PULLENSHOPE WETLAND DELINIATION STUDY

Conducted on the farm
Roodepoort 151 IS

for

ECO ELEMENTUM (Pty) Ltd

July 2013

Title:

Wetland delineation report for the Pullenshope Project on the farm Roodepoort 151 IS

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Report no: *WET/V1/PULLENSHOPE/2013/07*

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July 2013

DOCUMENT LIMITATIONS AND INDEMNITY

Time and budgetary constraints limited the depth of the survey and Menco reserves the right to modify aspects of the deliverables in the final document and thereafter

EXECUTIVE SUMMARY

The proposed coal mine development on the farm Roodepoort 151 IS has the risk to potentially impact on wetland areas that transect the property. In order to determine the extent of the wetlands within the project area, Eco Elementum (Pty) Ltd has appointed M2 Environmental (hereafter referred to as Menco) to conduct wetland investigation on the farm Roodepoort 151 IS.

According to the South African National Biodiversity Institute's (SANBI) Atlas for Freshwater Ecosystem Priority Areas (2011), the project area is not situated within a FEPA with regards to the rivers found in the quaternary catchment. However, this is not applicable to the wetlands found within the area, which are considered to be wetlands of local priority.

Based on the hydro-geomorphic setting, a channelled valley bottom wetland type (mainly fed by the unnamed tributaries of the Woestalleen Spruit) was identified in the project area.

The stream linked to the wetland is an unnamed tributary of the Woestalleen Spruit. The field survey has revealed that the wetland soils are permanently waterlogged. The area was recently burned and identification of wetland plants was thus not possible in most cases. The PES for the Pullenshope wetland is Class D (Largely Modified) with the overall classification in terms of the EIS is Moderate, indicating that the Wetland is not considered of National importance. It could be reported that a large change in ecosystem processes and loss of natural habitat and biota has occurred within the proposed project area.

The wetland buffer zone indicated in this report was set at 100m. It is the opinion of the specialists that this is sufficient as an overall buffer zone, but that it might not be sufficient at certain areas, as the water level seemed to be shallow in some of the higher lying areas. This may be as a result of some of the agricultural activities penetrating an aquifer feeding the wetland.

A water use license authorisation in terms of section 40 of the National Water Act, Act 36 of 1998 for the section 21(c) and (i) uses must be applied for if any mine development activities are to take place within 500m from any wetland boundaries.

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1. INTRODUCTION

Wetlands are widely recognised as being some of the richest and most productive ecosystems on the planet. Wetlands are protected by Law in South Africa (National Water Act of South Africa (Act 36 of 1998).

It is also acknowledged that wetlands and riparian areas perform many functions that are valuable to society including the supply of water and the improvement of water quality. The habitats created by wetlands and rivers are also important for many plant and animal species. Not all wetlands or rivers develop in the same way and may not perform ecosystem services to the same extent. Where areas of human settlement and development threaten to encroach and impact on wetlands or riparian areas, it is important that the wetland's ecological integrity be assessed.

The proposed coal mine development on the farm Roodepoort 151 IS has the risk to potentially impact on wetland areas that transect the property. In order to determine the extent of the wetlands on the property Eco Elementum (Pty) Ltd has appointed M2 Environmental (hereafter referred to as Menco) to conduct wetland investigation on the farm Roodepoort 151 IS located within the Nkangala District Municipality near Pullenshope in the Mpumalanga province.

2. TERMS OF REFERENCE

2.1 SCOPE OF WORK

Eco Elementum (Pty) Ltd has requested Menco to conduct a wetland study in order to:

- Determine the nature and importance of water resources potentially impacted by the proposed development;
- Delineation of areas classified as wetlands;
- Functionality and current status of the delineated wetlands; and
- Identify practicable mitigation measures to reduce negative impacts on the wetlands and indicate how these can be implemented during the construction, operational and closure of phases of the proposed mining development

2.2 STUDY REQUIREMENTS

- All specialist studies shall be undertaken by suitably qualified specialists who are registered in accordance with the Natural Scientific Professions Act (2003) as Professional Natural Scientists within the field of Ecological Science and have specific post-graduate qualifications relating to wetlands. In the absence of the latter, the specialist have attended

an appropriate course on wetland rehabilitation and delineation (copy of certificate should be provided).

- The wetland delineation procedure to identify the outer edge of the temporary zone of the wetland, which marks the boundary between the wetland and adjacent terrestrial areas and is that part of the wetland that remains flooded or saturated close to the soil surface for only a few weeks in the year, but long enough to develop anaerobic conditions and determine the nature of the plants growing in the soil.
- Delineation undertaken according to "DWAF, 2003: A practical Guideline Procedure for the Identification and Delineation of Wetlands and Riparian Zones".
- Locating the outer edge of the temporary zone shall make use of four specific indicators:
    - terrain unit indicator,
    - soil form indicator,
    - soil wetness indicator and
    - vegetative indicator.
- The wetland and a protective buffer zone, beginning from the outer edge of the wetland temporary zone, to be designated as sensitive in sensitivity map with labelling according to *Sensitivity Mapping rules for Biodiversity Assessments*.
- The catchment of all pan wetlands will be demarcated.

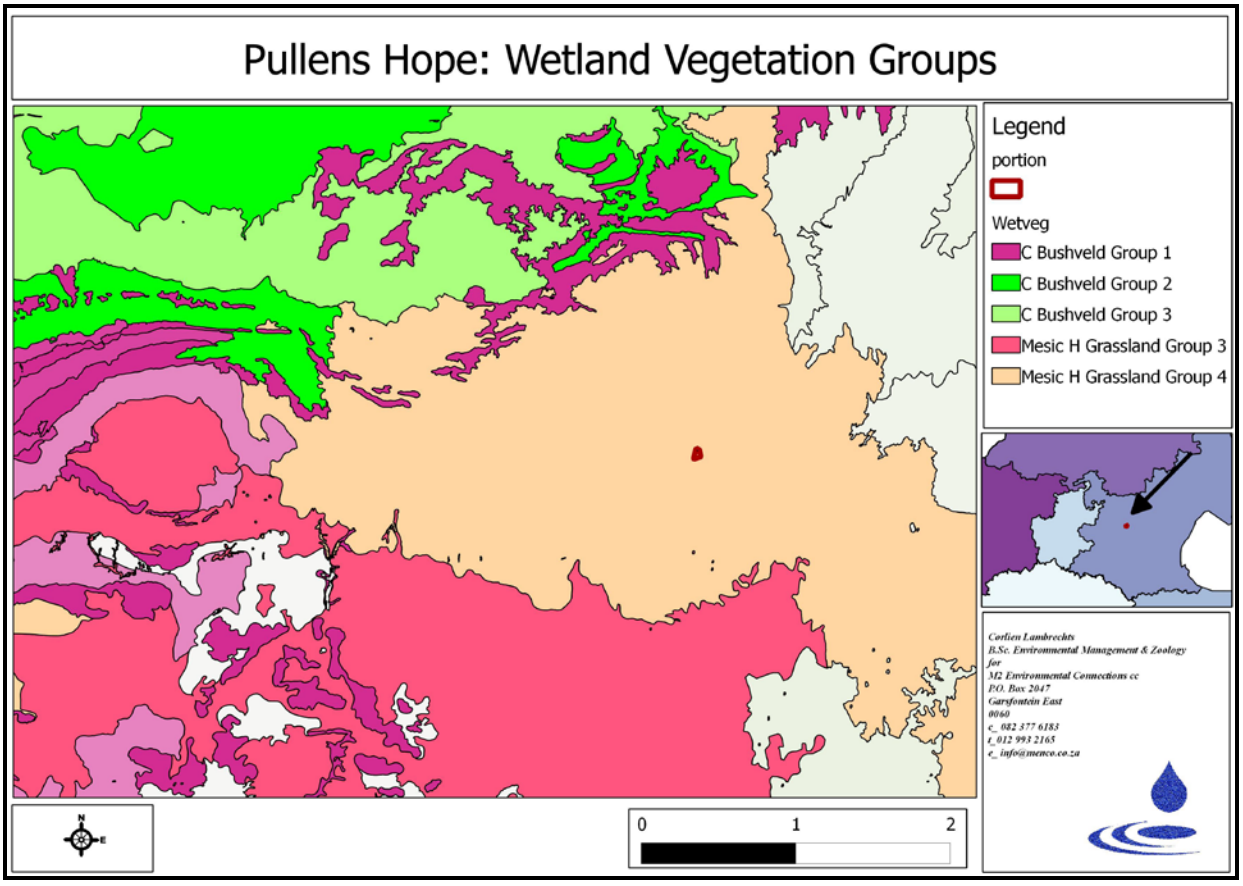


Figure 2-1: Vegetation indicator for Pullenshope wetland

3. DOCUMENT LIMITATIONS

The following report limitations are noted:

- This wetland assessment only outlines wetlands directly related to the farm Roodepoort 151 IS and does not include wetlands outside the scope of work
- Many other wetlands are found within the drainage of the Woestalleen Spruit and its tributaries and are not included in this wetland assessment
- Wetlands as indicated by the latest SANBI GIS database are indicated in **Figure 5-2** and **Figure 6-1** and may or may not align to every extent of the desktop delineation and field delineation conducted as part of this study.
- The buffer zones indicated in **Figure 6-1** are only applicable to the delineated wetland for this study and does not include buffer zones for other wetlands within the area as indicated by the desktop delineation and the SANBI GIS Database for wetlands of national priority.

4. LEGAL ASSESSMENT

As prescribed in Government Notice No. 1199 dated 18 December 2009 "Replacement of General Authorization in terms of Section 39 of the National Water Act, 1998 (Act No. 36 1998)" for Section 21(c) and (i) water uses, some of the water uses excluded from the GN No. 1199 are related to wetlands and are:

> 6. *This Notice does not-*
> *a) apply to the use of water in terms of section 21(c) and (i) for the rehabilitation of a wetland;*
> *b) apply to the use of water in terms of section 21(c) and (i) within a 500 metre radius from the boundary of any wetland.*

According to the NATIONAL WATER ACT (Act No 36 of 1998) a watercourse refers to:

> *a) a river or spring;*
> *b) a natural channel in which water flows regularly or intermittently;*
> *c) a wetland, lake or dam into which, or from which, water flows; and*
> *d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks;*

In the case that any of the above mentioned activities should or would potentially take place within the 1:50 year floodline or 100m horizontal distance of a watercourse, the

following water uses are triggered and a formal application for a water use license need to be applied for:

- *Section 21(c)* impeding or diverting the flow of water in a watercourse;
- *Section 21(i)* altering the bed, banks, course or characteristics of a watercourse;

Any construction activities therefore located within 500m of a wetland boundary thus need to be authorized in terms of Section 21(c) and (i) water use.

5. DESKTOP FINDINGS

According to the South African National Biodiversity Institute's (SANBI) Atlas for Freshwater Ecosystem Priority Areas (2011), the project area is not situated within a FEPA with regards to the rivers found in the quaternary catchment (**Figure 5-1).** However, this is not applicable to the wetlands found within the area, which are considered to be wetlands of national priority.

All wetlands identified on the study site are classified within the Central Bushveld Group 3 wetland vegetation group. The wetland(s) are delineated as channeled valley bottomed wetlands (refer **Table 5-1**, **Figure 5-2** and **Figure 6-1**). It is recommended that all information resources available for decision making regarding the extent of wetlands associated with the study area be utilized i.e. SANBI GIS Database, desktop delineation and field delineation.

Most of the upper Olifants River Catchment falls within the Highveld Ecoregion, (elevation of 1250 to 1750 mamsl), characterized by gently undulating grasslands with numerous wetlands, and underlain the Vryheid formation Karroo Series sediments. Median annual simulated runoff per quaternary catchment varies from 10 to 250 mm. The coefficient of variation for annual simulated runoff per quaternary catchment varies between 40 and 160 % (Kleynhans *et al,* 1998).

Table 5-1: Summarised desktop findings for B21B catchment

Quaternary	River	Integrated Ecological Importance	Resource stress	Recommendation
B12B	Klein Olifants	D (Low)	Water Quality	EcoStatus 3 Rapid III Address water quality issues to improve RHP monitoring
B12E	Klein Olifants	C (PES, High)	Upstream dam, not fully utilised, water quality problems)	EcoStatus 4 Intermediate ERM

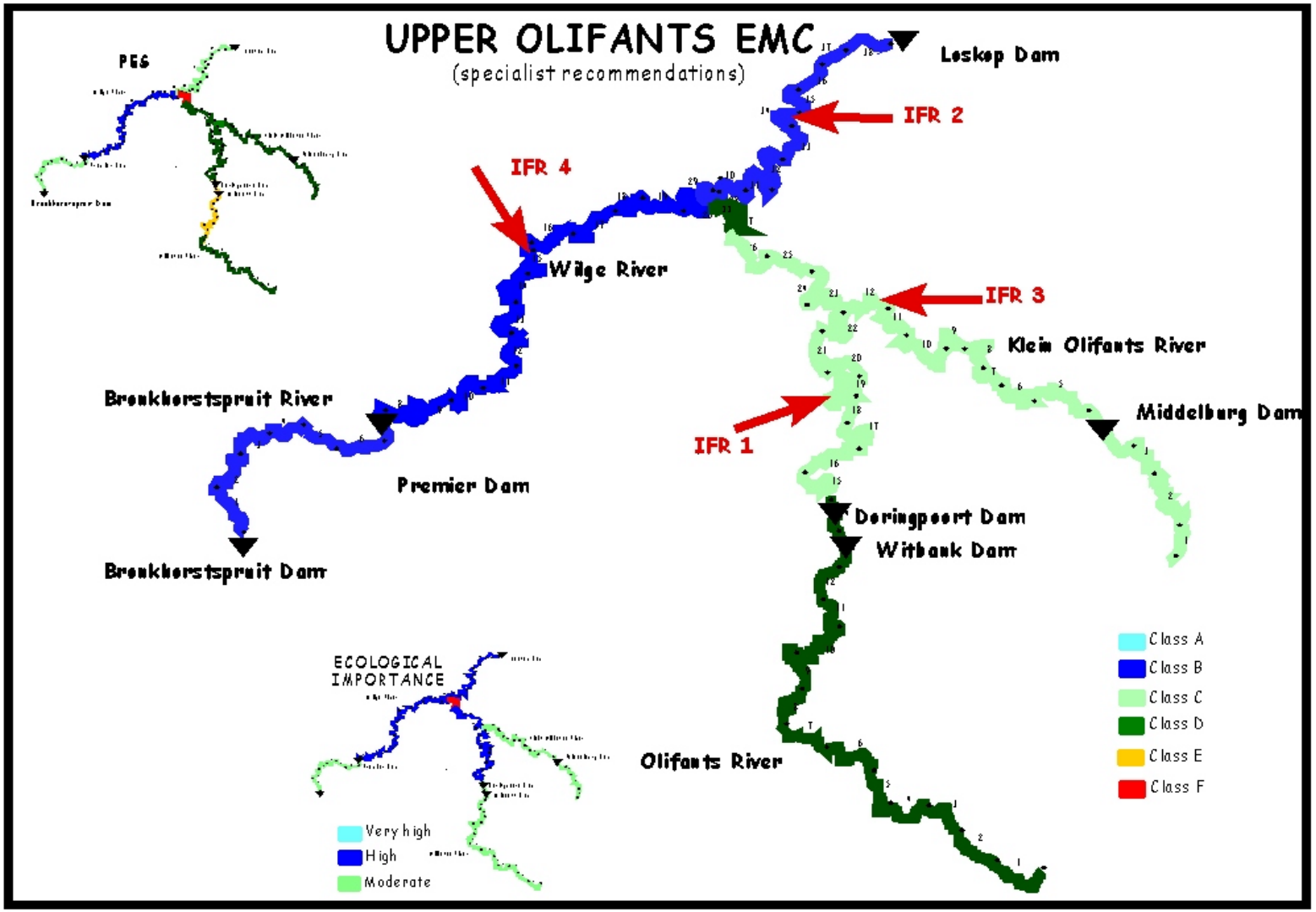


Figure 5-1: Upper Olifants River Water Management Area, (DWA 2001)

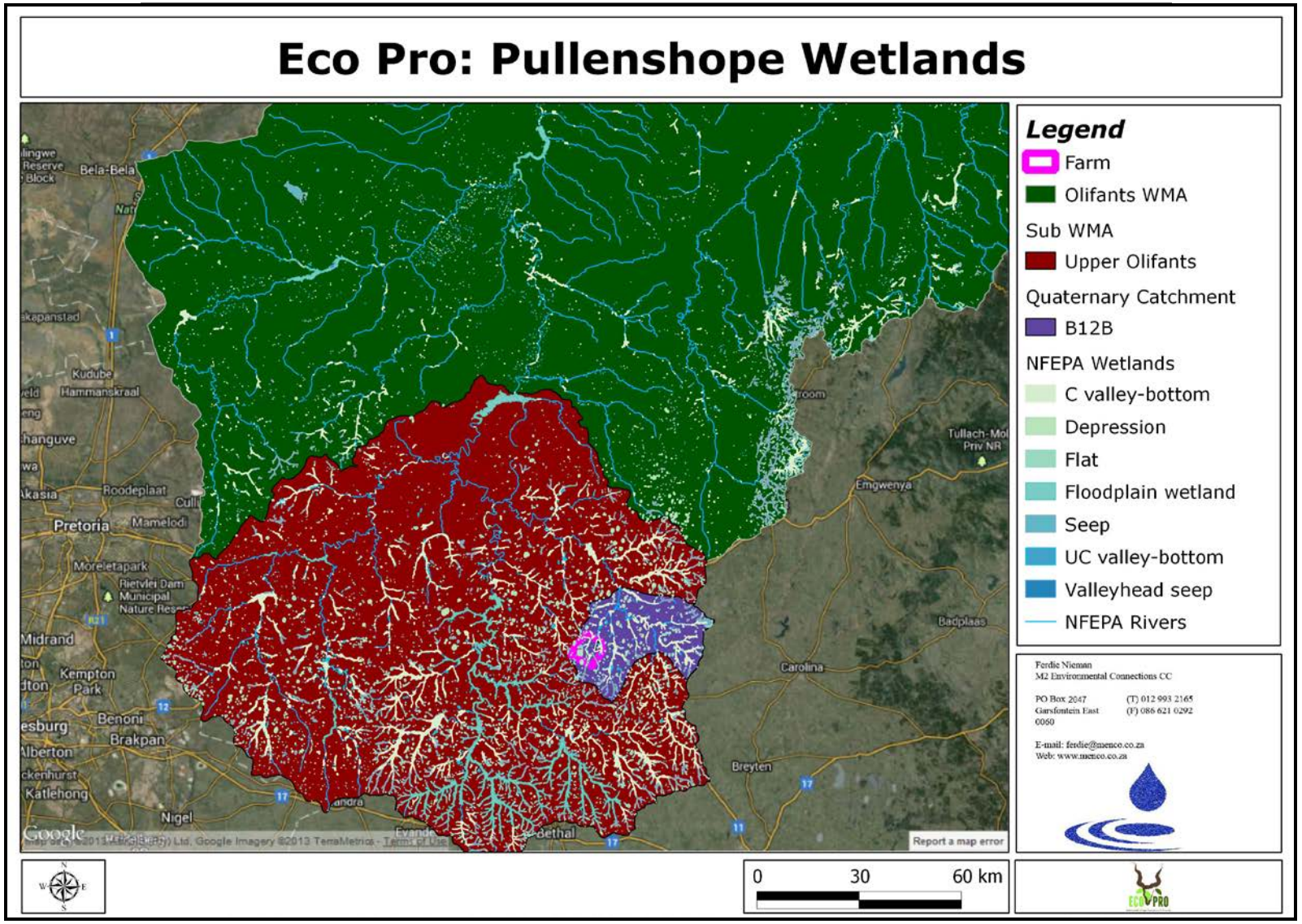


Figure 5-2: National Freshwater Priority Wetland types applicable to the B12B drainage region

6. METHOD

6.1 METHODOLOGY

The assessment was conducted as part of a three phase approach. The first phase consisted of a rapid desktop assessment. The second phase was conducted in field to gather data. The third phase consisted of a second desktop assessment by combining field data and desktop data.

1. Rapid desktop assessment:
    - Google Earth satellite imagery
    - Aerial photographs
    - GIS mapping software

2. Field assessment by identifying the presence of one (at least) or more of the following attributes:
    - Wetland/hydromorphic soils
    - Hydrophytes
    - High water table

3. Combining desktop data, field data and calculating the Wetland Index of Habitat Integrity (DWA, 2007) by using the following indices:
    - Present Ecological status
    - Ecological Importance and Sensitivity
    - Ecosystem Services supplied by wetland

The following sections deal with the Wetland Index of Habitat Integrity as performed as part of the third phase of the study approach.

6.2 WETLAND DELINEATION AND ASSESSMENT

6.2.1 Present ecological status

Wetland functionality is defined as a measure of the deviation of wetland structure and function from its natural reference condition. In the current assessment the hydrological, geomorphological and vegetation integrity was assessed for the wetland unit associated with the study site in order to provide a Present Ecological Status (PES) score. The health categories used to describe the integrity of wetlands are contained in **Table 6-1**.

Table 6-1: Health categories used for describing Wetlands (WET-Health)

Description	Class Boundary	Health Status
Unmodified natural	>4	A
Largely natural with few modifications. A slight change in ecosystem processes is discernable and a small loss of natural habitats and biota may have taken place	>3 and <=4	B
Moderately modified. A moderate change in ecosystem and loss of natural habitats has taken place but the natural habitat remains predominantly intact	>2 and <=3	C
Largely modified. A large change in ecosystem processes and loss of natural habitat and biota has occurred	2	D
The change in ecosystem processes and loss of natural habitat and biota is great but some remaining natural habitat features are still recognizable.	>0 and <2	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	0	F

The present Ecological status (PES) method (DWAF, 1995) was used to establish the integrity of the wetland located on Roodepoort 151 IS. This method is based on the modified Habitat Integrity Approach developed by Kleynhans (DWAF, 2005). Anthropogenic modification of the criteria and its attributes can have an impact on the ecological integrity of the wetland as contained in **Table 6-2**.

6.2.2 Preliminary Impact Assessment

Wetlands and riparian areas perform many functions that are valuable to society including the supply of water and the improvement of water quality. The habitats created by wetlands and rivers are also important for many plant and animal species. Not all wetlands or rivers develop in the same way and may not perform ecosystem services to the same extent. Where areas of human settlement and development threaten to encroach and impact on wetlands or riparian areas, it is important that the wetland's ecological integrity be assessed.

With reference to **Figure 6-1** and **Figure 6-2** it is evident that the proposed mining development plan falls within the wetland buffer zone. However, mining in this area could be considered in terms of the impacted system caused by drain water discharge from the Hendrina Power Station. This wetland appears to be largely impacted by mining and farming activities in close proximity. Sediment input into the system is increased form the natural reference condition due to various roads and mining activities. Roads and channels have impacted the natural flow of the system.

Some of the water is caught up in a dam area within the wetland further impacting on the natural flow. The vegetation of this wetland has been significantly altered, although some natural occurring plants, such as *Phragmites australis,* and *Typha capensis* remain within the centre of the wetland (Permanent zone) the surrounding area has been invaded by various exotic plants and trees such as *Acacia mearnsii* and *Verbena bonariensis.*

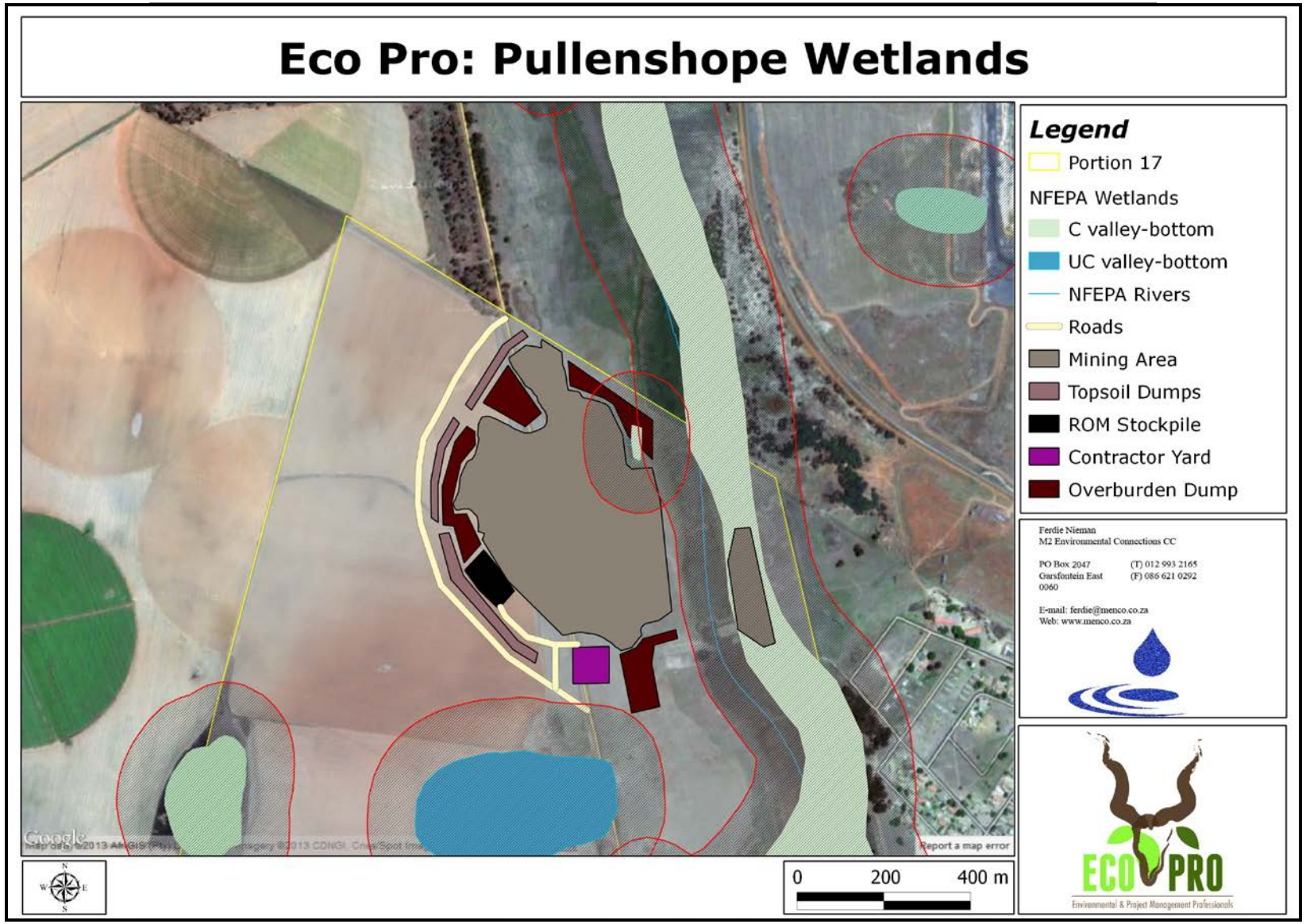


Figure 6-1: Map indicating the wetlands with buffer zones on the farm Roodepoort, Pullenshope

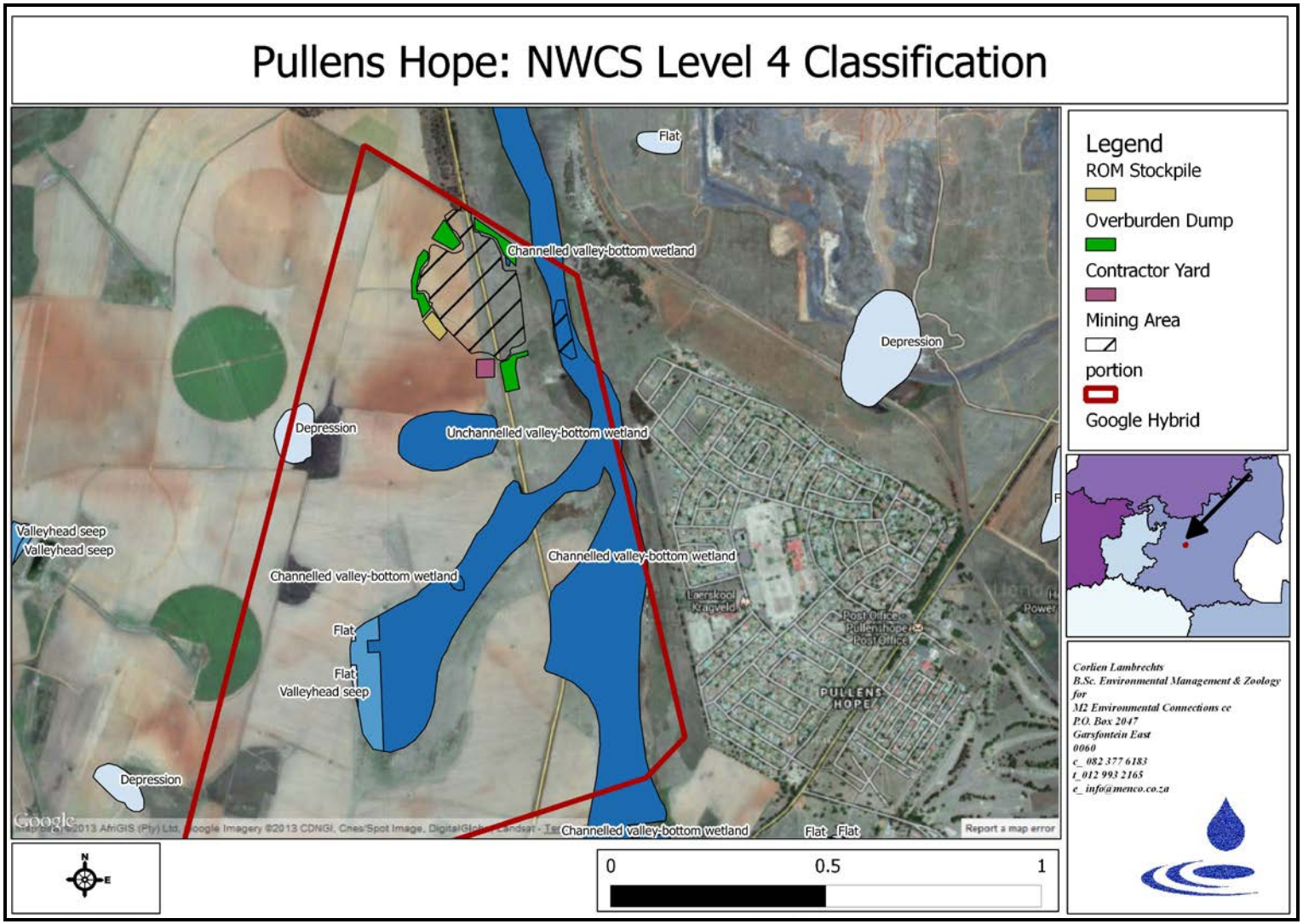


Figure 6-2: Mine development in relation to wetlands

Table 6-2: Habitat Integrity Assessment criteria for wetlands

Criteria and Attributes	Relevance
Hydrological	
Flow modification	Consequence of abstraction, regulation by impoundments or increased runoff from human settlements or agricultural land. Changes in flow regime, volumes, velocity which affect inundation of wetland habitats resulting in floristic changes or incorrect cues to biota. Abstraction of groundwater flows to or from a 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. Measured directly by lab analysis or assessed indirectly from upstream agricultural activities, human settlements and industrial activities.
Sediment load modification	Consequence of reduction due to entrapment by impoundments 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	
Canalization	Results in desiccation or changes to inundation patterns of wetland and thus changes in habitat. River diversions or drainage.
Topographic alteration	Consequence of infilling, ploughing, dykes, trampling, bridges, roads, railway lines and other substrate disruptive activities which reduce or change wetland habitat.
Biota	
Terrestrial encroachment	Consequence of 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 function.
Indigenous vegetation removal	Direct destruction of habitat through farming activities, grazing or firewood collection affecting wildlife habitat ad flow attenuation functions, organic matter input and increase in potential for erosion.
Invasive plant encroachment	Affects habitat characteristics through changes in community structure and water quality (oxygen reduction and shading)
Alien fauna	Presence of alien fauna affecting faunal community structure
Over utilization of biota	Overgrazing and over fishing

Attributes above are rated and scored as one of the following:					
Natural/unmodified	5	Largely natural	4	Moderately modified	3
Largely modified	2	Seriously modified	1	Critical modified	0

The PES of the wetland was based on the available information for each criterion listed in Table 4-1 and the mean score determined for each wetland (refer Table 4-2). This methodology is based on the assumption that extensive degradation of any wetland attributes may determine the PESC (DWAF, 2005).

6.2.3 Ecological Importance and Sensitivity

The Ecological Importance and Sensitivity (EIS) assessment was conducted according to the guidelines as discussed by DWAF (1999). In this guideline DWA defines "ecological importance" of a water resource as an expression of its importance to the maintenance of ecological diversity and function on local and wider scales (regional, national). Ecological sensitivity refers to the system's ability to resist disturbance and its capability to recover disturbance once it has occurred.

In the method outlined by DWA a series of determinates for EIS are assessed for the wetlands on a scale of 0 to 4 (refer **Table 6-3**), where 0 indicates no importance and 4 indicates very high importance. The median of the determinants is used to determine the EIS of the wetland unit (refer **Table 6-4**).

Table 6-3: Score sheet for determining EIS

Primary determinants
• Rare and endangered species
• Species/taxon riches
• Diversity of habitat types or features
• Migration route/breeding and feeding site for wetland species
• Sensitivity to change in the natural hydrological regime
• Sensitivity to water quality changes
• Flood storage, energy dissipation and particulate/element removal
Modifying determinants
• Protected status
• Ecological Integrity

Table 6-4: Ecological Importance and Sensitivity categories

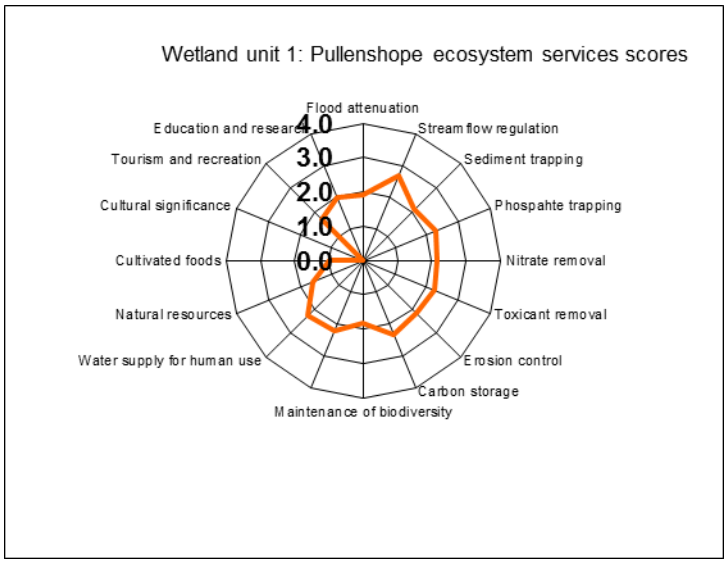
Range of median	EIS Category	Category description
>3 and <=4	Very High	Wetlands that are considered ecologically important and sensitive on a national scale. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. Play major role in moderating the quantity and quality of water in major rivers.
<2 and <=3	High	Wetlands that are considered to be ecological important and sensitive. The biodiversity of these wetlands is usually very sensitive to flow and habitat modifications. Play a role in moderating the quantity and quality of water in major rivers.
>1 and <=2	Moderate	Wetlands that are to be considered to be ecological important and sensitive. The biodiversity of these wetlands is not usually sensitive to flow and habitat modifications. Play a small role in moderating the quantity and quality of water in major rivers.
>0 and <=1	Low/Marginal	Wetlands that are not ecological important and sensitive at any scale. The biodiversity of these wetlands are ubiquitous and not sensitive to flow and habitat modifications. Play an insignificant role in moderating the quantity and quality of water in major rivers.

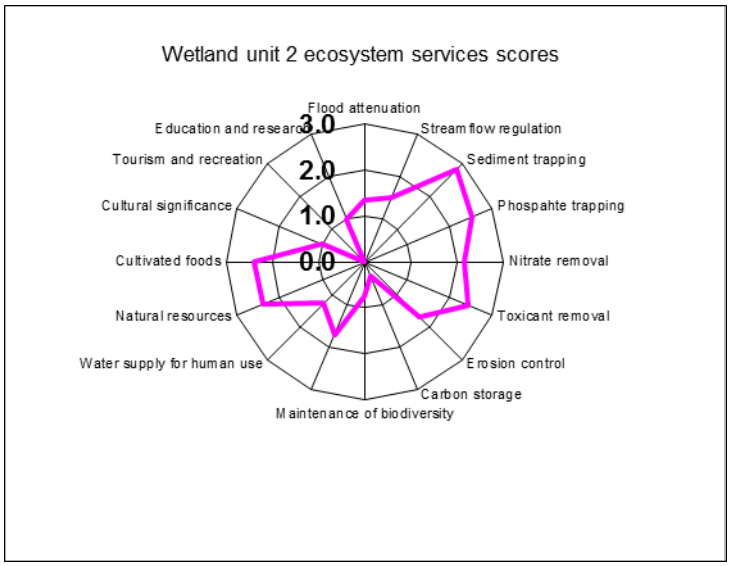
6.2.4 Ecosystem Services supplied by the Wetland

The assessment of the ecosystem services supplied by the identified wetland units was conducted according to the guidelines as described by Kotze et al (2005). A level 2 assessment was undertaken which examines and rates *Natural* as well as *Human* Services.

The following natural services were assessed by means of the Wetland Assessment Datasheet (WetTool):

- Flood attenuation
- Stream flow regulation
- Sediment trapping
- Phosphate trapping
- Nitrate removal
- Toxicant removal
- Erosion control
- Carbon storage
- Maintenance of biodiversity





Scores for each of the above natural services assessment were allocated a class based on those shown in **Table 6-5**. These scores were then added to determine the overall level of natural services for the wetland unit using the classes in **Table 6-6**.

Table 6-5: Classes for service scores

Class Boundary	Class Score
0 – 0.99	1
1 – 1.99	2
2 – 2.99	3
3 – 4	4

Table 6-6: Classes for the overall level of natural services provided by a wetland unit

Class Boundaries	Class	Class description
30 – 36	Very high	Unmodified, natural condition
24 – 29.9	High	Largely natural with few modifications
18 – 23.9	Moderate	Moderately modified, but with some loss of natural habitats
12 – 17.9	Low	Largely modified. A large loss of natural habitats and basic ecosystem functions has occurred
6 – 11.9	Very low	Seriously modified. The losses of natural habitats and basic ecosystem functions are extensive
0 - 5.9	Non existent	Critically modified. Modifications have reached a critical level and the system has been modified completely with an almost complete loss of natural habitat.

The following human services indicators were assessed:

- Water supply for human use
- Natural resources
- Cultivated foods
- Cultural significance
- Tourism and recreation
- Education and research

Scores for each of the above human services assessments were allocated a class based on those shown in **Table 6-6**. These scores were then added to determine the overall level of human services for the wetland unit using the classes as shown in **Table 6-7**.

Table 6-7: Classes for overall level of human services provided by wetland unit

Class Boundaries	Class	Class description
20 -24	Very high	Local people are extremely dependent on the wetland and benefit from it greatly

Class Boundaries	Class	Class description
16 – 19.9	High	Local people have a high level of dependence on the wetland and benefit from it considerably
12 – 15.9	Moderate	Local people are moderately dependent on the wetland and benefit from it occasionally
8 – 11.9	Low	Local people have a low dependency on the wetland and seldom benefit from it
4 – 7.9	Very low	Local people rarely rely on the wetland and almost never benefit from it
0 – 3.9	Non existent	Local people have no interaction with the wetland and never receive benefits from it.

7. RESULTS

Based on the hydro-geomorphic setting, a channelled valley bottom wetland type was identified in the project area. The hydrological benefits from this wetland are indicated in **Table 7-1**. Site photographs are indicated in **Figure 7-1**, **Figure 7-2**, and **Figure 7-3**.

The project area is located in the B12B Quaternary catchment (Upper Olifants sub-Water Management Area). The property area is located at the head waters of the Klein Olifants River systems. The stream linked to the wetland is an unnamed tributary to the Woestalleen Spruit. The 2008 PES and EIS (desktop) for the main tributaries are:

- Woestalleen: PES class D (Largely Modified) and EIS low
- Klein Olifants: PES class C (Moderately Modified) and EIS moderate


Figure 7-1: Photographs indicating the permanently waterlogged soils (left) and the wetland during winter conditions (right)


Figure 7-2: Photographs indicating the Dam (left) and the area earmarked for possible mining (right)


Figure 7-3: Photographs indicating the storm water runoff towards wetland (left) and drainage channels to drain wet areas (right)

The field survey has revealed that the wetland soils are permanently waterlogged. PES for the Pullenshope wetland is Class D (Largely Natural). The overall classification in terms of the EIS is Moderate, indicating that the Pullenshope wetland is not considered of National importance. The summarised results are contained in **Table 7-2**.

Table 7-1: Hydrological benefits provided by identified wetland units

Wetland	Generic Hydrological benefits provided by the wetlands							
Hydro-Geomorphic Type	Flood attenuation		Stream flow regulation	Erosion control	Sediment trapping	PO_4	NO_3	Toxicants[1]
Channeled valley bottom wetland	Early wet Season	Late wet Season						
	+	+	++	++	++	++	++	++
Un-channelled valley bottom	0	0	0	+	++	++	++	++
Rating	0 + ++	Benefit unlikely to be provided to any significant extent Benefit likely to be present at least to some degree Benefit very likely to be present (and often supplied to a high level)						

Table 7-2: PES, EIS, Hydro-functional Importance and Direct Human Benefits

Wetland	PES	EIS			Eco services	
		Ecological Importance & Sensitivity	Hydro-Functional Importance	Direct Human Benefits	Natural	Human
Pullenshope Wetland 1	2.0 Largely Modified D	2.3 Moderately	2.2 Moderately	2.9 Moderately	19.2 High	13.3 Moderate
Un-channelled Wetland 2	1.8 Class E	2.2 Moderately	2.3 Moderately	2.4 Moderately	15.6 Moderate	6.2 Very Low

Refer to **Figure 6-2** for the locality of the wetlands within the project area.

8. WETLAND IMPACT ASSESSMENT

8.1 ENVIRONMENTAL RISK ASSESSMENT

The criteria for the description and assessment of environmental impacts were drawn from the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the NEMA.

The level of detail as depicted in the EIA regulations was fine-tuned by assigning specific values to each impact. In order to establish a coherent framework within which all impacts could be objectively assessed, it was necessary to establish a rating system, which was applied consistently to all the criteria. For such purposes each aspect was assigned a value, ranging from one (1) to five (5), depending on its definition. This assessment is a relative evaluation within the context of all the activities and the other impacts within the framework of the project. An explanation of the impact assessment criteria is defined in **Table 8-1** below.

Table 8-1: Criteria for Assessment of Impacts

Extent	
Classification of the physical and spatial scale of the impact	
Footprint (F)	The impacted area extends only as far as the activity, such as footprint occurring within the total site area.
Site (S)	The impact could affect the whole, or a significant portion of the site.
Regional (R)	The impact could affect the area including the neighbouring farms, the transport routes and the adjoining towns.
National (N)	The impact could have an effect that expands throughout the country (South Africa).
International (I)	Where the impact has international ramifications that extend beyond the boundaries of South Africa.
Duration	
The lifetime of the impact that is measured in relation to the lifetime of the proposed development.	
Short (ST)	The impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than that of the construction phase.
Short to Medium(S-M)	The impact will be relevant through to the end of a construction phase (1.5 years)
Medium (M)	The impact will last up to the end of the development phases, where after it will be entirely negated.
Long (LT)	The impact will continue or last for the entire operational lifetime i.e. exceed 30 years of the development, but will be mitigated by direct human action or by natural processes thereafter.
Permanent (P)	This is the only class of impact, which will be non-transitory. Mitigation either by man or natural process will not occur in such a way or in such a time span that the impact can be considered transient.

Intensity	
The intensity of the impact is considered by examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment itself. The intensity is rated as	
Low (L)	The impact alters the affected environment in such a way that the natural processes or functions are not affected.
Medium (M)	The affected environment is altered, but functions and processes continue, albeit in a modified way.
High (H)	Function or process of the affected environment is disturbed to the extent where it temporarily or permanently ceases.
Probability	
This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the life cycle of the activity, and not at any given time. The classes are rated as follows:	
Probable (Pr)	The possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is zero (0 %).
Possible (Po)	The possibility of the impact occurring is very low, due either to the circumstances, design or experience. The chances of this impact occurring is defined as 25 %.
Likely (L)	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50 %.
Highly Likely (HL)	It is most likely that the impacts will occur at some stage of the development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75 %.
Definite (D)	The impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied on. The chance of this impact occurring is defined as 100 %.

The impact quantification scores are given in **Table 8-2**. Determination of significance refers to the foreseeable significance of the impact after the successful implementation of the necessary mitigation measures. The Significance Rating (SR) is determined as follows:

Equation 1:

Significance Rating (SR) = (Extent + Intensity + Duration) x Probability

Table 8-2: Assessment Criteria and Ranking Scales

PROBABILITY		**MAGNITUDE**	
Description / Meaning	Score	Description / Meaning	Score
Definite/don't know	5	Very high/don't know	10
Highly likely	4	High	8
Likely	3	Moderate	6
Possible	2	Low	4
Improbable	1	Insignificant	2
DURATION		**SPATIAL SCALE**	
Description / Meaning	Score	Description / Meaning	Score

Permanent	5	International	5
Long Term	4	National	4
Medium Term	3	Regional	3
Short term	2	Local	2
Temporary	1	Footprint	1

The significance ranking without mitigation and with implementation of the mitigation measures should be interpreted as presented in **Table 8-3** and **Table 8-4**.

Table 8-3: Significance of potential impacts without mitigation

SR < 30	Low (L)	Impacts with little real effect and which should not have an influence on or require modification of the project design or alternative mitigation. No mitigation is required.
30 < SR < 60	Medium (M)	Where it could have an influence on the decision unless it is mitigated. An impact or benefit which is sufficiently important to require management. Of moderate significance - could influence the decisions about the project if left unmanaged.
SR > 60	High (H)	Impact is significant, mitigation is critical to reduce impact or risk. Resulting impact could influence the decision depending on the possible mitigation. An impact which could influence the decision about whether or not to proceed with the project.

Table 8-4: Significance of potential impacts with mitigation

SR < 30	Low (L)	The impact is mitigated to the point where it is of limited importance.
30 < SR < 60	Medium (M)	Notwithstanding the successful implementation of the mitigation measures, to reduce the negative impacts to acceptable levels, the negative impact will remain of significance. However, taken within the overall context of the project, the persistent impact does not constitute a fatal flaw.
SR > 60	High (H)	The impact is of major importance. Mitigation of the impact is not possible on a cost-effective basis. The impact is regarded as high importance and taken within the overall context of the project, is regarded as a fatal flaw. An impact regarded as high significance, after mitigation could render the entire development option or entire project proposal unacceptable.

Sensitive receptors such as wetlands and surface water quality could be impacted by means of two pathways (refer **Table 8-5**) being a point source discharge or diffuse pollution as a result of mining activities on an identified receptor. A point source is a direct discharge of polluted water to the environment and no such water management approach is envisaged for the proposed mine. Thus impacts will arise from accidental spillages and diffuse sources such as specified below:

- Accidental diesel and oil spill on site
- Uncontrolled discharges from dirty water containment systems
- Seepage from dirty water containment structures
- Seepage from mine residue deposits and stockpiles
- Storm water runoff from contaminated areas
- Seepage and spills from the proposed box cut areas; and
- Seepage from PCD and infiltration directly to the aquifer

The potential areas where diffuse pollution could arise are the following:

- Crusher and Screening plant, ROM and Stockpile area
- AMD seepage
- Existing and proposed infrastructure (PCD), including opencast areas

Table 8-5: Source and Receptor Pathways

Source	Pathway	Receptor
Opencast Pit Waste Rock Dump Coal Discard Dump Coal Product Stockpiles Pollution Control Dams Neighboring mines (and discharges from Eskom Power Station drains) Other potential source of impact	Movement through the vadose (unsaturated) zone Movement through the aquifer Movement through surface runoff in storm water or watercourse Movement through mining voids Airborne migration of sulphide minerals, contaminants or dust	Aquatic fauna and flora in the receiving watercourse, wetland Identified water users abstracting water from the surface water resource Identified water users abstracting groundwater through a borehole for domestic, livestock watering or irrigation use

8.2 CONSTRUCTION PHASE

A very short construction phase will commence at Roodepoort Colliery and will entail the following activities:

- Stripping of topsoil;
- Construction of the box cut/ opencast;
- Construction of new access road;
- Stockpiling of topsoil, subsoil and overburden;
- Construction of storm water drains;
- Construction of Pollution Control Dams; and
- Office, workshops, ablution facilities, stores, yards, fuel bays and weighbridge.

The impact of the proposed mining activities on the wetland during the construction phase is discussed below.

Nature: The proposed coal mine and associated infrastructure/ processes may have impacts on the existing wetland as well as aquatic fauna and flora.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Likely (3)	Possible (2)
Significance	**45 (Medium)**	**26 (Low)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Implement a Zero Effluent Discharge (ZED) policy,		
Cumulative Impacts: Increased sediment load		
Residual Impacts: Bio accumulation of toxic metals within aquatic eco-systems		

8.3 OPERATIONAL PHASE

During the operational phase of Roodepoort Colliery 10 box cuts on the northern side (N01 – N10) will ultimately impact on the channelled valley bottom wetland system as base-flow in the river system will be altered due to influx into the pit areas. Wetland vegetation will be reduced caused by poorer water quality and dust fall out. Sedimentation stemming from disturbed areas will reduce the efficiency of wetland functioning.

Nature: The proposed coal mine and associated infrastructure may have impacts on the existing wetland as well as aquatic fauna and flora.		
	Without mitigation	**With mitigation**
Extent	Regional (3)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	High (8)	Moderate (6)
Probability	Highly Likely (4)	Likely (3)
Significance	**60 (High)**	**39 (Moderate)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: Implementation of an approved Wetland Rehabilitation Plan		
Cumulative Impacts: Increased sediment load , cumulative loss of wetland systems		
Residual Impacts: Bio accumulation of toxic metals within aquatic eco-systems		

The impact of mining on the wetland system is definite and without mitigation will have a High significance. If mitigation measures are implemented mining will have a moderate impact on the wetland system.

Mining needs to be regulated by means of a water use authorisation for section 21(c) and (i) water uses as contemplated in the National Water Act, 1998 (Act 36 of 1998).

8.4 CLOSURE PHASE

The conservation status of the vegetation type in the Woestalleen wetland system is not considered endangered. However, transformation of wetlands by mining and agricultural activities in the area has increased the stress on the wetlands areas in the catchment. During the closure phase Roodepoort Colliery will be obliged to compile a Wetland Rehabilitation Strategy to be implemented in order to:

- Conserve wetland flora and biodiversity;
- Prevent alien and invasive plant species establishment;
- Control stormwater runoff to the wetland by preventing erosion;
- Realign roads in the wetland areas;
- Re-vegetation of rehabilitated areas with indigenous facultative and obligated wetland species.

9. DISCUSSION AND RECOMMENDATION

9.1 DISCUSSION

The wetland study conducted for the proposed mine of the farm Roodepoort 151 IS was based primarily on the latest datasets available for national and regional wetland systems and was refined with a field investigation.

The importance and existence of these wetlands were then further compared to the importance of their management on a regional scale (aquatic biodiversity sub-catchment, quaternary catchment, and National Freshwater Ecosystem Priority Area's (NFEPA's) for rivers and wetlands). FEPA's represent rivers, wetlands and estuaries that are required to maintain a high integrity for the protection of our country's freshwater ecosystems and water resources for human use. This protection is not aimed to exclude the identified areas from human contact, but rather to promote efficient planning and management strategies in and around these areas.

The wetland study revealed that the Wetland PES is Largely Modified with a Low EIS. It is important in the hydro functional capacity of the area and the Woestalleen Spruit, as the area is located on highly erodible soils.

The wetland buffer zone indicated in this report was set at 100m. It is the opinion of the specialists that this is sufficient as an overall buffer zone, but that it might not be sufficient at certain areas, as the water level seemed to be shallow in some of the higher lying areas (refer **Figure 7-3**). This may be as a result of some of the stormwater discharge penetrating an aquifer feeding the wetland. Development in areas where aquifers drain into the wetland will inevitably dry up the wetland.

9.2 RECOMMENDATIONS

The wetlands have a high biodiversity conservation value on a national scale. It is thus recommended that the following considerations be taken into account and applied accordingly:

- Firstly an application be made for section 21(c) and (i) uses for any construction activity within 100m of the wetland (refer **Figure 6-1**).
- Secondly that a minimum of 100m buffer zone be maintained around the wetland areas wherein no activities are allowed to take place in order to protect the integrity of the wetland as the wetland still remains a national priority wetland in a good condition with a very high ecological importance and sensitivity. This buffer

zone should be clearly demarcated as a “NO GO” area to prevent any accidental entrance into the area (refer **Figure 6-1**).

- That all conditions as stipulated in the ROD be adhered to before commencement of construction activities
- The proposed future development activities should not interfere with bank stability or the erosive potential of the streams and soils found on site.
- Any activities that my potentially result in significant adverse effects on the in stream or the riparian habitat should be avoided to allow for the implementation of alternatives that are less environmentally harmful. This requires the provision of less harmful alternatives and where these alternatives are not feasible, environmentally sound management and engineering practices should be applied for all areas that may be affected in an adverse way.
- Strict storm-water management practices must be applied and incorporated into management with the aid of a suitably qualified engineer to avoid disposal or spillage of any environmentally harmful materials or waste into the riparian habitat and stream.
- Should the avoidance or minimization of the proposed impacts not be possible, compensatory measures for any damage to the in stream or riparian habitat must be provided.
- Should the mitigation measures fail to adequately protect the integrity of the in stream or riparian habitat, compensatory measures must be provided.
- The wetland areas should be included in to an open space system in accordance with the spatial planning on a large scale and should not be fragmented in any way.
- No construction activities should be allowed within the wetland area as this would adversely affect the species composition and integrity of the wetland.
- Should the development needs to transgress the wetland areas, a water use license authorisation in terms of section 40 of the National Water Act, Act 36 of 1998 for the section 21(c) and (i) uses must be applied for.

10. REFERENCES

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