FRESHWATER SCREENING ASSESSMENT: PENNY LODGE, ZULULAND RHINO RESERVE, KWAZULU NATAL

Prepared for:
IDM Consultants

Prepared by:
Louise Zdanow
SACNASP Reg. no. 114072

reviewed by
Natasha van de Haar
SACNASP Reg. no. 400229/11

Date: August 2016

Table of Contents

1. Introduction 3
1.1. Background 3
1.2. Limitations and Assumptions 4
2. Method of Assessment 4
3. Results 5
3.1. Overview of Background Information 5
3.2. Watercourse Delineation 7
3.3. Watercourse Description 7
3.2.1 Msunduzi River and Associated Riparian Area 7
3.2.3 Ephemeral Drainage Line 8
3.2.2 Dam 9
4. Conclusions and Recommendations 9
5. References 10

Disclaimer

EnviroSwift KZN (Pty) Ltd has exercised all due care in the reviewing of all available information and the delineation of the watercourse boundary. The accuracy of the results and conclusions from the assessment are entirely reliant on the accuracy and completeness of available desktop information and professional judgment. EnviroSwift KZN (Pty) Ltd does not accept responsibility for any errors or omissions in the assessment and therefore does not accept any consequential liability arising from commercial decisions made, which are based on the information contained in this report.

1. Introduction

1.1. Background

EnviroSwift KZN (Pty) Ltd has been appointed by IDM Consultants in order to conduct a freshwater screening assessment within an area earmarked for the development of a lodge located adjacent to the Msunduzi River within the Zululand Rhino Reserve in KwaZulu Natal (KZN).

The proposed development comprises:

- A main single story lodge;
- Four single story accommodation units linked by a raised timber walkway with services below (e.g. potable water and sewerage);
- A new dirt access road; and
- An evapotranspiration area.

The project footprint as well as the general surroundings will be referred to as the 'study area' in the remainder of the report and its location is indicated in the figures to follow.

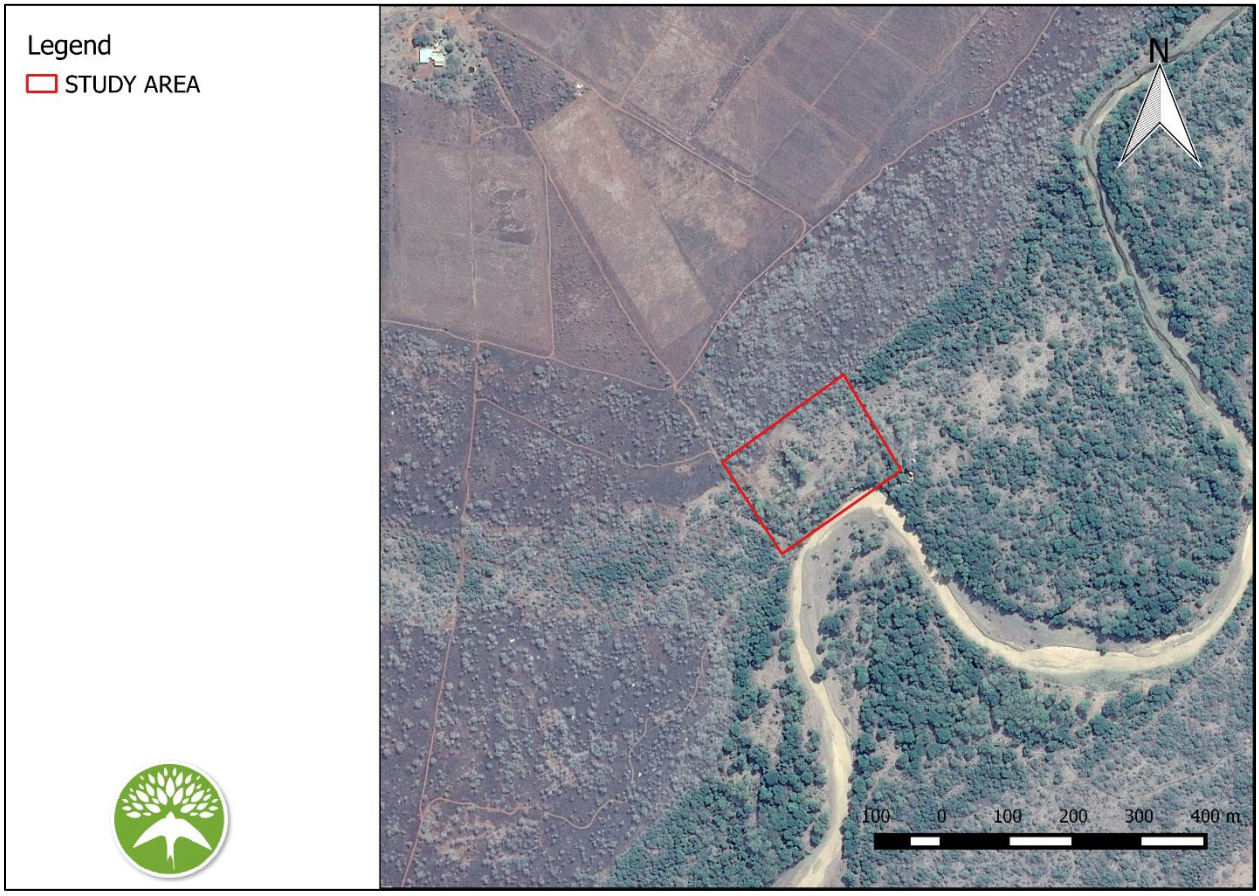

Figure 1: Study area in relation to surrounding areas (Google Earth, 2016).

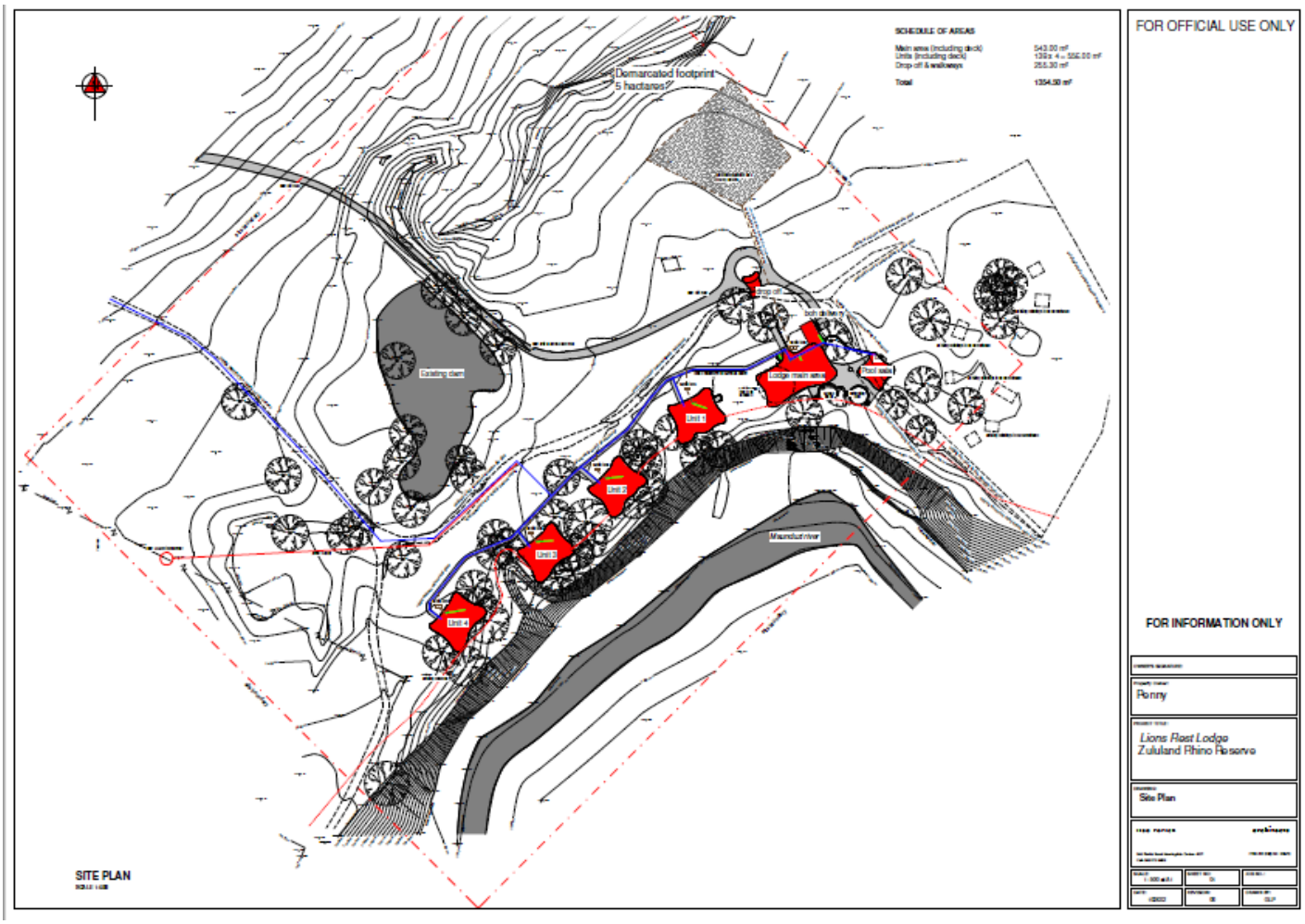

Figure 2: Penny Lodge site plan.

1.2. Limitations and Assumptions

The scope of work included a site survey, the delineation of watercourses within the study area and a desktop study Should the proposed activities require authorisation in terms of the National Water Act (NWA) or the National Environmental Management Act (NEMA) the competent authorities will be required to consider whether or not a more detailed freshwater impact assessment will be required.

The accuracy of the Global Positioning System (GPS) utilised will affect the accuracy of the watercourse delineation. A Garmin GPSMap 64 was used which has an estimated accuracy rating of 3-5 metres. EnviroSwift KZN is however of the opinion that this limitation is of no material significance and that the freshwater-related constraints have been adequately identified.

A single site assessment was undertaken in August 2016. Seasonal variation relating to watercourse characteristics such as vegetation was therefore not taken into consideration. Onsite delineation was supplemented with the use of historical digital satellite imagery (Google Earth Pro, 2016) in order to refine the boundary of the riparian areas where required. Therefore, the watercourse delineation as presented in this report is considered sufficient to guide layout planning and assist with the identification of authorisation requirements in terms of the NWA and NEMA that may or may not be required.

2. Method of Assessment

The scope of work included a desktop assessment of available national and provincial databases such as provincial conservation and biodiversity plans and the National Freshwater Ecosystem Priority Areas project (NFEPA, 2011).

The desktop assessment was followed by a physical site survey undertaken on the 18th of August 2016. Freshwater features were delineated based on the presence of riparian indicators as defined by the delineation manual drafted by the Department of Water Affairs and Forestry (DWAF, 2008).

3. Results

3.1. Overview of Background Information

The study area falls within the Lowveld Ecoregion (Table 1) and within the Usutu to Mhlathuze Water Management Area (WMA) and the Mkuze sub-Water Management Area (sub-WMA) as defined by NFEPA (2011). The quaternary catchment indicated for the study area is W31K.

Table 1: Main attributes of the Lowveld Ecoregion (Kleynhans, 2005).

Main Attributes	Lowveld Ecoregion
Terrain Morphology: Broad division (dominant types in bold) (Primary)	Plains; Low Relief; **Plains; Moderate Relief**; Lowlands, Hills and Mountains; Moderate and High Relief (limited) Open Hills, Lowlands; Mountains; Moderate to High Relief; (limited) Closed Hills; Mountains; Moderate and High Relief (Limited)
Vegetation types (dominant types in bold) (Secondary)	**Mopane Bushveld;** Mopane Shrubveld; **Mixed Lowveld Bushveld;** Sour Lowveld Bushveld; Sweet Lowveld Bushveld; Natal Lowveld Bushveld; Lebombo Arid Mountain Bushveld; Mixed Bushveld North Eastern Mountain Grassland;
Altitude (m a.m.s.l) (Secondary)	0-700; 700-1300 limited
Mean annual precipitation (mm) (modifying)	200 to 1000
Coefficient of Variation (% of annual precipitation)	<20 to 35
Rainfall concentration index	30 to >65
Rainfall seasonality	Early to late summer
Mean annual temp. (°C)	16 to >22
Mean daily max. temp. (°C): February	24 to 32
Mean daily max. temp. (°C): July	18 to >24
Mean daily min. temp. (°C): February	14 to >20
Mean daily min temp. (°C): July	4 to >10
Median annual simulated runoff (mm) for quaternary catchment	10 to >250

According to the NFEPA database (2011) (Figure 3):

- The study area is located directly to the north of the perennial Msunduzi River which is indicated to be within a Class A (natural, unmodified) Present Ecological State (PES).

- A natural channelled valley bottom wetland has also been indicated along the portion of the Msunduzi River located adjacent to the study area. The channelled valley bottom wetland is indicated to be within a Category AB condition (natural, unmodified) and falls within the Lowveld Group 11 wetland vegetation group which is listed as Vulnerable within the region.
- The Msunduzi River and associated channelled valley bottom wetland are located within an Upstream Management Area. Upstream Management Areas are subquaternary catchments in which human activities need to be managed to prevent degradation of downstream river Freshwater Ecosystem Priority Areas (FEPAs) and Fish Support Areas.

Vector data obtained from the Surveyor General in 2015 also indicates an unnamed ephemeral drainage line within the northern portion of the study area (Figure 3).

According to the desktop assessment drafted by the Department of Water and Sanitation (DWS, 2014), the Msunduzi River is considered to be within a Present Ecological State (PES) Category B (largely natural with few modifications[1]) and is considered to be of a high Ecological Sensitivity (ES) and of a high Ecological Importance (EI). The default[2] Ecological Category (EC) for the river is Category B (largely natural with few modifications).

According to the Freshwater Systematic Conservation Plan for KZN (2007), the general catchment area of the freshwater features associated with the study area is 'available'. Areas indicated as 'available' are untransformed biodiversity areas which have no specific conservation priority.

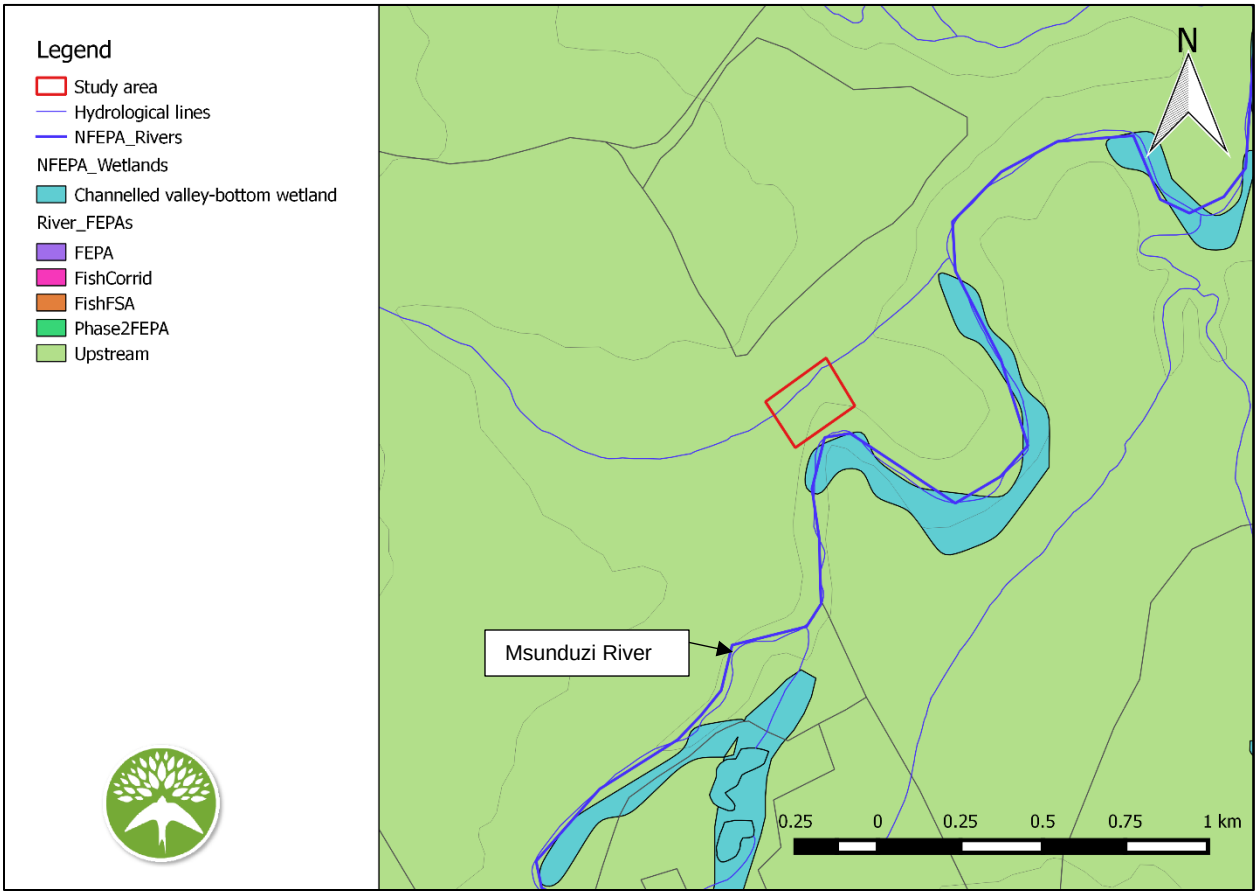

Figure 3: Freshwater features indicated by the NFEPA project (2011).

[1] The flow regime has been only slightly modified and pollution is limited to sediment. A small change in natural habitats may have taken place. However, the ecosystem functions are essentially unchanged.
[2] Based on median PES and highest of EI or ES means.

3.2. Watercourse Delineation

Indicators used to determine the boundary of the watercourses and associated riparian zones included:

1) Alluvial soils and recently deposited material;
2) Topography associated with riparian areas; and
3) Vegetation associated with riparian areas.

The locations of the different freshwater features identified and delineated within the study area are presented in the Figure below and more detailed descriptions of the above-mentioned indicators specifically associated with the different features are provided in section 3.3.

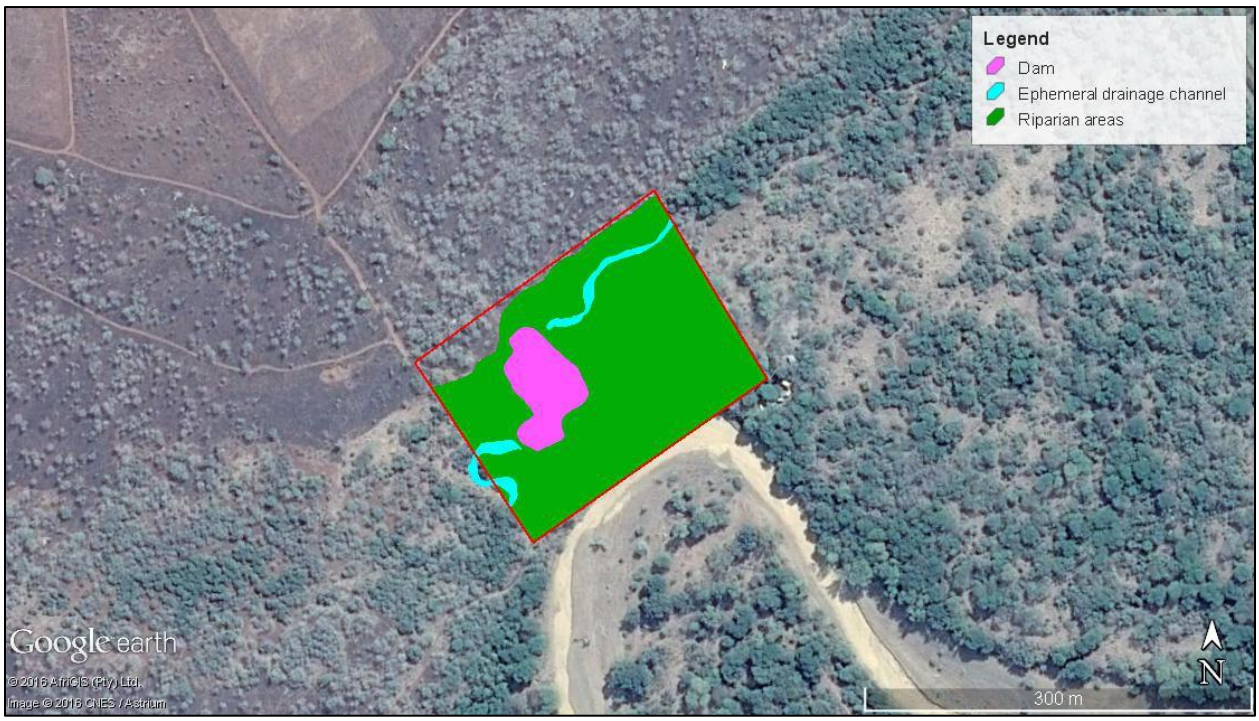

Figure 4: Freshwater features associated with the study area (indicated by red rectangle).

3.3. Watercourse Description

3.2.1 Msunduzi River and Associated Riparian Area

The portion of the Msunduzi River located adjacent to the study area is a lower foothill river characterised by a lower gradient, mixed-bed alluvial channel with sand and gravel dominating the bed. A well-defined riparian vegetation community has established on the banks of the Msunduzi River with a composition and physical structure distinct from vegetation communities of adjacent terrestrial areas. The riparian habitat of the river is characterised by the presence of tree and shrub species including *Vachellia*[3] *xanthophloea* (Fever tree), *Vachellia robusta* (Ankle thorn), *Vachelia nilotica* (Scented Thorn), *Senegalia*[4] *nigrescens* (Knob-Thorn), *Euclea divinorum* (Magic Guarri), *Euclea undulata* (small leaved guarri), *Euclea daphnoides*, (White stem guarri), *Carrisa bispinosa*, *Gymnosporia buxifolia* (Common Spikethorn), *Gymnosporia* cf. *heterophylla* (Angle-stem Spikethorn), *Ximenia Americana* var. *microphylla* (Small Blue Sourplum), *Cadaba natalensis* (Green-leaf Wormbush), *Schotia brachypetala* (Weeping Boer-bean) and *Dovyalis caffra* (Kei-Apple). None of these species are listed as protected within the National Forests Act (Act 84 of 1998) or the Natal Nature Conservation Ordinance (Act 15 of 1974).

The Msunduzi River is a flood driven system and is known for flash floods (Scott-Shaw, 2016 and ETC-Africa, 2015). These flood events have resulted in the significant erosion and collapse of the northern river bank close to where the accommodation units and main single story lodge are proposed. This has resulted

[3] Previously *Acacia*
[4] Previously *Acacia*

in the formation of steep, almost vertical riverbanks with the river bed located approximately 9m below the river flood plain.

The riparian area has also been impacted as a result of the historical development of a buried pipeline which is associated with an abandoned camp located adjacent to the study area. The development of this pipeline required the removal of riparian vegetation and the disturbance of riparian habitat within the vicinity of where the main single story lodge is proposed.

It should be noted that no wetland indicators as defined by DWAF (2008) were identified within the channelled valley bottom wetland as indicated by the NFEPA database (2011) and the area is considered to be more representative of riparian habitat.

Figure 5: Msunduzi River riparian area.

Figure 6: Erosion of the Msunduzi River bank.

3.2.3 Ephemeral Drainage Line

A drainage line is located within the northern portion of the study area. This drainage line is ephemeral in nature and is only likely to contain surface water after heavy rainfall events. The drainage line is also characterised by a riparian area with a distinct change in vegetation composition and structure when compared to surrounding terrestrial areas. Tree and shrub species encountered within the riparian habitat included species such as *Vachellia*[5] *xanthophloea* (Fever tree), *Vachellia robusta* (Ankle thorn), *Vachelia nilotica* (Scented Thorn), *Senegalia*[6] *nigrescens* (Knob-Thorn), *Pappea capensis* (Jacket-plum), *Euclea divinorum* (Magic Guarri), *Euclea undulata* (small leaved guarri), *Euclea daphnoides*, (White stem guarri),

[5] Previously *Acacia*
[6] Previously *Acacia*

Carrisa bispinosa, *Spirostachys africana* (Tamboti), *Gymnosporia buxifolia* (Common Spikethorn) and *Schotia brachypetala* (Weeping Boer-bean).

The portion of the ephemeral drainage line associated with the study area has been impacted as a result of the construction of an impoundment, discussed in more detail in the section that follows. The development of the impoundment has altered the natural hydrology regime and riparian vegetation assemblage. Erosion encountered downstream of the impoundment also indicates that the impact was not restricted to the area where the impoundment was constructed and it is considered possible that erosion would continue if not managed in future.

Figure 7: Ephemeral drainage line (left) and erosion noted in the channel of the ephemeral drainage line (right).

3.2.2 Dam

The ephemeral drainage line, discussed above, was impounded and presently consists of an open body of water surrounded by scattered individuals of *Vachellia xanthophloea* and *Senegalia nigrescens*. The impoundment is still augmented by the ephemeral drainage line during flood events. However, for the remainder of the year the water within the impoundment is supplemented by means of a borehole located outside of the study area.

Figure: 8: Impoundment created along the ephemeral drainage line.

4. Conclusions and Recommendations

Following the field survey, it was determined that the main single story lodge will be located within a portion of the riparian zone of the Msunduzi River that has been disturbed as a result of the historical development of a pipeline that serviced a camp just outside of the study area. The proposed gravel access road will travers the ephemeral drainage line on the dam wall and pipelines required as part of bulk services will be

placed along an existing gravel road entering the study area from the north west, crossing a portion of the ephemeral drainage line. As a result, the majority of the infrastructure would be developed within already disturbed areas with the exception of smaller isolated areas in the vicinity of the accommodation units and raised walkway. No SCC or protected tree species were identified during the site survey.

The main lodge, the four accommodation units and the raised walkway are located within the 1:50 and 1:100 year flood lines which raises some concern regarding the flooding of the development. However, according to Scott-Shaw (2016) the risk of flooding of the units is low as the accommodation units are elevated on stilts and the flood extent is likely to be characterised by low flowing inundation during such an event. Although the risk of significant flooding is low, the lodge and accommodation units are located in close proximity to the existing riverbank which appears to be prone to erosion and collapse during flood events. The freshwater specialist therefore supports the recommendation made by Drennan Maud (Pty) Ltd. that advocates the undertaking of a detailed geotechnical assessment to determine the effects of construction on the edge of the riverbank based on the results of a detailed topographical survey (Hadlow, 2016).

Taking into consideration the degree to which the areas earmarked for lodge infrastructure have already been disturbed, it is the opinion of the freshwater specialist that the proposed development, if undertaken in an environmentally sensitive manner, would most likely not result in significant impact on the identified watercourses or the associated riparian vegetation. However, in order to ensure potential impact is kept to a minimum the following general recommendations are proposed:

- The accommodation units should be strategically situated in already disturbed areas presently devoid of vegetation in order to reduce the footprint wherein riparian vegetation needs to be removed.
- Incorporate natural vegetation into the design of the development as far as practically possible e.g. develop around larger trees and only remove low brush where required.
- Rescue smaller trees, shrubs or forbs encountered within the construction footprint and relocate to areas that have historically been disturbed e.g. areas in the vicinity of the dam wall. In order to avoid disturbance of more intact vegetation within the remainder of the study area relocation to undisturbed areas should not be allowed.
- Landscaping should be kept to an absolute minimum. Indigenous trees, sourced from the local area, should be utilised for any landscaping required within the immediate vicinity of the lodge. The use of invasive grasses for lawns such as *Pennisetum clandestinum* should be prohibited.
- As part of the environmental authorisation process careful consideration should be given to the following:
    - Volume of stormwater runoff that will reach the river as well as effective management of erosion at areas where stormwater will be introduced into the river.
    - Keeping hard surfaces to a minimum.
    - The location of required waste water treatment plants as far as possible from the main channel of the Msunduzi River. All practical measures should be implemented to mitigate any potential spillage of either potable water, grey water or sewage. Effluent from the waste water treatment plant should preferably not be used for irrigation.
    - Any construction required at ephemeral drainage line crossings should ensure surface water flows freely and that erosion is adequately managed long term.

5. References

Boon, R. 2010. Pooley's Trees of Eastern South Africa: A Complete Guide. Flora and Fauna Publications Trust, Durban, RSA.

DWAF 2005, updated 2008. A practical field procedure for the identification and delineation of wetlands and riparian areas. DWA, Pretoria, RSA.

Ezemvelo KZN Wildlife. 2007. Freshwater Systematic Conservation Plan. Best Selected Surface (Marxan). Unpublished GIS coverage (Freshwater_cons_plan_2007), Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202

Ezemvelo KZN Wildlife (2016) KZN Biodiversity Spatial Planning Terms and Processes, Version 3.3

Hadlow. M. J. 2016. Geotechnical Assessment Proposed 'Penny Lodge' Development, Zululand Rhino Reserve. Drennan Maud (Pty) Ltd Geotechnical Engineers and Engineering Geologists.

Nel, JL, Driver, A., Strydom W.F., Maherry, A., Petersen, C., Hill, L., Roux, D.J, Nienaber, S., Van Deventer, H., Swartz, E. & Smith-Adao, L.B. 2011a. Atlas of Freshwater Ecosystem Priority Areas in South Africa: Maps to support sustainable development of water resources. Water Research Commission Report No. TT 500/11, Water Research Commission, Pretoria, RSA.

Present Ecological State, Ecological Importance and Ecological Sensitivity database for Primary Drainage Region W as developed by the RQS Department of the DWS. Available at http://www.dwa.gov.za/iwqs/rhp/eco/peseismodel.aspx retrieved August 2016.

Scott-Shaw, B. 2016. Brief Desktop Assessment of the 1:50 and 1:100 Year Flood for the Proposed Development of Penny Lodge Within the Zululand Rhino Reserve. NatureStamp.

Scott-Shaw, R. and Escott, B.J. (Eds) (2011) KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_011_wll.zip], Biodiversity Conservation Planning Division,Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.

The South African National Biodiversity Institute - Biodiversity GIS (BGIS) [online]. URL: http://bgis.sanbi.org retrieved 2016.