Wetland Delineation

Proposed Route 7 Truck Depot

Portions 174 and 175 Eloff Small Holdings

Delmas, Mpumalanga

Susan Carter-Brown

BSc Hon Environmental Science

September 2011

AFZELIA

Environmental Consultants cc

TABLE OF CONTENTS

1. INTRODUCTION
1.1 Background to Assessment **pg 3**
1.2 Scope of the study **pg 3**
1.3 Specialist team **pg 3**

2. METHODOLOGY
2.1 Wetland Delineation Tool **pg 4**
2.2 Procedure **pg 5**
2.3 Limitations and Assumptions **pg 5**

3. RESULTS
3.1 Site Description **pg 6**
3.2 Wetland Delineation **pg 6**

4. POTENTIAL IMPACTS of proposed Truck Stop **pg 6**

5. DISCUSSION AND RECOMMENDATION
5.1 Buffer **pg 7**
5.2 Geological implications **pg 7**
5.3 Wetland implications **pg 8**
5.4 Summary of mitigation measures **pg 10**

6. APPENDICES

Appendix A: **Locality Map**
Appendix B: **Geology layer**
Appendix C: **Wetland delineation**
Appendix D: **30m buffer on wetland**
Appendix E: **Aerial image of landscape**
Appendix F: **Site photos**
Appendix G : **Observation points**

Please direct any queries to –
Susan Carter-Brown
Afzelia Environmental Consultants
P O Box 95, Hilton, 3245
Tel: 033 343 2031
Fax: 033 343 2033
Email: susan@afzelia.co.za

1. INTRODUCTION

1.1 Background to the assessment

It is proposed that a Truck Stop, including a wash bay facility, be built on Holdings 174 and 175 of Eloff Small Holdings, outside Delmas. The locality of the site is seen in Appendix A.

Existing infrastructure and operations on the site include –

- Wash bay (foundations and side walls in place), 25m x 5m
- Oil separators adjacent to wash bay, 2m x 5m in 3 stages
- Ablutions (2 bathrooms, septic tank), 6.9m x 2.8m
- Storage of approximately 1000l oil in 210 oil drums (steel drip trays used)
- Storage of 30 000l diesel, aboveground storage tank, with bundwall
- 1 diesel bowser, for private use
- Stormwater management includes trenches at lower point of the property, intercepted by road drainage.

As per the information provided at the time of report-writing, the proposed Truck Stop would include the following –

- Workshop / storage area, 15.5m x 20m
- Completion of wash bay

Although there is no evidence presently of a wetland on the site, the historical / seasonal presence of a wetland in the north-western portion of the proposed development site was unknown and required investigation. Investigation of the presence of a wetland on the neighbouring property to the north of the site was also required.

Afzelia Environmental Consultants were appointed to determine the presence of wetlands; and (if present) to delineate the wetland in relation to the proposed development.

The proposed Truck Stop development is subject to an Environmental Impact Assessment (EIA), Basic Assessment under the EIA Regulations (2010) of the National Environmental Management Act (NEMA, Act 107 of 1998). The following wetland delineation will inform the EIA process, and - in the ethos of NEMA - aim to improve or maintain the current environmental state.

1.2 Scope of the study

- Investigate the proposed development site for the presence of a wetland.
  - If present: delineate the temporary, seasonal and permanent zones of the wetland.
- Investigate the neighbouring property to the north for the presence of a wetland.
  - If present: delineate the outer wetland edge (temporary zone), as relevant to the proposed development.
- Assess the potential impacts the development may have on the wetland system.
- Provide recommendations in light of the wetland delineation and proposed development.

1.3 Specialist team

This report has been prepared in accordance with the *General Requirements for EAPs or a person compiling a specialist report or undertaking a specialised* process as per Section 17 of GNR 543 – EIA Regulations (2010) and the NEMA (Act 107 of 1998). It has been prepared independently of any influence or prejudice by any parties. The following specialists were involved in the compilation of the report.

Table 1. Eshowe Wetland Assessment Project Team

Specialist	Qualification	Qualifications and Experience	Role
Susan Carter-Brown Afzelia Environmental Consultants	*BSc Honours, Environmental Science*	Susan has attended various courses on wetland assessment (Tools for Wetland Delineation, Pretoria 2010; WET-Health and WET-EcoServices, Rhodes University 2010). She has been involved in wetland assessments since February this year.	Susan conducted the fieldwork, all assessments and compiled the report.
Wolfgang Kanz Afzelia Environmental Consultants	*MSc Range and Forage Resources*	Wolf'gang's interest lies in vegetation dynamics, with specific expertise in grassland science and savannah ecology. He is involved in all facets of the Environmental Impact Assessment, including specialist consulting (*inter alia* biodiversity assessments, ecological screenings, roads and pipeline assessments) and managing the EIA process. Wolfgang has attended courses on stormwater management, effluent management, and riparian management.	Wolf reviewed the report and provided guidance where necessary.

2. METHODOLOGY

2.1 Wetland Delineation Tool

Contrary to general perspective, a wetland is not always a swamp or marsh area. According to the National Water Act (Act No. 36 of 1998), wetlands are defined 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".*

A wetland area is saturated with water to varying degrees throughout the seasons and over the years – such that, one could visit some wetlands during drier months and find no evidence of water in the system at all.

However, cycles of prolonged water saturation at varying frequencies and durations have definite and specific effects on vegetation composition and soil morphology. Thus, hydrophilic vegetation and soil wetness units (chroma, hue and value matrix; degree of mottling) can be used as indicators of wetland presence. Furthermore, topographical terrain units (e.g. slope, valleybottom, scarp) give evidence as to the possible presence of a wetland.

Using such wetland indicators, the Department of Water Affairs developed a tool for wetland practitioners to determine the patterns of water movement through an area, and delineate the boundary of a wetland. This accepted benchmark tool: *A practical Field Procedure for Identification and Delineation of Wetland and Riparian Areas – Edition 1 (DWA, 2005*) was used to determine the presence of a wetland, and to delineate its boundaries.

2.2 Procedure

Firstly, the site was subjected to a thorough desktop analysis. Due to the uncertainty of there being a wetland on the neighbouring property (with the possibility of the proposed development impacting on this system if it exists), the scope of investigation was extended approximately 50m into the neighbouring property. If a wetland did exist on the neighbouring property, the purpose of this study would not be to delineate the neighbouring wetland, but to focus on the relationship between the development site and the neighbouring wetland.

The underlying geological layers and topographical setting of the site was determined from the GIS database, as seen in the maps in Appendix B and A respectively.

Secondly, the site was visited on the 7th and 8th September 2011 in order to conduct necessary in-field procedures to delineate the system: vegetation sampling, soil sampling (using auger and Munsell Colour Chart), and topography assessment. The full extent of the development site; and relevant portions of the neighbouring property were traversed. Auger sample points were taken at a maximum of 50m intervals, and the points logged using a Garmin GPS 60 (see Appendix G). Fieldwork notes can be provided upon request.

2.3 Limitations and Assumptions

It is difficult to apply pure scientific methods within a natural environment without limitations and the need to make assumptions. The following constraints may have affected this assessment –

- A Garmin GPS 60 was used in the mapping of significant points on-site. The accuracy of the GPS was affected by the availability of corresponding satellites and ranged from 6 to 9m.
- A Munsell Soil Colour Chart was used to assess soil morphology. This tool requires that a *dry* sample of soil be assessed. However, due to in-field time constraints, wet soil samples were assessed. Wet samples would have consistently lower values than dry soils; and this is taken into consideration.
- A main district road, of some 23m including roadside drainage, runs along the northern border of the site. The road has been in use for 20 years and it is highly likely that localized hydrology has been altered as a result.
- The proposed development site was previously farmed, and the land ploughed. This modification and inversion of soil is highly likely to reduce the reliability of soil wetness indicators.
- The development has not yet been approved, and is still subject to changes in scope and layout. As such, potential impacts are assumed.
- The site visit was conducted in early September before the summer rains. Vegetation was not yet flowering, making the classification of some grass and sedge species difficult.

3. RESULTS

3.1 Site description

174 and 175 Eloff Holdings is located approximately 3km outside the town of Delmas, on the westbound dirt district road towards Geluk, within the Nkangala District Municipality, Mpumalanga.

Delmas experiences an annual rainfall of 500 to 750 ml, with the majority of rain falling in summer. Much dryland cropping of sunflowers and maize occurs to the north of the site, and various agri-industrial pursuits within the small-holdings occur to the south. The area is characterized by moderate summers and cold winters, with an average minimum temperature of 0°C and maximum of 23°C[1] respectively.

The site proposed for development is 3.5 hectares in extent. It is comprised of transformed veld grass, gravelled workshop areas, and a small office with ablutions. There are several gum trees growing in the northwest portion of the site, and basic landcover includes *Eragrostis* and *Paspalum* grass species, including ruderal (weedy) plants. The proposed site is relatively flat, with a gradual slope of 1-3% northwards, towards the district road.

See the site photos in Appendix F.

3.2 Wetland delineation

There is no wetland within the proposed development site.

However, there exists a wetland downslope of the property to the north, as seen in the map in Appendix C.

Note, that as mentioned above, only the wetland boundary relevant to the proposed development site was delineated. The remainder of the wetland area to the north was determined purely from desktop analysis and is a rough representation of the wetland area (see the observation points in the Appendix G).

As seen in the aerial landscape image in Appendix E, there are similar wetland systems to the east and northeast of the site.

4. POTENTIAL IMPACTS of PROPOSED TRUCK STOP

The following impacts have the potential to occur as a result of the proposed development -

- Increased pollutants from construction activities
- Increased sedimentation from construction activities
- Contamination of wetland and / or groundwater from petrochemical spillage / leakage
- Contamination of wetland and / or groundwater from oil spillage / leakage
- Contamination of wetland and / or groundwater from detergents used in wash bay
- Increase in volume and velocity of runoff from the site into the wetland, as a result of increased hard surfacing
- Increase in volume of water discharge from site, as a result of the wash bay
- Alteration of hydro-regime with dire impacts on nearby dolomitic formations.

Due to the gradual slope of the site and the culvert constructed under the district road, the runoff from the development site drains directly into the neighbouring wetland.

[1] *Mpumalanga Provincial Government. Department of Agriculture and Land Administration. Integrated Resource Information Report, Delmas 2005*

5. DISCUSSION AND RECOMMENDATIONS

5.1 Buffer

In order to mitigate against the potential impacts of the proposed development on the neighbouring wetland, it is recommended that the wetland be afforded a 'no development' buffer. The frequent temporal fluctuations of the water regime within a wetland's temporary zone give the area unique eco-tonal characteristics highly favorable to biodiversity. As such, buffering of a wetland must take place from the outer edge of this zone.

Different governing and regulatory bodies provide varying buffer width standards, as seen by the table below –

Regulating body	Setting	Buffer width
KZN Department of Agriculture, Environmental Affairs and Rural Development	Urban	15 to 30m
Gauteng Department of Agriculture, Conservation and Environment	Urban	30m
KZN Department of Agriculture, Environmental Affairs and Rural Development	Forestry plantations	20m
Conservation of Agricultural Resources Act (Act 84 of 1983)	Agricultural / Rural	10m
Gauteng Department of Agriculture, Conservation and Environment	Agricultural / Rural	50m

A functional assessment is required to determine the importance of the wetland and hence prescribe a site-specific buffer. However, in the absence of a functional assessment and considering the potential impacts of the development, a 30m buffer from the wetland edge is recommended. See the map of the buffered wetland in Appendix D.

5.2 Geological implications

The proposed development site is situated on sandstone and shale of the Vryheid formation, Ecca group and Karoo sequence which is deemed suitable for development. Although, it is found in close proximity (3 - 4km) to dolomite and chert lithology of the Black Reef formation of the Malmani Subgroup, Chuniespoort Group, Transvaal Sequence[2] (see the Geology Map in Appendix B). Diamictite and shale of the Dwyka formation, Ecca group, Karoo sequence is also found in a narrow band running approximately 2.5km to the east of the site. The dolomitic formations are, in places, overlain by a relatively thin cover of younger rocks of the Pretoria Group, Transvaal Supergroup, and / or Karoo Supergroup, and may be mantled by unconsolidated material of Cenozoic age.

Given that the development comprises a wash bay facility with associated increased water usage, the proximity of the site to dolomite formations is worrying.

Dolomite is formed of calcium / magnesium carbonate. Water, when combined with carbon dioxide from the atmosphere or soil, forms a weak carbonic acid. When this weakly-acidic groundwater circulates along tension fractures, faults and joints in dolomitic successions, it causes the carbonate minerals to be leached from the dolomite. This can lead to hard competent dolomitic bedrock being replaced by slightly leached jointed bedrock; and thereafter – often in sudden, dramatic transition – the dolomite becomes totally leached, and an incompetent, insoluble residual material[3] remains. This results in the formation of a sinkhole.

[2] *Keyser, N, Botha, GA and Groenewald, GH (1986).1:250 000 Geological Series, Geology Survey. Transvaal, EAST RAND 2628. University of Witwatersrand*
[3] *Department of Water Affairs (2009). Dolomite Guideline: A short guideline to available documents on procedures for developing dolomitic land.*

Given sufficient time and specific triggering mechanisms, instability and sinkholes form naturally. Although human activities can greatly increase i) the risk associated with sinkholes and ii) the frequency of their occurrence.

The primary anthropogenic triggers are as follows -

- The ingress of water from leaking water-bearing services;
- Poorly managed surface water drainage; and
- Groundwater level drawdown; including fluctuation of the water table outside of its natural range.

Thus, water management in dolomite areas is very important.

Considering the proximity of the proposed wash bay facility to the dolomitic formations, it is recommended that the washwater be re-used and recycled as far as possible, to ensure the overall water consumption / accumulation in the area is not dramatically increased; and groundwater regimes are not altered.

5.3 Wetland implications

It has been established that an intact wetland occurs to the north of the site. A 30m 'no development' buffer has been afforded this wetland.

Wetlands are highly valuable natural systems that perform numerous important functions, both directly and indirectly related to human well-being. Wetlands are protected by eight Acts and one Ordinance[4], proving that authorities recognise the critical need to conserve these multiple-use resources.

Small, but frequent spills and leakages are commonplace at a Truck Stop facility. For example –

- Spillage can occur during transfer of diesel from the road tanker to the storage tanks, including overfill of tanks due to faulty valves or human error.
- Spillage can occur during dispensing of diesel from storage tanks into vehicles and/or equipment.
- Small spills of new and used engine oil, lubricating oil, heating and illumination oil, degreasers and solvents in the workshop area, where vehicles are serviced or repaired.

Such small spills and leakages can have major impacts when incorporated with water (i.e. washed off forecourt / workshop area during rainfall event) and in entering wetland or groundwater systems.

In order to prevent impacts on the wetland system, the following recommendations are made -

	Recommendation	Reason
1.	A detailed Environmental Management Programme, that ensures all construction activities are to best standards, must be approved by the Competent Authority. The EMPr must include a Spill Contingency Plan for both construction and operational phases.	To prevent contamination and sedimentation of the wetland during construction activities.

[4] *The Lake Areas Development Act, Act No. 39 of 1975*
The National Water Act, Act No. 36 of 1998
The Mountain Catchment Areas Act, Act No. 63 of 1976
The Environmental Conservation Act, Act No. 73 of 1976
The National Environmental Management Act, Act No. 107 of 1998
The Conservation of Agricultural Resources Act, Act No. 43 of 1983
The Town Planning Ordinance 27 of 1949
The Physical Planning Act, Act No. 88 of 1967
The Forest Act, Act No. 84 of 1998

2.	Petrochemicals and oil must be stored on am impervious surface and within an impermeable bund wall. Bunded areas must be able to contain 110% of the volume of liquids being stored; and effective even under high temperature (in case of fire). Bund areas must drain to a closable valve or blind collection point / sump for regular, controlled release of bund contents such as rainwater, wash water, or spilled petrochemical products.	To allow for spills / leakages to be contained and disposed in a manner suitable for hazardous waste. To prevent contaminated water flowing into the wetland.
3.	All re-fuelling points must occur on impervious surfaces and within a bunded area or with the use of drip trays.	To prevent contaminated water flowing into the wetland. Contamination of water resources, especially groundwater, is one of the most prevalent environmental risks associated with service stations.
4.	Water from the wash bay facility must be reused and recycled through the system. This can be achieved via a series of treatment dams; or via engineered water reclaim systems.	In the interest of Best Practise and water conservation.
5.	Only organic, biodegradable soaps, waxes and degreasers must be used in the wash bay facility.	In order that these products may be decomposed prior to their entry into the wetland. It is well documented[5] that detergents have disastrous impacts on frog health. Although there has been no aquatic survey of the associated wetland, it is highly likely that frog species are present. As such, no pure / used detergents or detergent residues must enter the wetland system.
6.	Recycled water should pass through a retention dam and reed / sedge bed for the breakdown of soaps, waxes, degreasers and petrochemical compounds in the water. Bio-digester products may be added to the retention dams, if required.	In order that biodegradable detergents, soaps, waxes and degreasers, as well as petrochemical compounds, may be decomposed prior to entry into the wetland. No pure / used detergents or detergent residues must enter the wetland system. Contaminated discharges reaching sensitive ecosystems such as wetlands can result in an accumulation of pollutants, and interfere with the biological processes of *in-situ* floral and faunal species (especially frogs).
	The retention dam should comprise an open body of water to	

[5] *Corriveau et al (1973) Morphological modifications of the frog bladder induced by non-ionic detergents. Vivchews archiv B cell pathology zell-pathologic. Vol 14, No 1, pp 69 – 75*
Green, DM (1981) Adhesion of the toe-pads of treefrogs. Copeia. Vol 1981, No 4, pp 790 – 759
Rydgvist, B (1977) Electrophysiological membrane properties of frog muscle fibre: effect of detergents in the triton series. Acta Physiol Scand, Vol 101, pp 465 - 75

7.	allow for the denaturing of pollutants by the sun. Water must flow from the retention dam into a dense reed / sedge bed, consisting of wetland species (such as *Phragmites australis* and *Juncus kraussi).* The rate of flow through the dam and reed-bed should be at least 48 hours. Retention time must be monitored to ensure the system is functioning effectively: the slower the movement through the system, the better. The proposed method of stormwater management involving the digging of trenches at the lower end of the property is unacceptable, as untreated water would flow directly into the wetland.	Removal of toxicants from the recycled water. Dissipation of high velocity flows during rainfall events to prevent scour of the stormwater culvert.
	Oil and water separation devices must be fitted into the drains of the wash bay, workshop and forecourt areas. Devices must be fitted as close to the source of the contaminant as possible to retain the oil / hydrocarbon in a floatable, non-emulsified form.	To prevent contaminated water flowing into the wetland. Contamination of water resources, especially groundwater, is one of the most prevalent environmental risks associated with service stations.
8.	A water sample must be taken from the wetland for chemical analysis prior to the commencement of construction and operation of the proposed Truck Stop. This will serve as the benchmark standard against which further tests can be compared.	To establish an effective water monitoring system in order that any detrimental impacts on the wetland as a result of the development can be measured.
9.	Periodic (at least one per year) chemical analysis of a water sample from the wetland must take place. The results of such tests must be compared to the benchmark standard in order to ascertain whether the operational phase of the development is having a detrimental effect on the wetland water quality. Any detrimental impacts attributed to the Truck Stop must be reported and the cause remedied immediately.	To establish an effective water monitoring system in order that any detrimental impacts on the wetland as a result of the development can be measured. Consider polluting contributions from other surrounding land uses.

5.4 Summary of mitigation measures

- Afford 30m 'no development' buffer to the wetland.
- Re-use and recycle wash water as far as possible via a series of retention dams, or engineered water reclaim system.
- Submit for approval a detailed EMPr for the construction and operational phases, including a spill contingency plan.
- All hazardous substances must be stored and utilized on impervious surfaces, within a bunded area.
- Only organic, biodegradable soaps, waxes and degreasers must be used.
- Construct a retention dam and reed / sedge bed for the treatment of wash water and stormwater prior to entry into the wetland.
- Fit oil separators on all drains.
- Establish a water monitoring programme for the wetland.