m of the watercourse, whichever is the furthest.

Regulations GN 509 dated August 2016 under the Section 21 c and i water uses of the NWA, 1998 (Act No 36 of 1998) stipulates the:

"Extent of a watercourse" as:

(a) 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.

"Regulated area of a watercourse" for section 21(c) or (i) of the Act water uses in terms of this Notice means:

(a) 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;
(b) 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 (subject to compliance to section 144 of the Act); or

(c) A 500 m radius from the delineated boundary (extent) of any wetland or pan.

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

The purpose of the Biodiversity Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and the protection of species and ecosystems that warrant national protection. As part of its implementation strategy, the National Spatial Biodiversity Assessment was developed.

4. SCOPE OF WORK

4.1 Wetland Delineation and Assessment

The scope of work entailed the following:

- Field visit to delineate the outer boundary of wetland/riparian habitats within a 500 m buffer from the study site according to the methods contained in the manual 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas' (DWAF, 2005);
- Assess and describe the health of any wetland units identified, through evaluation of indicators based on geomorphology, hydrology and vegetation as per the WET-Health methods;
- Assess and describe the Ecological Services, Importance and Sensitivity (EIS) of any wetlands identified on site;
- Identify potential negative impacts on the wetland(s) from the Marieskop Access Road and assess the significance of these impacts;
- Provide recommended mitigation measures for the identified impacts in order to avert or lower the significance of the negative impacts.

4.2 Ecological Assessment

The scope of work entailed to the Biodiversity Assessment following:

- An examination of onsite and SANBI GIS databases on Endemic and Red Data faunal and floral species in the study area;

- Provide recommended mitigation measures for the identified impacts in order to avert or lower the significance of the negative impacts; and
- Identify any sensitive areas.

5. ASSUMPTIONS AND LIMITATIONS

- It is assumed that wetland plant species flowering only during specific times of the year could be confused with a very similar species of the same genus.
- Some wetland plant species that emerge and bloom during another time of the year or under very specific circumstances may have been missed entirely.
- In order to obtain a comprehensive understanding of the dynamics of the wetland habitats of the study area, surveys should ideally have been replicated over several seasons and over a number of years. However, due to project time constraints such long-term studies are not feasible and this survey was conducted in one season during a once-off site visit of two days.
- Data collection in this study relied heavily on data from representative, homogenous wetland sections, as well as general observations, analysis of satellite imagery from the past until the present, generic data and a desktop analysis.
- No formal water quality or aquatic faunal assessments (e.g., SASS 5) were conducted as part of this study. All comments on these subjects were made from estimations of the current, visible situation in the field.
- The specialist responsible for this study reserves the right to amend this report, recommendations and/or conclusions at any stage should any additional or otherwise significant information come to light.

6. SITE LOCATION

The proposed site is located at the remainder of the portion of the Tecklenburg 548 JU. The site is bound by three main roads which are R582 (Coopersdal), which is on the south and on the east is Strydom Block road. The N4 to Komatipoort exists on the north at approximately 4km from the site. It should be noted that the closest or the road that have access to the site is through R582, hence there are sugar cane farms on the northern side of the area, Refer to **Figure 2**.

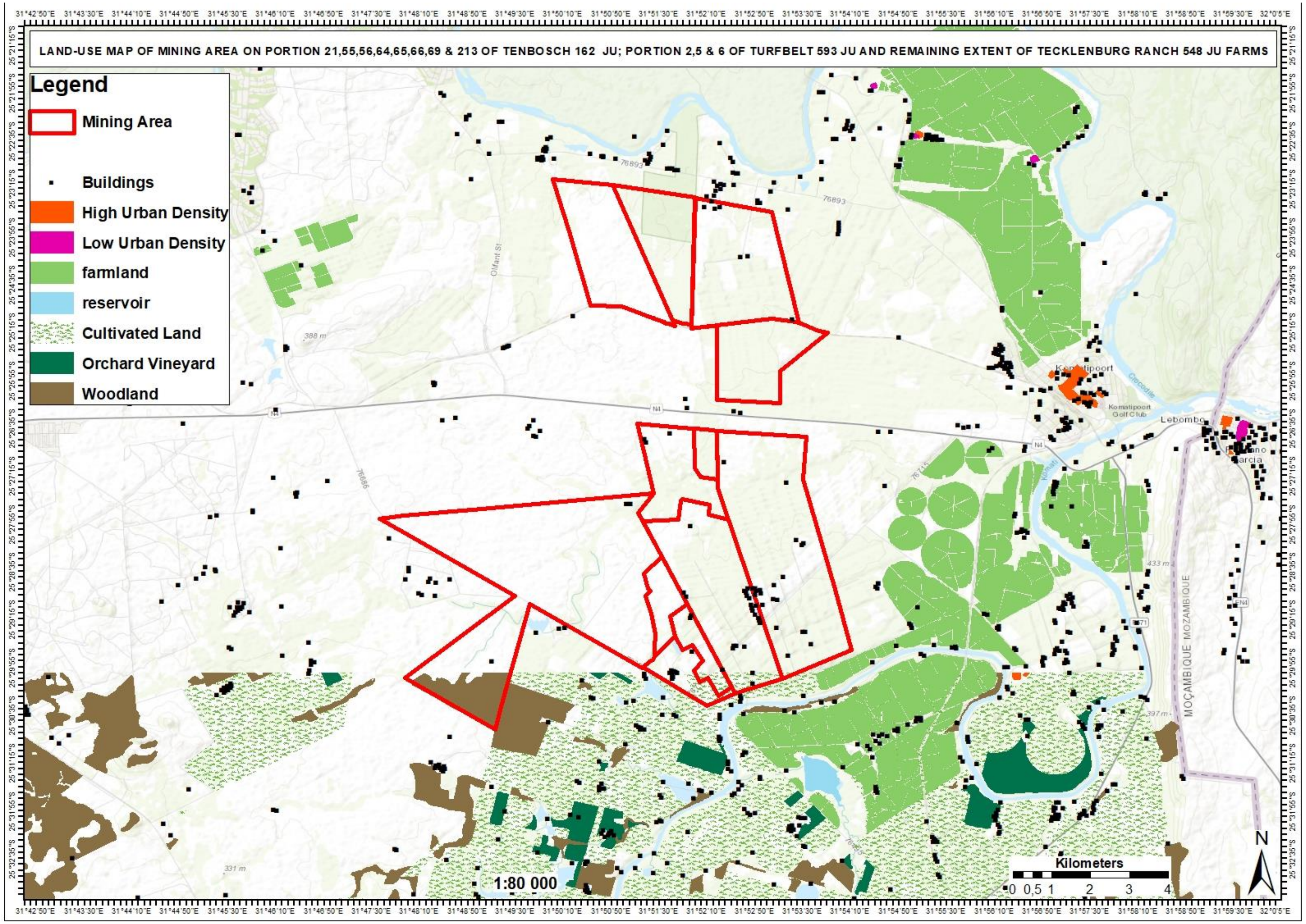

Figure 2: Landuse Map

7. METHODOLOGY

7.1 Wetland Assessment

For the purpose of this assessment, wetlands are considered as those ecosystems defined by the National Water Act No. 36 of 1998 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."

7.1.1 Desktop Assessment

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA)'s databases were undertaken for the project. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs. FEPAs are determined through a process of systematic biodiversity planning and involved collaboration of over 100 freshwater researchers and practitioners. They are identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009).

The assessment of the study site involved the investigation of aerial photography, GIS databases including the NFEPA and South African National Wetland maps as well as literature reviews of the study site in order to determine the likelihood of wetland areas within this site.

7.1.2 Field Assessment

The wetland delineation was conducted as per the procedures described in 'A Practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1' (Department of Water Affairs, 2005) (**Figure 3**). This document requires the delineator to give consideration to four indicators in order to find the outer edge of the wetland zone:

- The Terrain Unit Indicator helps to identify those parts of the landscape where wetlands are more likely to occur.
- The Soil Form Indicator identifies the soil forms, as defined by the Soil Classification Working Group (1991), which are associated with prolonged and frequent saturation.
- The Vegetation Indicator identifies hydrophilic vegetation associated with frequently saturated soils.
- The Soil Wetness Indicator identifies the morphological "signatures" developed in the soil profile as a result of prolonged and frequent saturation. Signs of wetness are characterised by a variety of aspects. These include marked variations in the colours of various soil components, known as mottling; a gleyed soil matrix or the presence of Mn/Fe concretions. It should be noted that the presence of signs of wetness within a soil profile is sufficient to classify an area as a wetland area despite the lack of other indicators.

In assessing whether an area is a wetland, the boundary of a wetland or a non-wetland area should be considered to be the point where the above indicators are no longer present. An understanding of the hydrological processes active within the area is also considered important when undertaking a wetland assessment. Indicators should be 'combined' to determine whether an area is a wetland, to delineate the boundary of that wetland and to assess its level of functionality and health.

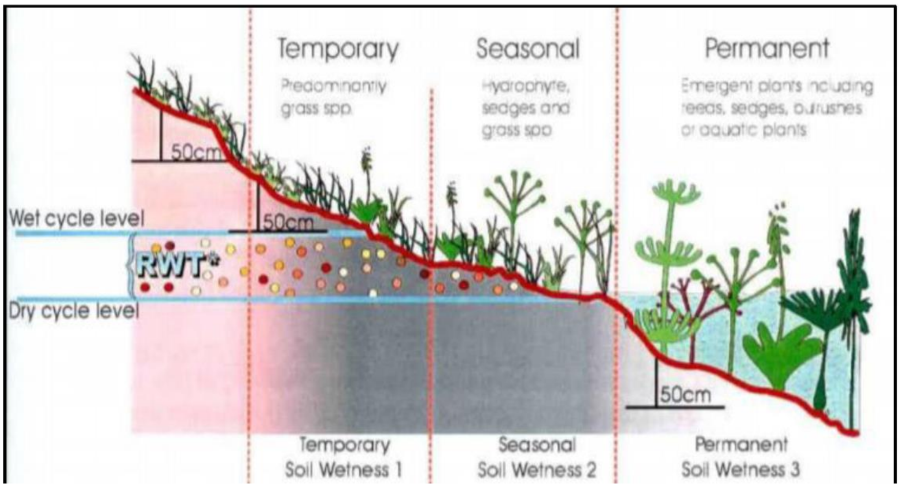

Figure 3: Different zones of wetness found in wetlands, indicating how the soil wetness and vegetation indicators change (DWAF, 2005).

7.1.3 Wetland Functionality and Health

Wetlands within the study area serve to improve habitat within and potentially downstream of the study area through the provision of various ecosystem services. Many of these functional benefits contribute directly or indirectly to increased biodiversity within the transformed study area as well as downstream of the study area through provision and maintenance of appropriate habitat and associated ecological processes (**Table 1**).

Table 1: Ecosystem services provided by wetlands (Kotze et al, 2008).

Ecosystem services supplied by wetlands	Indirect benefits	Regulating and supporting benefits		Flood attenuation	The spreading out and slowing down of floodwaters in the wetland, thereby reducing the severity of floods downstream.
				Streamflow regulation	Sustaining streamflow during low flow periods.
			Water quality enhanced benefits	Sediment trapping	The trapping and retention in the wetland of sediment carried by runoff waters
				Phosphate assimilation	Removal by the wetland of phosphates carried by runoff waters.
				Nitrate assimilation	Removal by the wetland of nitrates carried by runoff waters.
				Toxicant assimilation	Removal by the wetland of toxicants (e.g. metals, biocides and salts) carried by runoff waters.
				Erosion control	Controlling of erosion at the wetland site, principally through the protection provided by vegetation.
				Carbon storage	The trapping of carbon by the wetland, principally as soil organic matter.
	Biodiversity Maintenance				Through the provision of habitat and maintenance of natural process by the wetland, a contribution is made to maintaining biodiversity of the surrounding area.
	Direct benefits	Provisioning benefits		Provision of water for human use	The provision of water extracted directly from the wetland for domestic, agriculture or other purposes.
				Provision of harvestable resources	The provision of natural resources from the wetland, including livestock grazing, craft plants, fish, etc.
				Provision of cultivated foods	The provision of areas in the wetland favourable for the cultivation of foods.
		Cultural benefits		Cultural heritage	Places of special cultural significance in the wetland, e.g., for baptisms or harvesting of culturally significant plants.
				Tourism and recreation	Sites of value for tourism and recreation in the wetland, often associated with scenic beauty and abundant birdlife.
Education and research					Sites of value in the wetland for education or research.

An indication of the functions and ecosystem services provided by wetlands can be assessed through the WET- Ecoservices manual (Kotze et al., 2008) and are based on a number of characteristics that are relevant to the particular benefit provided by the wetland. A Level 2 WET-Ecoservices assessment was undertaken for the wetlands occurring on site. A Level 2 assessment is the highest form of WET-Ecoservices assessment that can be undertaken and involves an on-site and desktop assessment.

Each wetland's ability to contribute to ecosystem services within the study area is further dependant on the particular wetland's Present Ecological State (PES) in relation to a benchmark or reference condition. A Level 2 Wetland Health assessment was conducted on the wetlands delineated as per the procedures described in 'Wet-Health: A technique for rapidly assessing wetland health' (MacFarlane et al., 2009). This document assesses the health status of a wetland through evaluation of three main factors –

Hydrology: defined as the distribution and movement of water through a wetland and its soils.

Geomorphology: defined as the distribution and retention patterns of sediment within the wetland.

Vegetation: defined as the vegetation structural and compositional state.

The WET-Health tool evaluates the extent to which anthropogenic changes have impacted upon wetland functioning or condition through assessment of the above-mentioned three factors. Scores range from 0 indicating no impact to a maximum of 10 which would imply that impacts had completely destroyed the functioning of a particular component of the wetland. Impact scores obtained for each of the modules reflect the degree of change from natural reference conditions (**Table 2**).

Table 2: Guideline for interpreting the magnitude of impacts on wetland integrity.

IMPACT CATEGORY	DESCRIPTION	RANGE
None	No discernible modification or the modification is such that it has no impact on wetland integrity.	0 – 0.9
Small	Although identifiable, the impact of this modification on wetland integrity is small.	1 – 1.9
Moderate	The impact of this modification on wetland integrity is clearly identifiable, but limited.	2 – 3.9
Large	The modification has a clearly detrimental impact on wetland integrity. Approximately 50% of wetland integrity has been lost.	4 – 5.9
Serious	The modification has a clearly adverse effect on this component of habitat integrity. Well in excess of 50% of the wetland integrity has been lost.	6 – 7.9
Critical	The modification is present in such a way that the ecosystem processes of this component of wetland health are totally / almost totally destroyed.	8– 10

The tool evaluates the health of the wetland and is determined by a score known as the Present Ecological Score. The health assessments for the hydrology, geomorphology and vegetation components were then represented by the Present Ecological State (PES) categories. The PES categories are divided into six units (A-F) based on a gradient from "unmodified/natural" (Category A) to "severe/complete deviation from natural" (Category F) as depicted in **Table 3**.

Table 3: Health categories used by WET-Health for describing the integrity of wetlands.

DESCRIPTION	IMPACT SCORE	HEALTH CATEGORY
Unmodified, natural.	0 – 1.0	A
Largely natural with few modifications. A slight change in ecosystem processes is discernible and a small loss of natural habitats and biota may have taken place.	1.1 - 2.0	B
Moderately modified. A moderate change in ecosystem processes and loss of natural habitats has taken place but the natural habitat remains predominantly intact	2.1 - 4.0	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota and has occurred.	4.1 - 6.0	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	6.1 - 8.0	E
Modifications have reached a critical level and the ecosystem processes have been modified completely with an almost complete loss of natural habitat and biota.	8.1 - 10.0	F

Since hydrology, geomorphology and vegetation are interlinked their scores have been aggregated to obtain an overall PES health score using the following formula (MacFarlane et al., 2009):

Health = ((Hydrology score) x3 + (Geomorphology score) x2 + (Vegetation score) x2)) ÷ 7

This gives a score ranging from 0 (pristine) to 10 (critically impacted in all respects). Hydrology is weighted by a factor of 3 since it is considered to have the greatest contribution to wetland health. Due to differences in the pattern of water flow through various hydro-geomorphic (HGM) types (**Figure 4**), the tool requires that the wetland is divided into distinct HGM units at the outset. Ecosystem services for each HGM unit are then assessed separately.

Each HGM unit is discussed on the following pages in more detail in terms of the functional integrity, Present Ecological Score and the impacts which affect these.

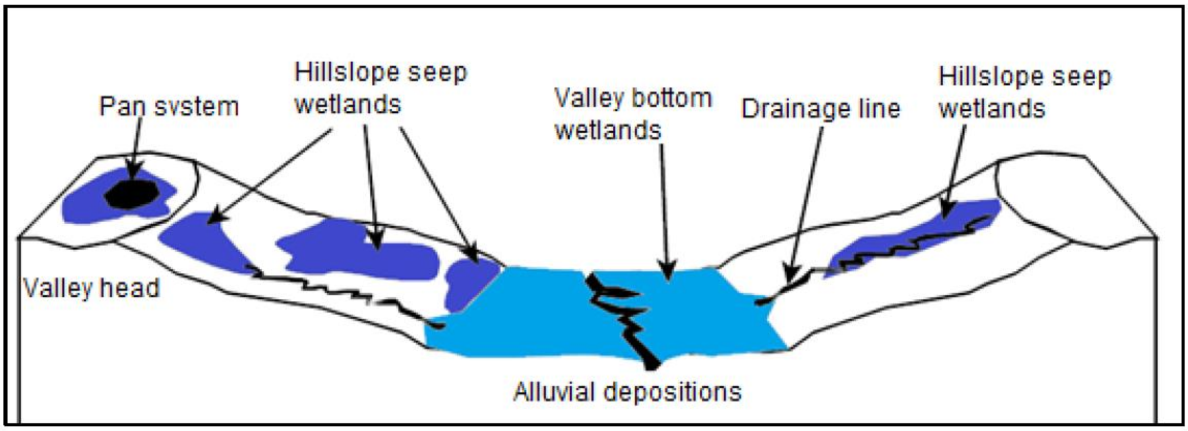

Figure 4: Diagrammatic representation of common wetland systems identified in Southern Africa (based on Kotze et al., 2008).

7.2 Risk Assessment to Watercourses

The risk assessment was conducted in accordance with the DWS risk-based water use authorisation approach and delegation guidelines.

The matrix assesses impacts in terms of consequence and likelihood. Consequence is calculated based on the following formula:

Consequence = Severity + Spatial Scale + Duration

Whereas likelihood is calculated as:

Likelihood=Frequency of Activity + Frequency of Incident +Legal Issues + Detection.

Significance is calculated as:

Significance \Risk= Consequence x Likelihood.

Each metric of the severity (flow regime, water quality, geomorphology, biota and habitat) and spatial scale, duration, frequency of the activity, frequency of the incident/impact and detection are rated to a 1 to 5 scale (GNR 509, of the National Water Act, 1998 (Act No. 36 of 1998) for Water Uses as Defined in Section 21(C) or Section 21(I), 2016). The score is then placed into one of the three classes, with low risks to the watercourse will qualify for a General Authorisation (GA). Medium and high-risk activities will require a Section 21(C) and (I) water use licence as per the National Water Act of 1998 (**Table 4**).

Table 4: Significance of the Section 21 C and I ratings matrix as prescribed by the National Water Act 1998 (Act No. 36).

Rating	Class	Management Description
1 – 55	(L) Low Risk	Acceptable as is or consider requirement for mitigation. Impact to watercourses and resource quality small and easily mitigated. Wetlands may be excluded.
56 – 169	M) Moderate Risk	Risk and impact on watercourses are notably and require mitigation measures on a higher level, which costs more and require specialist input.
170 – 300	(H) High Risk	Always involves wetlands. Watercourse(s) impacts by the activity are such that they impose a long-term threat on a large scale and lowering of the Reserve.

7.3 Ecological Desktop Assessment

It is important to note that many parts of South Africa contain high levels of biodiversity at species and ecosystem level. At any single site there may be large numbers of species or high ecological complexity. Sites also vary in their natural character and uniqueness and the level to which they have previously been disturbed. Assessing the impacts of the proposed construction of the road often requires evaluating the conservation value of the site relative to other natural areas in the surrounding area. Thus, the general approach and angle adopted for this type of study is to identify any potential faunal species that may have been affected by the existing road and other developments in the vicinity. This means that the focus of this report will be on rare, threatened, protected and conservation-worthy species.

Biodiversity issues are assessed by documenting whether any important biodiversity features occur on site, including species, ecosystems or processes that maintain ecosystems and/or species. Rare, threatened, protected and conservation-worthy species and habitats are considered to be the highest priority, the presence of which is most likely to result in significant negative impacts on the ecological environment. The focus on national and provincial priorities and critical biodiversity issues is in line with National Legislation protecting environmental and biodiversity resources.

Biodiversity areas represent terrestrial and aquatic sites identified as Critical Biodiversity Areas (CBAs), Ecological Support Areas (ESA), Other Natural Areas and No Natural Remaining Areas conducted by SANBI.

7.3.1 Critical Biodiversity Areas

Critical Biodiversity Areas are those areas required to meet biodiversity thresholds. CBA's are areas of terrestrial or aquatic features (or riparian vegetation alongside CBA aquatic features) which must be protected in their natural state to maintain biodiversity and ecosystem functioning (Desmet *et al*., 2013). According to Desmet *et al* (2013), these CBAs include:

i) Areas that need to be protected in order to meet national biodiversity pattern thresholds (target area);
ii) Areas required to ensure the continued existence and functioning of species and ecosystems (including the delivery of ecosystem services); and/or
iii) Important locations for biodiversity features or rare species.

7.3.2 Ecological Support Areas

Ecological Support Areas (ESA) are supporting zones required to prevent the degradation of Critical Biodiversity Areas and Protected Areas. An ESA may include an aquatic or terrestrial feature. ESAs can be further subdivided into Critical Ecological Support Areas (CESA) and Other Ecological Support Areas (OESA). Critical Ecological Support Areas are aquatic features, with their terrestrial buffers, which fall within priority sub-catchments, whose protection is required in order to support the aquatic and terrestrial CBAs. An example might be a river reach which feeds directly into a CBA. Other Ecological Support Areas are all remaining aquatic ecosystems (not classed as CESA or CBA), with their terrestrial buffers, which have a less direct impact on the CBA, e.g. a wetland that is geographically isolated from a CBA, but contributes to ecological processes such as groundwater recharge, thereby indirectly impacting on a CBA downstream. (Desmet et al., 2010).

7.3.3 Other Natural Areas

Other Natural Areas are areas of lesser biodiversity importance whose protection is not required in order to meet national biodiversity thresholds. Other Natural Areas may withstand some loss in terms of biodiversity through the conversion of their natural state for development. However, if all Critical Biodiversity Areas are not protected, certain Other Natural Areas will need to be reclassified as Critical Biodiversity Areas in order to meet thresholds. (Desmet et al., 2010).

No Natural Remaining Areas are those areas that have been irreversibly transformed through urban development, plantation and agriculture and poor land management. As a result, these areas no longer contribute to the biodiversity of the region. However, in some cases transformed land may be classified as an ESA or CBA if they still support biodiversity (Desmet et al., 2010).

7.3.4 Threatened Ecosystems

Ecosystem threat status outlines the degree to which ecosystems are still intact or alternatively losing vital aspects of their structure, function and composition, on which their ability to provide ecosystem services ultimately depends (Driver et al., 2012). Ecosystem types are categorised as Critically Endangered (CR), Endangered (EN), Vulnerable (VU) or Least Threatened (LT), based on the proportion of each ecosystem type that remains in good ecological condition (Driver et al., 2012).

7.4 Vegetation Assessment

A comprehensive study was carried out to document all species recorded in the area and to predict vegetation characteristics. This was augmented by a site visit and comprised of the following:

A walkover field survey of the site verifying the presence or absence of species predicted to occur on the site included:

i. Identification and location of keystone or indicator species that may be impacted;
ii. Identify important habitats, including wetlands, grasslands etc;
iii. Identify areas of conservation and/or ecological importance;
iv. Consider invasive alien plant status and rehabilitation potential of natural areas; and

v. An overall condition of the vegetation found in the area, including an assessment of cover and vegetation structure and were classified as vegetation communities.

7.4.1 Conservation priority and Sensitivity

The vegetation types were evaluated in terms of conservation priority according to the following categories:

- **High:** Ecologically sensitive and valuable land with high species richness and/or sensitive ecosystems and/or red data species that should be conserved. No development is to be allowed.
- **Medium-high:** Land that is partially disturbed but that is generally ecologically sensitive to development / disturbances.
- **Medium:** Land on which developments with a limited / low impact on the vegetation / ecosystem can be considered. It is recommended that certain portions of the natural vegetation be maintained in open spaces.
- **Medium-low:** Land of which small sections could be considered to be conserved, but where the area in general has little conservation value.
- **Low:** Land that has little conservation value where development will have an insignificant or no impact on the vegetation.

Sensitivity Areas that are of High and Medium-high conservation priority are regarded as High sensitivity areas in which developments should not be allowed Areas that fall in the Medium, Medium-low and Low conservation priority categories are regarded as Low sensitivity areas in which development may be allowed. Areas where other environmental factors such as high erodibility and steep slopes that play a significant role are regarded as Moderate sensitivity areas. Developments can be allowed in these areas if suitable mitigation measures can be implemented.

7.4.2 Alien Invasive Plants

Invasive alien plants are described as species which are 'non-indigenous' to an area and which have been introduced from other countries either intentionally (for domestic or commercial use) or accidentally; furthermore, they have the ability to reproduce and spread without the direct assistance of people into natural or semi-natural habitats and are destructive to biodiversity and human interests.

Notice 3 of the National Environmental Management: Biodiversity Act 2004 (Act No, 10 of 2004) lists 379 plant species that are legally declared invasive species. Each species is assigned to one of three categories based on the level of threat posed by the species and the legal status assigned to each:

- **Category 1a** – Plant species that must be combatted or eradicated.
- **Category 1b** – Plant species that must be controlled.
- **Category 2** – Plant species that must not be allowed to spread outside any property.
- **Category 3** – Plant species that when occurring in riparian areas must be considered to be category 1b Listed Invasive Species and must be managed according to regulation 3 of NEM:BA,2014.

7.4.3 Faunal assessment

The faunal investigation was focused on mammals, reptiles and amphibians. The following methodology was applied:

- The data sets discussed above under "sources of information" were collected/collated and examined to determine the focus species for this study;
- The data was examined to determine the possible occurrence of any Red Data and non-Red Data species;
- The site was comprehensively assessed during a field investigation to determine fauna and faunal micro habitats present within the site.
- The impacts of the existing Road on faunal species were assessed and mitigation measures were proposed.

7.5 Significance of Identified Impacts on Biodiversity

Significance scoring 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 as seen in **Table 5**. Impact scores given "with mitigation" are based on the assumption that the mitigation measures recommended in this assessment are implemented correctly and rehabilitation of the site is undertaken. Failure to implement mitigation measures during operation will keep impacts at an unacceptably high level.

Table 5: Significance scoring used for each potential impact.

Probability	Duration
1 - very improbable	1 - very short duration (0-1years)
2 - improbable	2- short duration (2-5 years)
3 - probable	3 - medium term (5-15 years)
4 - highly probable	4 - long term (>15 years)
5 - definite	5 - permanent/unknown
Extent	**Magnitude**
1 - limited to the site	2 – minor
2 - limited to the local area	4 – low
3 - limited to the region	6 – moderate
4 - national	8 – high
5 - international	10 – very high

Significance Points = (Magnitude + Duration + Extent) x Probability. The maximum value is 100 Significance Points.

Potential Environmental Impacts are rated as high, moderate or low significance as per the following:

<30 significance points = Low environmental significance

31-59 significance points = Moderate environmental significance

>60 significance points = High environmental significance.

8. BACKGROUND INFORMATION

8.1 DESCRIPTION OF THE BIOPHYSICAL ENVIRONMENT

8.1.1 GEOLOGY & SOILS

The site is characterized by Karoo Supergroup shale and lesser sandstone layers are punctuated by sheets and dykes of Jurassic dolerite. Soils (Sterkspruit, Swartland and Estcourt soil forms) are rich in sodium and very susceptible to erosion. Land types include Dc and Ea.

8.1.2 CLIMATE

The site is characterized by Summer rainfall with dry winters. The Mean Annual Precipitation (MAP) about 450–850 mm. Generally a frost-free region. See also climate diagram for SVl 4 Delagoa Lowveld.In addition the mining right area, consists of the Letaba Formation basalts of the Karoo Supergroup in this area give rise to black, brown or red clayey soils, usually not more the 1 m deep. Vertisols, such as the Arcadia soil form, occur in low-lying areas and concave plains. Land types mainly Ea with some Dc.

8.1.3 VEGETATION FOUND ON THE MINING RIGHT AREA

According to the SANBIGIS database the shaft site consists of the SVl 4 Delagoa Lowveld vegetation type. This vegetation is characterized Dense tree or tall shrub layer dominated by *Acacia welwitschii*, often forming thickets. Herb layer has in addition to grass species a wide variety of forbs. Areas are often heavily grazed which sometimes drastically reduces the grass cover (Mucina and Rutherford.,2006) The entire properties consist of a number of including the Deloga Lowveld, Tshokwane-Hlane Basalt Lowveld, Granite Lowveld and the Kaalrug Mountain Bushveld vegetation units (**Figure 5**).

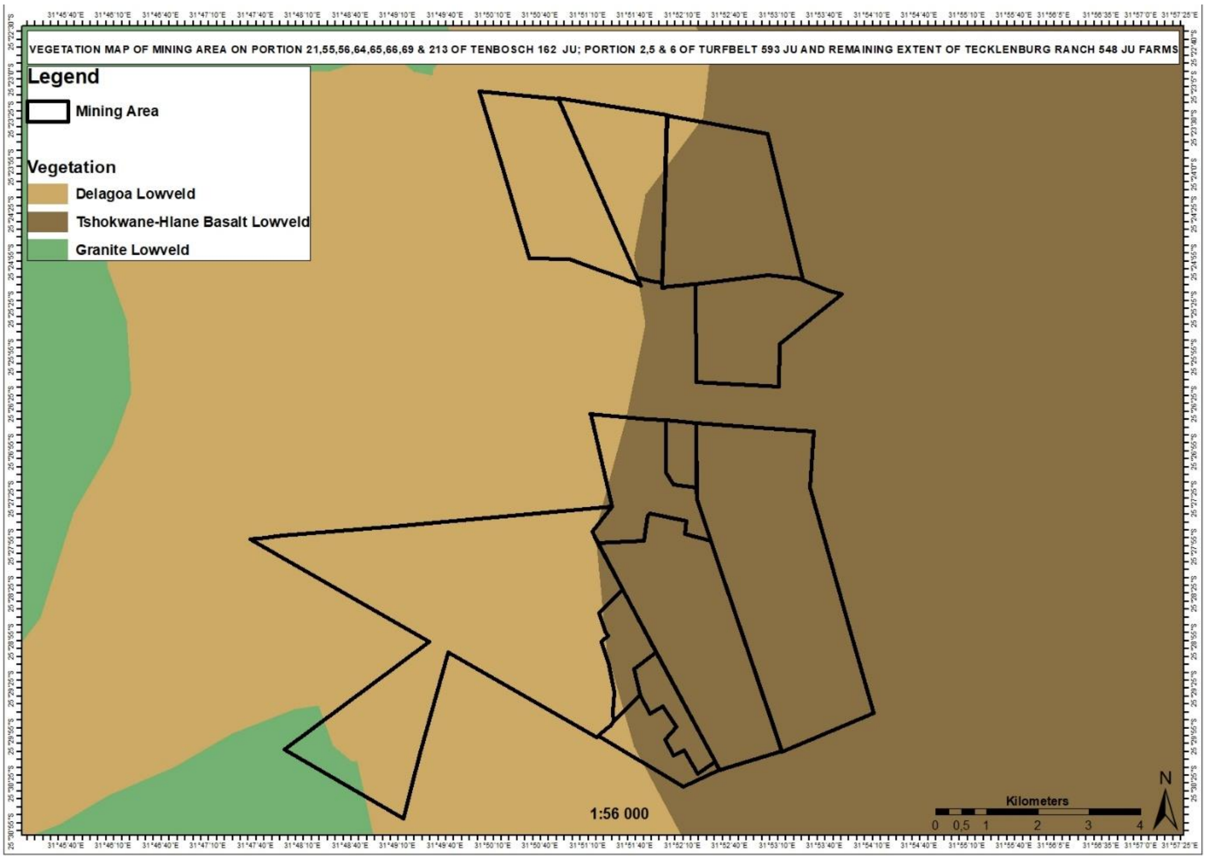

Figure 5: The vegetation type associated with the On The Remaining Extents Of Portions 18, 21, 55, 64, 69, 85, 213 Of Farm Tenbosch 162 JU, Portions 2, 5 And 6 Of Farm Turfbelt 593 JU And Farm Tecklenburg 548 JU

The SVl 4 Delagoa Lowveld is distributed across the Mpumalanga Province, Swaziland and marginally into KwaZulu-Natal Province: A narrow strip on plains immediately east of the SVl 3 Granite Lowveld from the Nsemani River west of Satara in the Kruger National Park southwards to immediately west of Lower Sabie Camp to the Pomba Guard Post west of Crocodile Bridge Camp to the Strydom Block in the south. Also a band in Swaziland from Mhlume in the north to Onverwacht Border Post in the south, extending marginally into KwaZulu-Natal at Pongola. Altitude 150–450 m.

Table 6: Important Taxa within the SVl 4 Delagoa Lowveld (Mucina and Rutherford 2006)

PLANT FORM	SPECIES
Small Trees	*Acacia senegal var. rostrata (d), A. welwitschii subsp. delagoensis (d), Albizia petersiana (d), Schotia capitata (d), Spirostachys africana (d), Pappea capensis.*
Tall Shrubs	*Euclea divinorum (d), Maerua parvifolia (d), Boscia mossambicensis, Dichrostachys cinerea, Ehretia rigida subsp. rigida, Flueggea virosa, Grewia bicolor, Rhus gueinzii.*
Low Shrubs	*Abutilon austro-africanum, Justicia flava, Zanthoxylum humile.*
Woody Climbers	*Cordia ovalis (d), Capparis tomentosa*

PLANT FORM	SPECIES
Graminoids	*Chloris virgata (d), Panicum coloratum (d), P. maximum (d), Sporobolus nitens (d), Aristida congesta, Chloris roxburghiana, Dactyloctenium aegyptium, Tragus berteronianus.*
Herbs:	*Blepharis integrifolia, Kyphocarpa angustifolia, Ruellia patula.*
Succulent Herb	*Aloe parvibracteata.*

8.1.4 VEGETATION UNIT-SVL 5 TSHOKWANE-HLANE BASALT LOWVELD

According to the SANBIGIS database the mining right area also consists of the SVl 5 Tshokwane-Hlane Basalt Lowveld vegetation type. This vegetation type is characterized by fairly flat plains with open tree savanna, often dominated by tall *Sclerocarya birrea* and *Acacia nigrescens* with a moderately developed shrub layer and a dense herbaceous layer. On some sloping areas with shallower soils, trees are stunted (e.g. *A. nigrescens*).

The SVl 5 Tshokwane-Hlane Basalt Lowveld vegetation type is distributed in the Mpumalanga Province and Swaziland (and very slightly into Limpopo Province). It is usually found On plains immediately west of the Lebombo Mountains from Balule and Satara Camps in Kruger National Park in the north, through Tshokwane, Lower Sabie and Crocodile Bridge Camps, Komatipoort to around Ngwenyeni in the south. In Swaziland it occurs from Vuvulane Settlement in the north, through Hlane Game Sanctuary to a point in the south approximately halfway between Siteki and Big Bend. Altitude 180–400 m[1].

Table 7: Important Taxa within the SVl 5 Tshokwane-Hlane Basalt Lowveld (Mucina and Rutherford 2006)

PLANT FORM	SPECIES
Tall Trees	*Acacia nigrescens (d), Sclerocarya birrea subsp. caffra (d), Philenoptera violacea*
Small Trees	*Acacia borleae, A. gerrardii, A. nilotica, A. tortilis subsp. heteracantha, Albizia harveyi, Combretum hereroense, C. imberbe, Lannea schweinfurthii var. stuhlmannii, Peltophorum africanum, Pterocarpus rotundifolius*
Tall Shrubs:	*Dichrostachys cinerea, Grewia bicolor, Gymnosporia maranguensis, Rhus*

[1] Remarks Different parts of this unit can show different rates of change over years, including some parts with very little change (Coetzee et al. 1977). Mapped as part of this unit is the small area (3% of the unit) east of Kumana waterhole, south of Satara (Kumana Sandveld of Gertenbach 1983b), which is on sandstone, but contains dolerite intrusions with clayey soil as well as some surface shales with sodium-saturated soil.

PLANT FORM	SPECIES
	gueinzii.
Low Shrubs:	*Acalypha segetalis, Dicoma tomentosa, Hermannia glanduligera, Justicia flava, J. protracta subsp. protracta, Seddera suffruticosa, Tragia dioica.*
Herbaceous Climber	*Commicarpus plumbagineus*
Graminoids	*Bothriochloa radicans (d), Digitaria eriantha subsp. eriantha (d), Panicum coloratum (d), P. maximum (d), Themeda triandra (d), Urochloa mosambicensis (d), Aristida congesta, Cenchrus ciliaris, Eragrostis superba, Heteropogon contortus.*
Herbs:	*Chamaecrista mimosoides, Gisekia africana, Thunbergia dregeana*
Succulent Herbs:	*Aloe zebrina, Orbea paradoxa, O. rogersii.*

8.2 Surface Hydrology

The aquatic sensitivity of the proposed site is classified as **VERY HIGH** in the Screening Report. The National Freshwater Ecosystems Priority Areas (NFEPA) identifies important wetlands in South Africa (**Figure 7**), The study site falls under the Inkomati Water Management Area (WMA=3). **Figure 7** is a specific representation of the watercourses/wetlands that are found along the existing access road. The existing Marieskop acces Road is located within 500m of a number of watercourses.

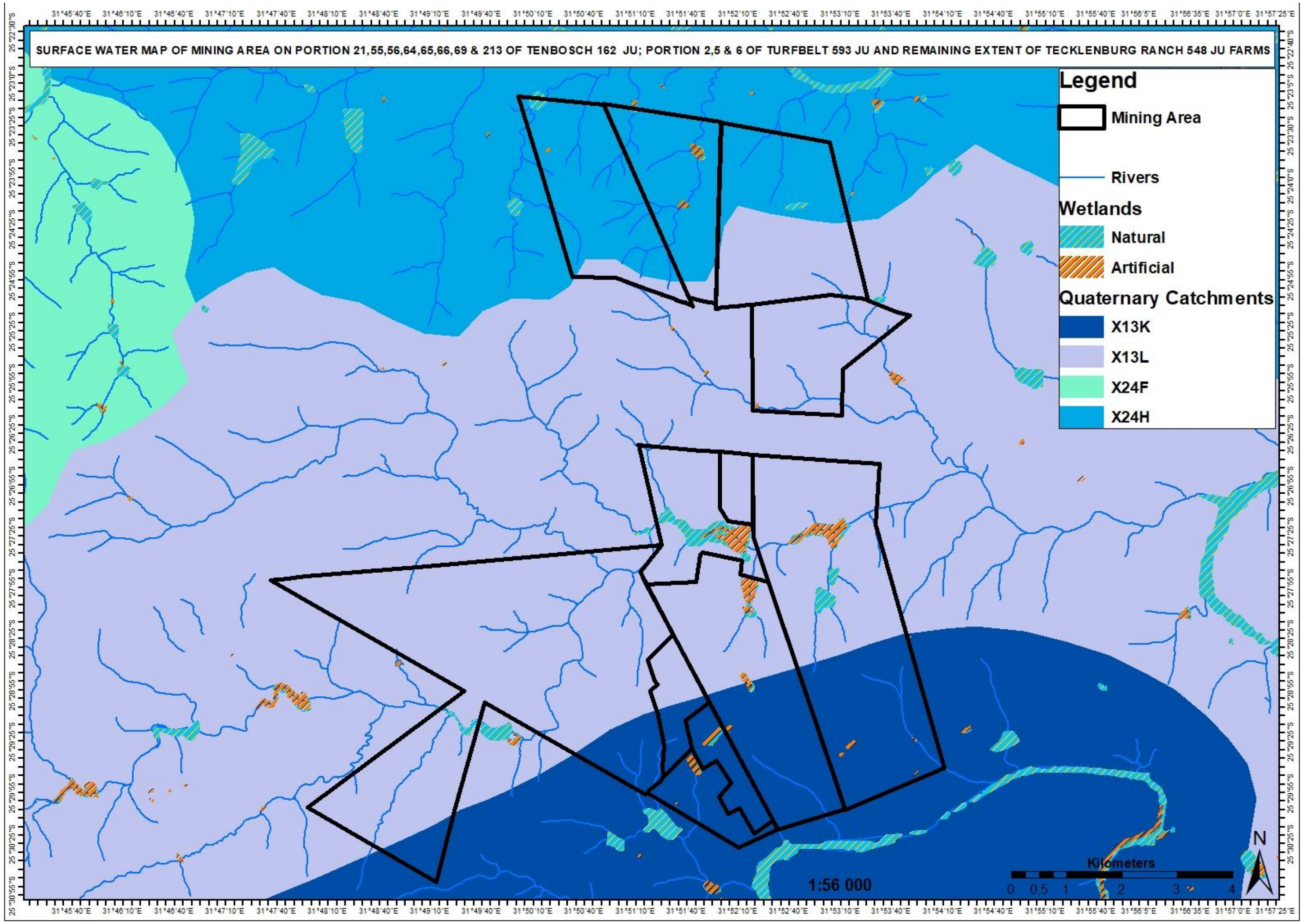

Figure 6: Wetland/Watercourses with in the proposed mining right area.

9. RESULTS

9.1 Wetland Delineation and Assessment

This section provides the findings of the various methodologies utilised during the wetland assessment.

9.1.1 Desktop Assessment

Examination of the National Freshwater Ecosystem Priority Areas (NFEPA) database were undertaken for the study site. The NFEPA project aims to produce maps which provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. They were identified based on a range of criteria dealing with the maintenance of key ecological processes and the conservation of ecosystem types and species associated with rivers, wetlands and estuaries (MacFarlane et al., 2009). Identification of FEPA Wetlands are based on a combination of special features and modelled wetland conditions that include expert knowledge on features of conservation importance as well as available spatial data on the occurrence of threatened frogs and wetland-dependent birds.

9.1.1.1 Field Survey

The study site suffered various degrees of disturbance as a result of the existing agricultural activities, sugarcane plantations and other anthropogenic activities that are linked to the agriculture and tourism sector. The site is infested with a number of alien invasive species that can be attributed to the disturbance of the site by the agricultural sector. The result has been high vegetation surface areas with moderate biodiversity sensitivity cover or topsoil.

9.1.1.2 Wetland Features

The proposed mine is located within 500m of a number of a watercourses (streams and a river), some of them gave (**Figure 7**). The study has a number of drainage lines that serve the purpose of conveying water into the perennial rivers and the existing culverts during and immediately after rainfall events. The existing watercourses service support a host of hydrophytes and avifaunal species onsite (**Figure 8**). Some of the wetlands were observed to be supporting the existing the agricultural activities (**Figure 9**).

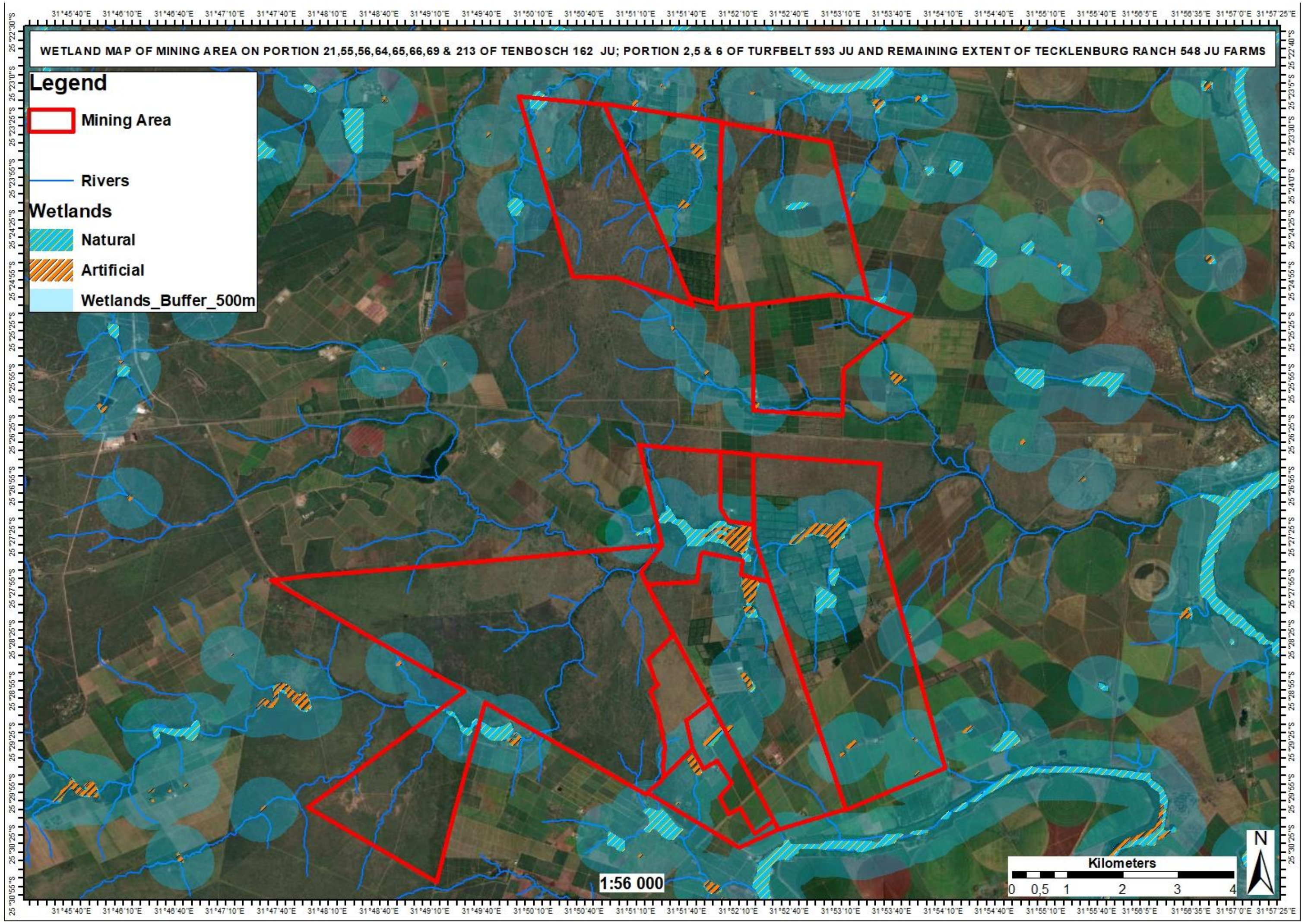

Figure 7:Map of the wetland and Watercourses within 500m of the study site.

COMMENT 1: NGWETI RIVER AND ASSOCIATED BRIDGE

COMMENTS 2: WETLAND/DAM OBSERVED ONSITE

COMMENTS : NATURAL WETLANDS LOCATED WITHIN SUGARCANE PLANTATIONS OBSERVED ONSITE

Figure 8: Delineated watercourses within the study site.

9.1.2 Terrain indicator

The topography of an area is generally a good practical indicator for identifying those parts in the landscape where wetlands are likely to occur. Generally, wetlands occur as a valley bottom unit however wetlands can also occur on steep to mid slopes where groundwater discharge is taking place through seeps (DWAF, 2005). In order to classify a wetland system, the localised landscape setting must be taken into consideration through ground-truthing of the study site after initial desktop investigations (Ollis et al., 2014).

The study site can be characterized as Gently to moderately sloping upper pediment slopes (**Figure 9**).

Figure 9: Slope of the study site

9.1.3 Soil wetness and soil form indicator

The watercourses onsite have water and support a host of hydrophytes and alien invasive plant species. Wetland areas were identified and mainly delineated according to the presence of hydric (wetland) soil types. Hydric soils are defined as those which show characteristics (redoximorphic features) resulting from prolonged and repeated saturation. Characteristics include the presence of mottling (i.e., bright insoluble manganese and iron compounds) a gleyed matrix and/or Mn/Fe concretions. The watercourses consist mainly of sand (**Figure 10**).

Figure 10:Soil Observed within one of the.

9.1.4 Vegetation indicator

According to DWAF (2005), vegetation is regarded as a key component to be used in the delineation procedure for wetlands. Vegetation also forms a central part of the wetland definition in the National Water Act, Act 36 of 1998. However, using vegetation as a primary wetland indicator requires an undisturbed condition (DWAF, 2005). Major disturbances were noted in the wetland systems making it difficult to rely solely on vegetation as a wetland indicator. The wetlands that were observed onsite are dominated by *Typha capensis* species (**Figure 11**), .Disturbances included the presence of alien invasive species such as the Castor oil plant (*Ricinus communis*), Bugweed (Solanum mauritianum) (*Tecoma stans*) and Silverleaf nightshade (*Solanum elaeagnifolium*) existing disturbance attributed to the existing landuses and erosion within the area.

Figure 11: Reeds observed within the wetlands onsite.

The pro cuts through three different vegetation types/units, however it is dominated by the SVl 4 Delagoa Lowveld vegetation unit. The vegetation was observed to be characterized by dense tree and a tall shrub layer dominated by *Acacia welwitschii*, often forming thickets (**Figure 12**). The study site consist of a diverse range of grass species, and wide variety of Forbes.

Figure 12: Vegetation observed onsite.

The study site was observed to been heavily grazed, and it was also subjected to wood harvesting, resulting in a disturbance that enabled the proliferation of *lantana camara* (**Figure 13**). L. camara is a highly variable ornamental shrub, native of the neotropics. It has been introduced to most of the tropics and subtropics as a hedge plant and has since been reported as extremely weedy and invasive in many countries. It is generally deleterious to biodiversity and has been reported as an agricultural weed resulting in large economic losses in a number of countries. In addition to this, it increases the risk of fire, is poisonous to livestock and is a host for numerous pests and diseases. L. camara is difficult to control. In Australia, India and South Africa aggressive measures to eradicate L. camara over the last two centuries have been largely unsuccessful, and the invasion trajectory has continued upwards despite control measures. This species has been the target of biological control programmes for over a century, with successful control only being reported in a few instances[2].

Figure 13: Lantana camara observed onsite.

The study site has an abundance of the protected Marula tree (*Sclerocarya birrea*) (**Figure 14**). The marula is a medium-sized to large deciduous tree with an erect trunk and rounded crown. It is one of the plants that played a role in feeding people in ancient times. This tree grows easily from seed sown in washed river sand in spring[3]. It can also grow from a truncheon planted in the early spring. It is fast-growing, with a growth rate of up to 1.5 m per year. This tree is very sensitive to frost and grows best in frost-free areas under warm conditions. The tree is protected in accordance to the National Forests Act no 84 of 1998 (as amended).

[2] https://www.cabidigitallibrary.org/doi/10.1079/cabicompendium.29771
[3] https://pza.sanbi.org/sclerocarya-birrea

Figure 14: Marula tree observed onsite.

9.1.5 Wetland Delineation

Any wetlands identified on the site were categorised according to the National Wetland Classification System for South Africa (Ollis et al., 2013). The wetland area was classified as a hydrogeomorphic (HGM) unit. An HGM unit is a recognisable physiographic wetland-unit based on the geomorphic setting, water source of the wetland and the water flow patterns (MacFarlane et al., 2009). The proposed project is located within 500m of a number of wetlands and watercourses (largest being Komati and Ngwedi river) (**Figure 15**).

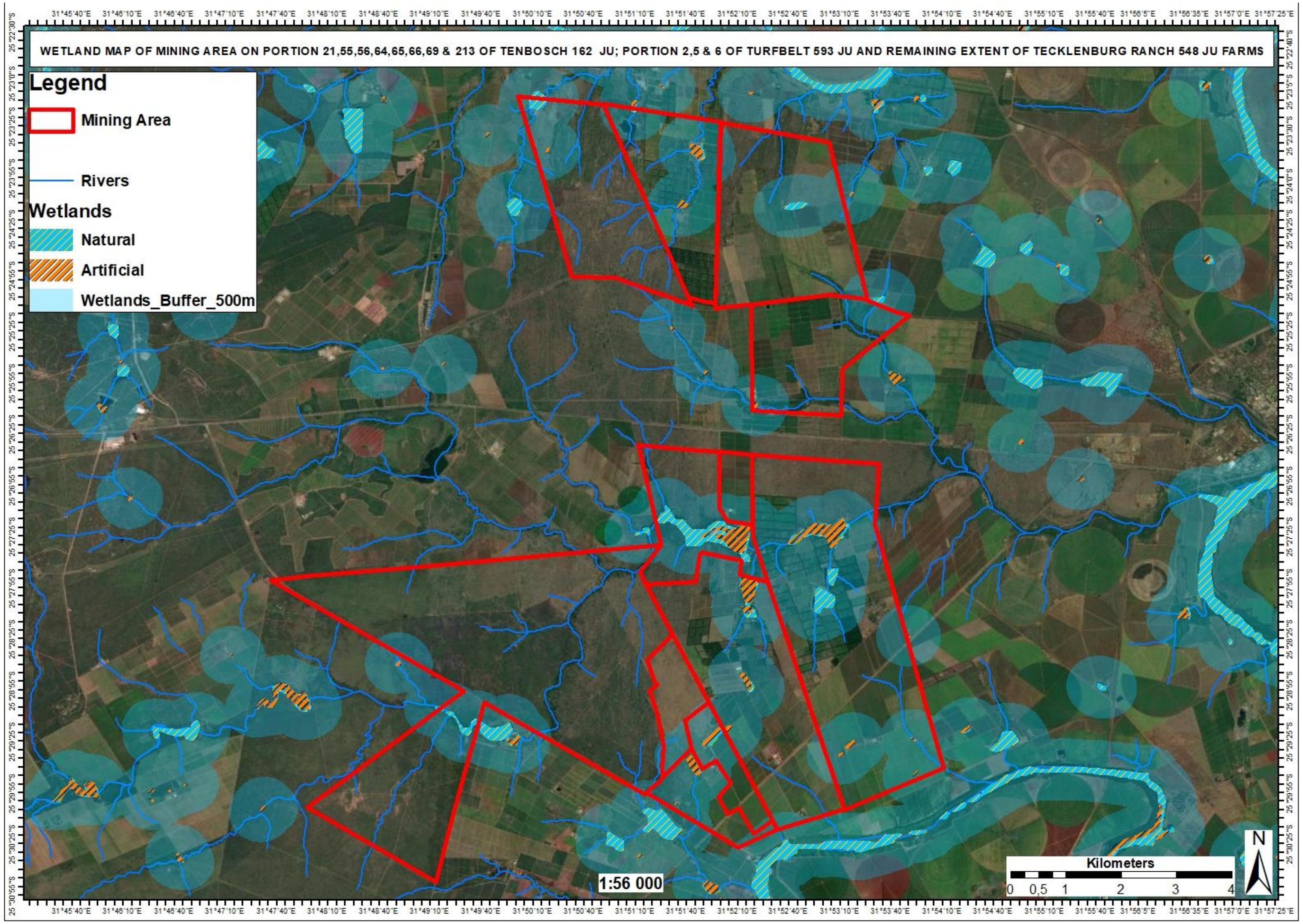

Figure 15:Wetland delineation Map.

9.2 Wetland Functional and Health Assessment

9.2.1 Wetland Ecological Importance and Sensitivity

The EIS and functions were calculated using the new draft DWA guidelines and model, as developed by M. Rountree, but not yet published. Information used form the SIBIS and VEGMAP products. A mean score between 0 and 4 is obtained, with 0 as the lowest and 4 as the highest score. No classification of the scores is given.

The watercourses onsite have an Ecological Importance and Sensitivity (EIS) score of 1 (**Table 7**). This is a value between 0 and 4, with 0 being very low and 4 very high. The rivers, therefore, have a Medium EIS score. It is regarded as being modified.

Table 8: EIS calculation of the average wetland onsite.

ECOLOGICAL IMPORTANCE AND SENSITIVITY	SCORE (0-4)	*CONFIDENCE (1-5)*	MOTIVATION
Biodiversity support	**3.00**	***4***	
Presence of Red Data species	**4.00**	*4.00*	No known red data or protected species observed on site.
Populations of unique species	**0.00**	*4.00*	No unique plant or animal populations were observed.
Migration/breeding/feeding sites	**2.00**	*4.00*	Though a few bird species were observed, few nests were present.
Landscape scale	**1.00**	***4.80***	
Protection status of the wetland	**4.00**	*5.00*	The wetland and surrounding area have been exposed to various industrial and housing developments surrounding the area.
Protection status of the vegetation type	**4.00**	*5.00*	The wetland is not located in an Endangered and Vulnerable vegetation types. Although dominated by *Phragmites* it is very homogeneous as a result of the polluted state of the water. The vegetation surrounding the wetland is mostly pioneer and alien invasive

ECOLOGICAL IMPORTANCE AND SENSITIVITY	SCORE (0-4)	*CONFIDENCE (1-5)*	MOTIVATION
			species with few indigenous species present.
Regional context of the ecological integrity	**2.50**	*5.00*	The wetland is in PES class E due to the large scale degradation of the surrounding areas as well as the wetland area itself.
Size and rarity of the wetland type/s present	**4.00**	*4.00*	The wetland is not particularly rare and has no vulnerable ecosystem present.
Diversity of habitat types	**1.00**	*5.00*	The wetland has a low species diversity as well as habitat diversity. The wetland is dominated by a homogeneous stand of *Phragmites* australis.

9.2.2 Wetland Health and PES

It should be noted in **Table 8** by Kleynhans (1999) that if a score of less than 2 is attributed to any impact, the lowest rating, rather than the mean, is used to attribute PES class.

Table 9:PES classes (from Kleynhans 1999) indicating the interpretation of the mean scores to rate the PES category.

WITHIN GENERALLY ACCEPTABLE RANGE		
Category	**Score**	**Description**
A	>4	Unmodified, or approximates natural condition and/or represents a natural condition due to successful rehabilitation process/program(s) which has occurred and/or are in the process of occurring.
B	>3 and 4	Largely natural with few modifications. A small change in natural habitats and biota may have taken place but the ecosystem functions are essentially unchanged Moderately modified.

C	>2 and 3	Loss and change of natural habitat and biota have occurred, but the basic ecosystem functions are still predominantly unchanged.
D	2	Largely modified. A large loss of natural habitats and basic Ecosystem functions has occurred.
OUTSIDE GENERAL ACCEPTABLE RANGE		
E	>0 and 2	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive Critically modified.
F	0	Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat

The wetland perennial rivers in the study area have EIS categories and EMC values as indicated in **Table 9**.

Table 10: Summary of EIS onsite.

Wetland	EIS category	EMC
Perennial River	C	D
Non Perennial River	C	C
Natural Wetlands	C	C

9.2.3 Wetland ecoservices

WET-EcoServices (Kotze et al. 2004) is a tool for evaluating the services provided by the watercourses (Rivers, allowing for more informed planning and decision-making. In general, the riverine wetland provides low-moderate ecosystem services (spider diagram right). Because of the destruction of natural vegetation and the resulting loss of habitat for insects and amphibians, it has a low species richness and biodiversity. (See **Figure 16**).

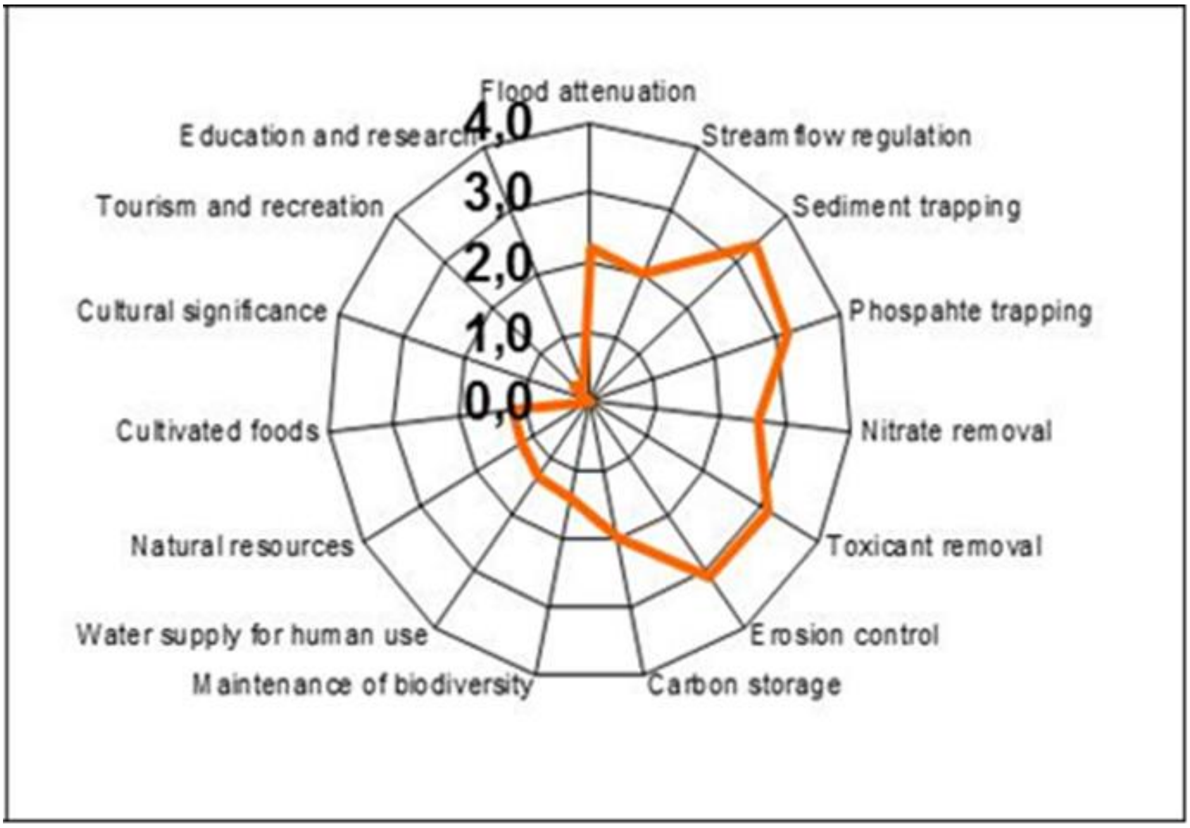

Figure 16: Eco services

9.3 Ecological Assessment

9.3.1 Critical Biodiversity Areas

According to the 2006 Mpumalanga Biodiversity Conservation Plan[4], the proposed mine is located within an Ecological Support Area (ESA), while a small section is located within a heavily degraded area (**Figure 17**, Sensitivity map). Ecological Support Areas are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of Critical Biodiversity Areas and/or in delivering ecosystem services. Critical Biodiversity Areas are areas required to meet biodiversity targets for ecosystems, species and ecological processes, as identified in a systematic biodiversity plan, while.

NB! The primary purpose of a map of Critical Biodiversity Areas and Ecological Support Areas is to guide decision-making about where best to locate development. It should

[4] MTPA. 2014. Mpumalanga Biodiversity Sector Plan Handbook. Compiled by Lötter M.C., Cadman, M.J. and Lechmere-Oertel R.G. Mpumalanga Tourism & Parks Agency, Mbombela (Nelspruit)

inform land-use planning, environmental assessment and authorisations, and natural resource management, by a range of sectors whose policies and decisions impact on biodiversity. It is the biodiversity sector's input into multi-sectoral planning and decision-making processes[5].

[5] Chapter 12 of the National Biodiversity Assessment (Driver et al. 2012)

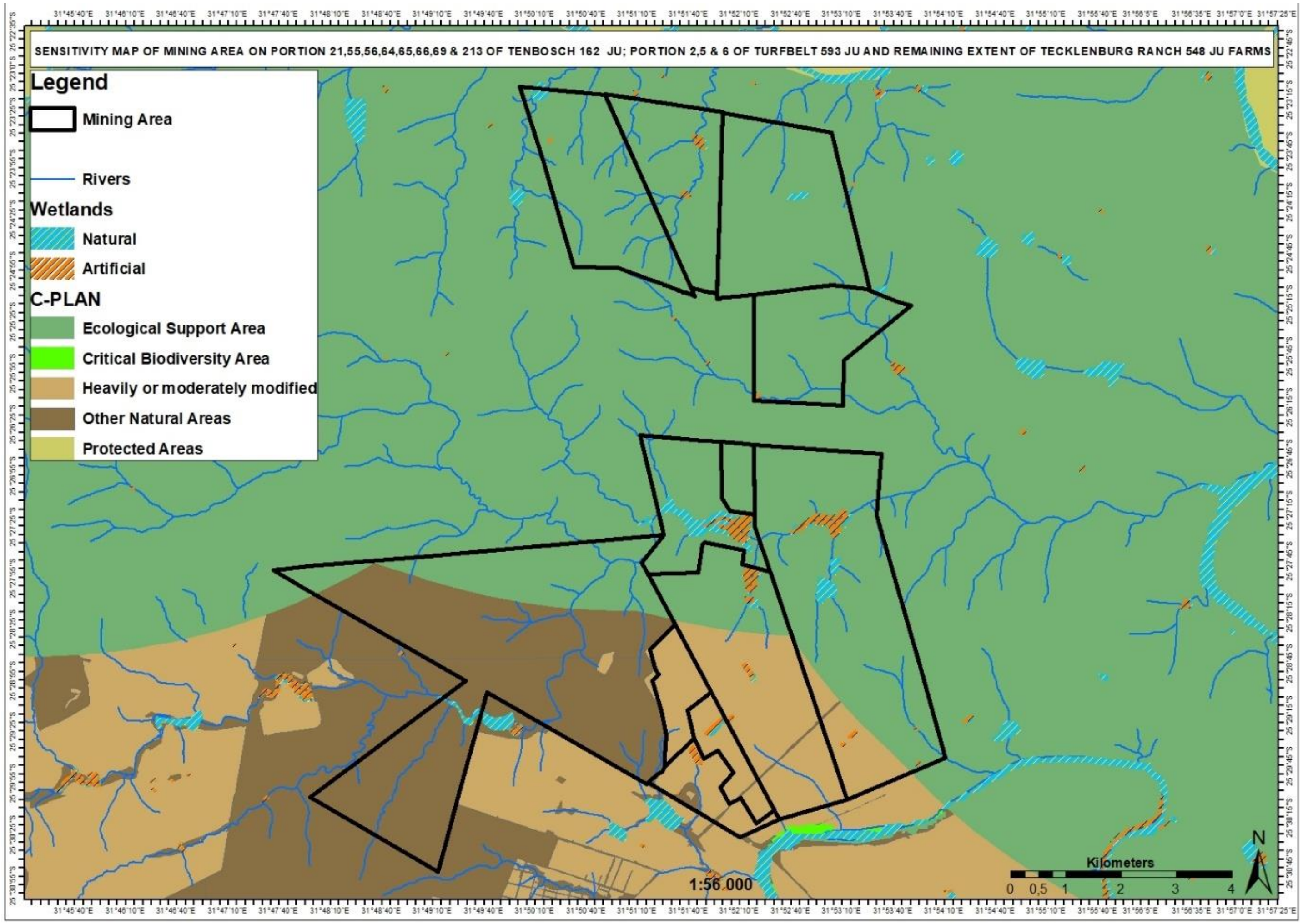

Figure 17: Mining Right Area In Relation to the 2006 Mpumalanga Biodiversity Conservation Plan.

9.3.2 Freshwater Aquatic Species

The freshwater habitats (watercourses) onsite consist mainly of terrestrial plant species (Figure 16). It is important to note that plants such as algae, water lilies, and willow trees help keep the water clean by using their root systems to filter pollution and excess nutrients from the water. The watercourses have hydrophytes such as Typha capensis During the site inspection there was evidence of avifaunal species within the watercourses (**Figure 17**).

Figure 18:Typical Freshwater Habitat onsite.

9.3.3 Invertebrates

No invertebrates were observed onsite, the freshwater ecosystems onsite. In order to get accurate results, invertebrate traps should be placed along the watercourses for a number of days.

10. RISK ASSESSMENT OF DELINEATED WETLAND

The following impact assessment is supplied, the assessment was conducted only for existing degradation of the study site by the existing access Road site with the focus on wetland habitats. From the assessments it is clear that impacts can be expected from the proposed activities (**Table 11**).

Table 11: Summary of the Impact Assessment (Watercourses and the wetlands).

IMPACT	SCENARIO	EXTENT	DURATION	MAGNITUDE	PROBABILITY	IMPACT SIGNIFICANCE	STATUS
Direct loss and disturbance of wetland habitats	Before Mitigation	1-Site	4-Long Term	4-Low	4-High	36-Moderate	Negative
	Post Mitigation	1-Site	1-Immediate	4-Low	2-Low	8-Low	Negative
Alien invasion of native species habitat	Before Mitigation	2-Local	5-Permanent	8-High	5-High	75-High	Negative
	Post Mitigation	1-Site	4-Long Term	6-Moderate	2-Low	22-Low	Negative
Biodiversity Loss	Before Mitigation	1-Site	5-Permanent	4-Low	4-Low	30-Low	Negative
	Post Mitigation	1-Site	4-Long Term	4-Low	4-Low	18-Low	Negative
Interruption in Hydrology	Before Mitigation	2-Local	6-Medium	5-Definite	5-Define	65-High	Negative
	Post Mitigation	1-Site	4-Low	3-Medium	3-Medium	24-Low	Negative

Ground Water Quality deterioration	Before Mitigation	1-Local	6-Moderate	4-High	4-High	44-Moderate	Negative
	Post Mitigation	1-Site	4-Low	3-Medium	3-Medium	18-Low	Negative

Vegetation clearing has occurred and resulted increased turbidity and sedimentation in the watercourse as well as altered flow patterns. The machinery used has a risk of hydrocarbon spills into the watercourse. There are impacts on the flow patterns to the watercourse.

This report highlights the findings for a one site survey, limiting the confidence for the risk assessment in **Table 11 above**.

Operational Phase

Increased sedimentation may occur as a result from the runoff from the tar road This has the potential to change habitat structure within the receiving environment and this will in turn result in changes in ecosystem function. Changes in habitat structure due to sedimentation would result in changes in the species composition.

Water quality impairment has the potential to change ecosystem function, change community structure as species sensitive to water quality impairment are eliminated and tolerant species increase in number, this results in a loss of biodiversity of sensitive species.

Invasive alien plants have far-reaching detrimental effects on native biota and has been widely accepted as being a leading cause of biodiversity loss. They typically have rapid reproductive turnover and are able to outcompete native species for environmental resources, alter soil stability, and promote erosion, change litter accumulation and soil properties. In addition, certain alien plants exacerbate soil erosion whilst others contribute to a reduction in stream flow thereby potentially increasing sediment inputs and altering natural hydrology of receiving watercourses. These impacts negatively affect areas that are largely natural (with low existing weed levels) greater than for areas already characterised by dense infestations of alien plants with low indigenous plant diversity (Macfarlane *et al*., 2014).

10.1.1 Sedimentation and soil erosion

Soil erosion will result in the deposition of sediment into the freshwater system; posing a risk to the downstream catchment geomorphological/functional integrity. Subsequent impacts that are likely to result are:

- sedimentation of the watercourse that will be destructive to many faunal species affecting their habitat; breeding and feeding cycles.

Local site factors such as soil erodibility, vegetation cover, gradient of local slopes and regional rainfall/runoff intensity will affect the probability and intensity of erosion impacts (Macfarlane *et al*., 2014). Typical results of erosion & sedimentation on water resources may include:

- Localised scouring at stormwater discharge points into watercourses
- Deposition of large masses of sediment downstream causing localised channel braiding, instability of the riverbanks and alterations in water distribution.

10.1.2 Pollution of water resources and soil

Changes to the water quality will result in changes to the ecosystem structure and function as well as a potential loss of biodiversity. Water quality pollution leads to modification of the species composition where sensitive species are lost and organisms tolerant to environmental changes dominate the community structure. Any substances entering and polluting watercourses will directly impact downstream ecology through surface runoff during rainfall events, or subsurface water movement, particularly during the wetter summer months.

Contaminants such as hydrocarbons, solids, pathogens and hazardous materials may enter watercourses (examples include petrol/diesel, oil/grease, paint, cement/concrete and other hazardous substances). These contaminants negatively affect aquatic ecosystems including sensitive or intolerant species of flora and fauna. Where significant changes in water quality occur, this will ultimately result in a shift in aquatic species composition, favouring more tolerant species, and potentially resulting in the localised exclusion of sensitive species. Water quality monitoring must be implemented to ensure sustainable management of water sources within that area. Sudden drastic changes in water quality can also have chronic effects on aquatic biota leading to localised extinctions. Deterioration in water quality will also affect its suitability for human domestic/agricultural use and have far reaching impacts for local communities who may rely on rivers as water supply (Macfarlane et al., 2014).

10.1.3 Alien Invasive Species

There are alien invasive plant species currently present along the Road. Any ground disturbance provides an opportunity for alien invasive plant species to spread and for new species to establish themselves in the areas. Alien invader plant species pose an ecological threat as they alter habitat structure, lower biodiversity (both number and "quality" of species), change nutrient cycling and productivity, and modify food webs (Zedler & Kercher, 2004). Such changes on the ecology of the riparian habitat have/will have a detrimental impact on its ability to maintain both floral and faunal biodiversity. Invasive alien plant species, particularly woody species, have much increased water usage compared with indigenous vegetation. Many alien invasive plant species are particularly found in riparian ecosystems and their invasion results in the destruction of indigenous species; increased inflammable biomass (high fire intensity); erosion; clogging of waterways such as small streams and drainage channels causing decreased river flows and incision of river beds and banks. This results in an overall impact on the hydrological functioning of the system.

10.1.4 Mitigation

The proposed upgrading of the road will have negative effects on the environment. The following mitigation measures may reduce the severity of impacts:

- Rehabilitation of the disturbed areas;
- Minimising pollutants entering the watercourse;
- Implement a programme for the clearing/eradication of alien species including long term control of such species;
- Wetland monitoring and biomonitoring must take place bi-annually.

Sedimentation and soil erosion

Mitigation options

- Do not allow surface water or stormwater to be concentrated, or to flow down cut or fill slopes without erosion protection measures being in place.
- Exposed soils must be rehabilitated as soon as practically possible to limit the risk of erosion. Erosion control measures must be employed where required.

- Riparian vegetation bordering on drainage lines, wetlands and rivers will be considered environmentally sensitive and impacts on these habitats should be avoided.
- If erosion has taken place, rehabilitation will commence as soon as possible.

Pollution of water resources and soil

Mitigation options

- Demarcate wetland areas to avoid unauthorised access.
- No washing of any equipment in close proximity to a watercourse is permitted.
- No releases of any substances that could be toxic to fauna or faunal habitats within the channels or any watercourses is permitted.
- 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 (not to be disposed of within the natural environment). Any contaminated soil must be removed, and the affected area rehabilitated immediately.
- Education of workers is key to establishing good pollution prevention practices. Training programs must provide information on material handling and spill prevention and response, to better prepare employees in case of an emergency.
- Signs should also be placed at appropriate locations to remind workers of good housekeeping practices including litter and pollution control.
- The proper storage and handling of hazardous substances (hydrocarbons and chemicals) needs to be ensured. All employees handling fuels and other hazardous materials are to be properly trained. Storage containers must be regularly inspected so as to prevent leaks.
- All contractors and employees should undergo induction which is to include a component of environmental awareness.

Alien Invasive Species

Mitigation Options

- An alien invasive management programme must be incorporated into an Environmental Management Programme.
- Ongoing alien plant control must be undertaken, particularly in the disturbed areas as these areas will quickly be colonised by invasive alien species, especially in the riparian zone, which is particularly sensitive to AIP infestation.
- Herbicides must be carefully applied, in order to prevent any chemicals from entering the river. Spraying of herbicides within or near to the wetland areas is strictly forbidden.
- Re-instate indigenous vegetation (grasses and indigenous trees) in disturbed areas.
- After rehabilitation, re-vegetate any exposed surfaces and mulch re-vegetated areas.
- Select appropriate species for wetland and terrestrial areas and ensure species diversity is enhanced, with species commonly found in the natural wetland area.

10.2 Assessment Of the No-Go Alternative

Currently there is no proposal from a wetland point of view of a no-go alternative, Since the road is already in existence. In addition, the necessary culverts and crossing structures have been constructed.

10.3 Monitoring Requirements

There are no monitoring requirements for the proposed development, because the sites are currently dry. In the event that the proposed road upgrade activities will encroach on the watercourses/wetland, the following is strongly advised from a wetland point of view:

- It is strongly advised that a wetland/aquatic specialist is appointed during the construction, operational and decommissioning phases to monitor impacts and related mitigation measures regarding wetlands and the faunal and floral assemblages occurring in this habitat.
- If the no-go alternative is enforced no monitoring is advised at this stage.

11. FINAL COMMENTS

The aquatic sensitivity of the proposed site is classified as VERY HIGH in the Screening Report. The study site falls under the Inkomati Water Management Area (WMA), and the proposed Tenbosch mine is located within 500m of a number of watercourses (Perennial Rivers and Non Perennial River), and wetlands, the study site is located within an Ecological Support (ESA). This was confirmed during the site inspection. of three systems and are driven by a combination of interflow (seepage), overland flow and artesian springs. Given that underground mining is proposed, it is crucial that water flow pathways in the soil and underlying geology be understood. The importance of wetlands, the risk associated with potential impacts and the potential loss of water through interrupting subsurface flow pathways should be informed by thorough hydropedological and geohydrological studies.

The ecological significance of the watercourses should be viewed in the context of the overall level of functionality of the catchment, and the integrity of the freshwater ecosystem. Since the applicant is proposing the construction of a road, it is important to take note of section 19 of the NWA (1998), owners / managers / people occupying land on which any activity or process undertaken which causes or is likely to cause pollution or degradation of a water resource must take all reasonable measures to prevent any such disturbance from occurring, continuing or recurring. These measures may include measures to (*inter alia*):

- Cease, modify, or control any act or process causing the pollution/degradation.
- Comply with any prescribed waste standard or management practice.
- Contain or prevent the movement of pollutants or the source of degradation.
- Remedy the effects of the pollution/degradation.

Remedy the effects of any disturbance to the bed and banks of a watercourse/wetland.

12. RECOMMENDATIONS

- Allocate reasonable buffers between the mine activities and the wetlands onsite.
- Include environmental awareness aspects into the site induction program to ensure all staff are aware of the location and importance of wetland habitats.
- Establish emergency response measures and a clearly defined chain of communication to rapidly deal with any unforeseen impacts to wetlands, e.g. spills.
- No stockpiling of material may take place within the wetland/watercourse areas and temporary construction camps and infrastructure should also be located outside the wetland footprint.
- Regular cleaning up of the wetland areas should be undertaken to remove litter.
- Design and implement a construction stormwater management plan that aims to minimise the concentration of flow and increase in flow velocity, as well as minimising sediment transport off site.
- Where practically possible, the major earthworks should be undertaken during the dry season (roughly from April to August) to limit erosion due to rainfall runoff.
- Store and handle potentially polluting substances and waste in designated, bunded facilities.
- Waste should be regularly removed from the construction site by suitably equipped and qualified operators and disposed of in approved facilities.
- Locate temporary waste and hazardous substance storage facilities a minimum of 100m from any wetland edge.
- Keep sufficient quantities of spill clean-up materials on site.

13. REFERENCES

ACOCKS, J.P.H. 1988. Third Edition. Veld Types of South Africa. Memoirs of the Botanical Survey of South Africa No. 57, Botanical Research Institute, RSA

BREEN, C.M. (ED.). 1997. How Wet is a Wetland? – An Introduction to Understanding Wetland Hydrology, Soils and Landforms, Wetland-Use Booklet 2, Share-Net, Wildlife Society of South Africa

BROMILOW, C. 2001. Problem plants of South Africa. Briza Publications, Pretoria.

COLLINS, N.B. 2005. Wetlands: The basics and some more. Free State Department of Tourism, Environmental and Economic Affairs.

(DWAF) DEPARTMENT OF WATER AFFAIRS AND FORESTRY. 2003. A Practical field procedure for identification and delineation of wetlands and riparian areas, Final Draft.

DEPARTMENT OF WATER AFFAIRS AND FORESTRY (2003). National Water resource Strategy (Final Draft). DWAF. Pretoria. South Africa.

DEPARTMENT OF WATER AFFAIRS AND FORESTRY (1998). National Water Act; Act No.36 of 1998. South Africa.

ENVIROGUARD ECOLOGICAL SERVICES. 2010. Wetland delineation for remaining extent of Portion 7 of the Farm Mooifontein 141 IR Gauteng Province. Unpublished report.

(DWAF) DEPARTMENT OF WATER AFFAIRS AND FORESTRY. (2005). A practical field procedure for the identification and delineation of wetlands and riparian areas. DWAF, Pretoria, South Africa.

HENDERSON, L. (2001). Alien weeds and invasive plants – A complete guide to declared weeds and invaders in South Africa. Plant Protection Research Institute, Agricultural Research Council Handbook No 12. Pretoria.

LOW, A. B. AND REBELO, A. G. (EDS) (1998). Vegetation of South Africa, Lesotho and Swaziland. Department of Environmental Affairs & Tourism, Pretoria.

KOTZE, D.C., KLUG, J.R., HUGHES, J.C. AND BREEN, C.M., 1996. Improved criteria for classifying hydromorphic soils in South Africa. S.Afr. J. Plant and Soil, 13(3)

KOTZE, D.C., MARNEWECK, G.C. Draft document 1999: Guidelines for delineating the wetland boundary and zones within a wetland under the South African Water Act.

KOTZE, D.C., MARNEWECK, G.C., BATCHELOR, A.L., LINDLEY, D.S., AND COLLINS, N.B., 2005. WET-EcoServices - A technique for rapidly assessing ecosystem services supplied by wetlands, Draft unpublished report.

MUCINA, L AND RUTHERFORD, M.C. (eds) 2006. The vegetation of South Africa, Lesotho and Swaziland. Strelitzia 19. SANBI, Pretoria.

SOIL CLASSIFICATION WORKING GROUP. 1991. Soil Classification: a taxonomic system for South Africa. Memoirs of the Agricultural Natural Resources of South Africa, No 15,

VAN OUDTSHOORN, F. (1999). Guide to grasses of southern Africa. Briza Publications, Pretoria.