

Annex E

Specialist Studies and Declaration

Your Ref.:
Our Ref.: 5336/2020/MVR/mvr

21 August 2020

**ERM SOUTHERN AFRICA (PTY) LTD
SUITE S005
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WESTWAY OFFICE PARK
WESTVILLE
3635**

Submitted via email: c/o - kamogelo@thembeka-env.co.za

ATTENTION: Stephanie Gopaul

Dear Stephanie,

RE: CONFIRMATION OF THE FINDINGS OF THE SPECIALIST BIODIVERSITY STUDY THAT WAS CONDUCTED FOR THE BHANGAZI COMMUNITY LODGE IN THE ISIMANGALISO WETLAND PARK, KWAZULU-NATAL

Terratest (Pty) Ltd was approached by ERM Southern Africa to consider the findings of the specialist Biodiversity Assessment that was conducted in 2016 for the site associated with the Bhangazi Community Lodge in the isiMangaliso Wetland Park, KwaZulu-Natal.

It is understood from the correspondence received from ERM Southern Africa that the layout for the lodge has been amended to make provision for the specific layout changes from what was assessed in our report, these changes are as follows:

Mitigation Measure	Nett Result
Remove proposed new access road, in favour of using the existing access road to the fishing camp area.	No longer need to clear an extent of 200m ² (forested area) for the access road alignment.
Relocate restaurant and pool complex from forest zone to disturbed fishing camp zone.	No longer need to clear an extent of 350m ² (forested area) for the restaurant and pool complex.
Following above, no requirement for new access road leading to restaurant complex.	No longer need to clear an extent of 200m ² (forested area) for the service road alignment.
Reducing the size of the proposed 2 and 4 bed chalet units from 75 m ² to 50 m ² and 40m ² respectively.	Potentially cleared area reduced from 1350m ² to 970m ² (footprint of raised decks, not necessarily clearance of forest canopy).
Forest infrastructure limited to chalets and boardwalks only, all on raised timber decks.	Reduction of impact on undergrowth.

Based on the information provided and discussions had with members of the project team it our opinion that the impacts identified in the Biodiversity Assessment will not change based on the proposed amendments to the layout.

Furthermore, considering the proposed amendments it is our opinion that this alternative layout should result in a marginal reduction in the severity of the impacts and should be supported.

It must be stressed that the opinion provided above is based on the discussions and information provided by the project team and no additional site assessments were conducted in this regard.

If you need any further clarity regarding the above, please feel free to contact me directly.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'M. L. L. Z'.

Magnus van Rooyen
Executive Associate
For TERRATEST (PTY) LTD



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

FINDINGS OF A SURVEY OF THE BIODIVERSITY AT THE SITE OF A PROPOSED NEW LODGE DEVELOPMENT ADJACENT TO LAKE BHANGAZI SOUTH IN THE ISIMANGALISO WETLAND PARK WORLD HERITAGE SITE

Kindly note the following:

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2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
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4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
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Private Bag X447
Pretoria
0001

Physical address:

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Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

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B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	3	Percentage Procurement recognition
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2. DECLARATION BY THE SPECIALIST

I, Magnus van Rooyen, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

M. van Rooyen

Signature of the Specialist

Terratest (Pty) Ltd

Name of Company:

18 October 2020

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Magnus van Rooyen, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

M. L. L.

Signature of the Specialist

Terratest (Pty) Ltd

Name of Company

18 October 2020

Date

Antonette de Beer

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REF: 9162R OPE (02 SEPTEMBER 2016)

COMMISSIONER OF OATHS (RSA)
ANTONETTE DE BEER
PA TO REGIONAL DIRECTOR PE
BOSCH PROJECTS (PTY) LTD

Signature of the Commissioner of Oaths

18/10/2020

Date

**FINDINGS OF A SURVEY OF THE BIODIVERSITY AT THE
SITE OF A PROPOSED NEW LODGE DEVELOPMENT
ADJACENT TO LAKE BHANGAZI SOUTH IN THE ISIMANGALISO
WETLAND PARK WORLD HERITAGE SITE**



Hygrophilous Grassland, Core Wetland, and Forest Margin

September 2016

Carried out by:



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**FINDINGS OF A SURVEY OF THE BIODIVERSITY AT THE
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ADJACENT TO LAKE BHANGAZI SOUTH IN THE ISIMANGALISO
WETLAND PARK WORLD HERITAGE SITE**



		VERIFICATION PAGE		Form 4.3.1 Rev 01
Project Number: 41539-019		Date: 2016-09-30	Status: Final	
© COPYRIGHT: Terratest (Pty) Ltd.				
QUALITY VERIFICATION				
This report has been prepared under the controls established by a quality management system that meets the requirements of ISO9001: 2008 which has been independently certified by DEKRA Certification under certificate number 90906882				
Verification	Capacity	Name	Signature	Date
By Author	Ecologist	D.J. Alletson		30/09/2016
Checked by	Executive Associate	M. van Rooyen		30/09/2016
Authorised by	Executive Associate	M. van Rooyen		30/09/2016

TABLE OF CONTENTS

1. INTRODUCTION	1
2. DEVELOPMENT DESCRIPTION	1
3. DESCRIPTION OF THE STUDY AREA.....	2
4. TERMS OF REFERENCE	5
5. STUDY PROCEDURE.....	5
5.1 Desktop Study	5
5.2 Field Survey.....	6
6. STUDY FINDINGS	7
6.1 Desktop Study Findings.....	7
6.1.1 Vegetation	7
6.1.2 Faunal Diversity.....	8
6.2 Field Survey Findings	12
6.2.1 Trees within the Development Site	12
6.2.2 Forbs and other Plants within the Development Site.....	17
6.2.3 Fauna within the Study Area.....	19
6.2.4 Wetlands within the Study Area.....	21
7. CONSIDERATION OF THE POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON THE BIODIVERSITY IN THE AREA	27
7.1 Loss of Further Forest	27
7.2 Disturbance to the Fauna of the Area	28
7.3 Risk of Nutrient Enrichment of Wetlands in the Area and of Lake Bhanghazi South	29
7.4 Increase in the Level of Alien Plant Infestation of the Area	31
7.5 Increase in the Level of Solid Waste in the Study Area.....	32
8. MITIGATION OF IMPACTS	33
8.1 Loss of Further Forest	33
8.2 Disturbance to the Fauna of the Area	34
8.3 Risk of Nutrient Enrichment of Wetlands in the Area and of Lake Bhanghazi South	35
8.5 Increase in the Level of Alien Plant Infestation of the Area	36
9. LITERATURE CITED AND REFERENCES USED	39

LIST OF TABLES

Table 1. Objectives and Terms of Reference for the study.....	5
Table 2. Designations of wetlands according to the two data sets referred to.	9
Table 3. List of features derived from the Minset Database of biodiversity priority features in the nine polygons which cover the proposed development site and its 500 m buffer zone. None of the polygons are totally enclosed within the study area.	11
Table 4. Components of the faunal diversity in the iSimangaliso Wetland Park and at the development site. Species of probable concern in the study area are listed. Sources: iWPA (2011), CSIR 1993).....	12
Table 5. List of plant species found in the Coastal Forest at the study site. NOTE: Tree species protected under the National Forests Act (Act 84 of 1998) are denoted by shaded cells.....	14
Table 6. Trees found on the low ridges between wetland areas.....	15
Table 7. Locations of specimens of the four protected tree species found in the forests and on a forested strip between wetland areas. Shaded cells denote particularly large specimens.	16
Table 8. List of indigenous forbs and other plants seen in the study area.	18
Table 9. List of alien plants seen in the study area. “***” Refers to the Conservation of Agricultural Resources Act (Act 43 of 1983).	19
Table 10. List of fungi and parasitic plants.	19
Table 11. List of mammals seen in the vicinity of the site.....	20
Table 12. List of butterflies seen in the study area.	20
Table 13. Assessment of the impact relating to loss of forest in the project area.....	27
Table 14. Assessment of impacts on the fauna in the vicinity of the project.	28
Table 15. Comparable wastewater discharge water qualities.....	29
Table 16. Assessment of impacts associated with nutrient enrichment of Lake Bhangazi South....	30
Table 17. Assessment of the impacts associated with spread of alien weed species in the Eastern Shores (Mfabeni) Area.....	31
Table 18. Assessment of the impacts associated with spread of solid waste in the vicinity of the lodge.....	32
Table 19. Monitoring requirements associated with the development and operation of the lodge. .	38

LIST OF FIGURES

Figure 1. Locality plan showing the site of the proposed development in relation to Cape Vidal and to the town of St Lucia.	4
Figure 2. Distribution of KwaZulu-Natal Wetlands Database and NFEPA Wetlands Database wetland systems in the study area.	10
Figure 3. Observed present core wetland patches and hygrophilous wetlands within the study area.	25
Figure 4. Observed present core wetland patches nested within core wetland areas visible in a wetter year. NOTE: The extended wetlands were drawn from Google earth images and so the boundaries were not confirmed by field observation.	26
Figure 5. Hierarchy of mitigatory measures. Source: Ezemvelo KZN Wildlife (2010).....	33

FINDINGS OF A SURVEY OF THE BIODIVERSITY AT THE SITE OF A PROPOSED NEW LODGE DEVELOPMENT ADJACENT TO LAKE BHANGAZI SOUTH IN THE ISIMANGALISO WETLAND PARK WORLD HERITAGE SITE

1. INTRODUCTION

This document presents the findings of a biodiversity survey undertaken at the site of a proposed tourism development adjacent to Lake Bhangazi South near Cape Vidal in the iSimangaliso Wetland Park World Heritage Site. The development forms a component of the settlement of a land claim by people, or their descendants, who were removed from the area between the 1950s and 1970s. In order to undertake this development, the members of the Bhangazi Community formed the Bhangazi Community Trust and that entity is being assisted through the development process by the African Safari Foundation.

The study on the site was undertaken in accordance with terms of reference provided by ERM Southern Africa (Pty) Ltd (the Client). Both desktop and site surveys were done although the latter was significantly affected by both the season and the extremely dry conditions at the time. These conditions resulted in wetland areas shrinking to a small fraction of their full extent, and to much of the vegetation not being visible. Despite this results which are of use were obtained but some further work is recommended.

As required, an assessment of the potential impacts which are likely to arise if the development goes ahead has been undertaken, and five key issues are noted. Means of mitigating these impacts are put forward and based on the estimated success of these measures, an opinion is provided on whether the project should be authorised or not.

2. DEVELOPMENT DESCRIPTION

The proposed development would consist of a lodge which would have the following components:

- 10 x 2 bed units.
- 8 x 4 bed units.
- A Trail Camp consisting of 4 x 2 bed units with a communal braai area.
- A restaurant near the lake shore. Footprint of 300 m². Together with a recreation deck and a swimming pool area.
- Staff quarters. 8 of. Each to be 50 m² and single storey.

- A manager's house.
- Parking areas:
 - Visitors parking (18)
 - Chalet parking (13)
 - Bus parking (2)
 - Staff parking (3)
 - Lodge vehicles (2)
 - Game drive vehicle (1)
- A reception area.
- Service facilities.

3. DESCRIPTION OF THE STUDY AREA

The study area is located at the south-eastern corner of Lake Bhangazi South and is situated between the backwater arm of the lake and the main road linking Cape Vidal and St Lucia. See Figure 1. The area consists of two portions which are designated as the developable site (Area A) in the north and a non-developable site (Area B) in the south. They are 5.06 ha and 4.88 ha in extent respectively, with a total area of 9.94 ha.

At present much of Area A is utilised by a Cape Vidal satellite "fisherman's" camp which consists of two tourist accommodation units, with a total capacity of 34 people, and a number of linked staff accommodation units. This camp is approximately 2 km from the Cape Vidal Office and 30 km from the town of St Lucia. Area B has also been subject to some disturbance since a part of it has been cleared for a sports field. However, there are no buildings within it.

Adjacent to the Bhangazi Trust site are a number of Ezemvelo KZN Wildlife staff accommodation units and other infrastructure. It is not anticipated that these will be changed on account of the lodge.

The natural vegetation within which the proposed lodge is to be situated consists primarily of Northern Coastal Forest (FOz 7) according to Mucina and Rutherford (2006). Further detail is provided in Section 6.

Between the forest margin and the water body of the lake lies a variable strip of hygrophilous grassland. The width of this strip varies considerably according to the level of the water in the lake and the plant community changes according to conditions.

The topography at the development site consists of a slope, rising up from the shore of the lake and its associated wetlands, to the foot of the high dune cordon which runs parallel to

the beach. Near the foot of the dune is an area of relatively low slope and this is where the present camp, as well as the Ezemvelo KZN Wildlife buildings, are located. The camp is at an elevation of 40 masl while the dune crest is at 155 masl.

In accordance with the requirements of the National Water Act (Act 36 of 1988) it is necessary to consider all watercourses within 32 m of the proposed development and all wetlands within 500 m of the site. The relevant sections in this regard are Section 21 (c) which covers activities which may “impede or divert” the flow of water in a watercourse, and Section 21 (i) which covers activities which may result in the “bed, banks, course or characteristics of a watercourse being altered”. In addition, Section 6 (b) of Government Notice 1199 of 18 December 2009 calls for consideration of all wetlands within 500 m of the development footprint. For this reason, a buffer strip of 500 m in width around the development site was included into the study area.

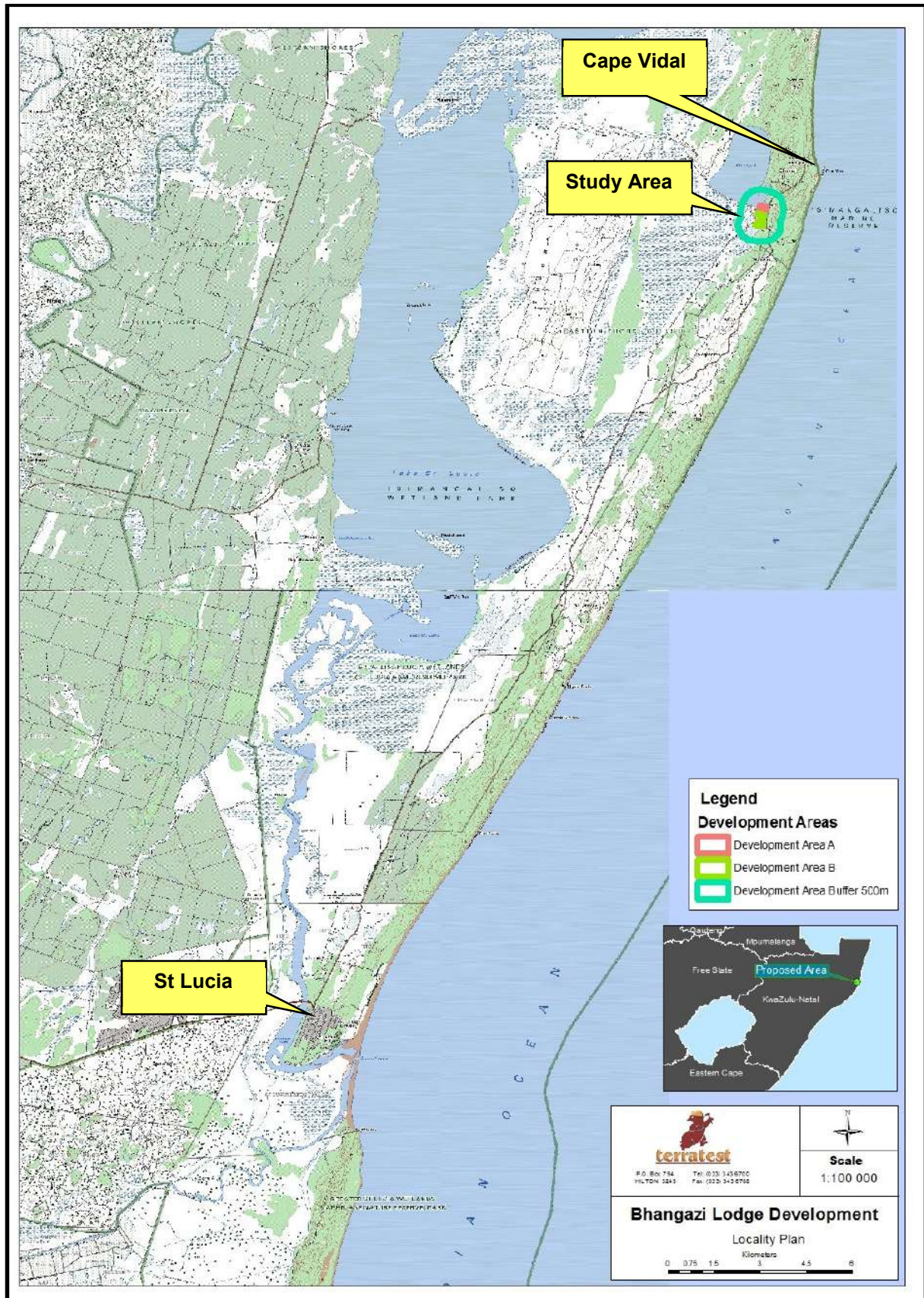


FIGURE 1. Locality plan showing the site of the proposed development in relation to Cape Vidal and to the town of St Lucia.

4. TERMS OF REFERENCE

The terms of reference provided by the client for the biodiversity survey were as shown in Table 1.

Table 1. Objectives and Terms of Reference for the study

OBJECTIVES	
<ul style="list-style-type: none"> • To assist in defining possible biodiversity related constraints and benefits associated with the proposed development of the lodge. • To determine the potential biodiversity indirect, direct and cumulative risks/impacts to receptors for the project site. • To advise on mitigation measures for identified significant risks/impacts and measures to enhance positive opportunities/impacts of the project. 	
SCOPE OF WORK	
<ol style="list-style-type: none"> i. Collection of available baseline biodiversity data to establish the biodiversity value of the site location and immediate surroundings, particularly hotspots where biodiversity is concentrated and / or where populations of threatened species, Red Data Species, conservation worthy species, medicinal plants and critical habitats are confirmed to occur. If any of these occur on the proposed site they will be mapped. ii. To identify and delineate all wetlands within a 500 m radius of the development site. iii. To determine the impacts (extent, significance, duration of impact) that the proposed development will have on these wetlands. iv. Physical survey of the lodge development site to identify sensitive biodiversity habitats or species. v. To prepare a baseline environment description of the site including a description of the fauna, flora, and wetlands. vi. To identify ecological impacts associated with the proposed lodge development. vii. To undertake and impact assessment according to ERM's standard impact assessment methodology. viii. To document the results of the impact assessment including proposed mitigation. ix. To provide input into the environmental management plan as per the format to be prescribed by ERM. 	

5. STUDY PROCEDURE

The study was undertaken in a number of phases which were a desktop study, a field survey, and reporting.

5.1 Desktop Study

The purpose of the desktop study was to obtain as much information as possible prior to visiting the site. However, the site visit did not mark the end of the desktop study since investigations into the available literature continued after that event was completed. Sources of information interrogated included the following:

- Vegetation type. Source: Mucina and Rutherford (2006).

- The KwaZulu-Natal Provincial Conservation Plan and its associated databases.
- Wetlands. Sources: KwaZulu-Natal provincial Wetland Database and Mapping. National Freshwater Ecosystem Priority Areas (NFEPA) database and maps.
- Faunal diversity. Sources: iSimangaliso Wetland Park Integrated Management Plan (2010 – 2016) (iWPA, 2011), Important Bird Areas. Source: Birdlife South Africa.
- Species literature for amphibians, reptiles and mammals.

In addition to the above data sources, Google Earth was used to obtain a visual impression of the study area and to generate a list of sites which were to be investigated on the ground. Since conditions have varied greatly in recent years, as a result of the drought, reference was made to multiple images in order to gain an understanding of the changes. Particular attention was given to surface features which would be indicators of surface and ground water movements and discussion on this topic was held with Dr R. Taylor who was the regional ecologist, now retired, for Ezemvelo KZN Wildlife but who is still involved in groundwater studies in the area.

5.2 Field Survey

A field survey of the site was undertaken over the period 12 – 14 July 2016. The participants in the survey were as follows:

- Dr D.N. Johnson. Trees and birds
- Mr D.J. Alletson Wetlands
- Ms E.M. Holder Flowering plants

During the course of the survey the entire area was walked over as best possible. Some difficulty was encountered in the forests since dense vegetation made entry very difficult or even impossible in places. However, use was made of game trails and so access was better than might otherwise be expected.

The wetland areas could be easily accessed since the drought conditions had dried the systems out and no open water was found at any location other than for the primary basin of Lake Bhangazi itself. The backwater arm of the lake was also completely dry.

The team members worked largely independently of one another. Each carried a GPS unit to record the positions of any species or features of particular significance and photographs were taken. Where plants could not be identified, specimens (clippings) were kept to aid identification at a later time. No trapping or other collecting of animals was done but note was kept of species seen.

The wetlands were to be delineated in accordance with the Department of Water Affairs and Forestry (now Department of Water and Sanitation) Guidelines (DWAf, 2005). This method makes use of four wetland “indicators” as described below:

- The Terrain Unit Indicator. This indicator helps identify those parts of the landscape where wetlands are likely to occur.
- The Soil Form Indicator. This indicator consists of soil forms which are associated with prolonged and frequent water saturation.
- The Soil Wetness Indicator. This indicator is based on soil characteristics which develop as a result of prolonged and frequent water saturation.
- The Vegetation Indicator. This indicator is based on vegetation which consists either entirely or largely of plant species which are associated with frequently or permanently saturated soils. Such species and vegetation are described as being “hydrophilic”.

Conditions at the observation points were noted and the positions were logged by means of a Garmin GPS unit. The spatial data was captured in Google Earth and in the Arc Map GIS.

6. STUDY FINDINGS

This section provides the key findings based on the desktop interrogation of available information as well as the observations made during the site assessment.

6.1 Desktop Study Findings

6.1.1 Vegetation

The natural vegetation in which the proposed lodge is to be situated consists primarily of Northern Coastal Forest (FOz 7) according to Mucina and Rutherford (2006). The general distribution of this vegetation type is primarily within KwaZulu-Natal (with a very small extent in the Eastern Cape) along the Indian Ocean coastline.

The vegetation and landscape features of the vegetation type is characterised by species-rich, tall to medium-high subtropical coastal forests occurring on the rolling coastal plains and stabilised coastal dunes. The forests on the coastal plains are dominated by *Drypetes natalensis*, *Englerophytum natalense*, *Albizia adianthifolia*, *Diospyros inhacaensis* etc. The low-tree and shrubby understoreys are species-rich and contain many taxa of (sub) tropical origin. The forests on the stabilised dunes well established tree, shrub and herb layers consisting of a combination of *Mimusops caffra*, *Sideroxylon inerme*, *Dovyalis longispina*, *Acacia kosiensis* and *Psydrax obovata* subsp. *obovata* in the tree layer, *Brachylaena*

discolour var. *discolour*, *Chrysanthemoides monilifera* subsp. *rotundata*, *Carissa bispinosa* subsp. *bispinosa*, *Euclea natalensis*, *E. racemosa*, *Eugenia capensis*, *Gymnosporia nemorosa*, *Kraussia floribunda*, *Peddiea africana*, *Strelitzia nicolai* and *Dracaena aletiformis*, in the understory and *Asystasia gangetica*, *Isoglossa woodii*, *Microsporum scolopendria*, *Zamiculas zamiifolia* and *Oplismenus hirtellus* typically forming the herbaceous layer. Herbaceous vines and woody climbers (*Acacia kraussiana*, *Artabotrys monteiroae*, *Delbergia armata*, *Landolphia kirkii*, *Monothotaxis caffra*, *Rhoicissus tomentosa*, *Rhus nebulosa*, *Scutia myrtina*, *Uvaria caffra*, *Gloria superba* etc.) are important structural determinants in these forests.

Furthermore, Scott-Shaw (2011) recognises eight sub-types of this forest type and all are classified as being either “Endangered” or “Critically Endangered”. Two types, which are Maputaland Moist Coastal Lowlands Forest and Maputaland Dune Forest, are present on the dunes in the vicinity of the study site and the actual development site is in the former.

The iSimangaliso Wetland Park lies within the Maputaland Centre of Endemism (van Wyk and Smith, 2001) which, in turn is a part of the Maputaland-Pondoland-Albany Biodiversity Hotspot. The iSimangaliso Wetland Park Integrated Management Plan states that 2 185 plant species have been recorded in the Park. These represent 9% of the flora of South Africa and 31% of the flora of KwaZulu-Natal. A total of 44 species are endemic to the region and three species are known to occur only within the Park.

The KwaZulu-Natal Provincial Conservation Plan has designated the site as being within a conservation area based on the high levels of biodiversity. It is designated as Biodiversity Priority Area 1 and the study area, including the 500 m surrounding buffer, is covered by a total of nine polygons. The priority systems or species in each of these polygons are listed in Table 3.

The listed features include areas of vegetation types, both terrestrial and aquatic, and a number of Mollusc, Myriapod, and Orthopteran species. Because the development is intended to be entirely within the forested area, it is apparent that the features most likely to be affected will be the forest, and some of the Molluscs and Myriapoda are the most likely to be affected since many members of those taxa are forest dwellers.

6.1.2 Faunal Diversity

The faunal diversity of the Park Statistics, as listed in the Integrated Management Plan is shown in Table 4 It is, however, to be noted that the lists apply to the Park in its entirety and not to just the area around the development site. The Table 3 also indicates faunal species

of concern in accordance with the Minset Database which are either known to be, or are likely to be, present within the development site.

6.1.3 Wetlands

The wetland mapping used during the desktop study was the current Ezemvelo KZN Wildlife wetland map and the current National Freshwater Ecosystem Priority Areas (NFEPA) database and map, see Figure 2. The information contained in these maps are purely as an indication of the possible presence of any wetland areas in a specific location. The presence of these wetlands shown in these databases will be groundtruthed during the site assessment. The designations used by the two systems are shown in Table 2

Table 2. Designations of wetlands according to the two data sets referred to.

WETLAND DATABASE AND MAPPING SYSTEM	
Ezemvelo KZN Wildlife wetland database and map	National Freshwater Ecosystem Priority Areas (NFEPA) database and map
Freshwater Wetlands : Subtropical Freshwater Wetlands : Tall Grassland/ Sedge/ Reed Wetlands	Natural
Freshwater Wetlands : Subtropical Freshwater Wetlands : Short Grass/ Sedge Wetlands	

The separation of the wetlands in the study area into tall and short types was noted and formed a guideline for the field work which was to follow.

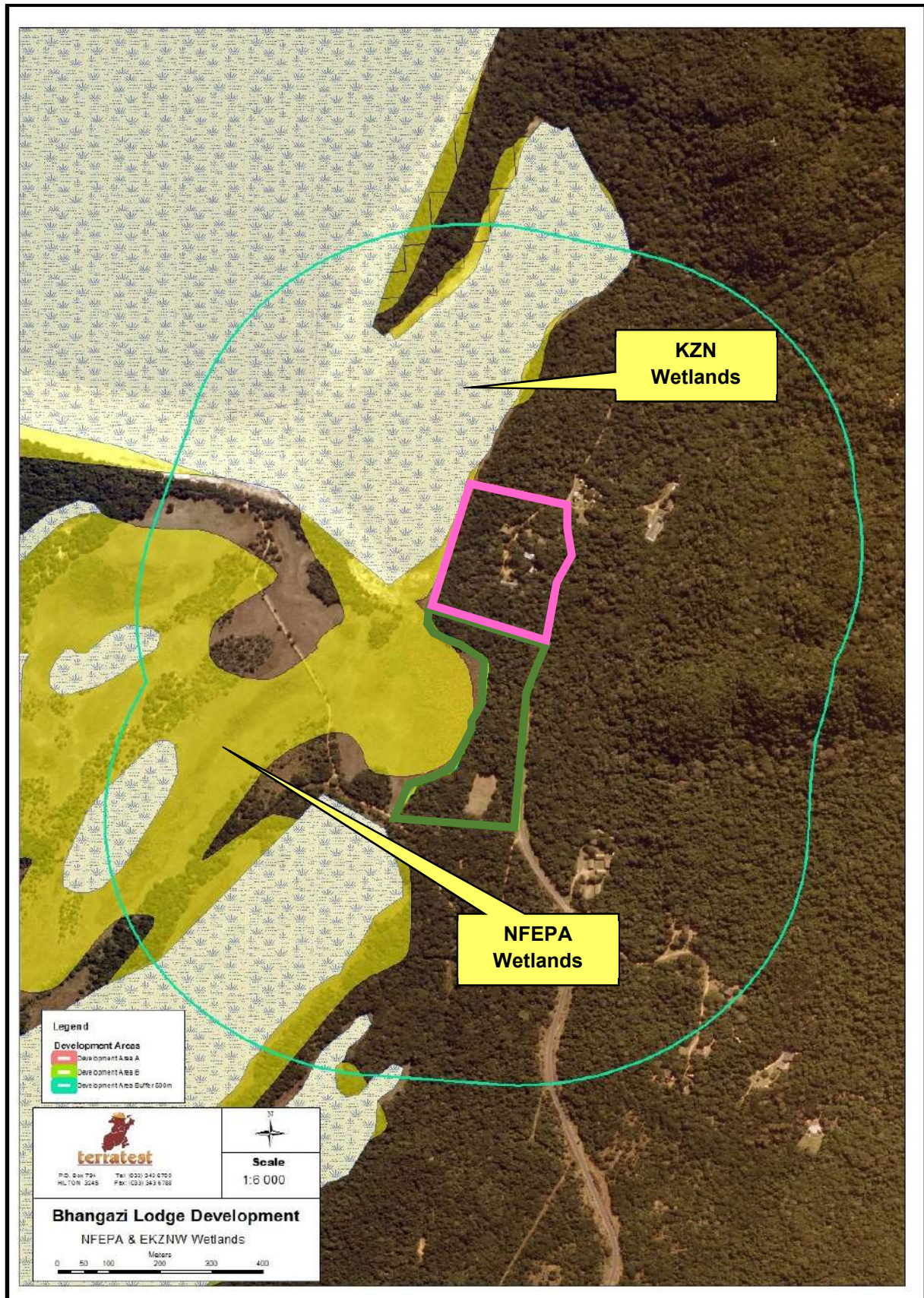


FIGURE 2. Distribution of KwaZulu-Natal Wetlands Database and NFEPA Wetlands Database wetland systems in the study area.

Table 3. List of features derived from the Minset Database of biodiversity priority features in the nine polygons which cover the proposed development site and its 500 m buffer zone. None of the polygons are totally enclosed within the study area.

MINSET POLYGON									
	1	2	3	4	5	6	7	8	9
Area	42.307	84.22	33.187	23.777	30.622	29.214	17.12	45.38	36.421
1	<i>Centrobolus richardi</i>	<i>Doratogonus zuluensis</i>	<i>Centrobolus rugulosus</i>	<i>Parepistaurus eburlineatus</i>	<i>Doratogonus zuluensis</i>	<i>Centrobolus richardi</i>	<i>Centrobolus rugulosus</i>	<i>Centrobolus fulgidus</i>	<i>Centrobolus rugulosus</i>
2	<i>Orthoporoides laccatus</i>	Subtropical Freshwater Wetlands	Subtropical Freshwater Wetlands	<i>Edouardia conulus</i>	KwaZulu-Natal Dune Forests	KwaZulu-Natal Coastal Forests	KwaZulu-Natal Dune Forests	Subtropical Freshwater Wetlands	KwaZulu-Natal Coastal Forests
3	KwaZulu-Natal Coastal Forests	KwaZulu-Natal Dune Forests	KwaZulu-Natal Dune Forests	<i>Gulella zuluensis</i>	Subtropical Freshwater Wetlands	<i>Orthoporoides laccatus</i>	KwaZulu-Natal Coastal Forests	KwaZulu-Natal Coastal Forests	<i>Orthoporoides laccatus</i>
4	<i>Doratogonus zuluensis</i>	KwaZulu-Natal Coastal Forests	KwaZulu-Natal Coastal Forests	<i>Gulella aliciae</i>	KwaZulu-Natal Coastal Forests	Subtropical Freshwater Wetlands	<i>Doratogonus zuluensis</i>	<i>Orthoporoides laccatus</i>	Subtropical Freshwater Wetlands
5	<i>Centrobolus rugulosus</i>	<i>Orthoporoides corrugatus</i>	<i>Orthoporoides laccatus</i>	Maputaland Coastal Grassland	<i>Orthoporoides laccatus</i>	<i>Centrobolus rugulosus</i>	<i>Centrobolus richardi</i>	<i>Orthoporoides corrugatus</i>	<i>Doratogonus zuluensis</i>
6	Maputaland Coastal Grassland	<i>Centrobolus rugulosus</i>	<i>Orthoporoides corrugatus</i>	<i>Orthoporoides corrugatus</i>	<i>Centrobolus rugulosus</i>	<i>Gulella aliciae</i>	<i>Centrobolus fulgidus</i>	<i>Doratogonus zuluensis</i>	<i>Centrobolus fulgidus</i>
7	<i>Gulella aliciae</i>	<i>Centrobolus richardi</i>	<i>Centrobolus richardi</i>	KwaZulu-Natal Coastal Forests	<i>Centrobolus richardi</i>	<i>Gulella zuluensis</i>	<i>Gulella aliciae</i>	<i>Centrobolus richardi</i>	Maputaland Coastal Grassland
8	<i>Gulella zuluensis</i>	Maputaland Coastal Grassland	<i>Centrobolus fulgidus</i>	Subtropical Freshwater Wetlands	<i>Centrobolus fulgidus</i>	<i>Parepistaurus eburlineatus</i>	<i>Gulella zuluensis</i>	Maputaland Coastal Grassland	<i>Gulella aliciae</i>
9	<i>Parepistaurus eburlineatus</i>	<i>Gulella aliciae</i>	Maputaland Coastal Grassland		<i>Gulella aliciae</i>	<i>Doratogonus zuluensis</i>	<i>Parepistaurus eburlineatus</i>	<i>Gulella aliciae</i>	<i>Gulella zuluensis</i>
10	<i>Gulella zuluensis</i>	<i>Gulella zuluensis</i>	<i>Gulella aliciae</i>		<i>Parepistaurus eburlineatus</i>	<i>Centrobolus fulgidus</i>	<i>Orthoporoides laccatus</i>	<i>Gulella zuluensis</i>	<i>Parepistaurus eburlineatus</i>

Table 4. Components of the faunal diversity in the iSimangaliso Wetland Park and at the development site. Species of probable concern in the study area are listed. Sources: iWPA (2011), CSIR 1993.

	FAUNAL GROUP				
	Mammals	Birds	Reptiles	Amphibians	Invertebrates
No. Species in Park	97 viable breeding populations	521	109	50	Unknown
No. Species on the Eastern Shores	65	286	60	39	Unknown
No. Red Data Species on the Eastern Shores	13	39	11	2	Unknown
Species of conservation importance known to be in the vicinity of the development site	Samango Monkey (<i>Cercopithecus albogularis</i>)	See Section 6.2.3	Gaboon Adder (<i>Bitis gabonica gabonica</i>)	Pickersgill's Reed Frog (<i>Hyperolius pickersgilli</i>)	Unknown
	Red Duiker (<i>Cephalophus natalensis</i>)		Setario's Dwarf Chameleon (<i>Bradypodion setaroi</i>)	Golden Dwarf Reed Frog (<i>Afrixalus aureus</i>)	
	Tonga Red Squirrel (<i>Paraxerus palliatus tongensis</i>)				
	Leopard (<i>Panthera pardus</i>)				

6.2 Field Survey Findings

Since the proposed development is to be restricted to the Development Area (Area A), most of the emphasis of the field survey was placed on that area. However, in order to be as inclusive as possible, some sampling was also done in the non-development Area (Area B) and in the strips of woody vegetation situated between and around the wetlands in the study area.

6.2.1 Trees within the Development Site

Since Areas A and B are contiguous, and lie within the same vegetation community, the findings from the two areas are not separated. The lists of tree species which were compiled are presented in Tables 5 and 6. Included are four species which are protected in terms of the National Forests Act (Act 84 of 1998) and the geographic co-ordinates of specimens of each of those species are

presented in Table 7. It is to be noted that the documented specimens of each protected species are highly unlikely to be the only ones present in the study area but they were the only ones observed.

The tree list is likely to be comprehensive since the forest is not deciduous and identification of all species seen was possible. It is estimated that at least 85% of the species present in the area have been identified. Those not accounted for are likely to be present in only small numbers or even as single specimens. Examination of the Protected Tree Species list suggests only two further protected species that are likely to be present at the site. They are *Podocarpus falcatus* and *Warburgia salutaris*. The presence of either is highly unlikely in the habitat at the development site.

Alien tree species were only present in very low numbers. Within Area A are the remains of an old garden with Coconut Palms (*Cocos nucifera*), Mango Trees (*Mangifera indica*), and Bougainvillea (*Bougainvillea* sp.) being present. Small stands of Chromolaena (*Chromolaena odorata*) are scattered throughout the area but at generally low densities.

Table 5. List of plant species found in the Coastal Forest at the study site. NOTE: Tree species protected under the National Forests Act (Act 84 of 1998) are denoted by shaded cells.

Scientific Name	Common Name	Scientific Name	Common Name
<i>Acacia kosiensis</i>	Dune Sweet Thorn	<i>Clerodendrum glabrum</i>	Tinderwood
<i>Acridocarpus natalitius</i>	Narrow-leaf Moth-fruit	<i>Cussonia zuluensis</i>	Zulu Cabbage-tree
<i>Adenia gummifera</i>	Green-stem	<i>Dovyalis longispina</i>	Coast Kei-apple
<i>Adenopodia spicata</i>	Spiny Splinter-bean	<i>Dovyalis rhamnoides</i>	Sourberry Kei-apple
<i>Albizia adianthifolia</i>	Flatcrown	<i>Dracaena hookeriana</i>	Large-leaf Dragon-tree
<i>Allophylus natalensis</i>	Dune False-currant	<i>Drypetes natalensis</i>	Stem-fruit Ironplum
<i>Ancylobotrys petersiana</i>	Climbing Milk-apricot	<i>Ekebergia capensis</i>	Cape-ash
<i>Antidesma venosum</i>	Tassel-berry	<i>Erythroxylum emarginatum</i>	African Coca-tree
<i>Apodytes dimidiata</i>	White-pear	<i>Euclea natalensis</i>	Hairy Guarri
<i>Bersama lucens</i>	Glossy White-ash	<i>Ficus burtt-davyi</i>	Scrambling Fig
<i>Brachylaena discolor</i>	Coast Silver-oak	<i>Ficus lutea</i>	Giant-leaf Fig
<i>Bridelia cathartica</i>	Blue Sweet-berry	<i>Ficus natalensis</i>	Coast Strangler Fig
<i>Canthium inerme</i>	Turkey-berry	<i>Garcinia livingstonei</i>	African Mangosteen
<i>Capparis brassii</i>	Narrow-leaf Caper-bush	<i>Grewia caffra</i>	Climbing Raisin
<i>Catunaregam obovata</i>	Coast Bone-apple	<i>Grewia occidentalis</i>	Cross-berry Raisin
<i>Celtis africana</i>	White stinkwood	<i>Gymnosporia arenicola</i>	Dune Spikethorn
<i>Clausena anisata</i>	Horsewood	<i>Gymnosporia nemorosa</i>	White-spot Forest Spikethorn
<i>Hymenocardia ulmoides</i>	Red-heart Tree	<i>Searsia nebulosa</i>	Coast Currant
<i>Kraussia floribunda</i>	Rhino coffee	<i>Sideroxylon inerme</i>	White-milkwood
<i>Lagynias lasiantha</i>	Smooth Pendent-medlar	<i>Strelitzia nicolai</i>	Natal Wild Banana
<i>Landolphia kirkii</i>	Rubber Vine	<i>Strychnos gerrardii</i>	Coast Monkey-orange
<i>Maerua nervosa</i>	Natal Bush-cherry	<i>Strychnos mitis</i>	Pit-leaf Bitterberry
<i>Mimusops caffra</i>	Coast Red-milkwood	<i>Synaptolepis kirkii</i>	Dream Herb
<i>Monanthes caffra</i>	Dwaba-berry	<i>Syzygium cordatum</i>	Umdoni
<i>Ochna barbosae</i>	Sand Ochna	<i>Tarenna junodii</i>	Climbing Tarenna
<i>Ozoroa obovata</i>	Coast Resin-tree	<i>Teclea gerrardii</i>	Zulu Cherry-orange

Scientific Name	Common Name	Scientific Name	Common Name
<i>Pavetta gerstneri</i>	Zulu Brides-bush	<i>Tricalysia delagoensis</i>	Tonga Jackal-coffee
<i>Pavetta natalensis</i>	Coast Brides-bush	<i>Tricalysia sonderiana</i>	Coast Jackal-coffee
<i>Peddiea africana</i>	Poison-olive	<i>Trichilia dregeana</i>	Forest Natal Mahogany
<i>Phoenix reclinata</i>	Wild Date Palm	<i>Uvaria caffra</i>	Small-fruit cluster-pear
<i>Psydrax obovata</i>	Quar	<i>Vangueria infausta</i>	Velvet Wild-medlar
<i>Rhoicissus digitata</i>	Five-finger Grape	<i>Vepris lanceolata</i>	White-ironwood
<i>Sclerocarya birrea</i>	Marula	<i>Xylothea kraussiana</i>	African-dogrose
<i>Sclerocroton integerrimum</i>	Duiker-berry	<i>Zanthoxylum capense</i>	Small Knobwood
<i>Scutia myrtina</i>	Cat-thorn	<i>Ziziphus mucronata</i>	Buffalo-thorn
<i>Searsia natalensis</i>	Northern Dune Curren		

Table 6. Trees found on the low ridges between wetland areas.

Scientific Name	Common Name	Scientific Name	Common Name
<i>Acacia kosiensis</i>	Dune Sweet Thorn	<i>Euclea natalensis</i>	Hairy Guarri
<i>Adenia gummiifera</i>	Green-stem	<i>Eugenia capensis</i>	Dune Myrtle
<i>Albizia adianthifolia</i>	Flatcrown	<i>Ficus burtt-davyi</i>	Scrambling Fig
<i>Allophylus natalensis</i>	Dune False-curren	<i>Ficus lutea</i>	Giant-leaf Fig
<i>Antidesma venosum</i>	Tassel-berry	<i>Ficus natalensis</i>	Coast Strangler Fig
<i>Apodytes dimidiata</i>	White-pear	<i>Ficus trichopoda</i>	Swamp Fig
<i>Brachylaena discolor</i>	Coast Silver-oak	<i>Garcinia livingstonei</i>	African Mangosteen
<i>Bridelia cathartica</i>	Blue Sweet-berry	<i>Grewia caffra</i>	Climbing Raisin
<i>Canthium inerme</i>	Turkey-berry	<i>Grewia occidentalis</i>	Cross-berry Raisin
<i>Celtis africana</i>	White stinkwood	<i>Gymnosporia nemorosa</i>	White-spot Forest Spikethorn
<i>Clausena anisata</i>	Horsewood	<i>Hymenocardia ulmoides</i>	Red-heart Tree
<i>Clerodendrum glabrum</i>	Tinderwood	<i>Kraussia floribunda</i>	Rhino coffee
<i>Dodonaea viscosa</i>	Narrow-leaf Sand-olive	<i>Mimusops caffra</i>	Coast Red-milkwood
<i>Dovyalis longispina</i>	Coast Kei-apple	<i>Monanthes caffra</i>	Rubber Vine
<i>Dovyalis rhamnoides</i>	Sourberry Kei-apple	<i>Ochna barbosae</i>	Sand Ochna
<i>Ekebergia capensis</i>	Cape-ash	<i>Ozoroa obovata</i>	Coast Resin-tree

Scientific Name	Common Name	Scientific Name	Common Name
<i>Erythroxylum emarginatum</i>	African Coca-tree	<i>Pavetta gerstneri</i>	Zulu Brides-bush
<i>Peddiea africana</i>	Poison Olive	<i>Synaptolepis kirkii</i>	Dream Herb
<i>Phoenix reclinata</i>	Wild Date Palm	<i>Syzygium cordatum</i>	Umdoni
<i>Psydrax locuples</i>	Sand Quar	<i>Tarenna junodii</i>	Climbing Tarenna
<i>Psydrax obovata</i>	Quar	<i>Teclea gerrardii</i>	Zulu Cherry-orange
<i>Rapanea melanophloeos</i>	Poison-olive	<i>Tricalysia delagoensis</i>	Tonga Jackal-coffee
<i>Rhoicissus digitata</i>	Five-finger Grape	<i>Tricalysia sonderiana</i>	Coast Jacka;-coffee
<i>Sclerocarya birrea</i>	Marula	<i>Trichilia dregeana</i>	Forest Natal Mahogany
<i>Scutia myrtina</i>	Cat-thorn	<i>Uvaria caffra</i>	Small-fruit cluster-pear
<i>Searsia natalensis</i>	Northern Dune Currant	<i>Vepris lanceolata</i>	White-ironwood
<i>Searsia nebulosa</i>	Coast Currant	<i>Xylothea kraussiana</i>	African-dogrose
<i>Sideroxylon inerme</i>	White-milkwood	<i>Zanthoxylum capense</i>	Small Knobwood
<i>Strelitzia nicolai</i>	Natal Wild Banana	<i>Ziziphus mucronata</i>	Buffalo-thorn
<i>Strychnos spinosa</i>	Green Monkey-orange		

Table 7. Locations of specimens of the four protected tree species found in the forests and on a forested strip between wetland areas. Shaded cells denote particularly large specimens.

<i>Ficus trichopoda</i>	<i>Mimusops caffra</i>	<i>Sclerocarya birrea</i>	<i>Sideroxylon inerme</i>
E 28° 8'23.6" S 32°32'30.9"	E 28° 08' 20.7" S 32° 32' 38.8"	E 28° 08' 17.1" S 32° 32' 39.5"	E 28° 08' 17.1 S 32° 32' 39.2"
	E 28° 08' 24.1" S 32° 32' 34.6"	E 28° 08' 17.0" S 32° 32' 39.5"	E 28° 08' 18.9 S 32° 32' 38.9"
		E 28° 08' 18.7" S 32° 32' 8.8"	E 28° 08' 20.8" S 32° 32' 38.5"
		E 28° 08' 17.1" S 32° 32' 40.0"	E 28° 08' 21.7" S 32° 32' 38.3"
		E 28° 08' 21.6" S 32° 32' 34.7"	E 28° 08' 19. " S 32° 32' 39.7"
		E 28° 08' 25.1" S 32° 32' 36.9"	E 28° 08' 17.2" S 32° 32' 40.0"
		E 28° 08' 26.2" S 32° 32' 37.6"	E 28° 08' 21.2" S 32° 32' 35.2"

6.2.2 Forbs and other Plants within the Development Site

As with the forest trees, the survey of forbs and other low plants was conducted primarily in and around the development area. However, some note was also taken of species within the wetland areas. It was realised that the survey was severely impeded by both the season, and the drought conditions. The species that were identified are listed in Table 8 while the alien plant species are listed in Table 9. Finally, Table 10 lists the fungi and parasitic plants seen.

None of the plants listed are protected and most are widespread and common.

Table 8. List of indigenous forbs and other plants seen in the study area.

Scientific Name	Family	Common Name	Scientific Name	Family	Common Name
<i>Aneilema aequinoctiale</i>	Commelinaceae	Clinging aneilema	<i>Ipomoea crassipes</i>	Convolvulaceae	Leafy-flowered ipomoea
<i>Anthericum saundersiae</i>	Anthericaceae	Weeping anthericum	<i>Isoglossa woodii</i>	Acanthaceae	Buckweed
<i>Aristea cognata</i>	Iridaceae	Blue-eyed grass	<i>Kyllinga alba</i>	Cyperaceae	White button sedge
<i>Asparagus densiflorus</i>	Asparagaceae	Emerald fern	<i>Leonotis leonurus</i>	Lamiaceae	Wild dagga
<i>Asparagus virgatus</i>	Asparagaceae	Broom asparagus	<i>Lepidium africanum</i>	Brassicaceae	Pepperweed
<i>Asplenium anisophyllum</i>	Aspleniaceae	Fern	<i>Lobelia anceps</i>	Lobeliaceae	Swamp lobelia
<i>Asystasia gangetica</i>	Acanthaceae	Spreading herb	<i>Lobelia coronopifolia</i>	Lobeliaceae	Wild lobelia
<i>Ceratiosicyos laevis</i>	Achariaceae	Cucumber pod creeper	<i>Lobelia pteropoda</i>	Lobeliaceae	Wild lobelia
<i>Cheilanthes viridus</i> <i>var. macrophylla</i>	Sinopteridaceae	Fern	<i>Ludwigia octovalvis</i>	Onagraceae	Shrubby ludwigia
<i>Christella dentata</i>	Thelypteridaceae	Marsh fern	<i>Mariscus macrocarpus</i>	Cyperaceae	Mariscus
<i>Commelina benghalensis</i>	Commelinaceae	Commelina	<i>Microsorium scolopendria</i>	Polypodiaceae	Fern
<i>Commelina erecta</i>	Commelinaceae	Blue commelina	<i>Momordica balsamina</i>	Cucurbitaceae	African cucumber
<i>Commicarpus pentandrus</i>	Nyctaginaceae	Cerise stars	<i>Persicaria senegalensis</i>	Polygonaceae	Silver snake root
<i>Conyza ulmifolia</i>	Asteraceae	Elm-leaved conyza	<i>Phyllanthus burchellii</i>	Euphorbiaceae	Herb
<i>Crassula alba</i>	Crassulaceae	Crassula	<i>Priva cordifolia</i>	Verbenaceae	Blaasklits
<i>Crinum cf. delagoense</i>	Amaryllidaceae	Lily	<i>Pupalia lalppacea</i>	Amaranthaceae	Forest burr
<i>Cyperus albostriatus</i>	Cyperaceae	Forest star sedge	<i>Sansevieria hyacinthoides</i>	Dracaenaceae	Mother-in-law's tongue
<i>Cyperus cf. laevigatus</i>	Cyperaceae	Smooth sedge	<i>Senecio deltoideus</i>	Asteraceae	Herbaceous scrambler
<i>Desmodium incanum</i>	Fabaceae	Sweethearts	<i>Senecio madagascariensis</i>	Asteraceae	Annual herb
<i>Euphorbia hirta</i>	Euphorbiaceae	Red milkweed	<i>Senecio tamoides</i>	Asteraceae	Canary creeper
<i>Helichrysum cooperi</i>	Asteraceae	Yellow helichrysum	<i>Sida rhombifolia</i>	Malvaceae	Taaiman
<i>Helichrysum kraussii</i>	Asteraceae	Straw everlasting	<i>Smilax anceps</i>	Smilacaceae	Leg ripper
<i>Hewittia malabarica</i>	Convolvulaceae	Dwarf morning glory	<i>Tecoma capensis</i>	Bignoniaceae	Cape honeysuckle
<i>Hibiscus cf. calyphyllus</i>	Malvaceae	Large yellow wild hibiscus	<i>Tephrosia polystachya</i>	Fabaceae	Swamp tephrosia
<i>Indigofera spicata</i>	Fabaceae	Creeping indigo	<i>Tragia glabrata</i>	Euphorbiaceae	Stinging nettle

Table 9. List of alien plants seen in the study area. “*” Refers to the Conservation of Agricultural Resources Act (Act 43 of 1983).**

Scientific Name	Family	Common Name	CARA Category**
<i>Achyranthus aspera</i>	Amaranthaceae	Burweed	Weed, Category 1
<i>Ageratum houstonianum</i>	Asteraceae	Blue weed	Weed, Category 1
<i>Argemone cf. ochroleuca</i>	Papaveraceae	Mexican poppy	Weed, Category 1
<i>Boerhavia diffusa</i>	Nyctaginaceae	Spiderling	
<i>Bougainvillea sp.</i>	Nyctaginaceae	Creeper	
<i>Catharanthus roseus</i>	Apocynaceae	Periwinkle	
<i>Centella asiatica</i>	Apiaceae	Marsh pennywort	
<i>Chromolaena odorata</i>	Asteraceae	Paraffin weed	Weed, Category 1
<i>Cirsium vulgare</i>	Asteraceae	Scotch thistle	Weed, Category 1
<i>Conyza bonariensis</i>	Asteraceae	Fleabane	
<i>Cotula australis</i>	Asteraceae	Staggers weed	
<i>Datura stramonium</i>	Solanaceae	Common thorn apple	Weed, Category 1
<i>Eclipta prostrata</i>	Asteraceae	Eclipta	
<i>Galinsoga parviflora</i>	Asteraceae	Quickweed	
<i>Gamochaeta pensylvanica</i>	Asteraceae	Roerkruid	
<i>Hydrocotyle bonariensis</i>	Apiaceae	Perdekloutjies	
<i>Oxalis corniculata</i>	Oxalidaceae	Yellow creeping sorrel	
<i>Richardia brasiliensis</i>	Rubiaceae	Tropical richardia	
<i>Spilanthes mauritiana</i>	Asteraceae	Herb	
<i>Tridax procumbens</i>	Asteraceae	Weed	
<i>Vicia cf. sativa</i>	Fabaceae	Purple vetch	

Table 10. List of fungi and parasitic plants.

Scientific Name	Common Name
<i>Coriolus versicolor</i>	Turkey tail
<i>Lentinus stupeus</i>	Bluegum wood
<i>Lysurus corallocephala</i>	Stinkhorn
<i>Pycnoporus sanguineus</i>	Cinnabar

6.2.3 Fauna within the Study Area

As indicated, observations on the fauna were restricted to those species seen during the course of the vegetation and wetland studies. In addition, however, a list of birds likely to be resident in the study area, or to occasionally fly over it, was also compiled. The mammal species seen are listed in Table 11 and the butterflies seen are listed in Table 12.

Table 11. List of mammals seen in the vicinity of the site

Scientific Name	Common Name	Status
<i>Cephalophus natalensis</i>	Red Duiker	Least Concern
<i>Cercopithecus mitis labiatus</i>	Samango Monkey	Endangered
<i>Cercopithecus pygerythrus</i>	Vervet Monkey	Least Concern
<i>Hippopotamus amphibius</i>	Hippopotamus	Least Concern
<i>Kobus ellipsiprymnus ellipsiprymnus</i>	Waterbuck	Least Concern
<i>Paraxerus palliatus tongensis</i>	Tonga Red Squirrel	Endangered
<i>Phacochoerus africanus</i>	Warthog	Least Concern
<i>Redunca arundinum</i>	Common Reedbuck	Least Concern
<i>Silvicapra grimmia</i>	Grey Duiker	Least Concern
<i>Syncerus caffer caffer</i>	Cape Buffalo	Least Concern
<i>Tragelaphus strepsiceros</i>	Kudu	Least Concern
<i>Tragelaphus scriptus</i>	Bushbuck	Least Concern

Table 12. List of butterflies seen in the study area.

Scientific Name	Family	Common Name
<i>Aneilema aequinoctiale</i>	Commelinaceae	Clinging Aneilema
<i>Belenois creona</i>	Pieridae	African Common White
<i>Hyalites igola</i>	Nymphalidae	Dusky-veined Acraea
<i>Hypolimnna misippus</i>	Nymphalidae	Common Diadem
<i>Vanessa cardui</i>	Nymphalidae	Painted Lady

All of the listed species are common. The Eastern Shores (Mfabeni) area of Lake St Lucia region is known to be particularly rich in butterfly diversity as a consequence of the wide variety of habitat types there. Thus the list of observed species is a small fraction of the overall diversity.

The list of birds is presented in Appendix I. The number of Red Data species present is large, but must be viewed in context. The core area of the proposed development is coastal forest. Only three of the listed species depend upon it; Spotted Ground-Thrush, African Broadbill and Woodward's Batis. The latter two are resident; the thrush is a non-breeding winter visitor, and then only in transit.

The buffer area is primarily a mosaic of seasonal marsh and grassland. This is used by all the other listed species to varying degrees. The specialist wet grassland species are the African Grass-Owl, Swamp Nightjar, African Marsh-Harrier, Lesser Jacana, Woolly-necked Stork and Rosy-throated Longclaw. All of these would be directly impacted by habitat loss, and to a degree proportional to the loss.

The remaining listed species do not rely on the mosaic, but can, and usually do, use open water – Saddle-billed Stork, Caspian Tern, Yellow-billed Stork; dry grassland – Denham's Bustard, Black-bellied Bustard; or are flexible depending upon current local conditions – Southern Banded Snake-Eagle, Martial Eagle, African Crowned Eagle.

Pel's Fishing-Owl is only transient at best, being reliant upon tall trees overlooking permanent water.

6.2.4 Wetlands within the Study Area

Although the development site consists entirely of dry terrestrial ecosystems, approximately 40 % the study area shows wetland characteristics. Figure 2 shows the wetlands as included in the KwaZulu-Natal Wetland database and in the NFEPA Database but even casual examination shows those outlines to be flawed. It is probable that the error is one of mapping technicalities. However, for the purposes of this study it had been determined that more precise field delineation would be undertaken in accordance with the Department of Water Affairs and Forestry (DWAF) Guidelines and these were followed as closely as conditions permitted.

The terrain indicator was of value as wetlands were found to occur only in the lowest lying areas of the site. Thus, with a very high degree of confidence it was not necessary to make extensive searches in the eastern part of the study area since that area lies on the steep slopes of the high dune cordon. Any surface (rain) water in this area percolates into the soil and down to the groundwater body which, although dynamic and variable with climatic conditions (R. Taylor, *pers comm*), is always too deep to allow wetland vegetation to establish.

As required, a soil survey was done, with a bucket auger being used as it lifts the sandy soil better than the standard Dutch auger. Holes were augered to a depth of approximately 1.2 m. However, in the soils of the study area, the normal soil characteristics, in the form of mottling and gleying, do not develop. Instead the soil develops a richly organic A Horizon which is dark charcoal grey to black in colour. This condition can extend to a depth of a metre or more and is indicative of the early stages in formation of peat. However, none of the holes showed true peat or gyttja. Underneath the dark soil is a clay-rich horizon which is often the stratum which holds the water near the surface rather than allowing it to simply percolate away into the porous sand. Below the clay the sand colour fades to grey brown and, from experience from deeper boreholes drilled by machine in the same general area, although not from this study, the colour will persist to the underlying Cretaceous bedrock.

The very base of the soil column may be paler in colour as a result of the leaching of iron minerals from the sand.

It was noted that the soils in the wetland basins had no clear lateral boundaries. The darkest material in the deepest area grades away in a smooth continuum to a pale grey/brown or grey/yellow sand at the edge of the wetland basin. This transition may be easily seen on the surface but it was also noted that the sand heaps pushed up by moles made the transition even more visible. Given the porosity of the sand in the area it is suspected that the dark (organic) component of the sand may, at any point above the deepest basin floor, be quite variable since it will dry out under drought conditions and then either oxidise and/or be blown away. When the wetland basins refill, the organic material which is derived from plants once again accumulate. Despite this change around the margins, the deepest areas do remain constant and it was found that by logging their margins, the edges of reedbeds would be followed even though the plants were not visible at the time due to the dry conditions.

It was found that the vegetation in the wetlands was significantly altered from what would be anticipated under more normal conditions. In places, trees had been able to grow to a height of approximately two metres. Species observed to have done this included *Acacia kosiensis* and *Brachylaena discolor*. Their presence is indicative of the long dry period that has been experienced.

While no trace of aquatic macrophytes was found, in some of the wetlands are areas of dead or dormant emergent species such as *Phragmites australis*, *A. mauritanus*, *Persicaria senegalensis*, *Cyperus fastigiatus* and *Scleria poiformis*. Elsewhere, *Eleocharis limosa*, *Pycreus* sp., *Kyllinga* sp., *Juncus kraussii*, and *Cyperus* sp. were scattered throughout a grass sward which was often grazed to a flat lawn-like condition by a variety of large herbivores including Hippopotamus, Buffalo, Waterbuck, and Reedbuck. Grasses noted included *Cynodon dactylon* and *Stenotaphrum secundatum*.

It was noted that the line of transition between the forests, which dominate the eastern side of the study area, and the wetland areas, is remarkably sharp in most places. Elsewhere, where soil slopes are more gradual, the ecotone is wider and less obvious. However, it is clear that the tall trees do not tolerate the conditions in the wetland basins and so a zone of wetland influence is indicated. Since the soils in this area are pale coloured, it is apparent that it is seldom, if ever, wet for long enough for organic material to accumulate and thus a hygrophilous grassland is indicated. This blends downwards to what, in normal climatic conditions, would be true wetland dominated by wetland obligate species. For the purposes of this study, a combination of the darkest soils and, where available, traces of the wetland

obligates, were taken as indicators of true, or “core”, wetland. However, it must be recognised that there is seldom a clear transitional line.

The finding was that, within the study area, the amount of core wetland that could be delineated was very small. See Figure 3. Six small patches, with a total area of 4.18 ha were found and two of these, with a total area of 0.58 ha were within the backwater basin of the lake. All the area around these patches, but within the study area, was designated as hygrophilous grassland. In contrast, when the core wetlands from a wetter year are considered, even within the study area the extent is very much greater. See Figure 4. It is noteworthy that the wetland patch which was the least affected was that directly alongside the Area B, that will not be developed. It is thought that this is the case because the surface drainage in all the core areas indicated is toward the lake and so the lowest point is that nearest to the lake. The divide between this north-flowing area and the very much larger Mfabeni Swamp is indicated in Figure 4. The significance of this divide is considered further in Section 8.3.



Photograph 1. View of the vestigial core wetland. The darker cover which did not reflect water, was used as the indicator.



Photograph 2. View of the sharp transition between wetland and forest. This site is in the backwater basin of the lake and has both core wetland and hygrophilous grassland.

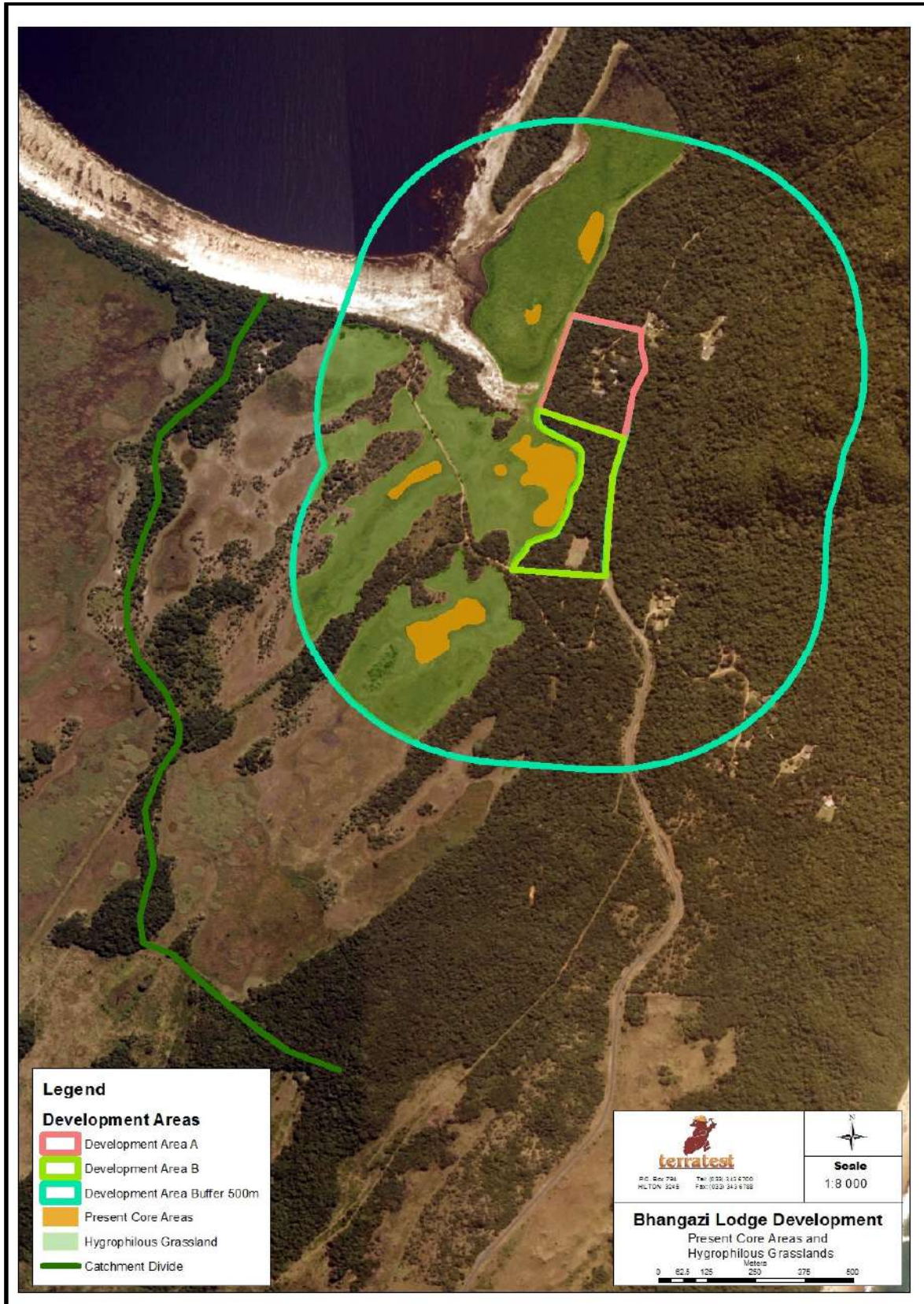


FIGURE 3. Observed present core wetland patches and hygrophilous wetlands within the study area.

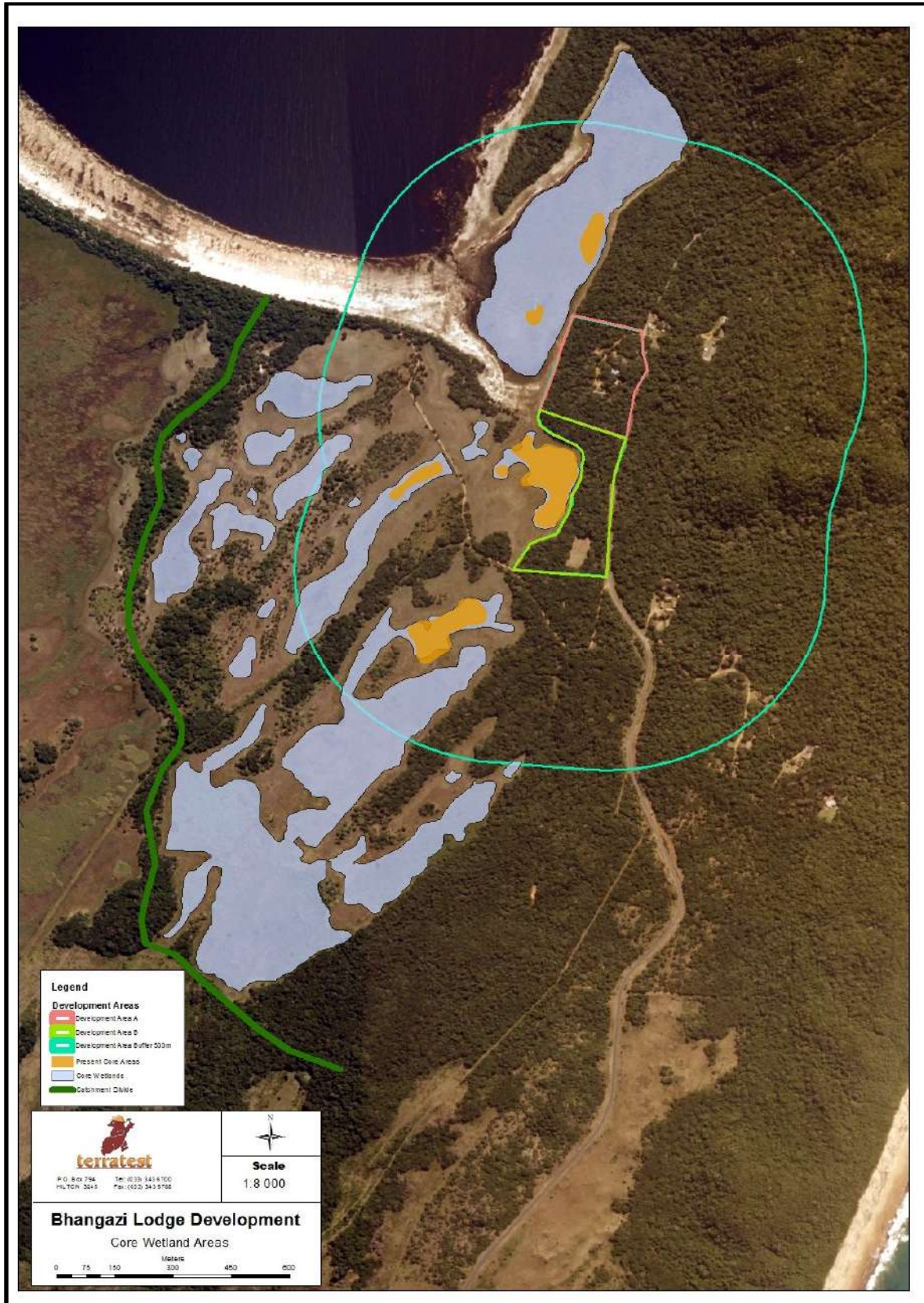


FIGURE 4. Observed present core wetland patches nested within core wetland areas visible in a wetter year. Note, the extended wetlands were drawn from Google earth images and so the boundaries were not confirmed by field observation.

7. CONSIDERATION OF THE POTENTIAL IMPACTS OF THE PROPOSED DEVELOPMENT ON THE BIODIVERSITY IN THE AREA

Since the development area is already substantially transformed from the natural state as a result of both the fishing camp and the Ezemvelo KZN Wildlife staff accommodation being present, the fresh impacts arising out of the proposed lodge development are lower than would be the case if the site was considered to be pristine. The foreseen impacts are assessed as per the terminology for evaluation of the potential impacts which were provided by the Client.

7.1 Loss of Further Forest

Although there has already been some loss of forest within the lodge development footprint, the extent of the new development implies that further loss will be inevitable. The concept plans provided indicate that there will be considerable expansion towards the lake and so the western part of the area will be the most affected. At present this area is relatively undisturbed. The forest vegetation which would be lost, consists of “Maputaland Moist Coastal Lowlands Forest” which is listed as being “Endangered”. On the basis of the plans, it is thought that at least 60% of the presently untouched forest will be felled or otherwise severely impacted upon. Most of the trees which are protected under the National Forests Act (Act 84 of 1998) are within this area. The anticipated impact arising out of the loss of forest is assessed as shown in Table 13.

Table 13. Assessment of the impact relating to loss of forest in the project area.

Criterion	Rating	Comment
Nature	Negative	The project will result in the extensive loss of the endangered forest type within its footprint
Type	Direct	The project cannot go ahead as contemplated without incurring forest loss.
Duration	Permanent	The loss will remain at least as long as the project or other development on the site persists.
Extent	Local	The loss of vegetation will be restricted to the project site.
Scale		Up to 4 ha of forest could be lost. It is assumed that Area B will not be developed.
Frequency	Once-off	It is assumed that the lodge will not be developed in a stage-by-stage manner.
Magnitude	High	The permanent loss of an “Endangered” forest type is an impact of High magnitude.

Receptor Sensitivity	High	The sensitivity and value of the forest in relation to biodiversity conservation are both high. In addition, the site is in a World Heritage Site Park.
Significance	Major	The rating is derived from the high magnitude value and the high receptor sensitivity and value.

7.2 Disturbance to the Fauna of the Area

The new lodge will affect the fauna of the area in different ways and the extent of the impact will be greater than the extent of the development. These are the impacts arising out of loss of feeding and/or breeding habitat and the impact arising out of increased human presence and activity in the area. Within the forest, a number of species, both vertebrate and invertebrate, will be driven away from the site and will be unlikely to return. However, others, including monkeys and some birds will return and at least pass through the area if not actually include the area in their home ranges. Bushbuck and Red Duiker are known to become conditioned to human presence and may even become semi-permanent residents as they have done at the nearby Cape Vidal Camp.

Indirect impacts on the fauna would come from higher traffic volumes, which raise the risk of roadkills. The impacts on the fauna are assessed as shown in Table 14.

Table 14. Assessment of impacts on the fauna in the vicinity of the project.

Criterion	Rating	Comment
Nature	Negative	The project will result in considerable disturbance to the fauna in its footprint. Most affected will be the larger mammals, which may totally desert the site, but some birds, reptiles, amphibians, and invertebrates will also lose habitat.
Type	Direct	The project cannot go ahead as contemplated without incurring this impact.
Duration	Permanent	The loss will remain at least as long as the project or other development on the site persists.
Extent	Local to Regional	The loss of habitat will not be restricted to the project site but will extend some distance around it. Species which are territorial may have difficulty in finding living space elsewhere. If they cannot do so, then the consequence will be a reduction in population size either through premature mortality or through reduced breeding success.
Scale		Up to 4 ha of forest could be lost but the additional human presence is likely to make the impacted area greater.
Frequency	Once-off	It is assumed that the lodge will not be developed in a stage-by-stage manner.

Magnitude	High	The threat to species such as Samango Monkey (“Vulnerable”), Red Duiker, and Tonga Red Squirrel (“Endangered”) is an impact of High magnitude.
Receptor Sensitivity	High	The sensitivity and value of the forest habitat in relation to biodiversity conservation are both high. In addition, the site is in a World Heritage Site Park.
Significance	Moderate	The rating is derived from the high magnitude value and the high receptor sensitivity but is reduced as the area affected directly is small. In addition, there is a large amount of similar habitat in the immediate vicinity.

7.3 Risk of Nutrient Enrichment of Wetlands in the Area and of Lake Bhanghazi South

It is understood that the sewer system that is proposed to service the development is to consist of a package plant that makes provision for a sealed underground system that makes use of a natural bio-digestion process to break down the organic matter in the sewer water. A product of this natural bio-digestion process is a grey water discharge. The chemical analysis of this grey water discharge was provided and compared to the “Wastewater limit values for wastewater discharge in the Wetlands Park”, as per the iSimangoliso Wetland Wastewater Treatment and Disposal – Guideline and Protocol.

The comparable wastewater discharge water qualities are provided in Table 15 and shows that the grey water sample analysis results provided by the package plant manufacturer does not meet the limits as per the guideline protocol.

Table 15. Comparable wastewater discharge water qualities

Substance/Parameter	Wastewater Discharge Limits as per Guideline Protocol	Discharge levels as per the package plant information
Chemical Oxygen Demand (mg/l)	30(i)	22
pH	5.5 – 7.5	6.7
Ammonia (ionised and un-ionised) as Nitrogen (mg/l)	2	8.7
Nitrate/Nitrite as Nitrogen (mg/l)	1.5	22.3
Suspended Solids (mg/l)	10	20
Otho-Phosphate as phosphorous	1 (median) and 2.5 (maximum)	3.5

Based on the above, it is clear that the grey water levels produced by the proposed package plant does not produce water of a quality that meets the limits as prescribed by the iSimangoliso Wetland Park World Heritage Site protocol on wastewater discharge. It is therefore assumed that this type of plant will not be accepted by the park management.

However, any release of water, including treated water, will have the consequence of releasing plant nutrients, including nitrogenous compounds and phosphates, into the area. Since the lake nutrient levels are naturally low, the system is considered to be oligotrophic. The aquatic fauna and flora have become adapted to this state and a change to higher concentrations of nutrients would bring about considerable changes in the lentic ecosystem. These changes would include the appearance of algal blooms, shifts in the composition of the fish and invertebrate assemblages, changes in the riparian vegetation, and it is surmised, possible impacts on the larger predators such as Crocodiles and Fish Eagles. Bacterial contamination may also occur and could become a threat to animals which drink there.

These impacts are assessed as shown in Table 15.

Table 16. Assessment of impacts associated with nutrient enrichment of Lake Bhangazi South.

Criterion	Rating	Comment
Nature	Negative	The impact would result in considerable disturbance to the ecology of the lake.
Type	Indirect	The project could proceed without incurring this impact.
Duration	Permanent	The loss will remain at least as long as the environment continues to receive nutrient rich effluent. Should the impact take place, but then be corrected, it is probable that recovery will take years as the nutrient substances will have to be purged from the system by natural processes.
Extent	Local	The contamination will be largely apparent in the lake. If nutrients enter the groundwater and flow through the Mfabeni Swamp, they will almost certainly be taken up in the swamp prior to reaching Lake St Lucia.
Scale		The affected area will be Lake Bhangazi South.
Frequency	Possibly intermittent	This impact could be repeated over and over depending on the management of the waste water at the lodge site.
Magnitude	Medium	The threat is easily avoided but, if it happens could open the developer to action in terms of the National Water Act (Act 36 of 1988).
Receptor Sensitivity	High	The sensitivity and value of the lake in relation to biodiversity conservation are both high. In addition, the site

		is in a World Heritage Site Park.
Significance	Major	The rating is derived from the high magnitude value and the high receptor sensitivity.

7.4 Increase in the Level of Alien Plant Infestation of the Area

The Eastern Shores (Mfabeni) area has had a long history of invasion by alien plant species. Certain of these plants were “escapees” from the commercial timber plantations which used to be present in the area but which are now gone, and other invasive species such as *Chromolaena odorata*, *Psidium guajava* and *Ricinis communis*. The spread of these was to some extent assisted by the plantation operations as newly harvested areas were readily available to pioneer species, but there was also penetration into the areas of untouched natural veld as well.

The opening of the area to fresh development will inevitably result in the increase of alien plant growth even if the lodge has an indigenous plant policy. The species most likely to appear are those listed above but others, such as Mexican poppy (*Argemone* spp.) could also be accidentally introduced as it is present, at low densities, in the area. However, it must be noted that, as the lodge grounds are landscaped and vegetation covered is re-established, the risk and extent of weed invasion are likely to decrease. The impacts are assessed as shown in Table 16.

Table 17. Assessment of the impacts associated with spread of alien weed species in the Eastern Shores (Mfabeni) Area.

Criterion	Rating	Comment
Nature	Negative	The impact could result in considerable disturbance to the ecology of the area.
Type	Indirect	With good management the project could proceed without incurring this impact or, at worst, it being small.
Duration	Permanent	The risk will remain as long as there are open areas which may be readily colonised by pioneer weed species.
Extent	Local but with risk of spreading	If alien weeds do become established at the development site then it is very probable that propagules will be spread to the surrounding areas.
Scale		The affected area could be extensive with invasions of weeds along the road, or in other areas where the soil is disturbed.
Frequency	Possibly intermittent	This impact could be repeated over and over depending on the management of the weeds at the lodge site.
Magnitude	Small to Medium	The threat could be avoided but, if it happens could affect a

		large area.
Receptor Sensitivity	High	The sensitivity and value of the vegetation communities in the area around the development site are high. In addition, the site is in a World Heritage Site Park.
Significance	Major	The rating is derived from the high magnitude value and the high receptor sensitivity.

7.5 Increase in the Level of Solid Waste in the Study Area

While it is anticipated that there will be a solid waste management system that will remove the matter from the Park, it is inevitable that some waste will enter the system. During the course of survey reported on here, quantities of waste were found at some distance from the fishing camp. It is thought that most of it would have been carried there by monkeys. Apart from being unsightly, there is some risk that some items might be ingested by animals or that there might be risk of localised pollution from the contents of containers being spilled.

Table 18. Assessment of the impacts associated with spread of solid waste in the vicinity of the lodge.

Criterion	Rating	Comment
Nature	Negative	The impact would be unsightly and could result in pollution of the area and/or pose a threat to animals which feed on it.
Type	Indirect	The project could proceed without incurring this impact, or with good management, it being small.
Duration	Permanent	The risk will remain as long as the development persists.
Extent	Local	The impact will not extend very far from the lodge.
Scale		The impact will be minor and will occur in only a small area around the lodge.
Frequency	Possibly intermittent	This impact could be repeated over and over depending on the management of the lodge site.
Magnitude	Small to Medium	The threat could be avoided but, if it happens is unlikely to affect a large area.
Receptor Sensitivity	Low	The sensitivity and value of the floral and faunal communities in the area around the development site are low in this regard.
Significance	Minor	The rating is derived from the medium magnitude value and the low receptor sensitivity.

8. MITIGATION OF IMPACTS

The terms of reference for this study call for the provision of mitigatory measures to reduce the impacts which would arise from the proposed development. As a matter of principle therefore, it was determined that the hierarchy of mitigation measures should be adhered to and the concept is shown in Figure 5.

Thus the recommendations which follow are intended first to avoid or minimise any impacts prior to any consideration of means of repairing or restoring damaged components of the environment. Given the location of the development site within the iSimangaliso Wetland Park World Heritage Site, the option of remote offsets is not considered to be viable.

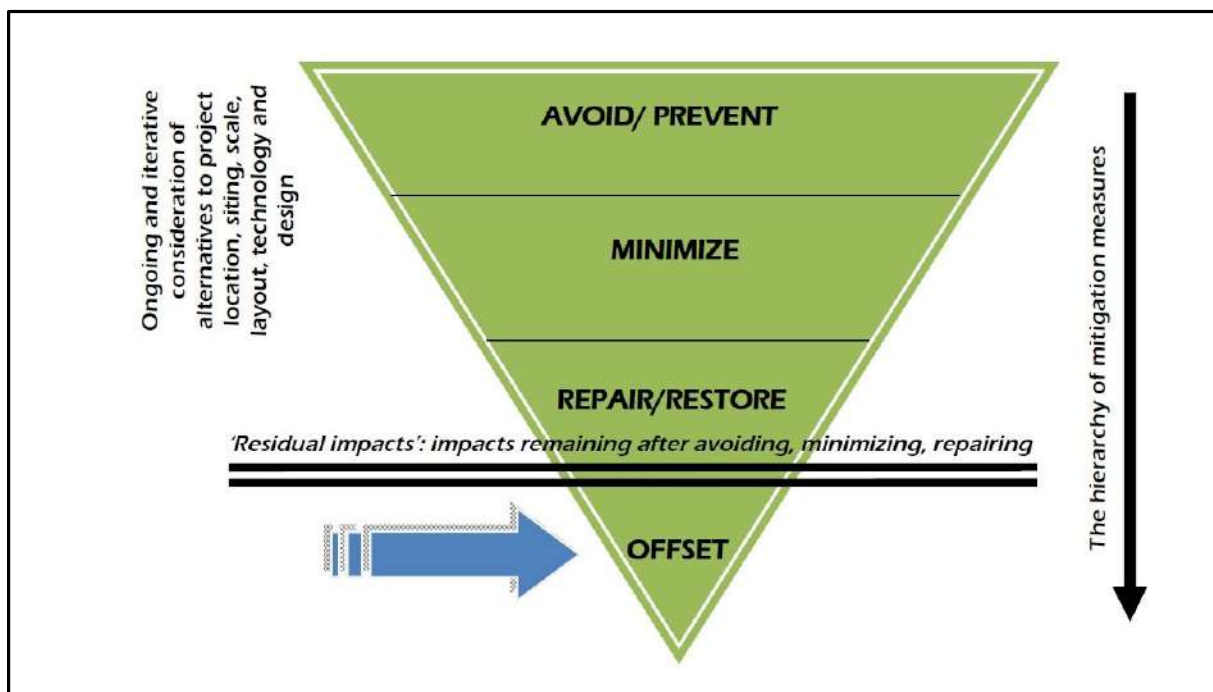


FIGURE 5. Hierarchy of mitigatory measures. Source: Ezemvelo KZN Wildlife (2010).

8.1 Loss of Further Forest

As indicated, the development will not be possible without the destruction of an area of forest which is of an “Endangered” type. Thus the first step of the mitigatory hierarchy is not possible and the first and second steps must be considered but in their correct sequence.

In order to minimise the impact on the forest, mitigatory actions are called for as follows:

- The tree specialist should be requested to mark out all trees or other features which are of especial conservation value and which should be retained if at all possible.

These trees or features should be marked by means of a tag or tape and should have their positions logged with a GPS.

- The existence of the valuable trees identified in the step above should be brought to the attention of the project planners/architects and the layout should be modified if at all possible to retain the trees. This process may be iterative but is of sufficient importance that the time and effort must be made available.
- Once the above process has been completed, and the design is finalised, care must be taken to ensure that it is properly implemented. The contractors appointed to carry out the various components of the project must be made fully aware of the environmental requirements and these requirements must be a part of the contract tender document. The appointed contractors must be given an induction presentation in this regard.
- At the time of site clearing the appointed Environmental Control Officer (ECO) must be on site so as to ensure that the protected features are left intact.
- Throughout the construction phase the site must continue to be monitored so as to ensure that the protected features are left intact.
- The ECO and the project planners/architects should consider the post-construction landscaping of the lodge grounds. It is strongly recommended that only plants indigenous to the region be used for the purpose and that tree planting be considered in places. Ideally the trees used will be saplings sourced on the site.

8.2 Disturbance to the Fauna of the Area

The impacts on the fauna are very largely unavoidable and will, in any event be partially covered by other actions such as minimising the impact on the forest. However, the following actions are recommended:

- The gardens around the lodge should be fairly dense in terms of their shrubbery and ideally there will be some stands of vegetation which are also at least 2 m tall.
- Leaf litter must be allowed to accumulate on the ground as numerous birds and small mammals forage in leaf litter.
- Use of chemicals such as herbicides and insecticides must be kept to a minimum and ideally should not be used at all.
- Large windows should have bird warning stickers on them. People should be encouraged to walk on well-defined roads, paths, and walkways.
- Traffic calming measures such as speed humps must be installed.

- All power and telephone lines should be buried and may not be strung between buildings.
- External lights should have shades that keep the light down on the ground where it is needed.
- There may be no resident dogs or cats on the site.
- If there is to be access to the wetlands and lake, it must be very tightly controlled. People must be confined to boardwalks and to fixed viewing points.
- Notices in lodge rooms should inform guests of the risk of the presence of wild animals and provide information on correct behaviour.

8.3 Risk of Nutrient Enrichment of Wetlands in the Area and of Lake Bhangazi South

This impact has been rated as being “Major” and is one that must be addressed extremely thoroughly. The following mitigatory actions are recommended:

- The project planners/architects must, as a matter of priority make a firm statement of how it is intended to deal with waste water and sewage. This statement should be subjected to review and acceptance by the park management.
- An appropriate specialist must compile all available data relating to the chemistry and biology of Lake Bhangazi South. The compiled information must be available to serve as a benchmark for the system.
- The methods used for the Cape Vidal Camp, and the degree of their success or otherwise, must be taken into consideration.
- It is very strongly recommended that there be no discharge of effluent water at any place where it might make its way back into the wetlands near the lodge site or into the lake. The catchment divide line shown in Figure 4 is reckoned to be the boundary between the Mfabeni peat swamp and the north-flowing grassland/wetland complex which discharges toward the lake. However, this boundary is not impermeable and there is evidence that water on the eastern side of the Mfabeni system also flows northwards to the lake at times (Rawlins and Kelbe, 1991, Venter, 2003. Grundling *et al*, 2014, R Taylor, *Pers Comm*, 2016).
- It is very strongly recommended that the lodge be operated on a conservancy tank system and that the waste be taken to the treatment works at the town of St Lucia.

8.5 Increase in the Level of Alien Plant Infestation of the Area

As indicated, the development of the lodge will have the consequence of opening areas which may be invaded by alien weed species. Experience gained from the past timber operations in the area shows that the process, especially in regard to *Chromolaena odorata* which has wind-borne propagules, may be rapid. The following mitigatory actions are recommended:

- From the outset of the lodge construction process a programme of alien weed control must be set in place. This process will be included in the terms of reference of the tender document for construction contractors, and will include a mandatory initial training component for the successful bidders.
- From the outset a monitoring programme must be set in place to check for the appearance of alien weed species. Where found they must be eradicated immediately with the preferred method of control being hand weeding rather than through use of herbicides.
- The area covered by the monitoring programme must include both Areas A and B, and a larger strip around them. The extent of this strip must be negotiated with Ezemvelo KZN Wildlife and the iSimangaliso Wetland Park Authority.
- It will be the responsibility of the Lodge Environmental Manager, during operation of the lodge, and the appointed ECO, during the construction of the lodge, to implement the on-site components of the programme.

8.5 Littering and Solid Waste

Littering and solid waste are items that will form part of the daily management regime at the lodge. However, such actions will be confined to the actual lodge grounds. In addition, the following action is required:

- Routine patrols through the area around the lodge grounds. This area must include both Areas A and B, and a strip around them of at least 200 m in width around them.

8.6 Monitoring Requirements

Since the proposed development site is located in an area of such high social and biodiversity value that it is listed as a World Heritage Site, it will be necessary to develop and maintain a monitoring programme some of which will have to be sustained for as long as the project itself persists. A summary of the presently perceived monitoring requirements is

presented in Table 18 but it must be noted that this list is not to be considered as final or exhaustive since, in all probability, future actions will call for additional monitoring.

Table 19. Monitoring requirements associated with the development and operation of the lodge.

Environmental Issue	Monitoring Requirement	Timing and Duration of Monitoring Programme		Responsibility
		Construction Phase	Operational Phase	
Loss of forest	The boundaries of the development must be clearly defined and demarcated prior to the start of construction and then be checked periodically to ensure that no incremental creep takes place.	Weekly	Biannually	LEM, IWPA, ECO
Disturbance to the fauna of the area	Patrols of the area around the lodge should be undertaken on a random basis but at no more than two month intervals.	Weekly	Bi-monthly	LEM, IWPA, ECO
Pollution of Lake Bhangazi South	Water quality must be monitored to ensure that nutrient enrichment and coliform contamination do not happen. Variables to measure include at least pH, Conductivity, Total Dissolved Solids, Total Suspended Solids, Nitrates, Phosphates, Faecal Coliforms, Total Coliforms, Chlorophyll.	Monthly	Biannually	LEM, IWPA, ECO
Alien Weed Infestation	An area which includes Areas A and B and a strip around them is to be patrolled and checked for growths of alien weeds.	Monthly	Biannually in October and April	LEM, ECO
Spread of solid waste	An area which includes Areas A and B, and a strip around them, is to be patrolled and checked for littering and waste.	Weekly	<ul style="list-style-type: none"> Daily grounds cleaning plus monthly patrols through a wider area. Fortnightly inspections of the waste handling and disposal facilities 	LEM, ECO

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APPENDIX I

List of birds in the study area

Red Data Listed Species

Species	Status
Spotted Ground-Thrush	Endangered
Saddle-billed Stork	Endangered
African Grass-Owl	Vulnerable
Pel's Fishing-Owl	Vulnerable
Swamp Nightjar	Vulnerable
Denham's Bustard	Vulnerable
Southern Banded Snake-Eagle	Vulnerable
African Marsh-Harrier	Vulnerable
Martial Eagle	Vulnerable
Black-bellied Bustard	Near-threatened
Lesser Jacana	Near-threatened
Collared Pratincole	Near-threatened
Caspian Tern	Near-threatened
African Crowned Eagle	Near-threatened
Yellow-billed Stork	Near-threatened
Woolly-necked Stork	Near-threatened
African Broadbill	Near-threatened
Woodwards' Batis	Near-threatened
Rosy-throated Longclaw	Near-threatened

Complete Species List

Species	Species	Species
Coqui Francolin	European Bee-eater	African Green-Pigeon
Crested Francolin	Speckled Mousebird	Denham's Bustard
Common Quail	Red-faced Mousebird	Black-bellied Bustard
Crested Guineafowl	Jacobin Cuckoo	Buff-spotted Flufftail
Helmeted Guineafowl	Red-chested Cuckoo	Black Crake
White-faced Duck	Black Cuckoo	African Purple Swamphen
White-backed Duck	Klaas's Cuckoo	Common Moorhen
Egyptian Goose	African Emerald Cuckoo	African Snipe
Spur-winged Goose	Diderick Cuckoo	Marsh Sandpiper
Comb Duck	Green Malkoha	Common Greenshank
African Pygmy-Goose	Black Coucal	Wood Sandpiper
Red-billed Teal	Burchell's Coucal	Common Sandpiper
Scaly-throated Honeyguide	African Palm-Swift	Little Stint
Greater Honeyguide	Alpine Swift	African Jacana
Lesser Honeyguide	Common Swift	Lesser Jacana
Golden-tailed Woodpecker	African Black Swift	Water Thick-knee
Cardinal Woodpecker	Little Swift	Black-winged Stilt
White-eared Barbet	White-rumped Swift	Common Ringed Plover
Yellow-rumped Tinkerbird	Livingstone's Turaco	Kittlitz's Plover
Black-collared Barbet	African Grass-Owl	Three-banded Plover
Crowned Hornbill	Spotted Eagle-Owl	Blacksmith Lapwing
Trumpeter Hornbill	Pel's Fishing-Owl	African Wattled Lapwing
African Hoopoe	African Wood-Owl	Senegal Lapwing
Narina Trogon	Marsh Owl	Collared Pratincole
European Roller	Fiery-necked Nightjar	Grey-headed Gull
Malachite Kingfisher	Swamp Nightjar	Caspian Tern
African Pygmy-Kingfisher	Square-tailed Nightjar	Swift Tern
Brown-hooded Kingfisher	African Olive-Pigeon	Common Tern
Giant Kingfisher	Lemon Dove	Little Tern
Pied Kingfisher	Red-eyed Dove	Whiskered Tern
Little Bee-eater	Emerald-spotted Wood-Dove	White-winged Tern
Blue-cheeked Bee-eater	Tambourine Dove	Osprey

Species	Species	Species
African Cuckoo Hawk	Black-crowned Night-Heron	Wire-tailed Swallow
Black-shouldered Kite	Hamerkop	Lesser Striped Swallow
Yellow-billed Kite	Glossy Ibis	Red-breasted Swallow
African Fish-Eagle	Hadedda Ibis	Black Saw-wing
Black-chested Snake-Eagle	African Spoonbill	Dark-capped Bulbul
Brown Snake-Eagle	African Sacred Ibis	Sombre Greenbul
Southern Banded Snake-Eagle	Yellow-billed Stork	Yellow-bellied Greenbul
Western Marsh-Harrier	Woolly-necked Stork	Terrestrial Brownbul
African Marsh-Harrier	Saddle-billed Stork	Yellow-streaked Greenbul
Montagu's Harrier	African Broadbill	Eastern Nicator
Lizard Buzzard	Black-headed Oriole	Little Rush-Warbler
African Harrier-Hawk	Square-tailed Drongo	Sedge Warbler
African Goshawk	Fork-tailed Drongo	African Reed-Warbler
Little Sparrowhawk	Blue-mantled Crested Flycatcher	Marsh Warbler
Black Sparrowhawk	African Paradise-Flycatcher	Great Reed-Warbler
Steppe Buzzard	Black-backed Puffback	Lesser Swamp-Warbler
Martial Eagle	Black-crowned Tchagra	Dark-capped Yellow Warbler
Long-crested Eagle	Southern Boubou	Willow Warbler
African Crowned Eagle	Orange-breasted Bush-Shrike	Cape White-eye
Amur Falcon	Olive Bush-Shrike	Red-faced Cisticola
Little Grebe	Gorgeous Bush-Shrike	Rattling Cisticola
African Darter	Woodwards' Batis	Rufous-winged Cisticola
Reed Cormorant	Chinspot Batis	Croaking Cisticola
White-breasted Cormorant	Black-throated Wattle-eye	Zitting Cisticola
Little Egret	Pied Crow	Tawny-flanked Prinia
Yellow-billed Egret	Red-backed Shrike	Yellow-breasted Apalis
Grey Heron	Common Fiscal	Rudd's Apalis
Black-headed Heron	Southern Black Tit	Green-backed Camaroptera
Goliath Heron	Sand Martin	Rufous-naped Lark
Purple Heron	Brown-throated Martin	Flappet Lark
Cattle Egret	Banded Martin	Spotted Ground-Thrush
Squacco Heron	Barn Swallow	Kurrichane Thrush

Species	Species	Species
Rufous-bellied Heron	White-throated Swallow	Pale Flycatcher
Southern Black Flycatcher	Purple-banded Sunbird	Common Waxbill
African Dusky Flycatcher	Lesser Masked-Weaver	Bronze Mannikin
Ashy Flycatcher	Spectacled Weaver	Red-backed Mannikin
White-starred Robin	Yellow Weaver	African Pied Wagtail
Red-capped Robin-Chat	Southern Brown-throated Weaver	Cape Wagtail
Brown Scrub-Robin	Village Weaver	Yellow-throated Longclaw
White-browed Scrub-Robin	Dark-backed Weaver	Cape Longclaw
African Stonechat	Southern Red Bishop	Rosy-throated Longclaw
Black-bellied Starling	Fan-tailed Widowbird	African Pipit
Eastern Olive Sunbird	Cuckoo Finch	Yellow-fronted Canary
Grey Sunbird	Thick-billed Weaver	Brimstone Canary
Scarlet-chested Sunbird	Green Twinspot	Streaky-headed Seedeater
Collared Sunbird	Grey Waxbill	

Your Reference:
Our Reference: 41539/019/TS/01

15th August 2016

Manager: Environmental Division
Terratest (Pty) Ltd
P O Box 794
HILTON
3245

ATTENTION: Mr M VAN ROOYEN

Dear Sir

PROPOSED BHANGAZI LODGE DEVELOPMENT
GEOTECHNICAL DESK-TOP STUDY

1. INTRODUCTION

This report presents the results of a geotechnical desk-top assessment undertaken for the proposed development of a tourist lodge located adjacent to the south eastern end of Lake Bhangazi South, in the isiMangaliso Wetland Park, approximately 30km NNE of the town of St Lucia, as indicated on Figure 1.



Figure 1: Locality Plan

The proposed development will be constructed on one of two concessions, referred to on Figure 1 as Concession Area A and being 5.06 ha in extent. The site is located on the western side of the St Lucia to Cape Vidal road and lies between the peripheral wetland zone of Lake Bhangazi South and the foot of the main coastal dune cordon, at elevations varying between 15m and 35m above mean sea level.

Based upon the information provided the proposed development will comprise the following components:

- Tourist accommodation ranging from single to family units and a trails camp. It is understood that these will be tented structures constructed on elevated decks.
- Staff quarters and a manager's house. It is uncertain whether these will be tented or masonry structures.
- Administrative buildings including a reception area and a boat and recreational storage facility. It is uncertain as to the type of construction for these buildings.
- A restaurant, entertainment and recreation area. Again it is uncertain as to the building type and configuration.
- Appurtenant infrastructure, such as access roads and parking.

2. GEOLOGY AND ENGINEERING GEOLOGICAL INFLUENCE FACTORS

According to the 1:250 000 Geological Map 27½32, St Lucia, the area is underlain by Quaternary and recent unconsolidated sedimentary deposits comprising redistributed aeolian sand, dune cordon sand and alluvial / lacustrine deposits. At depth these are likely to be underlain by Cretaceous sedimentary rocks of the Zululand Group.

The peripheral deposits around the lake are likely to comprises dark coloured, organic sand and silt, abruptly transforming with increasing elevation just below the site boundary to beige / buff to greyish brown, fine to medium grained sand. Continuing eastwards with increasing elevation the geology changes to red-brown, clayey silty sand of the Berea Formation, which forms the dune cordon running parallel to the coastline. The proposed development is expected to straddle both redistributed aeolian sand on the lower western side and the Berea Formation on the higher eastern side of the site.

The redistributed aeolian sand prevails as a consistent, non-cohesive, inert, fine to medium grained sand with a very loose consistency, high porosity and a natural angle of repose of about 27° to 30°. It requires densification in foundations and subgrades to pre-induce collapse settlement and to increase its bearing strength. It requires stabilisation and retention in slopes and acts as a running sand if not retained in slopes steeper than its angle of repose. In retrospect following treatment it is capable of sustaining relatively high bearing pressures and is non-active.

The Berea Formation is typically variable, both laterally and vertically, mainly related to variable clay and moisture contents. Unless proven to the contrary, a collapse potential must be assumed. The sands are also erodible and prone to slope stability problems. There are numerous case studies associated with construction in the Berea Formation, mostly in the Durban area and these are documented in Volume 4 of Engineering Geology of Southern Africa, by A B A Brink (1985).

Kantey and Brink devised a “good practice” methodology for construction in the Berea Formation on the Durban Bluff. They recommend that for an acceptable factor of safety structures are not to be constructed on slopes steeper than 22.5° . They also state that for slopes steeper than 30° , the maximum depth of the slip circle or plane of sliding will not exceed 6m, measured perpendicular to the slope. Consequently, construction on slopes steeper than 22.5° require foundation stabilisation to extend to at least 6m, combined with controlled storm-water drainage measures. These measures have proved successful in eliminating landslides, instability and associated distress to structures on the Bluff, as well as other areas underlain by the Berea Formation.

The sands of the Berea Formation have been successfully used in road subgrades and the construction of the lower pavement layers. They have also been used with variable levels of success in the construction of the upper pavement layers following stabilisation with cement or lime. In certain parts of the Mozambique coastal plain, where no other suitable materials for road construction occur, they have been used in the construction of cement stabilised base. Problems with block cracking are common due to the high stabiliser contents necessary to produce the required design strengths, but generally on higher road categories than those envisaged for the proposed development.

3. FOUNDING CONDITIONS

It is understood that the major proportion of the proposed structures will be lightly loaded tented accommodation constructed on elevated decks supported by columns. The fact that the site is underlain by sandy soils implies that no problems are likely in respect of an active founding medium and long term settlement, but the materials are potentially collapsible with low in-situ bearing capacity. It is recommended that the columns are founded on spot bases or pad footings designed and sized for the structural loads.

Should masonry buildings be proposed it is anticipated that these will be single storey, as the information provided mentions the imposition of height restrictions to ensure that buildings and infrastructure are not visually obtrusive above the tree line. Masonry buildings may be founded on conventional strip footings designed and sized for the structural loads.

Conventional founding levels of 0.6m below surface are considered appropriate, provided that pre-treatment is undertaken beyond this, within the depth of foundation influence, normally 1.5 times the footing width. It is recommended that foundation trenches be over-excavated below 0.6m to depths equal to 1.5 times the footing width. It is expected that excavation depths will be to between

about 1m and 1.2m below surface. The bases of the excavations must be compacted to between 95% and 100% of the modified AASHTO maximum dry density. The excavated materials must be moisture conditioned and returned into the excavation in layer thicknesses not exceeding 200mm and compacted to between 95% and 100% of modified AASHTO maximum dry density at the optimum moisture content. The trench fill, constructed in this manner, will extend from the bases of the excavations to a depth of 0.6m below surface and will form the subgrade upon which the foundations are constructed.

Similarly, for the construction of internal roads, road-bed treatment will be required to obviate collapse settlement and strengthen the subgrade. It is recommended that this entail ripping the road-bed to a depth of at least 0.3m, moisture conditioning and compacting to at least 95% of modified AASHTO maximum dry density, at the optimum moisture content. The pavement structure above this must be designed to sustain the anticipated traffic loads.

4. CUT AND FILL BATTER SLOPES

The sandy soils underlying the site are susceptible to erosion and slope instability. All cut and fill slopes steeper than 33° must be retained. All other slopes and denuded areas must be protected by the establishment and maintenance of a vegetal groundcover with an interlocking root system. The use of geosynthetic slope protection systems (Multi-cell, Soil Saver or similar) could be considered to provide anchorage for the establishment of vegetation.

The recommended measures proposed by Kantey and Brink, as alluded to in Section 2, must be following in respect of the positioning and founding of building structures on cut platforms or slopes.

5. DRAINAGE

The site must be protected against the adverse effects of raindrop impact and sheet-wash by surface protection, as mentioned in Section 4, and a properly designed storm-water management system. All runoff and surface flow must be collected and channelled to exit the low point of the site. Cut-off berms must be constructed along the tops of slopes to divert runoff away and obviate flow down slope faces.

6. EFFLUENT DISPOSAL

The likely groundwater conditions, depth to the water table and high permeability of the underlying soils implies that on-site disposal of effluent is likely to pose a pollution threat. Consequently, soak-away effluent disposal systems are considered unsuitable and it is recommended that consideration is given to the use of conservancy tanks or similar retention systems that are periodically emptied for disposal at a permitted waste-water treatment plant, in St Lucia or Mtubatuba.

7. SOLID WASTE DISPOSAL

For the reasons given in Section 6, the absence of a suitable barrier zone to exclude the infiltration of leachate into the groundwater renders the site unsuitable for solid waste disposal. It is recommended that provision is made to transfer waste to a regional landfill facility in St Lucia or Mtubatuba.

8. CONSTRUCTION MATERIALS

The Aeolian sand underlying a significant proportion of the site is may be marginally suitable as fine aggregate for the manufacture of concrete, but is considered generally to be too fine grained and equi-granular.

It is recommended that clayey silty sand of the Berea Formation derived from cut be reserved for use in the construction of fill platforms for buildings and the lower road pavement layers, namely fill and lower selected subgrade. The construction of the upper selected subgrade, subbase and base course layers will need to consider the use of suitable gravel or crushed rock aggregates procured from an approved source, such as the commercial quarry in Mtubatuba.

Similarly, aggregates for use in the construction of road surfacing and the manufacture of concrete will have to be procured from commercial sources.

9. CONCLUSION

It is concluded, based purely upon a desk-top analysis, that from a geotechnical perspective the site is suitable for the proposed development, but due to its sensitive nature will require special design considerations. In summary, whilst requiring verification in the form of an on-site geotechnical investigation prior to project implementation, the following pertinent aspects must be noted:

- The site is underlain by sandy soils of Quaternary age, namely wind-blown sand and Berea Formation dune sand. These will provide a suitable founding medium for the proposed structures provided that pre-treatment is undertaken to address potential collapse and ensure adequate bearing capacity.
- It is envisaged that foundations comprise conventional footings founded on an engineered trench fill that utilises the in-situ excavated materials.
- Slope retention and protection must be implemented, as the in-situ soils are erodible.
- Drainage and storm-water management will be an essential component of the project design, to prevent erosion and ensure site stability.
- The site is not considered suitable for the on-site disposal of effluent by soak-away and provision will need to be made to install temporary retention systems, which are periodically emptied for disposal off site.

- Similarly, the site is considered unsuitable for solid waste disposal and provision will need to be made for waste transfer and disposal off site.
- The Berea Formation clayey silty sand is usable as subgrade, fill and lower pavement layers. Aggregates and materials for upper pavement layer construction will have to be procured from suitable off site sources, such as the commercial quarry in Mtubatuba.

We trust that we have adequately addressed your requirements. Please contact the undersigned should you require clarification on any aspect of this desk-top evaluation report.

Yours faithfully

T SPEIRS Pr Sci Nat
Senior Associate

K DIEMONT Pr Sci Nat
Senior Engineering Geologist

for: **TERRATEST (PTY) LTD**



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

File Reference Number:	(For official use only)
NEAS Reference Number:	DEA/EIA/
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

BHANGAZI CULTURAL HERITAGE LODGE DEVELOPMENT

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address: Department of Environmental Affairs Attention: Chief Director: Integrated Environmental Authorisations Private Bag X447 Pretoria 0001
Physical address: Department of Environmental Affairs Attention: Chief Director: Integrated Environmental Authorisations Environment House 473 Steve Biko Road Arcadia
Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at: Email: EIAAdmin@environment.gov.za

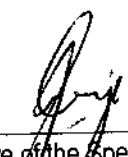
1. SPECIALIST INFORMATION

Specialist Company Name:	UMSUNGULI PROJECT MANAGEMENT CC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	6	Percentage Procurement recognition
			60%
Specialist name:	JANNIE CROUSE		
Specialist Qualifications:	PR TECHNI + PR CPM.		
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E-mail:	JANNIE@UMSUNGULI.CO.ZA		

2. DECLARATION BY THE SPECIALIST

I, J.G. CROUSE, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.


Signature of the Specialist

UMSUNGULI PROJECT MANAGEMENT CC.
Name of Company:

6/6/2019
Date



3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, J G Crowe, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

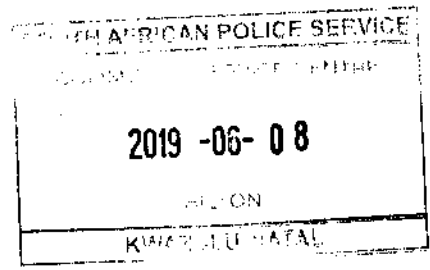
[Signature]
Signature of the Specialist

Umsheni PROJECT MANAGEMENT CC.
Name of Company

8 JUNE 2019
Date

[Signature] 05240576 W/LW
Lm Zandi
Signature of the Commissioner of Oaths

2019/06/08
Date



BHANGAZI LODGE DEVELOPMENT



BULK SERVICES ENGINEERING REPORT REVISION 1



PO Box 68, Merrivale 3291
Phone: 033-330 8386
Fax: 086 667 9713

JANUARY 2017

BHANGAZI LODGE DEVELOPMENT

BULK SERVICES ENGINEERING REPORT REVISION 1

I N D E X

1.	INTRODUCTION	3
2.	LOCATION AND ACCESS	3
3.	ENGINEERING DEVELOPMENT PROPOSAL	
3.1	General	3
3.2	Roads	4
3.3	Sewer	5
3.4	Water	6
3.5	Storm water	7
3.6	Refuse	7
3.7	Electricity	7
4.	CONCLUSION	8
ANNEXURE A	LOCALITY PLAN	9
ANNEXURE B	CONCEPTUAL LAYOUT PLAN	10
ANNEXURE C	SITE PHOTOGRAPHS	11

1. INTRODUCTION

Umsunguli Project Management cc was appointed to investigate and prepare a report on the capacity of existing bulk services located within the Isimangaliso Wetland Park, to be known as Bhangazi Lodge.

This report will assess the availability of all existing bulk infrastructure services and elaborate on the design criteria and specifications that will be applied in the detail design process.

The proposed development will include the following facilities:

- Reception and meet area
- 10 x 2 bed single units
- 8 x 4 bed family units
- 4 x 2 bed trails camp units
- Staff quarters
- Managers house
- 350m² restaurant
- Parking areas for vehicles and busses
- Associated infrastructure

2. LOCATION AND ACCESS

The proposed development is situated within the Isimangaliso Wetland Park, approximately 30km north of St. Lucia and 2km south of Cape Vidal. The site is situated along the main surfaced road between St. Lucia and Cape Vidal.

Access to the site is from the N3 offramp through Mtubatuba to St. Lucia and then taking the surfaced road through Isimangaliso Wetland Park to the border with KZN Ezemvelo at Cape Vidal.

The GPS co-ordinates at the approximate center of the proposed lodge site are 28° 08' 01"S and 32° 32' 40"E. A locality plan is provided as Annexure A of this document.

3. ENGINEERING DEVELOPMENT PROPOSAL

3.1 General

Best practise requirements require that services be designed to connect to the existing municipal services infrastructure in order to accommodate the service requirements for developments of this nature. The internal services will be according to accepted engineering specifications and principles as well as acceptable environmental requirements and specifications, as provided in the Basic Assessment Report.

The following engineering design criteria will apply and assumptions made:

- (a) Where bulk services are not available, the infrastructure will be provided by the Client/Developer.
- (b) The provision of services to the proposed development will be designed to norms and standards in accordance with the “*Guidelines for Human Settlement Planning and Design*” (Red Book).
- (c) Site Development Plan provided by NuLeaf Planning and Environmental, dated May 2015.

A geotechnical investigation (August 2016) and Traffic Impact Statement (April 2016) have been commissioned by the client and should be referred to in conjunction with the engineering report.

Existing Services

The following existing services were observed during the site inspection conducted on 16 November 2016:

- Roads There is a surfaced road from St. Lucia to Cape Vidal.
- Water There is an existing borehole and reservoir near the proposed lodge site.
- Sanitation There are no existing bulk infrastructure services on site and all existing dwellings are served with septic tanks and soakaways.

3.2 Roads

3.2.1 Bulk Road Network

A Traffic Impact Statement was undertaken by AG Traffic and Transportation (Pty) Ltd during April 2016 and concluded that the existing road infrastructure is capable of handling the expected low traffic generation. No upgrades or improvements are required, although two access points and sufficient parking bays were recommended.

3.2.2 Internal Roads

All internal roads will be constructed to suit the anticipated traffic flow through the development, with parking provided at each unit, whilst parking bays for busses will be provided at the main reception area. All internal roads are expected to be gravel, which will also reduce stormwater runoff.

3.3 Sewer

There is no municipal bulk sewer available for the development to connect into and all existing dwellings at the site is served with septic tanks and soakaways.

The Greater St. Lucia Wetlands Park (Wetlands Park) is a protected area of national and international importance, and a declared World Heritage Site and all waste water infrastructure must take cognisance of their Waste Water Policy (Draft) document pertaining to Waste Water Treatment and Disposal: Guidelines and Protocol. The client has already indicated that they will be using the Biorock product which is a sewage package plant suitable for this type of application and conditions.

3.3.1 Internal Reticulation

The final positions of each unit and topography will determine the method of linking the internal sewer to the treatment facility. It may be necessary to serve each unit with a small pump to transfer effluent to the package plant for processing, as it may not be cost effective to provide each unit with a package plant. Wherever possible the internal reticulation should be designed to operate on a gravity main conveying raw effluent to the treatment plant, as this will reduce operation and maintenance costs.

The standards for the internal sewer reticulation to be installed with the proposed development can be summarised as follows:

➤	Pipe Material	:	uPVC
➤	Pipe class	:	Class 34 (300 kPa)
➤	Pipe diameters	:	110 / 160mm
➤	Minimum Grade	:	1:60
➤	Maximum Grade	:	1:10
➤	Bedding	:	Flexible (SABS1200LB)
➤	Manholes	:	1.0m Dia. Precast Concrete Manholes
➤	Manhole Spacing	:	80m (Maximum)
➤	Minimum Cover	:	800mm

3.3.2 Bulk Sewer

Due to the sensitivity of the Wetland Park, recommendations made in the geotechnical assessment and observing the waste water protocol for the Wetlands Park, it is clear that sewer effluent must be managed in a controlled manner to limit any negative impact on the environment and underground water resources.

The Biorock sewer package treatment plant is the preselected system for the development, although it must be mentioned that each unit requires a primary settlement tank before linking into the Biorock plant. These package plants can be installed for individual units or a combination of units, depending on the site topography or final configuration of the site layout. Outlets from the package plants can drain into soakaways.

3.4 Water

The provision of water to Bhangazi Lodge comprise of a number of systems. The proposed Bhangazi Lodge is expected to serve a total of 60 people in the units, a restaurant, staff quarters and a managers house. The water demand for this development is estimated at 23,200 litres per day and can be summarised as follows:

DESCRIPTION	UNITS	NUMBER OF PEOPLE	WATER CONSUMPTION	WATER DEMAND (l/day)
Managers house	1	4	250	1 000
Staff quarters	4	4	250	4 000
Single units	10	2	250	5 000
Family units	8	4	250	8 000
Trails Camp	4	2	250	2 000
Restaurant	1	30	90	2 700
Reception	1	2	250	500
Total Water Demand for Bhangazi Lodge (litres per day)				23 200

Option 1 – Potable Water

During our investigations, the manager of the Cape Vidal camp confirmed that there is a potable watermain from St. Lucia along the main road to Mission Rocks and Cape Vidal. The watermain is not currently in use, as the municipality cannot provide water due to the prolonged drought conditions. It is therefore only possible to provide potable water through this watermain during periods of no water restrictions. The pumps are also reported to be insufficient and would require further investigation. Bhangazi and Cape Vidal areas currently do not have potable water for human consumption and is reliant on the raw water from Bhangazi borehole. The condition of the pipe network and location of the pumps are unknown and may require further investigation.

Option 2 - Boreholes

There is an existing borehole located near the old fishermen's cottages where the new Bhangazi Lodge is proposed. The depth, yield and water quality of the borehole is unknown. The borehole feeds into a brick reservoir that appears to be in good condition and the reservoir has an estimated storage capacity of 70,000 litres. Water is transferred from the small reservoir at Bhangazi to the large reservoir at Cape Vidal using a duty and standby pump, each 5,5kW. In the pumphouse building are signs of old purification and settlement tanks, as well as old filters – all in disuse and not functional at the time of inspection. The Bhangazi reservoir also feeds the Ejabulani staff quarters and staff houses. Next to the reservoir is a standby generator that serves the MTN tower. The reservoir at Cape Vidal is located on high ground and has an estimated capacity of 265,000 litres. This reservoir serves the Cape Vidal camp sites, ablution blocks, shops, staff quarters and other amenities.

The staff at Cape Vidal reported that water is not fit for human consumption and should only be used in the ablution facilities and not for drinking. Visitors are expected to bring their own bottled water or buy bottled water from the local shop.

Option 3 – Lake Bhangazi

Lake Bhangazi is a freshwater lake, although the water may require some form of purification before considered safe for human consumption and compliant with SANS 241-2015. Abstraction from the lake would have to be from a jetty built into the lake and pumped for treatment and storage. This would be considered a visual impact on the surroundings and is thus not considered a viable option, especially as there is an existing borehole and water quality is not expected to be better than coming from the borehole.

3.5 Storm water

The storm water management strategy will be to prevent ponding, but to collect rainwater in tanks from roofs, where possible. The geotechnical report also advised that concentration should be avoided where possible due to stability of sand and ground conditions at specific angles.

The traditional design for storm water drainage systems has been to collect and convey storm water runoff as rapidly as possible to a suitable location where it can be discharged accordingly. However, this could lead to flooding and given the sensitive nature of the surrounding Lake Bhangazi and soil stability, it is essential that the stormwater is managed in a manner that would not impact negatively on Lake Bhangazi.

The sand has a high permeability and where ponding or concentration of stormwater runoff is unavoidable, shallow depressions can act as buffers to encourage seepage and recharge of the underground resources. These considerations must be taken into account during the design of the civil infrastructure services.

3.6 Refuse

With reference to the geotechnical assessment and possible pollution of underground resources through leachate, it is essential that domestic refuse be stored in a bunded area with a concrete floor. Refuse should be transferred to municipal landfill sites in St. Lucia or Mtubatuba.

3.7 Electricity

The proposed development will connect into the existing infrastructure. The site investigated established that there is a substation located at the Ejabulani staff quarters, directly opposite from the proposed lodge site. This substation serves the staff accommodation, Bhangazi Lodge and Cape Vidal.

The existing line to Cape Vidal is 11kV with a breaker at St. Lucia substation and owned by Eskom. At the KZN Ezemvelo Substation at Bhangazi, Eskom has a metering unit (Ref MTBR 1653) and the maximum load is 1.1MVA. The substation room and switchgear at Bhangazi is owned by KZN Ezemvelo, who also has the responsibility of the line beyond the substation to Cape Vidal.

The proposed development is expected to have a low power requirement and can only be finalised once the exact content of the electrical requirements is known. It is however strongly recommended that solar power be investigated, as it was reported that power outages are not frequent, but could last 7-10 days due to repairs and the remoteness of the area.

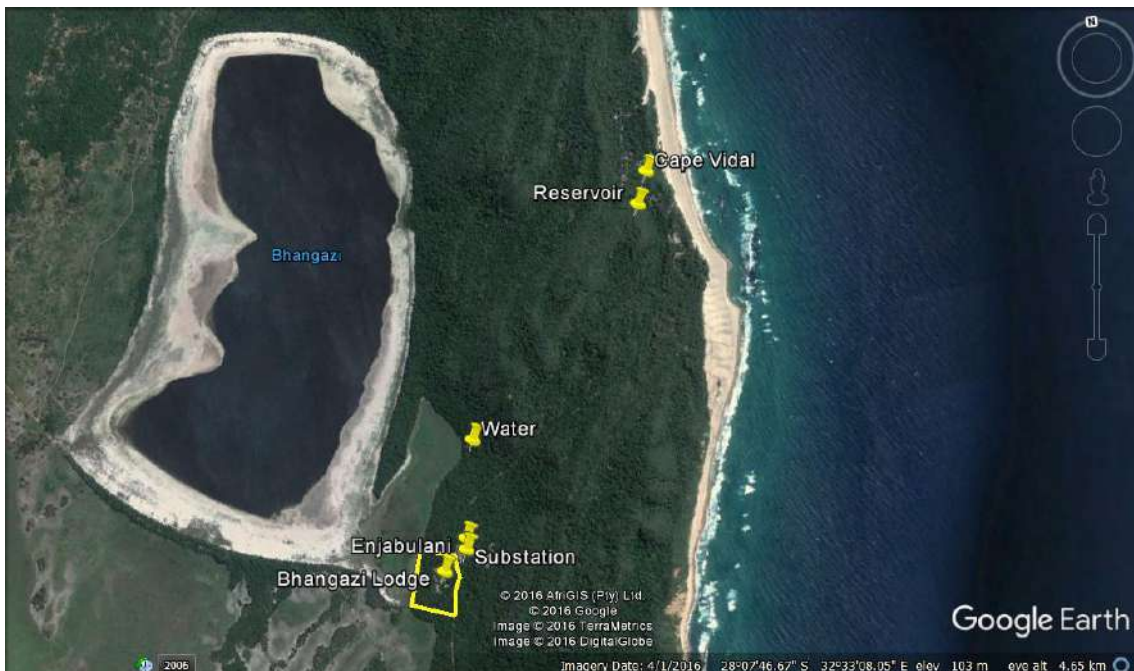
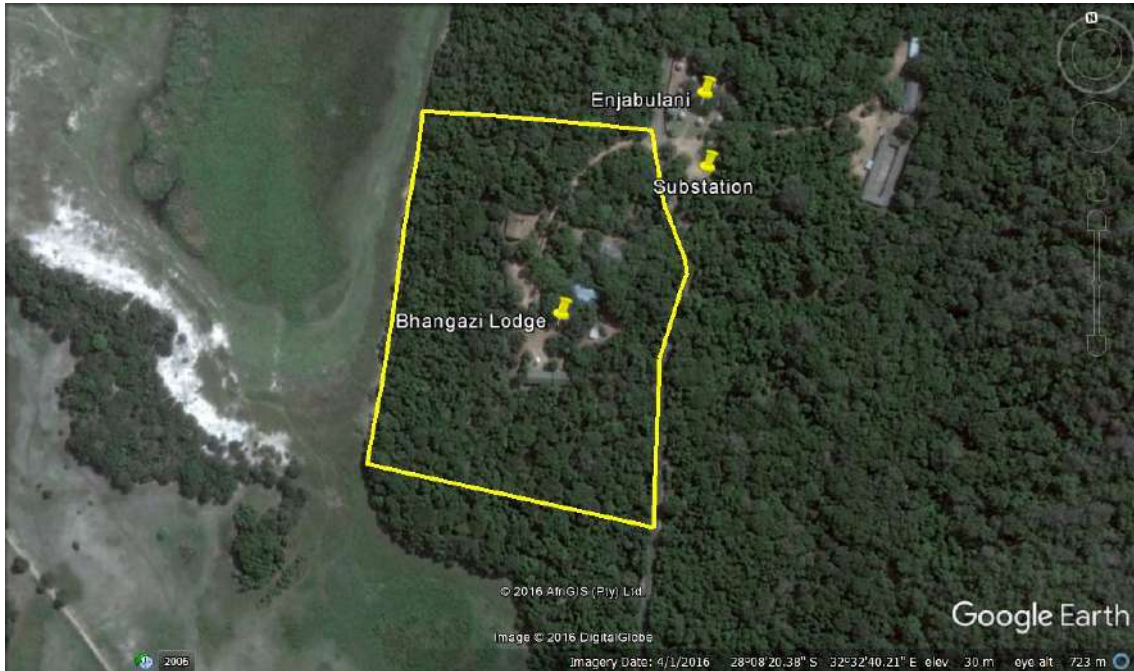
4. CONCLUSION

This report has been prepared to assess the availability and access to bulk infrastructures services for the proposed Bhangazi Lodge development located along the shores of Lake Bhangazi within the Isimangaliso Wetlands Park. The conclusion is that there are sufficient bulk services available to serve the development, subject to the following conditions:

- The development does not require any upgrades insofar roads are concerned.
- The potable water from St. Lucia should serve as the primary water source, but during drought or periods of interrupted supply, the borehole should serve as backup.
- The sustainable yield and water quality of the existing borehole has to be determined.
- Purification and treatment of the borehole should be further investigated.
- The use of the Biorock sewage package plant is acceptable, although it must comply with the Waste Water Treatment and Disposal: Guidelines and Protocol of the Wetlands Park.
- Outlets from the package plants should be positioned in such a manner to have the least impact on water quality and soil slope stability.
- The existing electrical infrastructure appears to be sufficient with a current availability of 1,1MVA, although distribution lines, etc may require further investigation during the design phase.
- Rainwater harvesting and solar power should be investigated for use within the development

ANNEXURE A

LOCALITY PLAN



ANNEXURE B

CONCEPTUAL LAYOUT PLAN



ANNEXURE C

SITE PHOTOGRAPHS



Existing dwelling at Bhangazi site



Existing dwelling at Bhangazi site



Existing substation at Bhangazi site with a reported capacity of 1,1MVA



Existing transformer at Bhangazi substation



Borehole chamber at Bhangazi site



Borehole with submersible pump at Bhangazi site



Water pumphouse at Bhangazi site



Existing water pumps at Bhangazi transferring raw water to reservoir at Cape Vidal



Old settling tanks not in use at Bhangazi water pumphouse



Old filters not in use at Bhangazi water pumphouse



Existing reservoir (70kl) at water pump station fed from the existing borehole



Standby generator at the water pump station serving the MTN tower



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

File Reference Number:
NEAS Reference Number:
Date Received:

(For official use only)
DEA/EIA/

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

BHANGAZI LODGE

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
2. This form is current as of 01 September 2018. It is the responsibility of the Applicant / Environmental Assessment Practitioner (EAP) to ascertain whether subsequent versions of the form have been published or produced by the Competent Authority. The latest available Departmental templates are available at <https://www.environment.gov.za/documents/forms>.
3. A copy of this form containing original signatures must be appended to all Draft and Final Reports submitted to the department for consideration.
4. All documentation delivered to the physical address contained in this form must be delivered during the official Departmental Officer Hours which is visible on the Departmental gate.
5. All EIA related documents (includes application forms, reports or any EIA related submissions) that are faxed; emailed; delivered to Security or placed in the Departmental Tender Box will not be accepted, only hardcopy submissions are accepted.

Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
Pretoria
0001

Physical address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za


1. SPECIALIST INFORMATION

Specialist Company Name:	UMSUNGULI PROJECT MANAGEMENT CC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	6	Percentage Procurement recognition
Specialist name:	JAN GABRIEL CRONJE		
Specialist Qualifications:	PR. TECHNI (CIVIL) PR. CIVIL.		
Professional affiliation/registration:	ECSA 200130223		
Physical address:	319 DISTRICT DRIVE MERRIVALE		
Postal address:	PO BOX 68, MERRIVALE		
Postal code:	3291		
Telephone:	Cell:	082 979 1305	
E-mail:	Fax:	-	
	JANNIE @ UMSUNGULI . CO. ZA		

2. DECLARATION BY THE SPECIALIST

I, J. G. CRONJE, declare that -

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.

Signature of the Specialist:  Umsunguli Project Management cc
 CK2009/106138/23
 PO Box 68
 Merrivale
 3291

Name of Company: VAT No. 4350257152
 Phone 033-3308386

Date: 18/8/2010

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, JAN GABRIEL CRONTE; swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

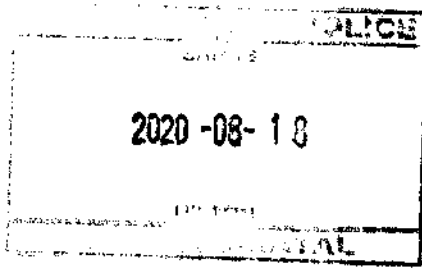
[Signature]
Signature of the Specialist

Umsunguni PROTECT MANAGEMENT CC.
Name of Company

18 August 2020.
Date

[Signature]
Signature of the Commissioner of Oaths

18th AUGUST 2020
Date



The Manager
 Thembeke Environmental Consulting (Pty) Ltd
 14 Impala Crescent
 La Lucia
 UMHLANGA
 4051

Ref No: UPM155/2.4
 18 August 2020

Attention: Ms Khamo Mokhino

BHANGAZI LODGE BASIC ASSESSMENT – ENGINEERING COMMENT

I refer to your email dated 7 August 2020 advising of the updating of the Basic Assessment Report and Public Participation Process to incorporate a number of changes, required by the client after receiving comments from Interested and Affected Parties.


The changes are as follows:

Mitigation Measure	Nett Result
Remove proposed new access road, in favour of using the existing access road to the fishing camp area.	No longer need to clear an extent of 200m ² (forested area) for the access road alignment.
Relocate restaurant and pool complex from forest zone to disturbed fishing camp zone.	No longer need to clear an extent of 350 m ² (forested area) for the restaurant and pool complex.
Following above, no requirement for new access road leading to restaurant complex.	No longer need to clear an extent of 200 m ² (forested area) for the service road alignment.
Reducing the size of the proposed 2 and 4 bed chalet units from 75 m ² to 50 m ² and 40 m ² respectively.	Potentially cleared area reduced from 1350 m ² to 970 m ² (footprint of raised decks, not necessarily clearance of forest canopy).
Forest infrastructure limited to chalets and boardwalks only, all on raised timber decks.	Reduction of impact on undergrowth.

The above changes will not impact on the provision of engineering services, as roads are reduce and therefore result in a positive change, due to less forested areas being disturbed. Our report and finding can therefore remain unchanged.

Please do not hesitate to contact us should you require any additional information.

Yours faithfully



JG CRONJE
 PrTechn (Civil), PrCPM