GIBB (PTY) LTD

TERRESTRIAL ECOLOGICAL ASSESSMENT FOR THE PROPOSED CONSTRUCTION AND UPGRADE OF THE GREATER MNQUMENI WATER SUPPLY SCHEME IN HARRY GWALA DISTRICT MUNICIPALITY, KWAZULU-NATAL PROVINCE

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DETAILS OF SPECIALIST CONSULTANT

Date:	June 2021
Document Title:	Terrestrial Ecological Assessment for the Proposed Construction and Upgrade of the Greater Mnqumeni Water Supply Scheme in Harry Gwala District Municipality, Kwazulu-Natal Province
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HARRY GWALA DISTRICT MUNICIPALITY

PROPOSED CONSTRUCTION AND UPGRADE OF THE GREATER MNQUMENI WATER SUPPLY SCHEME IN HARRY GWALA DISTRICT MUNICIPALITY, KWAZULU-NATAL PROVINCE

DRAFT TERRESTRIAL ECOLOGICAL ASSESSMENT REPORT

TABLE OF CONTENTS

TABLES

FIGURES

SPECIALISTS DECLARATION

I, Mark Summers as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- act as the independent specialist in this application;
- 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- declare that there are no circumstances that may compromise my objectivity in performing such work;
- 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;
- will comply with the Act, Regulations and all other applicable legislation;
- have no, and will not engage in, conflicting interests in the undertaking of the activity;
- have no vested interest in the proposed activity proceeding;
- 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;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- 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 specialist: 

Name of specialist: Mark Summers
Date: 14th June 2021

SPECIALISTS DECLARATION

I, Jake Alletson as the appointed independent specialist, in terms of the 2014 EIA Regulations, hereby declare that I:

- act as the independent specialist in this application;
- 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;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
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- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- all the particulars furnished by me in this specialist input/study are true and correct; and
- 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 specialist: 

Name of specialist: Jake Alletson
Date: 14th June 2021

TERMS OF REFERENCE

The study was to adhere to the following:

- Adherance to the content requirements of Terrestrial Plant and Animal Species Protocols, as per Government Notice No. 1150 of 30 October 2020.
- Adherence to all appropriate best practice guidelines, relevant legislation and authority requirements.
- Provide a thorough overview of all applicable legislation, guidelines.
- Cumulative impact identification and assessment
- Identification of sensitive areas to be avoided.
- Assessment of the significance of the proposed development during the Pre-construction, Construction, Operation, Decommissioning Phases and Cumulative impacts. Potential impacts should be rated in terms of the direct, indirect and cumulative.
    - Direct impacts: are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.
    - Indirect impacts: of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place as a result of the activity.
    - Cumulative impacts: are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.
- Comparative assessment of alternatives (if alternatives provided).
- Implications of specialist findings for the proposed development (e.g. permits, licenses etc.).
- Specify if any further assessment will be required.
- Include an Impact Statement, concluding whether project can be authorised or not.
- Recommend mitigation measures in order to minimise the impact of the proposed development.

Specific issues to be addressed are as follows:

- Review existing ecological information available;
- Determine the general ecological state of the proposed site, determine the occurrence of any red data and/or vulnerable species, or any sensitive species requiring special attention;
- Provide a detailed description of the baseline environment; and
- Provide mitigation measures to prevent and/or mitigate any environmental impacts that may occur due to the proposed project.

ASSUMPTIONS AND LIMITATIONS

The following assumptions, limitations, uncertainties are listed regarding the ecological assessment of the site:

- The study was undertaken in Autumn, however good rains have meant that vegetation could still be identified by leaves and remnant flowers;
- No bulbs were identified, and it is likely due to late season sampling;
- Rare and threatened plant species are, by their nature, usually very difficult to locate and can be easily missed.
- It must be assumed and accepted that many plant species, in particular geophytes and annuals, will be absent from the visible species assemblage;
- The assessment area was limited to the preferred abstraction point, alternative abstraction point, preferred rising main and associated access road, and alternative rising main;
- This study has only focused on the identification of faunal species that may occur on site, or were noted on site during fieldwork. Night time surveying was not undertaken due to budgetary constraints.
- Faunal assessments dealing with reptiles and birds are best undertaken during the warmer months of the year, as these species brunate or migrate during the winter months. Sampling occurred in Autumn (April 2020). Migratory bird species have left the area; therefore, a decreased species assemblage was expected. However, faunal activity is still dependent on weather conditions experienced on the day of sampling.
- Paucity in the data due to late season sampling is expected.

ACRONYMS

ADU	Animal Demographic Unit
AIS	Alien and Invasive species
BA	Basic Assessment
CBA	Critical Biodiversity Area
DAFF	Department of Agriculture, Forestry and Fisheries
DEA	Department of Environmental Affairs
DFFE	Department of Environment, Forestry and Fisheries
DWS	Department of Water and Sanitation
EA	Environmental Authorisation
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EDTEA	Economic Development, Tourism and Environmental Affairs
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMPr	Environmental Management Programme
ESA	Ecological Support Area
GIS	Geographical Information System
NEM:BA	National Environmental Management: Biodiversity Act
NEMA	National Environmental Management Act
PA	Protected Area
POC	Potential of Occurence
SABAP2	South African Bird Atlas Project 2
SANBI	South African National Biodiversity Institute
SCC	Species of conservation concern
ToPS	Threatened and Protected Species
ToR	Terms of Reference
TSCP	Terrestrial Systematic Conservation Plan

GLOSSARY

Definitions	
Alternative	Alternatives can refer to any of the following but are not limited to: alternative sites for development, alternative projects for a particular site, alternative site layouts, alternative designs, alternative processes and alternative materials.
Biodiversity	The diversity of genes, species and ecosystems, and the ecological and evolutionary processes that maintain that diversity.
Biodiversity offset	Conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three levels of the mitigation hierarchy have been explicitly considered (i.e. to avoid, minimize and rehabilitate / restore impacts). Offsets are the last resort form of mitigation, only to be implemented if nothing else can mitigate the impact.
Biodiversity priority areas	Features in the landscape that are important for conserving a representative sample of ecosystems and species, for maintaining ecological processes, or for the provision of ecosystem services. These are identified using a systematic spatial biodiversity planning process and include the following categories: Protected Areas, Critically Endangered and Endangered ecosystems, Critical Biodiversity Areas, Ecological Support Areas, and Focus Areas for land-based Protected Area expansion.
Category 1a Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as a species that must be combatted or eradicated. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. Landowners are obliged to take immediate steps to control Category 1a species.
Category 1b Listed Invasive Species	Species listed by notice in terms of section 70(1)(a) of the act, as species that must be controlled or 'contained'. These species are contained in Notice 3 of the AIS list, which is referred to as the National List of Invasive Species. However, where an Invasive Species Management Programme has been developed for a Category 1b species, then landowners are obliged to "control" the species in accordance with the requirements of that programme.
Category 2 Listed Invasive Species	Species which require a permit to carry out a restricted activity e.g. cultivation within an area specified in the Notice or an area specified in the permit, as the case may be. Category 2 includes plant species that have economic, recreational, aesthetic or other valued properties, notwithstanding their invasiveness. It is important to note that a Category 2 species that falls outside the demarcated area specified in the permit, becomes a Category 1b invasive species. Permit-holders must take all the necessary steps to prevent the escape and spread of the species.
Category 3 Listed Invasive Species	A species listed by notice in terms of section 70(1)(a) of the act, as species which are subject to exemptions in terms of section 71(3) and prohibitions in terms of section 71A of the act, as specified in the notice. Category 3 species are less-transforming invasive species which are regulated by activity. The principal focus with these species is to ensure that they are not introduced, sold or transported. However, Category 3 plant species are automatically Category 1b species within riparian and wetland areas.
CBA Maps	A map of Critical Biodiversity Areas and Ecological Support Areas based on a systematic biodiversity plan.
Connectivity	The spatial continuity of a habitat or land cover type across a landscape.
Corridor	A relatively narrow strip of a particular type that differs from the areas adjacent on both sides.
Critical Biodiversity Areas	Areas required to meet biodiversity targets of representivity and persistence for ecosystems, species and ecological processes, determined by a systematic conservation plan. They may be terrestrial or aquatic, and are mostly in a good

Definitions	
	ecological state. These areas need to be maintained in a natural or near-natural state, and a loss or degradation must be avoided. If these areas were to be modified, biodiversity targets could not be met.
Cumulative impact	Past, current and reasonably foreseeable future impacts of an activity, considered together with the impact of the proposed activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities.
Ecological condition	An assessment of the extent to which the composition, structure and function of an area or biodiversity feature has been modified from a reference condition of natural.
Ecological infrastructure	Naturally functioning ecosystems that generate or deliver valuable ecosystem services, e.g. mountain catchment areas, wetlands, and soils.
Ecological process	The functions and processes that operate to maintain and generate biodiversity.
Ecological Support Areas	An area that must be maintained in at least fair ecological condition in order to support the ecological functioning of a CBA or protected area, or to generate or deliver ecosystem services, or to meet remaining biodiversity targets for ecosystem types or species when it is not possible or necessary to meet them in natural or near natural areas. It is one of five broad categories on a CBA map, and a subset of biodiversity priority areas.
Ecosystem resilience	The ability of an ecosystem to maintain its functions (biological, chemical, and physical) in the face of disturbance or to recover from external pressures.
Ecosystem threshold	The tipping point where ongoing disturbance or change results in an irreversible change in its composition, structure and functioning. Surpassing ecosystem thresholds diminishes the quality and quantity of ecosystem services provided, rapidly reduces the ability of the ecosystem to sustain life, and results in less resilient ecosystems.
Ecosystem services	The benefits that people obtain from ecosystems, including provisioning services (such as food and water), regulating services (such as flood control), cultural services (such as recreational benefits), and supporting services (such as nutrient cycling, carbon storage) that maintain the conditions for life on Earth.
Edge	The portion of an ecosystem or cover type near its perimeter, and within which environmental conditions may differ from interior locations in the ecosystem.
Endemic	Restricted or exclusive to a particular geographic area and occurring nowhere else. Endemism refers to the occurrence of endemic species.
Exempted Alien Species	An alien species that is not regulated in terms of this statutory framework - as defined in Notice 2 of the AIS List.
Forbs	Herbaceous plants with soft leaves and non-woody stems.
Fragmentation	The breaking up of a habitat or cover type into smaller, disconnected parcels, often associated with, but not equivalent to, habitat loss.
Geophyte	Perennial plants having underground organs, such as bulbs, corms or tubers.
Hotspot	An area characterised by high levels of biodiversity and endemism, and that faces significant threats to that biodiversity.
Habitat	The area of an environment occupied by a species or group of species, due to the particular set of environmental conditions that prevail there.
Habitat loss	Conversion of natural habitat in an ecosystem to a land use or land cover class that results in irreversible change to the composition, structure and functional characteristics of the ecosystem concerned.
Prohibited Alien Species	An alien species listed by notice by the Minister, in respect of which a permit may not be issued as contemplated in section 67(1) of the act. These species are

Definitions	
	contained in Notice 4 of the Alien Invasive Species List, which is referred to as the List of Prohibited Alien Species.
Mitigate	The implementation of practical measures to reduce adverse impacts or enhance beneficial impacts of an action.
"No-Go" option	The “no-go” development alternative option assumes the site remains in its current state, i.e. there is no construction of a WEF and associated infrastructure in the proposed project area.
Patch	A surface area that differs from its surroundings in nature or appearance.
Red List	A publication that provides information on the conservation and threat status of species, based on scientific conservation assessments.
Rehabilitation	Less than full restoration of an ecosystem to its pre-disturbance condition.
Restoration	To return a site to an approximation of its condition before alteration.
Riparian	The land adjacent to a river or stream that is, at least periodically, influenced by flooding.
Runoff	Non-channelized surface water flow.
Succulent	Plants that have some parts that are more than normally thickened and fleshy, usually to retain water in arid climates or soil conditions.
Species of special / conservation concern	Species that have particular ecological, economic or cultural significance, including but not limited to threatened species.
Systematic biodiversity conservation planning	Scientific methodology for determining areas of biodiversity importance involving: mapping biodiversity features (such as ecosystems, species, spatial components of ecological processes); mapping a range of information related to these biodiversity features and their condition (such as patterns of land and resource use, existing protected areas); setting quantitative targets for biodiversity features, analysing the information using GIS; and developing maps that show spatial biodiversity priorities. Systematic biodiversity planning is often called ‘systematic conservation planning’ in the scientific literature.
Threatened ecosystems	An ecosystem that has been classified as Critically Endangered, Endangered or Vulnerable, based on analysis of ecosystem threat status. A threatened ecosystem has lost, or is losing, vital aspects of its structure, composition or function. The Biodiversity Act makes provision for the Minister or Environmental Affairs, or a provincial MEC of Environmental Affairs, to publish a list of threatened ecosystems.
Threatened species	A species that has been classified as Critically Endangered, Endangered or Vulnerable, based on a conservation assessment using a standard set of criteria developed by the IUCN for determining the likelihood of a species becoming extinct. A threatened species faces a high risk of extinction in the near future.

COMPLIANCE WITH SPECIES SPECIFIC PROTOCOLS AS PER GN. 1150 OF 30 OCTOBER 2020

Requirements of Animal and Plant Species Protocol – GN. 1150 30 October 2020 for Very High or High Site Sensitivity	**Section of specialist report addressing requirement**
This report must include as a minimum the following information:	
Contact details and relevant experience as well as the SACNASP registration number of the specialist preparing the assessment including a curriculum vitae;	**Appendix 7**
A signed statement of independence by the specialist;	**See Specialist Declaration on page vii and viii**
A statement on the duration, date and season of the site inspection and the relevance of the season to the outcome of the assessment;	**See Section 3: Site Visit and Sampling Methodology**
A description of the methodology used to undertake the site sensitivity verification, impact assessment and site inspection, including equipment and modelling used where relevant;	**Section 3, Section 4 and Section 5**
A description of the mean density of observations/number of sample sites per unit area and the site inspection observations;	**Section 6 and Section 7**
A description of the assumptions made and any uncertainties or gaps in knowledge or data;	**See Assumptions and Limitations**
Details of all SCC found or suspected to occur on site, ensuring sensitive species are appropriately reported;	**Section 6 and Section 7**
The online database name, hyperlink and record accession numbers for disseminated evidence of SCC found within the study area;	**Section 6**
The location of areas not suitable for development and to be avoided during construction where relevant;	**Section 8**
A discussion on the cumulative impacts;	**Section 8**
Impact management actions and impact management outcomes proposed by the specialist for inclusion in the Environmental Management Programme (EMPr);	**Section 8**
A reasoned opinion, based on the findings of the specialist assessment, regarding the acceptability or not of the development and if the development should receive approval or not, related to the specific theme being considered, and any conditions to which the opinion is subjected if relevant; and	**Section 8.9 and Section 9**
A motivation must be provided if there were any development footprints identified as per paragraph above that were identified as having “low” or “medium” terrestrial animal species sensitivity and were not considered appropriate.	**Section 1**

HARRY GWALA DISTRICT MUNICIPALITY

PROPOSED CONSTRUCTION AND UPGRADE OF THE GREATER MNQUMENI WATER SUPPLY SCHEME IN HARRY GWALA DISTRICT MUNICIPALITY, KWAZULU-NATAL PROVINCE

DRAFT TERRESTRIAL ECOLOGICAL ASSESSMENT REPORT

1 INTRODUCTION

SiVEST SA (Pty) Ltd, has been appointed by GIBB (Pty) Ltd to undertake a Terrestrial Biodiversity Assessment Report, for the proposed upgrade of bulk water infrastructure and construction of a new water abstraction point, access road and rising main, at the Ibisi River abstraction point and Water Treatment Works, within the Umzimkhulu Local Municipality, Harry Gwala District Municipality.

The original abstraction point was damaged during floods and is no longer able to supply water in a consistent manner. Therefore, a new permanent abstraction point, access road and rising main are proposed.

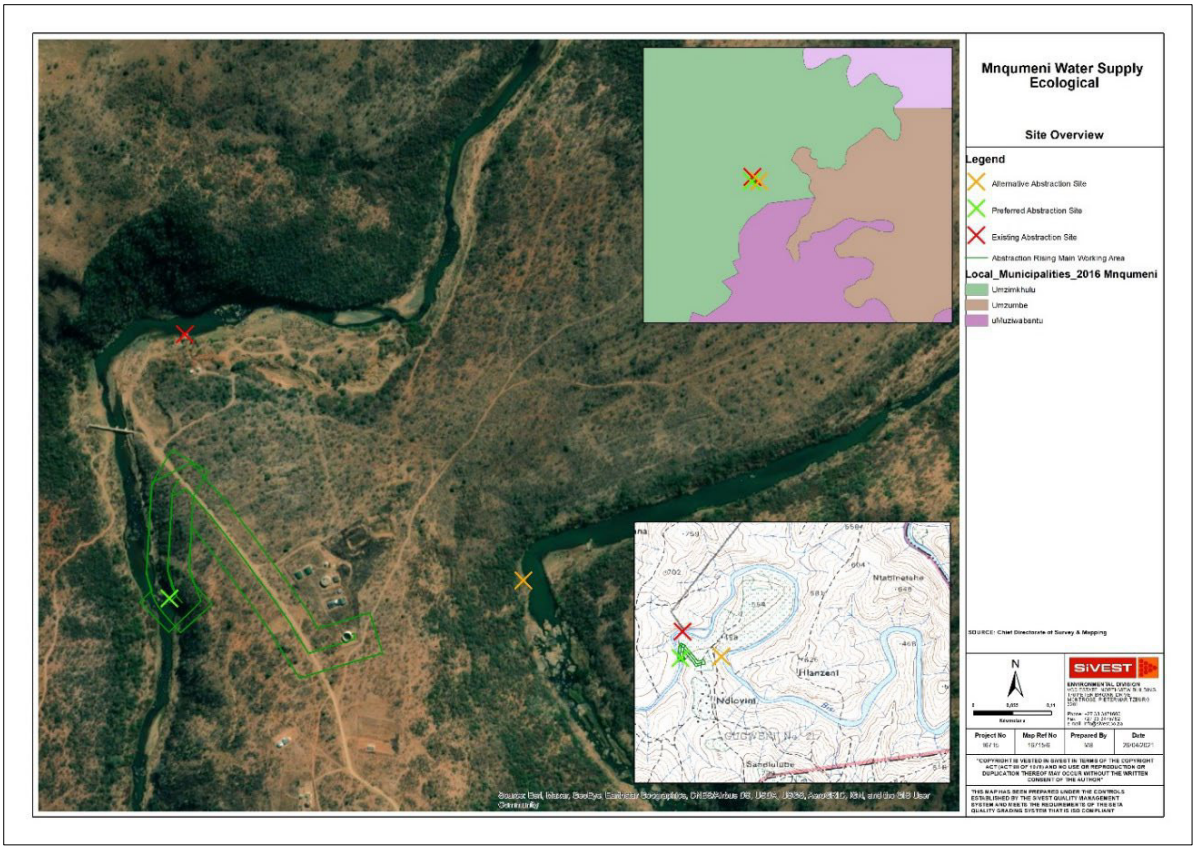

Figure 1: Site overview.

Please note, although a site inspection showed site sensitivity to be medium to low, a full Terrestrial Impact Assessment was undertaken as species of conservation concern could potentially occur on site; as per section 4.6 of the Plant / Animal Species Protocols of Government Notice No. 1150 of 30 October 2020, “Where SCC are found on site or have been confirmed to be likely present, a Terrestrial Plant / Animal Species Specialist Assessment must be submitted in accordance with the requirements specified for “very high” and “high” sensitivity in this protocol.”

2 PROJECT BACKGROUND

The Harry Gwala District Municipality (formerly Sisonke District Municipality) undertook the Santombe Water Supply project in 2009. The project entailed the development of a water supply scheme for the villages of Masameni, Mnqumeni, Ndlovini and Ehlanzeni in the Umzimkhulu Local Municipality. The scheme is supplied via a run of river abstraction on the Ibisi River and a 2Mℓ/day Water Treatment Works (WTW) located approximately 450m from the river abstraction site (GIBB, 2021).

Originally the Santombe WSS was developed to incorporate the villages in the area into a single centralised scheme as the existing independent schemes did not have a reliable water supply, as most of the villages were supplied either by public standpipes or yard taps supplied via borehole schemes, which dried up seasonally and experienced significant vandalism. Unfortunately, due to a number of reason the Santombe Water Supply System currently functions poorly, with most of the villages still without any reliable supply of water (GIBB, 2021).

As such, the Harry Gwala District Municipality (HGDM) appointed GIBB (Pty) Ltd (GIBB) to assess the existing system and identify options to address the operational failures and evaluate how best to supply the existing system and ensure that all villages receive water in accordance with the water supply standards adopted by HGDM (GIBB, 2021).

A result of the assessment conducted by GIBB, was that a new river abstraction works and refurbishment of existing pipelines, reticulation and pumping stations and WTW was immediately required. In this regard, two abstraction alternatives, one rising main, an overhead powerline routed to the abstraction pumphouse, and one access road alternative were presented to SiVEST, to assess for a Basic Assessment Report.

As such, this Terrestrial Ecological Report has assessed various aspects of the terrestrial ecology and provided recommendations. A similar report has been prepared for the aquatic ecosystems.

In terms of the ecological assessment, fieldwork was focused on the pipeline routings provided by GIBB.

3 SITE VISIT AND SAMPLING METHODOLOGY

The site visit was undertaken on the 27th April 2021 by Mark Summers and Jake Alletson. The weather conditions were warm (approximately 30°C) and windy. The study was undertaken in Autumn, however good rains have meant that vegetation could still be identified by leaves and remnant flowers.

3.1 Vegetation Sampling

A random vegetation sampling technique and "hotspot1" assessment technique was utilised, which focused the sampling effort on areas with natural vegetation or where the vegetation was dominated by indigenous species (i.e. not comprising a large proportion of alien invasive plant species). Individual plant species observed during the assessment were recorded to give an indication of species diversity and the overall species assemblage.

The sampling procedure proposed for this study is satisfactory for providing a general overview and rapid assessment of the plant diversity and assemblages that occur on site. This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment and to assess the possible impacts that may be imparted as a result of the proposed activities.

3.2 Faunal Sampling

The following methodology was used when sampling.

- Taxa specific lists were compiled with the use of databases such as the Animal Demographic Unit (ADU) Virtual Museum. These lists were compared with species seen on site visits.
- All site data was collated for the general area with a focus on the various alternatives presented, which gave an overall site assessment;
- Verification of fauna on site was done per taxa with a focus on movement, foraging, nesting and sites.
- Point count bird surveys, with a clear view of the surrounding vegetation, and walk through surveys were conducted in all of the habitat types around proposed development. Birds were identified visually or by their vocalisation.
- Active searches for reptiles and amphibians were conducted within habitats likely to harbour or be important for species.

The sampling procedure proposed for this study is satisfactory for providing a general overview and rapid assessment of the faunal diversity and assemblages that occur on site. This methodology allows sufficient information to be gathered to make the necessary inferences as to the ecological state of the receiving environment and to assess the possible impacts that may be imparted as a result of the proposed activities as well as the provision for rehabilitation recommendations and landscape management plans.

[1] **Hotspot in this context refers to areas in the landscape, such as rocky outcrops and wetlands that supply refugia to plant species that would otherwise not exist in said landscape due to disturbance**.

4 REGULATIONS GOVERNING THIS REPORT & LEGISLATION

The following legislation was consulted:

- National Environmental Management Act, Act No. 107 of 1998 (NEMA);
- National Forests Act (Act No. 84 of 1998);
- Terrestrial Plant and Animal Species Protols, Government Notice No. 1150 of 30 October 2020;
- Environment Conservation Act No. 73 of 1989, Amendment Notice No. R1183 of 1997;
- National Environmental Management: Biodiversity Act (Act No. 10 of 2004);
- Conservation of Agricultural Resources (Act No. 43 of 1983) as amended in 2001;
- International Union for Conservation of Nature (IUCN).

4.1 Permit / Licence requirements:

In terms of the National Forests Act, 1998 (Act No. 84 of 1998) and Government Notice 1339 of 6 August 1976 (promulgated under the Forest Act, 1984 (Act No. 122 of 1984) for protected tree species), the removal, relocation or pruning of any protected plants; or, three or more indigenous trees whose crowns are largely contiguous will require a Department of Agriculture, Fisheries and Forestry (DAFF) license.

Protected indigenous plants in general are controlled under the relevant provincial Ordinances or Acts dealing with nature conservation. In KZN the relevant statute is the 1974 Provincial Nature Conservation Ordinance. In terms of this Ordinance, a permit must be obtained from Ezemvelo KZN Wildlife to remove or destroy any plants listed in the Ordinance.

For a full list of legistation requirements, please contact the Specialist.

5 DESKTOP ASSESSMENT

One of the major advantages that technology has provided is the access to information. As a result of this and the ongoing pursuance of environmental knowledge, databases which can be interrogated to provide general information regarding the site have been developed.

This information in turn potentially predicts what may occur on the site and the site's value from a regional / provincial perspective in terms of conservation and biodiversity.

The caveat here is that the majority of these databases are created at a **landscape level**. In addition, the factors which are often utilised to determine many of the outputs are related to abiotic characteristics, such as rainfall, temperature, soil types, underlying geology, elevation and aspect.

The result, therefore, is the development of a database that provides a high level assessment of the area, which still requires **substantial ground-truthing** to illustrate the various components that comprise the landscape. The field survey may highlight areas of conservation significance and biodiversity richness as well as provide information regarding the *status quo;* and what consequences or concerns may be generated as a result of development.

A number of databases have been interrogated in the process of undertaking the Desktop Analysis. A summary of the methodology utilised for the generation of each of the databases has been tabulised below, with the description of the table available in **Appendix 8**.

Table 1: Databases Consulted in the Terrestrial Ecological Assessment

Database
Ezemvelo KZN Wildlife C-Plan & Sea Database
• Irreplaceability Analysis
• Critical Biodiversity Areas
• Ecological Support Areas
• Landscape Corridors
• Local Corridors
Bio Resource Units (BRU)
Environmental Potential Atlas
Mucina and Rutherford National Vegetation Types
KwaZulu – Natal Vegetation Types (KZN VT)
National Freshwater Ecosystem Priority Areas (NFEPA)
South African Bird Atlas Project 2
Animal Demographic Unit
• ReptileMAP
• FrogMAP
• MammalMAP
• LepiMAP

6 RESULTS OF THE DESKTOP ASSESSMENT

6.1 Department of Forestry, Fisheries and Environment Screening Tool

Plant sensitivity was identified as medium by the Screening Tool, with 13 species of conservation concern being noted as potentially occurring on site. Animal sensitivity was noted as low, with no species of conservation concern noted by the tool. These species are discussed in 7.2 below. Terrestrial biodiversity was noted to be Low.

The following sensitivities were identified by the DFFE Online Screening Tool, and have been interrogated in the assessment below:

Table 2: Environmental sensitivity themes

Theme	Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
Agriculture Theme			X	
Animal Species Theme				X
Aquatic Biodiversity Theme				X
Archaeological and Cultural Heritage Theme				X
Civil Aviation Theme				X
Defence Theme				X
Paleontology Theme			X	
Plant Species Theme			X	
Terrestrial Biodiversity Theme				X

Table 3: DFFE plant species potentially occurring on site.

Feature	Red List Status
Sensitive species 1252	Vulnerable
Sensitive species 685	Vulnerable
Sensitive species 1076	Vulnerable
Sensitive species 1251	Vulnerable
Sensitive species 535	Endangered
Sensitive species 1248	Vulnerable

Feature	Red List Status
Sensitive species 944	Vulnerable
Sensitive species 191	Vulnerable
Asclepias schlechteri	Endangered
Helichrysum pannosum	Endangered
Disperis woodii	Vulnerable
Senecio dregeanus	Vulnerable
Prunus africana	Vulnerable

6.2 Desktop vegetation description

6.2.1 C-Plan Biodiversity Features / Species within Project Area

The desktop analysis indicated that the site is classified as 0.05 (i.e. all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site) and the Minset analysis mirrors the C-Plan data with the area being deemed as not requiring protection. The CBA maps indicate that the area is natural with CBA Irreplaceable to the east of the rising main routing (**Figure 2**). Please note, should the Alternative Abstraction Site be chosen, it is likely that the rising main and associated access road will traverse a CBA Irreplaceable area.

In terms of the SEA and C-Plan data generated, through the physical characteristics that are present on site, a number of groups have been identified as potentially present on the site, and these groups are wholly significant in terms of conservation significance or parts thereof. The Tables below identify which groups are significant.

Table 4. SEA Data taken from Ezemvelo KZN Wildlife

YES	NO
Protected Landscapes	Protected Forests
	Protected Grasslands
	Important Vegetation Community
	Wetlands
	Protected Ecosystems and Communities
	Frogs
	Birds
	Blue Swallow
	Wattled Crane
	Invertebrates
	Mammals
	Oribi
	Medicinal Plants
	Reptiles
	Plants
	Protected Species

Table 5. TSCP Minset Data taken from Ezemvelo KZN Wildlife

Species name	Type
Eastern Valley Bushveld	Vegetation Type
Dry Ngongoni Veld	Vegetation Type
Odontomelus eshowe	Grasshopper
Gulella euthymia	Mollusc
Gulella separata	Mollusc
Doratogonus falcatus	Millipede
Spinotarsus maritzburgensis	Millipede
Spinotarsus destructus	Millipede
Doratogonus infragilis	Millipede
Patinatius bidentatus simulator	Millipede

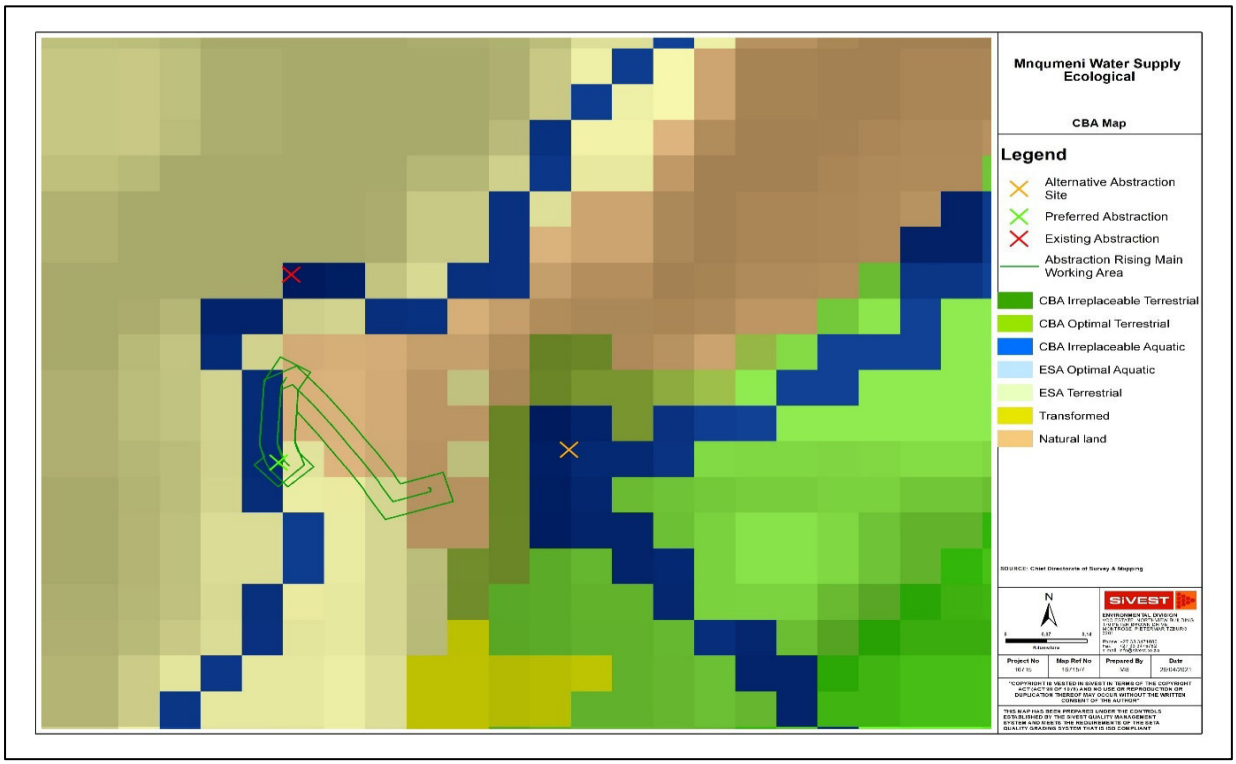

Figure 2: CBA Map

6.2.2 Bio Resource Units (BRU)

The Bioresource unit for the site is as follows:

Tb13 – Ubambulo
Bioresource Group 21: "Valley Bushveld".
BRG Subgroup 21.11.

Vegetation pattern: The vegetation consists of bushland and bushland thicket.
Indicator Species: No indictaor species have been specified.

The rainfall average is 688 mm per annum. The mean temperature is 18.3^{0}C and the climate rating is C3, slightly restricted growing season due to the occurrence of low temperatures and frost. The erosion rating for the site is 4.5, which translates to a high of erosion.

There are two perennial rivers, the Bisi River and the Mzimkhulu River. Please note there are a number of drainage lines, non-perennial streams and wetlands that are not captured at the coarse level at which this data has been defined.

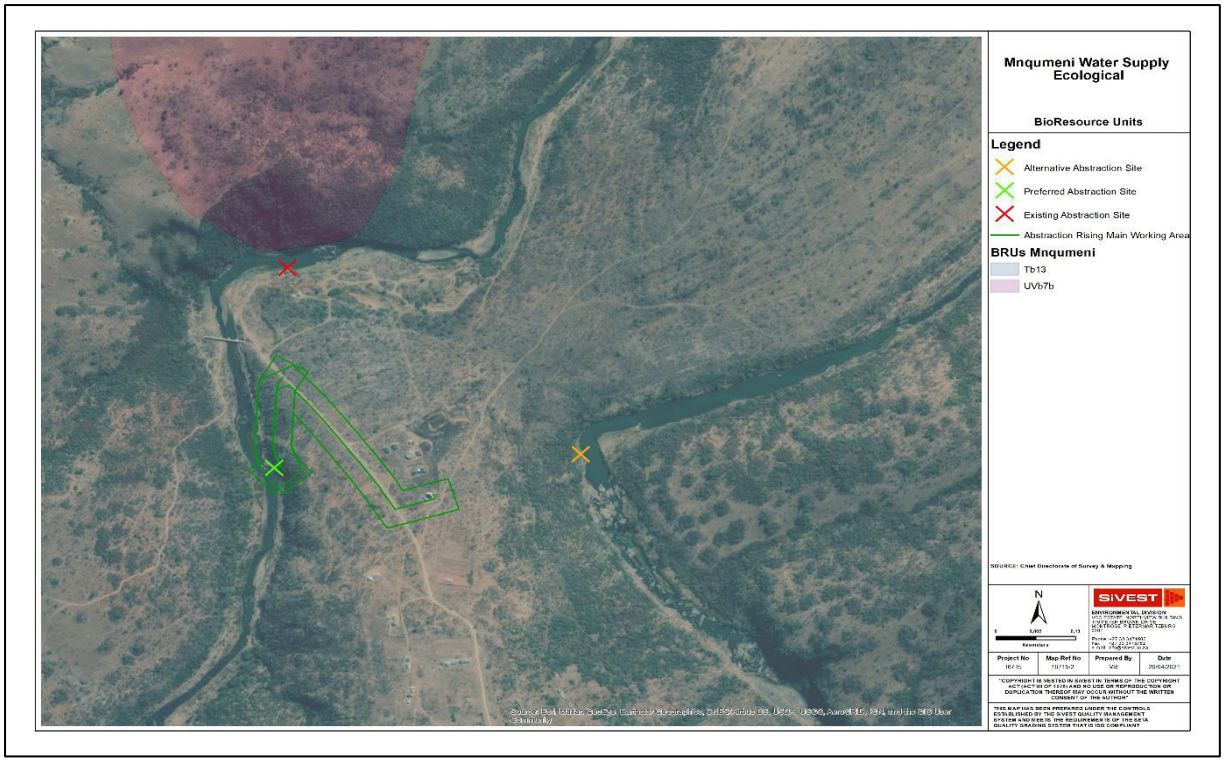

Figure 3: BRU Map

6.2.3 Environmental Potential Atlas

Soils of intermediate suitability for arable agriculture where climate permits.

The ENPAT data provides the following information about the geology for the site:
The geology of the site is comprised mainly granite, with small areas of tillite of the Dwyka Formation, sandstone of the Natal Group, dolerite and alluvium.

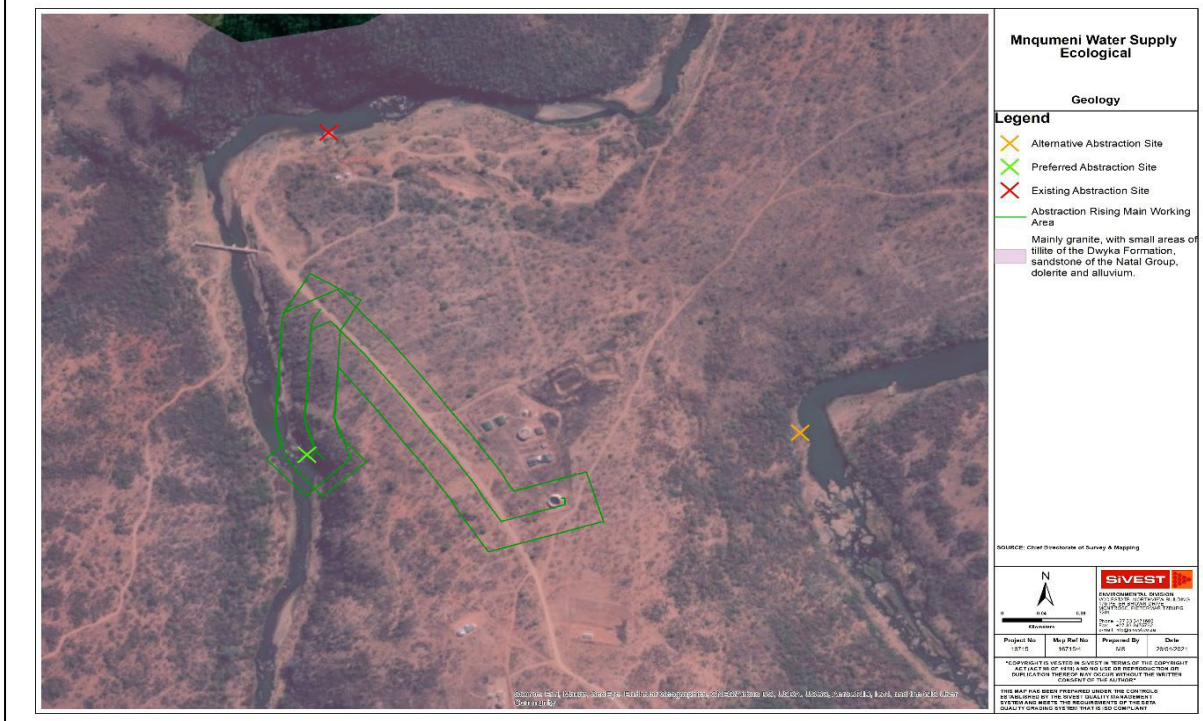

Figure 4: Geology Map

The ENPAT data provides the following information about the soils for the site:
Glenrosa and/or Mispah forms (other soils may occur), lime rare or absent in upland soils but generally present in low lying soils.

Figure 5: Soils Map

6.2.4 Mucina and Rutherford's Vegetation and KZN Vegetation Types

The classification of vegetation on site, is made at a very coarse scale, i.e. low resolution and falls within the Eastern Valley Bushveld (SVs 6) which is Least Threatened. In this case the KZN Wildlife Vegetation Type, and VegMap 2018 is the same.

Distribution KwaZulu-Natal and Eastern Cape Provinces: Deeply incised valleys of rivers including the lower reaches of the Thukela, Mvoti, Mgeni, Mlazi, Mkhomazi, Mzimkulu, Mzimkulwana, Mtamvuna, Mtentu, Msikaba, Mzimvubu (and its several tributaries), Mthatha, Mbhashe, Shixini, Qhorha and Great Kei. Very seldom extending to the coast. Altitude 100–1 000 m.

Vegetation & Landscape Features Semideciduous savanna woodlands in a mosaic with thickets, often succulent and dominated by species of Euphorbia and Aloe. Most of the river valleys run along a northwest-southeast axis which results in unequal distribution of rainfall on respective north-facing and south-facing slopes since the rain-bearing winds blow from the south. The steep north-facing slopes are sheltered from the rain and also receive greater amounts of insolation adding to xerophilous conditions on these slopes.

Important Taxa Tall Trees: *Acacia robusta, Sclerocarya birrea subsp. caffra. Small Trees: Acacia natalitia (d), A. nilotica (d), Combretum molle (d), Spirostachys africana (d), Acacia tortilis subsp. heteracantha, Berchemia zeyheri, Boscia albitrunca, Brachylaena elliptica, Cussonia spicata, Dombeya rotundifolia, Encephalartos natalensis, E. villosus, Hippobromus pauciflorus, Schotia brachypetala, Ziziphus mucronata. Succulent Trees: Euphorbia tirucalli (d), Aloe marlothii subsp. marlothii, A. rupestris, Euphorbia ingens, E. triangularis.* Tall Shrubs: *Dichrostachys cinerea (d), Calpurnia aurea, Coddia rudis, Ehretia rigida subsp. rigida, Euclea crispa subsp. crispa, Grewia occidentalis, Olea europaea subsp. africana.* Succulent Shrubs: *Aloe arborescens, Euphorbia grandicornis, Kleinia fulgens.* Soft Shrubs: *Hypoestes aristata, Peristrophe cernua*. Woody Climber: *Acacia brevispica subsp. dregeana.* Herbaceous Climber: *Ischnolepis natalensis*. Graminoids: A*ristida congesta (d), Eragrostis curvula (d), Hyparrhenia hirta (d), Melinis repens (d), Panicum maximum (d), Themeda triandra (d), Cymbopogon pospischilii, Eragrostis superba, Heteropogon contortus, Panicum deustum, Sporobolus fimbriatus, S. pyramidalis, Tristachya leucothrix, Urochloa mosambicensis.* Herbs: *Achyranthes aspera, Hibiscus pedunculatus.* Geophytic Herb: *Sansevieria hyacinthoides.*

Endemic Taxa Tall Shrub: *Bauhinia natalensis*. Succulent Herb: *Huernia pendula*.

Conservation Least threatened. Target 25%. Only 0.8% statutorily conserved, mainly in the Luchaba Wildlife Reserve; small patches also conserved in the Oribi Gorge Nature Reserve. Some 15% transformed mainly by cultivation. Alien plant invasions are a serious threat, with *Chromolaena odorata*, *Lantana camara* and *Caesalpinia decapetala* being most problematic.

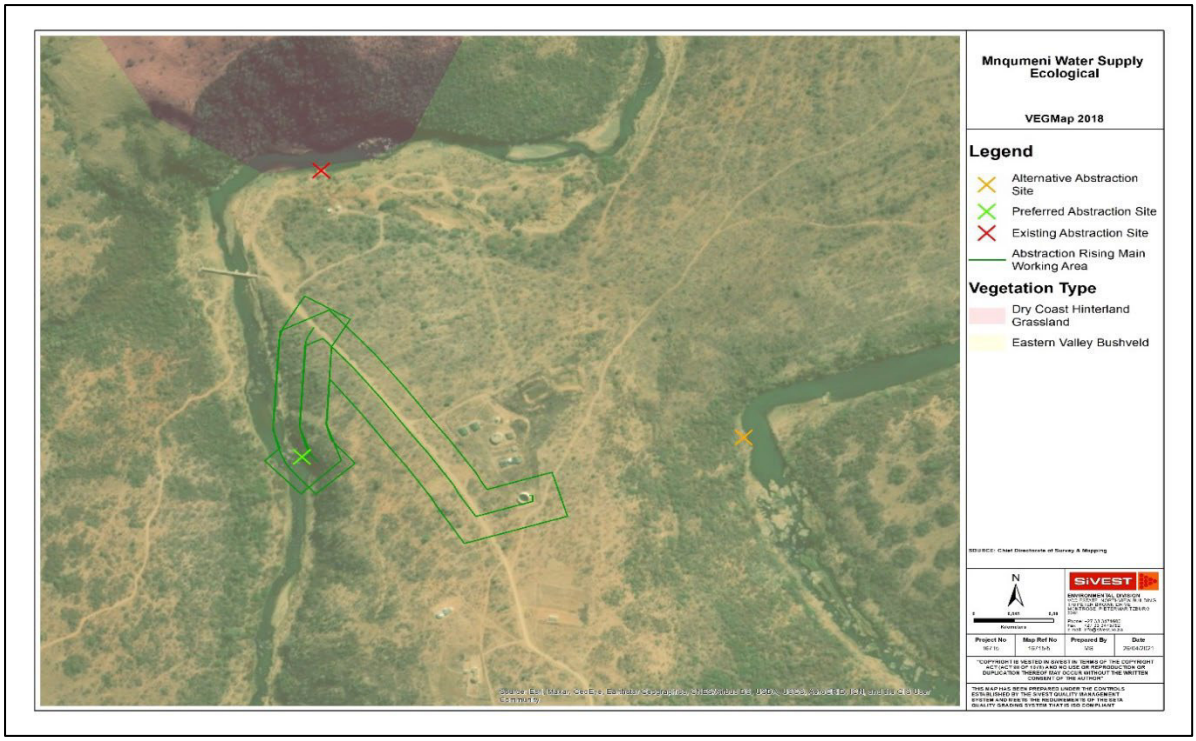

Figure 6: VegMap 2018 vegetation types.

6.2.5 National Freshwater Ecosystem Priority Areas (NFEPA) - SAIIAE

The Bisi River and floodlplain is considered a NFEPA Wetland and River. The South African Inventry of Inland Aquatic Ecosystems database identifies the Present Ecological State as Class C: Moderately Modified.

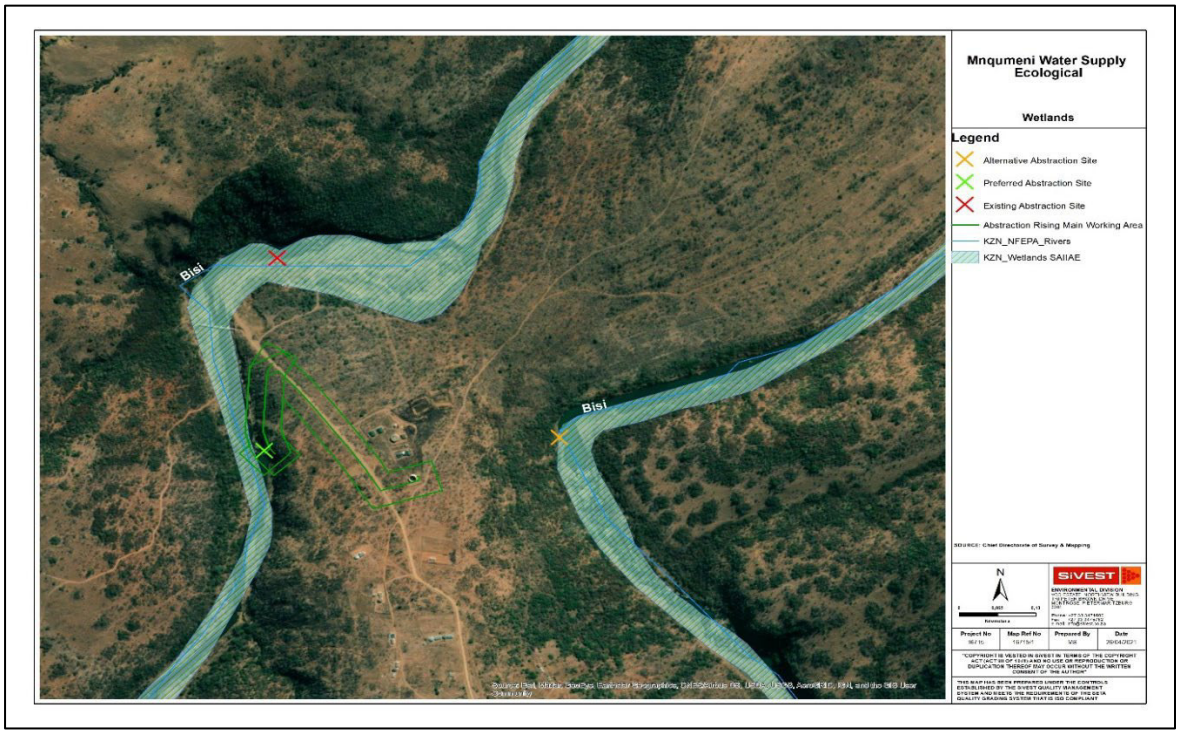

Figure 7: NFEPA / SAIIAE Wetland Map

6.3 Desktop faunal description

Databases allow for the rapid assessment of species which are predicted to occur in an area. These databases are compiled using verified citizen science observations, as well as correlating species and their habitat requirements and assigning the result to a habitat type. This results in species predicted for an area. These databases are continually updated and verified by the Animal Demographic Unit at the Fitzpatrick Institude of African Ornithology, University of Cape Town. This may often result in a wide paucity in data as no previous observations have been made in an area, resulting in no predicted data for that species in that area. This means that verification of faunal data is essential in filling in gaps that may occur at desktop level. Desktop data for the area around the Mnqumeni site is seen as relatively inaccurate due to low reporting rates and full protocols achieved within the study area for the various Animal Demographic Unit and South African Bird Atlas Project databases.

6.3.1 Critically Biodiverse Areas

Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely *Irreplaceable* and *Optimal*. Each of these can in turn be subdivided into additional subcategories. The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved.

Please see section 6.2.1 for a description of the CBA within the study site.

6.3.2 South African Bird Atlas Project 2

The South African Bird Atlas Project 2 (SABAP 2) Database was queried to determine which bird species have been recorded within the greater study area. Please note that the data represents a minimum presence ratio, which indicates species that have been recored in the area. This does not mean that other species do not occur in the pentad. Further to this, a good guidline to use for an accurate estimate of minimum presence ratio, is if more than 7-10 lists have been submitted for a pentad. Please note, only 2 lists were submitted for the pentad of the site (3025_3000), therefore a reference site was chosen (3030_2955), which was situated diagonally across from the site and exhibited similar geography and vegetation types. The reference site data was supplemented with species that were unique to the study site.

The complete list includes 207 species as listed in **Appendix 2** (4 new species for the pentad), with 27 species being confirmed on site (highlighted in **bold in Appendix 2**). Conservation status is given for Red Data Species on a Regional Basis as per the 2015 Eskom Red Data Book of Birds of South Africa (Taylor, 2015), where 8 potential Red Data species occur in the study area (**Table 6**). No Red Data species were identified during the assessment, with Lanner Falcon being the only species predicted to occur on site. No Important Bird Area fall within 10km of the proposed development, as defined by BirdLife South Africa (2018).

Table 6: Red Data avifaunal species predicted to occur on site (LC = Least Concerned, NT = Near Threatened, VU = Vulnerable, EN = Endangered, FP = Full Protocol, FPn = Full Protocol number).

Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Balearica regulorum	Grey Crowned Crane	EN, EN	35.2941	6	2020/10/25
Gyps coprotheres	Cape Vulture	EN, EN	17.6471	3	2020/10/25
Circus ranivorus	African Marsh-harrier	EN, LC	23.5294	4	2011/01/16
Bucorvus leadbeateri	Southern Ground-hornbill	EN, VU	5.8824	1	2010/04/25
Buteo trizonatus	Forest Buzzard	LC, NT	0	0	-
Sagittarius serpentarius	Secretarybird Secretarybird	VU, EN	0	0	-
Falco biarmicus	Lanner Falcon	VU, LC	23.5294	4	2020/10/25
Neotis denhami	Denham's Bustard	VU, NT	11.7647	2	2020/07/25

6.3.3 ReptileMAP

The Animal Demographic Unit's (ADU) ReptileMAP predicts that 15 reptile species occur within the greater study area. These are listed in **Appendix 3**, with no species seen during the assessment, and no species of conservation concern potentially occur within the study area.

6.3.4 FrogMAP

The ADU's FrogMAP predicts that 10 species of amphibians occur within the greater study area. The full list of amphibians predicted to be within the study area can be found in **Appendix 4**. Angola River Frogs (*Amietia angolensis*) were seen by the Aquatic Ecologist along the Bisi River bank. No species of conservation concern were predicted to occur.

6.3.5 MammalMAP

The ADU's MammalMAP predicts that 9 species of mammal occur within the study area (full list in **Appendix 5**). One species of mammal of conservation concern are predicted to occur within the greater study area, (**Table 7**). No mammal species was seen.

Table 7: Red List Mammal species predicted to occur within the study area.

Scientific name	Common name	Red list category	Number of records	Last recorded
Myosorex cafer	Dark-footed Mouse Shrew	Vulnerable (2016)	4	1986/12/17

6.3.6 LepiMAP

According to the ADU's LepiMAP, 82 species of lepidoptera are predicted to occur within the greater study area (full list in **Appendix 6**). **Three species** were seen on site, none of which are classified as species of conservation concern.

7 RESULTS OF FIELD ASSESSMENT

7.1 Vegetation Description

The study site is located within the Umzimkhulu Local Municipality, within 17km as the crow flies of the town of Harding. The area is surrounded by low density communal homesteads and communal grazing areas associated with the rural nature of the site. Free ranging livestock consisting of cattle and goats are unrestricted and roam over the general area. No erosion channels were identified around the study site, however the road leading to the WTW did have erosion channels due to stormwater flow. Very few alien and invasive species were identified in the assessment, classifying the site as natural.

According to Mucina and Rutherford 2006, the site is classified as Eastern Valley Bushveld (SVs6) which is a Least Threatened vegetation type. Upon undertaking the groundtruthing exercise it was found that site comprises mostly of indigenous secies, although species diversity was relatively low.

The preferred access point is located on a rocky outcrop / ledge, with a relatively steep slope running directly up the hill. The design Engineers (GIBB) have proposed to reduce the gradient by aligning the access road and rising main along the contour of the slope. The alternative site is located further away from the WTW and has a higher constant gradient, resulting in increased erosion risk and more vegetation clearance.

A total of 37 plant species were recorded during the field survey, of which 6 were alien. Two plant species fall under the KwaZulu-Natal Nature Conservation Management Act were noted within the development footprint (*Asparagus spp., Aloe ferox*).

7.1.1 Preferred rising main and associated access road

Vegetation associated with the abstraction point and steep west facing slope comprises of mixed layers of tress, up to 2.5m, shrubs up to 1.5m and an herbaceous and graminoid layer up to 1m in height (**Plate 1**). Diversity in this section of the proposed abstraction point and rising man was higher than the rest of the routing which runs parallel to the existing access road. The steepness of the slope prevents larger livestock like cattle from over-utilising this section of the rising main.

Plate 1: Typical vegetation growth profile the west facing slope by the abstraction point.

Tree species identified in the west facing slope portion of the rising main included but was not limited to Sickle Bush (*Dichrostachys cinerea*), Weeping boer-bean (*Schotia brachypetala*), River Bush Willow (*Combretum erythrophyllum*), Blue Spike-thorn (*Gymnosporia glaucophylla*), Scrambling Fig (*Ficus burtt-davyi*) and Natal Thorn (*Vachellia natalitia*), **Plate 2**.

Plate 2: From to left to bottom right, Sickle Bush, River Bush Willow, Blue Spikethorn and Scrambling Fig.

Further species noted in proximity to the western facing slope and valley line included Blue Guarri (*Euclea crispa*), River Euphorbia (*Euphorbia triangularis*), Rubber Euphorbia (*Euphorbia tirucalli*), Velvet Wild-medlar (*Vangueria infausta*) and Bitter Aloe (*Aloe ferox* – EKZNW Protected Species), **Plate 3**.

Plate 3: Top left to bottom right, Blue Guarri, River Euphorbia, Rubber Euphorbia, Velvet Wild-medlar and Bitter Aloe (EKZNW protected species).

The shrub layer, which was relatively constant through the site, comprised of sapling Sickle Bush, Natal Thorn, Wag-'n-bietjie (*Senegalia ataxacantha*), Hairy Puzzle-bush (*Ehretia obtusifolia*), and Small Bone-apple (*Coddia rudis*), **Plate 4**.

Plate 4: From left to right, Hairy Puzzle-bush and Small Bone-apple.

The herbaceous layer has a sparse diversity, with species including Wild Foxglove (*Ceratotheca trilobal*), *Dicliptera clinopodia*, Bush Violet (*Barleria obtusa*), *Asparagus spp.* (EKZNW Protected Species) and Netabos (*Kalanchoe rotundifolia*).

Plate 5: Wild Foxglove (*Ceratotheca trilobal*), *Dicliptera clinopodia*, Bush Violet (*Barleria obtusa*) and Netabos (*Kalanchoe rotundifolia*).

Grass sward height was at a maximum of 1m, however tuft diameter and basal cover was low, which is likely due to the rocky nature of the soil layers, and potential overgrazing. Graminiod species were dominated by a mixture of Buffalo Grass (*Aristida congesta* subsp. *congesta*), Ngongoni Grass (*Arastida junciformis*), Weeping Love Grass (*Eragrostis curvula*), Broad-leaved Bluestem *Diheteropogon amplectans*, Silky Grass (*Imperata cylindrica*), Natal Redtop (*Melenis repens*), Rat's Tail Dropseed (*Sporobolus pyramidalis*) and Cat's Tail Dropseed (*Sporobolus pyramidalis*), **Plate 6**. These species are unpalatable and are mostly Increaser 2 species, meaning that they increase in abundance with an increase in overgrazing.

Plate 6: From left to right, top to bottom – Rats Tail Dropseed, Cat's Tail Dropseed, Natal Redtop and Silky Grass.

The alien and invasive component comprised of Paraffin Bush (*Chromolaena odorata*), Spiny Cockle Bur (*Xanthium spinosum*), Khaki Bush (*Tagetes minuta*) and Peanut Butter Cassia (*Senna didymobotrya*). Please note, these species increase with disturbance, therefore an Alien Invasive Control Plan is required.

7.1.2 Roadside vegetation for preferred routing

Roadside vegetation is dominated by Increaser 2 species grasses, as mentioned above, as well as woody plant encroachment by Sickle Bush (*Dichrostachys cinerea*), Natal Thorn, and Wag-'n-bietjie shrubs (**Plate 7**). These species prevail when overgrazing and a lack of fire burning regimes are implemented.

Plate 7: Roadside vegetation associated with the rising main and access road routing.

7.1.3 Alternative Abstraction Point

Vegetation on the direct routing and at the Alternative Asbtraction Point mirrored that of the above vegetation descriptions. Heavy bush encroachment by Sickle Bush limited movement and access around the proposed abstraction point (**Plate 8**). No sensitive features or species were identified at the Alternative Abstraction Point.

Plate 8: Heavy bush encroachment on route to the alternative abstraction point.

7.2 Species identified by the DFFE Screening Tool.

No species highlighted in the DFFE Screening tool were identified on site, therefore lowering the plant sensitivity to low. It must be noted that bulbs may not have been identified due to the sampling season.

7.3 Vegetation Assessment

Within the context of this vegetation assessment, conservation importance is broadly defined as the importance of the encountered vegetation communities as a whole, and the role these areas will fulfill in the preservation and maintenance of biodiversity in the local area. Biodiversity maintenance and importance are a function of the specific biodiversity attributes and noteworthiness of the vegetation communities in question and the biotic integrity and future viability of these features.

The biodiversity noteworthiness of the system is a function of the following:

- species richness/diversity;
- rarity of the system;
- conservation status of the system (endangered, least concern etc.);
- habitat (real or potential) for Red Data Species; and
- presence of unique and/or special features,

The integrity and future viability of the system is a function of the following:

- Extent of buffer around the system;
- Connectivity of system to other natural areas in the landscape;
- Level of alteration to indigenous vegetation communities within the system;
- Level of invasive and pioneer species encroachment system; and
- Presence of hazardous and/or obstructive boundaries to fauna.

The scores for each function of biodiversity maintenance were determined according to the scoring system shown in **Table 9** below. The scores were totaled and averaged to determine the biodiversity maintenance services score. Thereafter, the overall scores were rated according to the rating scale in **Table 10** below.

7.3.1 Vegetation Biodiversity Assessment

In terms of assessing the impacts of a proposed development on the receiving environment, it is vital that the current state of the environment is assessed, and the level at which it contributes currently, is considered and recorded.

An assessment matrix has been developed to assist in determining the current biodiversity and conservation value of the various vegetation types that were encountered during the field survey (SiVEST, 2013). In addition, the biodiversity noteworthiness of the receiving environment is considered (i.e. does the environment hold any rare species, protected species and unique landscape features) as well as the functional integrity and future sustainability of the vegetation types in the immediate vicinity of the development. The final condition score of each landscape is calculated adding the Biodiversity noteworthiness score with the Functional integrity and Sustainability score. It must be noted that the two scores are weighted 50:50% respectively.

Table 8. Biodiversity maintenance services score sheet (Template and Description)

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity	Low	Med-Low	Medium	Med-High	High
Rarity	Low	Med-Low	Medium	Med-High	High
Conservation Status	Least Concern	Near-Threatened	Vulnerable	Endangered	Critically Endangered
Red Data	No	-	-	-	Yes
Uniqueness / Special features	None	Med-Low	Medium	Med-High	High
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer	Low	Med-Low	Medium	Med-High	High
Connectivity	Low	Med-Low	Medium	Med-High	High
Alteration	>50%	25-50%	5-25%	1-5%	<1%
Invasive/pioneers	>50%	25-50%	5-25%	1-5%	<1%
Size	<1 ha	1 – 2 ha	3 - 10 ha	10 – 15 ha	>15 ha

Table 9. Rating Scale for Biodiversity Maintenance services based on Assessment scores

Score:	**0-0.8**	**0.9-1.6**	**1.7-2.4**	**2.5-3.2**	**3.3-4.0**
Rating of the likely extent to which a service is being performed	Low	Moderately Low	Intermediate	Moderately High	High

A total of 37 plant species were recorded during the field survey, of which 6 were alien. Two plant species fall under the KwaZulu-Natal Nature Conservation Management Act were noted within the development footprint (*Asparagus spp., Aloe ferox*).

Please note, the Biodiversity Noteworthyness and Future Integrity assessments have been combined for both the preferred and alternative options as the vegetation on both sites mirror that of each other.

Biodiversity noteworthiness

In terms of the vegetation classifications that were identified from the aerial photography and ground truthed on site, the following assessment was made in terms of the noteworthiness of the vegetation that would be immediately impacted upon by the proposed Development

Table 10. Biodiversity noteworthiness of the proposed development.

	Scores				
Biodiversity Noteworthiness	**0**	**1**	**2**	**3**	**4**
Diversity		✓			
Rarity	✓				
Conservation Status	✓				
Red Data Species					✓
Uniqueness / Special features	✓				
OVERALL VALUE	Total Score/number of categories is 5 / 5= **1**				

Functional Integrity and Sustainability

The Functional Integrity and Sustainability speaks to the impact of the proposed activity on the receiving environment. It also speaks to the likelihood that it will be of significance, and whether there are significant mitigation and or amelioration measures that are required to be put in place to ensure that the impacts are manageable, and will not prove deleterious to the vegetation type as a whole.

Table 11. Future Integrity and viability of the proposed development.

	Scores				
Integrity & Future Viability	**0**	**1**	**2**	**3**	**4**
Buffer	✓				
Connectivity			✓		
Alteration				✓	
Invasive/pioneers			✓		
Size			✓		
OVERALL VALUE	Total Score/number of categories is 9 / 5= **1.8**				

- The average score of the proposed development is **1,** which indicates that this area is functioning at a moderately low level.
- The average score of the proposed development is **2,** which indicates that integrity and future viability is at an intermediate level.

7.4 Faunal Description

7.4.1 Avifauna

A total of 27 bird species were seen during the sampling period. Species seen were skittish, suggesting that they are hunted. All species seen were in flight, however the majority of the species seen do not range over large distances. This assumes that these birds were using the sample site as a viable home range and movement corridor, which is understandable as the sample site has riverine, valley bushveld and grassland habitat, surrounded by hillsides. Additionally, the suite of birds seen tend to inhabit the above mentioned vegetation types. The sampling period time of the year was likely a limiting factor in species richness as migratory avifauna would no longer be present at the end of April. No species of conservation concern were identified during the assessment.

There is potential for Lanner Falcon (Vulnerable) to forage through the area, with cliff sides present on steep valley lines within the greater study area.

Ground Hornbill (Endangered) could potentially forage on the hillside grasslands and valley bushveld within and around the study area.

Cape Vulture (Endangered) are a wide ranging species and could potentially occur on site. This species roosts and nests along cliff ledges, however it is not expected that this species will roost or nest at the proposed site due to the abundance of available sites further down the Umzimkhulu River.

It is unexpected that the proposed development will result in loss of habitat for these species of conservation concern. The skittish behavior of the birds resulted in only one species being photographed, see **Plate 9.**

Plate 9: Blue Waxbill (*Uraeginthus angolensis*)

7.4.2 Herpetofauna

Herpetofauna include both reptiles and amphibians. Angola River Frog were seen along the river bank in relatively high abundances, meaning that this species is using the river and associated habitat for foraging and breeding. The Bisi River and associated floodplain within the site are available habitats for amphibians. Amphibians are indicators of ecosystem health due to their sensitivity to polluted aquatic environments. Amphibians reduce in abundance when there are elevated pollution levels in the ecosystem. It is likely that the area is host to Guttural Toads (*Sclerophrys gutturalis*), Delalande's River Frog (*Amietia delalandii*), Common Platanna (*Xenopus laevis*) and Painted Reed Frog (*Hyperolius marmoratus*).

No reptile species were seen during the assessment. Habitat for valley bushveld and floodplain reptile species is present, therefore common species such as Variable Skinks (*Trachylepis varius*), Spotted Bush Snakes (*Philothamnus semivariegatus*), Brown Water Snakes (*Lycodonomorphus rufulus*), and Red-Lipped Heralds (*Crotaphopeltis hotamboeia*) are expected to occur on site. Community members confirmed the presence of Nile Monitors (*Varanus niloticus*). No species of conservation concern were noted in site.

7.4.3 Mammals

No mammal species were seen during the site assessment. Grassland habitat at the top of the hills, and valley bushveld and floodplains associated with the Bisi River is available for species such as Black-backed Jackal (*Canis mesomelas*), Caracal (*Caracal caracal*) and Vervet Monkey (*Chlorocebus pygerythrus pygerythrus*) however these species are very sensitive to communal hunting, therefore it is unlikely that these species will occur on the application site. The Near Threatened Dark-Footed Mouse Shrew (*Myosorex cafer*) is highlighted to potentially occur in the floodplain associated with the Bisi River, however the Red List of Mammals of Southern Africa, Lesotho and Swaziland restrict this species habitat to moist densely vegetation forests and grasslands, (Willows-Munro et al. 2016), therefore it is

unlikely that this species occurs on site as this vegetation is not present. No further species of conservation concern are likely to occur on site.

7.4.4 Butterflies

One butterfly species and one moth species were seen on site. The butterfly species was a Twin Dotted Border (Least Concern, *Mylothris rueppellii haemus*, **Plate 10**), who's larval food is the Mistletoe *Tapinanthis rubromarginatus*, which was seen on the hillside slope in ptoximity to the preferred abstraction point. The moth species seen was the Macomo Ranger (Least Concern, *Kedeates macomo*, **Plate 6**), who's larval food is the grass species *Imperata cylindrica*, which was seen on the floodplain. Species predicted to occur within the study area according to LepiMAP can be found in **Appendix 6**.

Plate 10: A pair of Twin Dotted Border butterflies.

Plate 11: A moth species, the Macomo Ranger.

7.4.5 Other Species

TSCP Minset predicts that one grasshopper species (*Odontomelus Eshowe,* no further information), two mollusc species (*Gulella euthymia, Gulella separate*, both KZN Endemics, may be present but no further information available) and five millipede species to occur on site (*Doratogonus falcatus, Spinotarsus maritzburgensis, Spinotarsus destructus Doratogonus infragilis, Patinatius bidentatus simulator*). It must be noted that very little information is known on the above invertebrates, with their known distributions limited to a few locations. It is however unlikely that these species occur on site due to their very isolated distributions.

7.5 Faunal Probability of Occurrence

Fauna POC Assessment Summary

The potential occurrence of fauna of conservation significance for the study area were highlighted at a desktop level by investigating:

1) Biodiversity features for the study area highlighted in the Provincial Terrestrial Systematic Conservation Plan or CPLAN (EKZNW, 2010);
2) Species records found in the South African Bird Atlas Project 2 (SABAP2) database;
3) Available species records (ADU, 2020); and
4) Professional experience regarding rare/threatened amphibian species, reptiles and small mammals and their habitat requirements in KZN.

The findings of the desktop faunal potential of occurrence (POC) assessment have been summarised in terms of potential mammals, avifauna (birds), amphibians, reptiles and invertebrates of conservation concern (i.e. Red-Dated Listed Species: CR: Critically Endangered, EN: Endangered, VU: Vulnerable, NT: Near Threatened). Note that species of Least Concern (LC), endemic species and species with restricted ranges have been excluded from the assessment, with the focus being on Red-Data Listed (threatened) species.

Table 12: Faunal probability of occurrence.

Group	Scientific Name	Common Name	Threat Status (regional, global)	Habitat Requirements / Preferences (IUCN, 2017)	Requirements Met	POC
Avifauna	*Gyps coprotheres*	Cape Vulture	EN, EN	Flies long distances over open country, although usually found near steep terrain, where it breeds and roosts on cliffs.	Yes – cliff faces present in Umzimkhulu and Bisi Valley	Unlikely to occur on site unless brought in by a vulture restaurant
	Neotis denhami	Denham's Bustard	VU, NT	Inhabits grasslands, grassy Acacia-studded dunes, fairly dense shrubland, light woodland, farmland, crops, dried marsh and arid scrub plains, high rainfall sour grassveld, planted pastures and cereal croplands in fynbos in South Africa	Yes - Dense shrubland and grassland present, particularly at top of valley away from study site	Potentially likely to occur, in particular at the top of the Bisi Valley away from the proposed site.
	Bucorvus leadbeateri	Southern Ground-Hornbill	EN, VU	It inhabits woodland and savanna, the species fares well in protected areas where human threats are excluded and rural areas where cattle assist in maintaining their preferred short grass habitat	Yes - habitat types present	Likely – This species is wide ranging, however it is possible that this species may forage within the area, including the study site.
	Sagittarius serpentarius	Secretarybird	VU, VU	The species inhabits grasslands, ranging from open plains to lightly wooded savanna, but is also found in agricultural areas and sub-desert. It ranges from sea-level to 3,000 m	No - habitat not open enough at study site	Unlikely
	Buteo trizonatus	Forest Buzzard	LC, NT	This species inhabits native temperate forests from sea level up to 1,000 m. It can also be found in plantations, though usually near to areas of native forest	No – habitat not present	Unlikely
	Balearica regulorum	Grey Crowned Crane	EN, EN	Wetlands such as marshes, pans and dams with tall emergent vegetation, riverbanks, open riverine woodland, shallowly flooded plains and temporary pools with adjacent grasslands, open savannas, croplands, pastures, fallow fields and irrigated areas	No - habitat type not present	Unlikely
	Circus ranivorus	African Marsh Harrier	EN, LC	The species breeds in wetlands, foraging primarily over reeds and lake margins	No – habitat not present	Unlikely
	Falco biarmicus	Lanner Falcon	VU, LC	Forest, Savanna, Shrubland, Grassland, Rocky areas (eg. inland cliffs, mountain peaks), Desert, Artificial/Terrestrial	Yes – cliff sides, shrubland and rocky areas present	Likely - flying or hunting over the area
Mammals	*Myosorex cafer*	Dark-footed Mouse Shrew	Vulnerable (2016)	Found near water in subtropical swamps, coastal forests, grassland, wetland and reedbed habitats.	No - habitat not present	Unlikely
Invertebrates	*Gulella euthymia*	Warty hunter snail	KZN Endemic	No information	No information	No information
	Gulella separata	Jigsaw-piece hunter snail	KZN Endemic	No information	No information	No information
	Odontomelus eshowe	No information	No information	No information	No information	No information
	Doratogonus falcatus	Sickle-shaped black millipede	Least Concern	No information	No information	No information
	Spinotarsus destructus	Destructive slender spined millipede	No information	Under rocks and cattle dung	No information	No information
	Spinotarsus maritzburgensis	Maritzburg slender spined millipede	No information	Under rocks, in leaf litter or top 30cm of soil	No information	No information
	Doratogonus infragilis		Endangered	Forest / shrubland	Yes - shrubland present	No information / highly unlikely due to fragmented nature of population
	Patinatius bidentatus simulator	Resembling two-toothed slender spined millipede	No information	No information	No information	No information

8 IMPACT ASSESSMENT

The nature of the activity is that it has the potential to cause negative environmental effects. However, if mitigation measures for the activity are correctly implemented and the rehabilitation is successful, minimal disturbance of environment will be seen (**See Appendix 9 for Methodology**).

The potential impacts of the proposed development mainly related to loss of terrestrial species as well as general species which are utilizing the site during construction. However, the loss of floral and faunal species of conservation concern is limited as very few, if any species are predicted to occur on site. Additionally, no threatened vegetation types are present on site. Consequently, loss of terrestrial fauna and flora will be on a localised scale and can be largely mitigated against, provided mitigation measures are implemented. The impact assessment focuses on the preferred abstraction point, preferred rising main, overhead electrical powerline and preferred access road in comparison to the alternative abstraction point. Please note that the impacts associated for the electrical powerlines are combined with the preferred rising main, as the overhead powerlines have a lesser impact than the rising main.

8.1 Planning and design phase impacts

No planning or design phase impacts were identified.

8.2 Construction phase impacts

8.2.1 Indigenous natural vegetation

Loss, degradation or fragmentation of vegetation through direct clearing.

8.2.2 Transformation of habitat for flora

Hard transformation of the access road and abstraction point will result in a marginal reduction in flora. The routing being a linear activity will result in the disturbance of the soil surface, and this often leads to the establishment of alien invasive plant species.

8.2.3 Erosion related impacts

Vegetation binds and protects the soil surface, and when removed, increases erosion potential. This may lead to water and wind removing vital topsoil and blocking up drains and eventually clogging roadsides,drainage lines wetlands and watercourses through sedimentation.

8.2.4 Habitat transformation and fragmentation for fauna

Continued transformation of vegetation in the area could result in a marginal reduction in flora and fauna for the area. Disturbance of the soil surface leads to the establishment of alien invasive plant species. Continued transformation of the land results in habitat fragmentation, where edge effects decrease suitable habitat for a wide range of fauna in the area. This leads to an overall indirect decline in faunal diversity.

8.3 Operation phase impacts

8.3.1 Erosion related impacts for operation phase

Erosion potential is increased in areas where vegetation has been removed. Hard transformation may increase water velocity in steeper areas and may result in a loss of topsoil and the erosion of drainage lines. This will aid in alien and invasive plant establishment and vegetation rehabilitation will be compromised as the loss of topsoil will delay rehabilitation efforts.

8.3.2 Biodiversity loss due to operation phase

Biodiversity loss during operation is expected to be minimal, if soil layers are maintained and vegetation re-establishment is achieved.

8.3.3 Vegetation

Establishment and spread of alien invasive plant species due disturbance vectors.

8.4 Decomission phase impacts

Decomissioning phase impacts are anticipated to be the same as the construction and operation phase impacts, therefore mitigation measures for the construction and operation phase must be followed should decommissioning of the proposed construction.

8.5 No-go alternative.

Please note that a No-Go option would be the status quo. This is not supported by the Ecologist as the need to provide a sustainable water supply to surrounding communties outweighs the proposed potential loss in biodiversity which is not considered to be significant. No threatened ecosystems, protected vegetation types, CBA areas, protected faunal species or ecological support areas are to be lost should the the project be approved.

8.6 Overall impact rating

The overall negative impact of the proposed project is expected to be a negative low pior to mitigation measures being implemented (22.8) with a post mitigation score of 15.9. A relatively limited area will be lost to development. This will result in the loss of some indigenous plants, but little anticipated impact on any floral or faunal species of conservation concern.

8.7 Impacts identified for all phases and routing alternatives

Table 13: Impact descriptions for both the preferred abstraction point, rising main and access road; and alternative abstraction point

Impact	Description	Mitigation
Construction Phase		
Indigenous natural vegetation	Loss, degradation or fragmentation of vegetation through direct clearing	• Footprint of the activity needs to be strictly adhered to. • A site specific Environmental Management Programme needs to be developed for the construction and operation phases. • An Environmental Control Officer (ECO) needs to be appointed for the duration of construction. • Permits for plants collection/removal need to be obtained prior to search and rescue operations. • Vegetation clearance in the construction phase is to be remove in a phased approach, as and when it becomes necessary as vegetation harbours fauna. • Sensitive areas need to be demarcated clearly before construction commences. • Areas outside of the construction zone are to be designated as “no-go areas.”
Transformation of habitat for flora	Hard transformation of proposed routing will result in a marginal reduction in flora. The routing being a linear activity will result in the disturbance of the soil surface, and this often leads to the establishment of alien invasive plant species.	• Servitude widths need to be a strictly adhered to. • Where possible, indigenous vegetation needs to be retained. • Clearance for construction should be done in a phased approach, and rehabilitation should be done as soon as work has ceased along the section of routing. • Where possible, construction should occur in the dry season to prevent soil loss through stormwater. • Where possible, manual clearance of the vegetation should be done so as to prevent the unnecessary movement of machinery in no-go areas. • The contractor should implement an alien invasive control programme, particularly in areas where soil disturbance occurs. • Soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth to prevent soil loss through wind and water erosion. • Strictly no trapping or hunting of fauna is allowed. • All open excavations need to be checked on a daily basis and any fauna that may be stranded will have to be caught and released by a qualified person. • Rehabilitation should take place as soon as construction of the section of line is complete. • Strictly no littering. The contractor should highlight this at daily toolbox talks and site clean-ups should occur on a daily occasion. • A mix of indigenous grass species, should be used for rehabilitation.
Erosion related impacts	Vegetation binds and protects the soil surface, and when removed, increases erosion potential. This may lead to water and wind removing vital topsoil and blocking up drains and eventually clogging roadsides and drainage lines.	• An approved Stormwater Management Plan should be implemented before construction occurs. • All stormwater outflows must be protected with reno-mattresses and gabion baskets to reduce the effect of erosion on the access road. • Where possible, indigenous vegetation needs to be retained. • Vegetation should be cleared only when construction occurs in that section of the routing. • Soil stockpiles need to be grassed with an indigenous mix or covered with shadecloth to prevent soil loss through wind and water erosion. • Rehabilitation should take place as soon as construction is complete. • In areas of higher gradient, access roads should have erosion berms to prevent soil loss.

Impact	Description	Mitigation
Construction Phase		
		• Construction activities should be limited to the winter months to prevent loss of soil to water runoff. • Spraying of the soil surface should occur when working in dusty conditions.
Habitat transformation and fragmentation for fauna	Continued transformation of vegetation in the area will result in a marginal reduction in flora and fauna for the area. Disturbance of the soil surface and a leads to the establishment of alien invasive plant species. Continued transformation of the land results in habitat fragmentation, where edge effects decrease suitable habitat for a wide range of fauna in the area. This leads to an overall indirect decline in faunal dversity.	• Construction footprint needs to be a strictly adhered to. • Clearance of land and vegetation is not allowed, unless clearance occurs within the authorised project area. • Areas outside of the construction zone must be demarcated as “no-go” areas. • Where possible, indigenous vegetation needs to be retained. • Manual clearance of alien and invasive vegetation should be done so as to prevent the unnecessary movement of machinery in no-go areas. • An alien and invasive control programme should implemented, particularly in areas where soil disturbance has occured. • Soil stockpiles need to be returned to the excavations, with the subsoil being placed first, followed by the topsoil. • Monthly ECO auditing should occur during rehabilitation of the site. Once rehabilitation is complete, one three month, and one six month follow up audit should be conducted to assess the state of rehabilitation.

Impact	Description	Mitigation
Operation Phase		
Erosion related impacts for operation phase	Erosion is currently occurring on the access road. The preferred routing access road us likely to have high erosion potential should proper stormwater control measures not be in place.	• An approved Stormwater Management Plan should be implemented before operation occurs. • All stormwater outflows must be protected with reno-mattresses and gabion baskets to reduce the effect of erosion on the access road. • Where possible, indigenous vegetation needs to be returned as soon as construction ceases. • Soil stockpiles need to be grassed with an indigenous mix and rehabilitated to prevent soil loss through wind and water erosion before operation phase begins. • Rehabilitation should take place as soon as construction is complete. • Operation phase should only begin once the ECO has deemed rehabilitation successful and mitigation measures have been implemented. • A six month check of the area should take place for the emergence erosion gulley’s, and if gulley’s emerge, will need to be rehabilitated immediately.
Biodiversity loss due to operation phase	Biodiversity could be lost if rehabilitation measures are not implemented. This can be partly mitigated if rehabilitation is successful.	• A post construction monitoring programme to ensure that rehabilitation efforts are successful and that edge effects are reduced. • Monthly monitoring of these sensitive areas should take place during the first year after construction to ensure that rehabilitation is successful. • Six monthly checks of the area should take place for the emergence of invader species.
Vegetation	Establishment and spread of alien invasive plant species due disturbance vectors	• Compile and implement Alien Invasive Management Plan. • Rehabilitate disturbed areas.

8.8 Impact scoring

The SiVEST Impact Scoring Methodology can be found in Appendix 9, which details the method used in assessing impacts. The impact assessment below should be read in conjunction with Appendix 9.

Table 14: Assessment of Impacts – Preferred abstraction point, road access and rising main

Nature of Impact	Spatial extent		Probability		Reversibility		Irreplaceable loss of resources		Duration		Intensity / Magnitude		Significance without mitigation	Significance with mitigation
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With		
Construction Phase														
Indigenous natural vegetation	1	1	3	2	1	1	2	2	2	2	2	2	18	16
Transformation of habitat for flora	1	1	3	2	1	1	2	2	2	2	3	2	27	16
Erosion related impacts	1	1	3	2	2	1	2	2	2	2	2	2	20	16
Habitat transformation and fragmentation for fauna	1	1	2	2	1	1	1	1	1	1	2	1	12	7
Operation Phase														
Erosion related impacts for operation phase	2	1	3	2	1	1	2	2	3	3	3	2	33	18
Biodiversity loss due to operation phase	2	1	3	2	2	1	3	2	3	3	2	2	26	18
Vegetation loss to alien and invasive establishment	1	1	3	2	2	2	3	2	3	3	2	2	24	20
Overall impact significance													22.8	15.9
													Low	Low

Table 15: Assessment of Impacts – Alternative abstraction point

Nature of Impact	Spatial extent		Probability		Reversibility		Irreplaceable loss of resources		Duration		Intensity / Magnitude		Significance without mitigation	Significance with mitigation
	Without	With	Without	With	Without	With	Without	With	Without	With	Without	With		
Construction Phase														
Indigenous natural vegetation	2	1	3	2	1	1	2	2	2	2	2	2	20	16
Transformation of habitat for flora	2	1	3	2	1	1	2	2	2	2	3	2	30	16
Erosion related impacts	3	2	3	2	2	1	2	2	2	2	2	2	24	18
Habitat transformation and fragmentation for fauna	2	1	2	2	1	1	1	1	1	1	2	1	14	7
Operation Phase														
Erosion related impacts for operation phase	3	2	3	2	1	1	2	2	3	3	3	2	36	18
Biodiversity loss due to operation phase	2	1	3	2	2	1	3	2	3	3	2	2	26	18
Vegetation loss to alien and invasive establishment	2	1	3	2	2	2	3	2	3	3	2	2	26	20
Overall impact significance													**25.14**	**16.1**
													Medium	**Low**

8.9 Impact Statement

The proposed development will result in a minor loss to biodiversity at a site level, however this loss can be largely mitigated against, provided the mitigation measures are implemented. Erosion potential is high due to steep slopes associated with the surrounding area. Effects of erosion can be limited provided a stormwater management plan and erosion protection measures are used at all stormwater outflows and on steep slopes.

The preferred abstraction point, rising main and access road are supported by the ecologist as this routing has a lower gradient on the road, and the cut and fill embankments that may be required can be supported by erosion measures. Overall loss of biodiversity and erosion potential is lower on the preferred routing in comparison to the alternative abstraction site, as the alternative abstraction site access road (which has not been defined at the time of the assessment), is further away from the WTW and has an overall steeper gradient. No fatal flaws have been identified and the Ecologist supports the proposed development provided the mitigation measures are implemented.

9 CONCLUSIONS

It is important to mention that additional species may have been overlooked during the field survey because of the plant life history characteristics exhibited by certain plant species during this time of the season. Some species, especially the plants which have underground bulbs, may not have emerged due variations in their life strategies. However, it is the Specialist's opinion that the vegetation that was recorded from the site assessment provides enough information in order for inferences and extrapolations as to the quality, and the likely impacts associated with a development of this nature, to be made.

When development does take place and indigenous plants will need to be removed or relocated, permits for their removal will need to be obtained from DAFF and Ezemvelo KZN Wildlife. The removal should occur during their dormant growth period months and with due care informed by a Translocation Plan, preferably complied by a qualified botanist or similarly qualified individual.

The plants should be relocated into areas with the same aspect, soil conditions and elevation to ensure that the relocations are successful. In addition, the plants should be placed into good-sized holes that are at least twice the size of underground organs. It is very important for survival for underground organs not to be damaged and for plants to be watered for a period of time. Bulbs, however, are able to withstand a relatively high level of disturbance, given their survival strategy of storing the required reserve resources in the bulb. These species will likely re- generate following their excavation and replacement. Any applicable approvals/permits/consents/licenses relating to the environment should be in place prior to any site clearing and development. Good housekeeping and management of the construction impacts will see no or very limited impact on the environment.

From a faunal perspective, the study area has a low conservation value. This is based on the potential for this site to harbour some species of conservation importance, which were not identified during the assessment, potentially as a result of the sampling time of year. Habitat for foraging is present in areas near the site, and so faunal species can move to adjacent areas during construction. This is unlikely to affect the status of species of conservation concern. It is not aniticipated that the proposed construction will have a long term negative effect on the fauna of the area. The fauna of the site is directly dependent on the

vegetation of the site, and the careful management of the vegetation (and soil) will benefit the fauna of the area.

The overall area is natural but diversity is medium to low and therefore has a low conservation value. Although species identified in the DFFE Screening Tool may be present on site (although only a few according to the POC table), the type of construction limits the overall loss in habitat for these species, especially if mitigation measures are implemented. Further to this, species identified in the TSCP Minset dataset mirror that of the DFFE Screening Tool.

The ecologist has no objection to the development provided all mitigation measures can be agreed and achieved are implemented.

10 RECOMMENDATIONS

Should any development take place the following is recommended but not limited to:

- Permits for the removal and relocation of plants (DAFF and EKZNW) must be in place before any construction can commence;
- A Translocation plan should inform the relocation of indigenous plants; including storing protected plants within an onsite plant storage area or for rehabilitation purposes. To be decided upon by the DAFF / EKZNW permit requirements.
- The appointed ECO should do a site walk through prior to construction commencing to search for breeding and nesting fauna. Should these be identified, a search and rescue operation by a suitably qualified person, must be undertaken before construction commences;
- Rehabilitation must occur once construction is complete in the relevant area;
- Community outreach regarding poaching of fauna should be undertaken;
- Rehabilitation of vegetation communities would improve faunal diversity across the site;
- An Alien Invasive Control Programme must be implemented.
- Erosion control measures and a Stormwater Management Plan must be implemented;
- Construction must occur in a phased approach and
- Care must be taken that veld fires are not started.
- No biodiversity offset plan is recommended.

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Appendix 1 Species list

Mnqumeni WSS	**Common Name**	**Growth Form**	**Origin**	**Status**
Aloe ferox Mill.	Bitter Aloe	Shrub	Indigenous	EKZNW Plant Permit
Aristida congesta Roem. & Schult. subsp. congesta	Buffalo Grass	Grass	Indigenous	
Barleria obtusa Nees	Bush violet	Herb	Indigenous	
Bidens pilosa L.	Black jack	Herb	Alien	
Ceratotheca triloba (Bernh.) Hook.f.	Wild foxglove	Herb	Indigenous	
Chloris gayana Kunth	Rhodes grass	Grass	Indigenous	
Chromolaena odorata (L.) R.M.King & H.Rob.	Trifid weed	Herb	Alien	1b
Coddia rudis	Small bone apple	Shrub	Indigenous	
Combretum erythrophyllum	River bush willow	Tree	Indigenous	
Dichrostachys cinerea (L.) Wight & Arn.	Sickle bush	Tree	Indigenous	
Dicliptera clinopodia Nees		Herb	Indigenous	
Diheteropogon amplectens (Nees) Clayton var. amplectens		Grass	Indigenous	
Diospyros lycioides susbsp. nitens	Blue bush	Shrub	Indigenous	
Ehretia obtusifolia Hochst. ex A.DC.	Hairy puzzle bush	Shrub	Indigenous	
Eragrostis curvula (Schrad.) Nees	African Love Grass	Grass	Indigenous	
Euclea crispa (Thunb.) Gürke	Blue guarri	Tree	Indigenous	
Euphorbia tirucalli L.	Rubber Euphorbia	Succulent Tree	Indigenous	
Euphorbia triangularis Desf.	River euphorbia	Succulent Tree	Indigenous	
Ficus burtt-davyi Hutch.	Burtt Davy's Fig	Tree	Indigenous	
Ficus spp.				
Grewia occidentalis L.	Cross-berry	Tree	Indigenous	
Gymnosporia glaucophylla Jordaan	Blue Spike-thorn	Shrub	Indigenous	
Hyparrhenia hirta (L.) Stapf	Thatch Grass	Indigenous	Grass	
Kalanchoe rotundifolia (Haw.) Haw.	Common Kalanchoe	Succulent	Indigenous	
Lantana camara L.	Tick berry	Shrub	Alien	1b
Melinis repens (Willd.) Zizka	Natal red top	Grass	Indigenous	
Phragmites mauritianus Kunth	Lowveld Reed	Reed	Indigenous	
Sansevieria hyacinthoides (L.) Druce	Mother-in-laws tongue	Herb	Indigenous	
Schotia brachypetala Sond.	Weeping boer-bean	Tree	Indigenous	
Senegalia ataxacantha (DC.) Kyal. & Boatwr.	Flame Thorn	Tree	Indigenous	

Mnqumeni WSS	**Common Name**	**Growth Form**	**Origin**	**Status**
Senna didymobotrya (Fresen.) H.S.Irwin & Barneby	Peanut butter senna	Shrub	Alien	1b
Sporobolus africanus (Poir.) Robyns & Tourn.	Ratstail Dropseed	Grass	Indigenous	
Sporobolus pyramidalis P. Beauv.	Giant rat's tail	Grass	Indigenous	
Tagetes minuta L.	Southern cone marigold	Herb	Alien	
Vangueria infausta Burch. subsp. infausta	Wild medlar	Tree	Indigenous	
Xanthium spinosum L.	Spiny cocklebur	Herb	Alien	1b

Appendix 2 SABAP2 Species List
Bold species are species identified during the assessment

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Crane	*Balearica regulorum*	Grey Crowned Crane	EN, EN	35.2941	6	2020/10/25
Vulture	*Gyps coprotheres*	Cape Vulture	EN, EN	17.6471	3	2020/10/25
Marsh-harrier	*Circus ranivorus*	African Marsh-harrier	EN, LC	23.5294	4	2011/01/16
Ground-hornbill	*Bucorvus leadbeateri*	Southern Ground-hornbill	EN, VU	5.8824	1	2010/04/25
Buzzard	*Buteo trizonatus*	Forest Buzzard	LC, NT	0	0	-
Secretarybird	*Sagittarius serpentarius*	Secretarybird Secretarybird	VU, EN	0	0	-
Falcon	*Falco biarmicus*	Lanner Falcon	VU, LC	23.5294	4	2020/10/25
Bustard	*Neotis denhami*	Denham's Bustard	VU, NT	11.7647	2	2020/07/25
Apalis	*Apalis thoracica*	Bar-throated Apalis	LC	41.1765	7	2020/10/25
Apalis	*Apalis flavida*	Yellow-breasted Apalis	LC	17.6471	3	2020/10/25
Barbet	***Lybius torquatus***	**Black-collared Barbet**	**LC**	**17.6471**	**3**	**2020/03/30**
Barbet	*Trachyphonus vaillantii*	Crested Barbet	LC	41.1765	7	2020/10/25
Batis	*Batis capensis*	Cape Batis	LC	64.7059	11	2020/10/25
Batis	*Batis molitor*	Chinspot Batis	LC	5.8824	1	2009/07/19
Bishop	*Euplectes orix*	Southern Red Bishop	LC	41.1765	7	2020/10/25
Boubou	***Laniarius ferrugineus***	**Southern Boubou**	**LC**	**64.7059**	**11**	**2020/10/25**
Brownbul	*Phyllastrephus terrestris*	Terrestrial Brownbul	LC	64.7059	11	2020/10/25
Bulbul	***Pycnonotus tricolor***	**Dark-capped Bulbul**	**LC**	**94.1176**	**16**	**2020/10/25**
Bush-shrike	*Malaconotus blanchoti*	Grey-headed Bush-shrike	LC	11.7647	2	2020/03/30
Bush-shrike	*Chlorophoneus olivaceus*	Olive Bush-shrike	LC	35.2941	6	2020/10/25
Bush-shrike	*Chlorophoneus sulfureopectus*	Orange-breasted Bush-shrike	LC	5.8824	1	2010/04/25
Buzzard	*Buteo rufofuscus*	Jackal Buzzard	LC	29.4118	5	2020/05/06
Buzzard	*Buteo buteo*	Steppe Buzzard	LC	11.7647	2	2019/12/08
Camaroptera	***Camaroptera brachyura***	**Green-backed Camaroptera**	**LC**	**47.0588**	**8**	**2020/10/25**
Canary	*Crithagra sulphurata*	Brimstone Canary	LC	5.8824	1	2020/03/18
Canary	*Serinus canicollis*	Cape Canary	LC	47.0588	8	2020/10/25
Canary	*Crithagra scotops*	Forest Canary	LC	17.6471	3	2020/10/22
Canary	***Crithagra mozambica***	**Yellow-fronted Canary**	**LC**	**64.7059**	**11**	**2020/10/25**
Chat	*Cercomela familiaris*	Familiar Chat	LC	23.5294	4	2020/05/06
Cisticola	*Cisticola natalensis*	Croaking Cisticola	LC	52.9412	9	2020/10/25

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Cisticola	*Cisticola aberrans*	Lazy Cisticola	LC	29.4118	5	2020/10/22
Cisticola	*Cisticola tinniens*	Levaillant's Cisticola	LC	82.3529	14	2020/10/25
Cisticola	*Cisticola ayresii*	Wing-snapping Cisticola	LC	29.4118	5	2020/10/25
Cisticola	*Cisticola juncidis*	Zitting Cisticola	LC	58.8235	10	2020/10/25
Cliff-chat	*Thamnolaea cinnamomeiventris*	Mocking Cliff-chat	LC	100	2	2014/07/30
Coot	*Fulica cristata*	Red-knobbed Coot	LC	41.1765	7	2020/10/25
Cormorant	*Microcarbo africanus*	Reed Cormorant	LC	17.6471	3	2010/04/25
Cormorant	*Phalacrocorax lucidus*	White-breasted Cormorant	LC	11.7647	2	2020/01/09
Coucal	*Centropus burchellii*	Burchell's Coucal	LC	47.0588	8	2020/10/25
Crake	*Amaurornis flavirostra*	Black Crake	LC	5.8824	1	2019/06/16
Crested-flycatcher	*Trochocercus cyanomelas*	Blue-mantled Crested-flycatcher	LC	17.6471	3	2020/03/30
Crow	*Corvus capensis*	Cape Crow	LC	52.9412	9	2020/10/25
Crow	*Corvus albus*	Pied Crow	LC	70.5882	12	2020/10/22
Cuckoo	*Cuculus clamosus*	Black Cuckoo	LC	17.6471	3	2020/10/25
Cuckoo	*Chrysococcyx caprius*	Diderick Cuckoo	LC	41.1765	7	2020/10/25
Cuckoo	*Chrysococcyx klaas*	Klaas's Cuckoo	LC	23.5294	4	2020/10/25
Cuckoo	*Cuculus solitarius*	Red-chested Cuckoo	LC	23.5294	4	2020/10/25
Cuckoo-shrike	*Campephaga flava*	Black Cuckoo-shrike	LC	29.4118	5	2020/10/22
Cuckoo-shrike	*Coracina caesia*	Grey Cuckoo-shrike	LC	5.8824	1	2020/10/25
Darter	*Anhinga rufa*	African Darter	LC	17.6471	3	2020/04/23
Dove	*Columba larvata*	Lemon Dove	LC	5.8824	1	2020/03/18
Dove	*Streptopelia semitorquata*	Red-eyed Dove	LC	76.4706	13	2020/10/25
Dove	*Columba livia*	Rock Dove	LC	5.8824	1	2020/01/09
Dove	*Turtur tympanistria*	Tambourine Dove	LC	0	0	-
Dove	***Streptopelia capicola***	**Ring-necked Dove**	**LC**			
Drongo	***Dicrurus adsimilis***	**Fork-tailed Drongo**	**LC**	**76.4706**	**13**	**2020/10/25**
Duck	***Anas sparsa***	**African Black Duck**	**LC**	**5.8824**	**1**	**2019/06/16**
Duck	*Thalassornis leuconotus*	White-backed Duck	LC	0	0	-
Duck	*Dendrocygna viduata*	White-faced Duck	LC	5.8824	1	2020/01/09
Duck	*Anas undulata*	Yellow-billed Duck	LC	47.0588	8	2020/10/22

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Eagle	*Lophaetus occipitalis*	Long-crested Eagle	LC	76.4706	13	2020/10/25
Egret	*Bubulcus ibis*	Cattle Egret	LC	11.7647	2	2020/07/25
Firefinch	***Lagonosticta rubricata***	**African Firefinch**	**LC**	**47.0588**	**8**	**2020/10/22**
Fiscal	***Lanius collaris***	**Common (Southern) Fiscal**	**LC**	**82.3529**	**14**	**2020/07/25**
Fish-eagle	*Haliaeetus vocifer*	African Fish-eagle	LC	23.5294	4	2020/10/25
Flufftail	*Sarothrura elegans*	Buff-spotted Flufftail	LC	5.8824	1	2020/01/09
Flufftail	*Sarothrura rufa*	Red-chested Flufftail	LC	5.8824	1	2020/05/06
Flycatcher	*Muscicapa adusta*	African Dusky Flycatcher	LC	29.4118	5	2020/03/30
Flycatcher	*Sigelus silens*	Fiscal Flycatcher	LC	11.7647	2	2020/04/23
Flycatcher	*Melaenornis pammelaina*	Southern Black Flycatcher	LC	5.8824	1	2010/04/25
Francolin	*Scleroptila levaillantii*	Red-winged Francolin	LC	5.8824	1	2020/10/25
Goose	*Alopochen aegyptiaca*	Egyptian Goose	LC	70.5882	12	2020/10/25
Goose	*Plectropterus gambensis*	Spur-winged Goose	LC	64.7059	11	2020/10/25
Goshawk	*Accipiter tachiro*	African Goshawk	LC	5.8824	1	2019/06/16
Grassbird	*Sphenoeacus afer*	Cape Grassbird	LC	41.1765	7	2020/10/25
Grebe	*Tachybaptus ruficollis*	Little Grebe	LC	52.9412	9	2020/07/25
Greenbul	***Andropadus importunus***	**Sombre Greenbul**	**LC**	**94.1176**	**16**	**2020/10/25**
Green-pigeon	*Treron calvus*	African Green-pigeon	LC	17.6471	3	2020/10/22
Guineafowl	*Numida meleagris*	Helmeted Guineafowl	LC	11.7647	2	2019/12/08
Hamerkop	*Scopus umbretta*	Hamerkop Hamerkop	LC	11.7647	2	2020/10/25
Harrier-Hawk	*Polyboroides typus*	African Harrier-Hawk	LC	23.5294	4	2020/10/25
Heron	*Ardea melanocephala*	Black-headed Heron	LC	76.4706	13	2020/10/25
Heron	*Ardea cinerea*	Grey Heron	LC	5.8824	1	2009/07/19
Honeybird	*Prodotiscus regulus*	Brown-backed Honeybird	LC	5.8824	1	2020/10/25
Honeyguide	*Indicator indicator*	Greater Honeyguide	LC	23.5294	4	2020/10/22
Honeyguide	*Indicator minor*	Lesser Honeyguide	LC	29.4118	5	2020/10/22
Honeyguide	*Indicator variegatus*	Scaly-throated Honeyguide	LC	11.7647	2	2020/04/23
Hoopoe	*Upupa africana*	African Hoopoe	LC	23.5294	4	2020/03/18
House-martin	*Delichon urbicum*	Common House-martin	LC	5.8824	1	2020/03/18
Ibis	*Threskiornis aethiopicus*	African Sacred Ibis	LC	5.8824	1	2020/05/06

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Ibis	*Bostrychia hagedash*	Hadeda Ibis	LC	82.3529	14	2020/10/25
Indigobird	*Vidua funerea*	Dusky Indigobird	LC	0	0	-
Jacana	*Actophilornis africanus*	African Jacana	LC	5.8824	1	2020/01/09
Kestrel	*Falco rupicolus*	Rock Kestrel	LC	0	0	-
Kingfisher	***Halcyon albiventris***	**Brown-hooded Kingfisher**	**LC**	**23.5294**	**4**	**2020/04/20**
Kingfisher	*Megaceryle maxima*	Giant Kingfisher	LC	35.2941	6	2020/10/22
Kingfisher	*Alcedo cristata*	Malachite Kingfisher	LC	23.5294	4	2020/05/06
Kingfisher	*Ceryle rudis*	Pied Kingfisher	LC	5.8824	1	2009/05/09
Kite	*Elanus caeruleus*	Black-shouldered Kite	LC	35.2941	6	2020/04/20
Kite	*Milvus aegyptius*	Yellow-billed Kite	LC	5.8824	1	2020/10/22
Lapwing	*Vanellus melanopterus*	Black-winged Lapwing	LC	5.8824	1	2020/10/25
Lapwing	*Vanellus armatus*	Blacksmith Lapwing	LC	82.3529	14	2020/10/25
Lark	*Mirafra africana*	Rufous-naped Lark	LC	29.4118	5	2020/10/25
Longclaw	*Macronyx capensis*	Cape Longclaw	LC	47.0588	8	2020/10/25
Longclaw	*Macronyx croceus*	Yellow-throated Longclaw	LC	11.7647	2	2011/01/16
Mannikin	*Lonchura cucullata*	Bronze Mannikin	LC	52.9412	9	2020/10/25
Martin	*Riparia paludicola*	Brown-throated Martin	LC	64.7059	11	2020/10/25
Martin	*Hirundo fuligula*	Rock Martin	LC	17.6471	3	2020/07/25
Moorhen	*Gallinula chloropus*	Common Moorhen	LC	23.5294	4	2020/10/22
Mousebird	***Colius striatus***	**Speckled Mousebird**	**LC**	**64.7059**	**11**	**2020/10/25**
Mousebird	***Urocolius indicus***	**Red-faced Mousebird**	**LC**			
Myna	*Acridotheres tristis*	Common Myna	LC	5.8824	1	2009/05/09
Neddicky	*Cisticola fulvicapilla*	Neddicky Neddicky	LC	58.8235	10	2020/10/25
Nightjar	*Caprimulgus pectoralis*	Fiery-necked Nightjar	LC	23.5294	4	2020/10/22
Olive-pigeon	*Columba arquatrix*	African Olive-pigeon	LC	58.8235	10	2020/07/25
Oriole	*Oriolus larvatus*	Black-headed Oriole	LC	70.5882	12	2020/10/25
Palm-swift	*Cypsiurus parvus*	African Palm-swift	LC	17.6471	3	2020/10/25
Paradise-flycatcher	*Terpsiphone viridis*	African Paradise-flycatcher	LC	29.4118	5	2020/10/25
Pigeon	*Columba guinea*	Speckled Pigeon	LC	23.5294	4	2020/03/30
Pipit	*Anthus cinnamomeus*	African Pipit	LC	5.8824	1	2020/10/25

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Pipit	*Anthus similis*	Nicholson's Pipit	LC	5.8824	1	2020/05/06
Pipit	*Anthus leucophrys*	Plain-backed Pipit	LC	11.7647	2	2020/10/22
Plover	*Charadrius tricollaris*	Three-banded Plover	LC	23.5294	4	2020/03/18
Pochard	*Netta erythrophthalma*	Southern Pochard	LC	11.7647	2	2010/07/04
Prinia	*Prinia hypoxantha*	Drakensberg Prinia	LC	47.0588	8	2020/10/25
Prinia	***Prinia subflava***	**Tawny-flanked Prinia**	**LC**	**17.6471**	**3**	**2020/10/22**
Puffback	*Dryoscopus cubla*	Black-backed Puffback	LC	41.1765	7	2020/10/25
Quail	*Coturnix coturnix*	Common Quail	LC	5.8824	1	2020/10/25
Quailfinch	*Ortygospiza fuscocrissa*	African Quailfinch	LC	5.8824	1	2020/05/06
Rail	*Rallus caerulescens*	African Rail	LC	5.8824	1	2019/06/16
Raven	*Corvus albicollis*	White-necked Raven	LC	23.5294	4	2020/07/25
Reed-warbler	*Acrocephalus baeticatus*	African Reed-warbler	LC	17.6471	3	2020/10/25
Robin-chat	***Cossypha caffra***	**Cape Robin-chat**	**LC**	**64.7059**	**11**	**2020/10/25**
Rock-thrush	*Monticola rupestris*	Cape Rock-thrush	LC	50	1	2014/07/30
Ruff	*Philomachus pugnax*	Ruff Ruff	LC	0	0	-
Rush-warbler	*Bradypterus baboecala*	Little Rush-warbler	LC	29.4118	5	2020/10/25
Sandpiper	*Tringa glareola*	Wood Sandpiper	LC	5.8824	1	2019/12/08
Saw-wing	*Psalidoprocne pristoptera*	Black (Southern race) Saw-wing	LC	35.2941	6	2020/10/25
Scrub-robin	***Cercotrichas leucophrys***	**White-browed Scrub-robin**	**LC**	**11.7647**	**2**	**2020/10/25**
Seedeater	*Crithagra gularis*	Streaky-headed Seedeater	LC	52.9412	9	2020/07/25
Shelduck	*Tadorna cana*	South African Shelduck	LC	52.9412	9	2020/10/22
Shoveler	*Anas smithii*	Cape Shoveler	LC	11.7647	2	2010/07/04
Snipe	*Gallinago nigripennis*	African Snipe	LC	17.6471	3	2020/01/09
Sparrow	***Passer melanurus***	**Cape Sparrow**	**LC**	**58.8235**	**10**	**2020/10/25**
Sparrow	*Passer domesticus*	House Sparrow	LC	41.1765	7	2020/10/25
Sparrow	*Passer diffusus*	Southern Grey-headed Sparrow	LC	17.6471	3	2020/10/22
Sparrowhawk	*Accipiter melanoleucus*	Black Sparrowhawk	LC	23.5294	4	2020/10/25
Spurfowl	***Pternistis natalensis***	**Natal Spurfowl**	**LC**			
Spurfowl	*Pternistis afer*	Red-necked Spurfowl	LC	76.4706	13	2020/10/25
Starling	***Lamprotornis nitens***	**Cape Glossy Starling**	**LC**	**11.7647**	**2**	**2020/10/22**

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Starling	*Sturnus vulgaris*	Common Starling	LC	17.6471	3	2020/10/25
Starling	*Onychognathus morio*	Red-winged Starling	LC	23.5294	4	2020/10/25
Starling	*Cinnyricinclus leucogaster*	Violet-backed Starling	LC	17.6471	3	2020/10/25
Stint	*Calidris minuta*	Little Stint	LC	0	0	-
Stonechat	*Saxicola torquatus*	African Stonechat	LC	82.3529	14	2020/10/25
Sunbird	***Cinnyris talatala***	**White-bellied Sunbird**	**LC**	**50**	**1**	**2009/01/04**
Sunbird	*Chalcomitra amethystina*	Amethyst Sunbird	LC	41.1765	7	2020/10/22
Sunbird	*Hedydipna collaris*	Collared Sunbird	LC	23.5294	4	2020/10/25
Sunbird	*Cinnyris afer*	Greater Double-collared Sunbird	LC	52.9412	9	2020/10/22
Sunbird	*Cyanomitra veroxii*	Grey Sunbird	LC	5.8824	1	2020/10/22
Sunbird	*Cyanomitra olivacea*	Olive Sunbird	LC	5.8824	1	2010/04/25
Sunbird	*Cinnyris chalybeus*	Southern Double-collared Sunbird	LC	23.5294	4	2020/10/25
Swallow	*Hirundo rustica*	Barn Swallow	LC	47.0588	8	2020/10/25
Swallow	*Cecropis cucullata*	Greater Striped Swallow	LC	52.9412	9	2020/10/25
Swallow	*Cecropis cucullata*	Lesser Striped Swallow	LC	29.4118	5	2020/10/25
Swallow	*Hirundo albigularis*	White-throated Swallow	LC	29.4118	5	2020/10/25
Swamp-warbler	*Acrocephalus gracilirostris*	Lesser Swamp-warbler	LC	11.7647	2	2020/10/25
Swift	*Apus barbatus*	African Black Swift	LC	11.7647	2	2020/07/25
Swift	*Tachymarptis melba*	Alpine Swift	LC	5.8824	1	2020/07/25
Swift	*Apus affinis*	Little Swift	LC	5.8824	1	2010/04/25
Swift	*Apus caffer*	White-rumped Swift	LC	23.5294	4	2020/10/25
Tchagra	*Tchagra senegalus*	Black-crowned Tchagra	LC	23.5294	4	2020/05/06
Tchagra	*Tchagra tchagra*	Southern Tchagra	LC	5.8824	1	2020/10/25
Teal	*Anas capensis*	Cape Teal	LC	5.8824	1	2010/07/04
Teal	*Anas hottentota*	Hottentot Teal	LC	5.8824	1	2010/07/04
Teal	*Anas erythrorhyncha*	Red-billed Teal	LC	41.1765	7	2020/10/25
Thick-knee	*Burhinus capensis*	Spotted Thick-knee	LC	0	0	-
Thrush	*Turdus litsitsirupa*	Groundscraper Thrush	LC	5.8824	1	2019/06/16
Thrush	*Turdus libonyanus*	Kurrichane Thrush	LC	5.8824	1	2020/10/22
Thrush	***Turdus olivaceus***	**Olive Thrush**	**LC**	**47.0588**	**8**	**2020/10/22**

Common Group	Scientific Name	Common Name	RD (Regional, Global)	fp	fpn	fp_last
Tit	*Parus niger*	Southern Black Tit	LC	52.9412	9	2020/10/25
Turaco	*Tauraco porphyreolophus*	Purple-crested Turaco	LC	50	1	2014/07/30
Turaco	*Tauraco corythaix*	Knysna Turaco	LC	17.6471	3	2020/03/18
Turtle-dove	*Streptopelia capicola*	Cape Turtle-dove	LC	88.2353	15	2020/10/25
Wagtail	***Motacilla capensis***	**Cape Wagtail**	**LC**	**76.4706**	**13**	**2020/10/25**
Wagtail	***Motacilla aguimp***	**Pied Wagtail**	**LC**			
Warbler	*Bradypterus barratti*	Barratt's Warbler	LC	5.8824	1	2020/04/20
Warbler	*Iduna natalensis*	Dark-capped Yellow Warbler	LC	23.5294	4	2020/10/25
Waxbill	*Estrilda astrild*	Common Waxbill	LC	64.7059	11	2020/10/25
Waxbill	***Uraeginthus angolensis***	**Blue Waxbill**	**LC**			
Waxbill	*Amandava subflava*	Orange-breasted Waxbill	LC	5.8824	1	2020/05/06
Waxbill	*Coccopygia melanotis*	Swee Waxbill	LC	17.6471	3	2020/07/25
Weaver	*Ploceus subaureus*	Yellow Weaver	LC	50	1	2009/01/04
Weaver	*Ploceus capensis*	Cape Weaver	LC	17.6471	3	2020/10/25
Weaver	*Ploceus bicolor*	Dark-backed Weaver	LC	41.1765	7	2020/10/25
Weaver	*Ploceus ocularis*	Spectacled Weaver	LC	41.1765	7	2020/10/25
Weaver	*Amblyospiza albifrons*	Thick-billed Weaver	LC	23.5294	4	2020/10/25
Weaver	*Ploceus cucullatus*	Village Weaver	LC	52.9412	9	2020/10/25
White-eye	***Zosterops virens***	**Cape White-eye**	**LC**	**70.5882**	**12**	**2020/10/25**
Whydah	*Vidua macroura*	Pin-tailed Whydah	LC	35.2941	6	2020/10/25
Widowbird	*Euplectes axillaris*	Fan-tailed Widowbird	LC	52.9412	9	2020/10/25
Widowbird	*Euplectes ardens*	Red-collared Widowbird	LC	29.4118	5	2020/10/25
Wood-dove	*Turtur chalcospilos*	Emerald-spotted Wood-dove	LC	11.7647	2	2020/07/25
Woodland-warbler	*Phylloscopus ruficapilla*	Yellow-throated Woodland-warbler	LC	23.5294	4	2020/10/25
Woodpecker	***Dendropicos fuscescens***	**Cardinal Woodpecker**	**LC**	**35.2941**	**6**	**2020/10/25**
Woodpecker	*Dendropicos griseocephalus*	Olive Woodpecker	LC	17.6471	3	2020/03/18
Wryneck	*Jynx ruficollis*	Red-throated Wryneck	LC	17.6471	3	2020/07/25

Appendix 3 ReptileMAP Species List

Family	Scientific name	Common name	Red list category	Number of records	Last recorded
Colubridae	*Crotaphopeltis hotamboeia*	Red-lipped Snake	Least Concern (SARCA 2014)	1	1900/06/15
Colubridae	*Dasypeltis inornata*	Southern Brown Egg-eater	Least Concern (SARCA 2014)	2	1987/01/13
Colubridae	*Dasypeltis scabra*	Rhombic Egg-eater	Least Concern (SARCA 2014)	1	1900/06/15
Colubridae	*Philothamnus hoplogaster*	South Eastern Green Snake	Least Concern (SARCA 2014)	1	1900/06/15
Colubridae	*Philothamnus occidentalis*	Western Natal Green Snake	Least Concern (SARCA 2014)	1	1986/05/11
Elapidae	*Elapsoidea sundevallii sundevallii*	Sundevall's Garter Snake		2	1900/06/15
Elapidae	*Hemachatus haemachatus*	Rinkhals	Least Concern (SARCA 2014)	1	1900/06/15
Lamprophiidae	*Lamprophis aurora*	Aurora House Snake	Least Concern (SARCA 2014)	1	1900/06/15
Lamprophiidae	*Limaformosa capensis*	Common File Snake	Least Concern (SARCA 2014)	1	1900/06/15
Lamprophiidae	*Lycodonomorphus inornatus*	Olive House Snake	Least Concern (SARCA 2014)	2	1985/10/16
Lamprophiidae	*Lycodonomorphus rufulus*	Brown Water Snake	Least Concern (SARCA 2014)	1	1900/06/15
Lamprophiidae	*Pseudaspis cana*	Mole Snake	Least Concern (SARCA 2014)	1	1900/06/15
Scincidae	*Trachylepis homalocephala*	Red-sided Skink	Least Concern (SARCA 2014)	1	2007/12/13
Viperidae	*Bitis arietans arietans*	Puff Adder	Least Concern (SARCA 2014)	2	1900/06/15
Viperidae	*Causus rhombeatus*	Rhombic Night Adder	Least Concern (SARCA 2014)	1	1900/06/15

Appendix 4 FrogMAP Species List

Family	Scientific name	Common name	Red list Category	Number of Records	Last recorded
Bufonidae	*Sclerophrys capensis*	Raucous Toad	Least Concern	2	2015/10/31
Bufonidae	*Sclerophrys gutturalis*	Guttural Toad	Least Concern (IUCN, 2016)	3	2015/10/31
Hyperoliidae	*Hyperolius marmoratus*	Painted Reed Frog	Least Concern (IUCN ver 3.1, 2013)	4	2001/12/27
Hyperoliidae	*Hyperolius pusillus*	Water Lily Frog	Least Concern	1	2001/12/27
Hyperoliidae	*Kassina senegalensis*	Bubbling Kassina	Least Concern	2	2001/12/27
Phrynobatrachidae	*Phrynobatrachus natalensis*	Snoring Puddle Frog	Least Concern (IUCN, 2013)	2	2001/12/27
Pyxicephalidae	*Amietia delalandii*	Delalande's River Frog	Least Concern (2017)	2	2015/10/31
Pyxicephalidae	*Cacosternum nanum*	Bronze Caco	Least Concern (2013)	1	1999/11/14
Pyxicephalidae	*Strongylopus fasciatus*	Striped Stream Frog	Least Concern	3	2013/05/03
Pyxicephalidae	*Strongylopus grayii*	Clicking Stream Frog	Least Concern	1	2001/12/27

Appendix 5 MammalMAP Species List

Family	Scientific name	Common name	Red list category	Number of records	Last recorded
Canidae	*Canis mesomelas*	Black-backed Jackal	Least Concern (2016)	1	2013/05/09
Cercopithecidae	*Chlorocebus pygerythrus pygerythrus*	Vervet Monkey (subspecies pygerythrus)	Least Concern (2008)	1	2013/05/19
Felidae	*Caracal caracal*	Caracal	Least Concern (2016)	3	2013/05/09
Felidae	*Felis silvestris*	Wildcat	Least Concern (2016)	1	1970/07/01
Herpestidae	*Atilax paludinosus*	Marsh Mongoose	Least Concern (2016)	1	2013/05/05
Muridae	*Mastomys natalensis*	Natal Mastomys	Least Concern (2016)	7	1981/12/26
Procaviidae	*Procavia capensis*	Cape Rock Hyrax	Least Concern (2016)	1	1995/08/14
Soricidae	*Myosorex cafer*	Dark-footed Mouse Shrew	Vulnerable (2016)	4	1986/12/17
Viverridae	*Genetta sp.*	Genets		1	2013/05/09

Appendix 6 LepiMAP Species List

Family	Scientific name	Common name	Red list category	Number of records	Last recorded
HESPERIIDAE	*Borbo fatuellus fatuellus*	Long-horned swift	Least Concern (SABCA 2013)	3	2011/05/02
HESPERIIDAE	*Calleagris kobela*	Pondo dark flat	Least Concern (SABCA 2013)	2	1998/03/24
HESPERIIDAE	*Eretis djaelaelae*	Marbled elf	Least Concern (SABCA 2013)	1	1973/10/20
HESPERIIDAE	*Netrobalane canopus*	Buff-tipped skipper	Least Concern (SABCA 2013)	1	1998/03/23
HESPERIIDAE	*Platylesches moritili*	Honey hopper	Least Concern (SABCA 2013)	2	1989/07/15
HESPERIIDAE	*Spialia ferax*	Striped sandman	Least Concern (SABCA 2013)	1	1989/07/15
HESPERIIDAE	*Tagiades flesus*	Clouded flat	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Alaena amazoula amazoula*	Yellow zulu	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Aloeides henningi*	Hillside russet	Least Concern (SABCA 2013)	1	1975/01/04
LYCAENIDAE	*Anthene amarah amarah*	Black-striped ciliate blue	Least Concern (SABCA 2013)	1	2015/10/31
LYCAENIDAE	*Anthene definita definita*	Steel-blue-ciliate blue	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Cacyreus lingeus*	Bush bronze	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Cacyreus virilis*	Mocker bronze	Least Concern (SABCA 2013)	1	1994/04/14
LYCAENIDAE	*Deudorix antalus*	Brown playboy	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Euchrysops malathana*	Grey smoky blue	Least Concern (SABCA 2013)	2	2011/05/02
LYCAENIDAE	*Hypolycaena buxtoni buxtoni*	Buxton's hairstreak	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Hypolycaena philippus philippus*	Purple-brown hairstreak	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Iolaus silas*	Southern sapphire	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Lampides boeticus*	Pea blue	Least Concern (SABCA 2013)	1	1986/03/31
LYCAENIDAE	*Lepidochrysops variabilis*	Variable giant cupid	Least Concern (SABCA 2013)	1	1974/11/02
LYCAENIDAE	*Leptomyrina gorgias gorgias*	Lilac-based black-eye	Least Concern (SABCA 2013)	1	1973/10/20
LYCAENIDAE	*Leptotes pirithous pirithous*	Common zebra blue	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Myrina dermaptera dermaptera*	Lesser fig tree blue	Least Concern (SABCA 2013)	3	2011/05/02
LYCAENIDAE	*Orachrysops subravus*	Grizzled cupid	Least Concern (SABCA 2013)	1	1998/11/14
LYCAENIDAE	*Pentila tropicalis fuscipunctata*	Spotted buff	Least Concern (SABCA 2013)	2	2011/05/02
LYCAENIDAE	*Pentila tropicalis tropicalis*	Spotted buff	Least Concern (SABCA 2013)	2	2011/05/02
LYCAENIDAE	*Zizeeria knysna knysna*	African grass blue	Least Concern (SABCA 2013)	1	2015/10/31
NYMPHALIDAE	*Acraea aganice aganice*	Dark wanderer	Least Concern (SABCA 2013)	2	2011/05/02
NYMPHALIDAE	*Acraea horta*	Garden acraea	Least Concern (SABCA 2013)	6	2011/05/02
NYMPHALIDAE	*Acraea natalica*	Black-based acraea	Least Concern (SABCA 2013)	3	2011/05/02

Family	Scientific name	Common name	Red list category	Number of records	Last recorded
NYMPHALIDAE	*Acraea petraea*	Blood-red acraea	Least Concern (SABCA 2013)	2	2011/05/02
NYMPHALIDAE	*Amauris albimaculata albimaculata*	Layman	Least Concern (SABCA 2013)	4	2011/05/02
NYMPHALIDAE	*Bicyclus safitza safitza*	Black-haired bush brown	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Cassionympha cassius*	Rainforest dull brown	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Charaxes brutus natalensis*	White-barred charaxes	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Charaxes varanes varanes*	Pearl charaxes	Least Concern (SABCA 2013)	2	2011/05/02
NYMPHALIDAE	*Cymothoe coranus coranus*	Blonde glider	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Danaus chrysippus orientis*	African plain tiger	Least Concern (SABCA 2013)	4	2015/10/31
NYMPHALIDAE	*Eurytela dryope angulata*	Golden piper	Least Concern (SABCA 2013)	4	2011/05/02
NYMPHALIDAE	*Eurytela hiarbas angustata*	Pied piper	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Hypolimnas anthedon wahlbergi*	Variable diadem	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Junonia hierta cebrene*	Yellow pansy	Least Concern (SABCA 2013)	3	2015/10/31
NYMPHALIDAE	*Junonia orithya madagascariensis*	African blue pansy	Least Concern (SABCA 2013)	1	2015/10/31
NYMPHALIDAE	*Lachnoptera ayresii*	Blotched leopard	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Neptis saclava marpessa*	Spotted sailer	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Paralethe dendrophilus albina*	Bush beauty	Least Concern (SABCA 2013)	1	1986/03/27
NYMPHALIDAE	*Paralethe dendrophilus dendrophilus*	Bush beauty	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Phalanta phalantha aethiopica*	African leopard	Least Concern (SABCA 2013)	2	2011/05/02
NYMPHALIDAE	*Precis archesia archesia*	Garden inspector	Least Concern (SABCA 2013)	5	2013/05/03
NYMPHALIDAE	*Precis octavia sesamus*	Southern gaudy commodore	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Protogoniomorpha parhassus*	Common Mother-of-pearl	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Pseudacraea eurytus imitator*	False wanderer	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Sevenia boisduvali boisduvali*	Boisduval's tree nymph	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Stygionympha scotina scotina*	Eastern hillside brown	Least Concern (SABCA 2013)	1	1974/11/02
NYMPHALIDAE	*Telchinia anacreon*	Orange telchinia	Least Concern (SABCA 2013)	2	2011/05/02
NYMPHALIDAE	*Telchinia cabira*	Yellow-banded telchinia	Least Concern (SABCA 2013)	1	1989/07/15
NYMPHALIDAE	*Telchinia encedon encedon*	White-barred telchinia	Least Concern (SABCA 2013)	4	2011/05/02
NYMPHALIDAE	*Telchinia esebria*	Dusky telchinia	Least Concern (SABCA 2013)	4	2013/05/03
NYMPHALIDAE	*Telchinia igola*	Dusky-veined telchinia	Least Concern (SABCA 2013)	3	2011/05/02
NYMPHALIDAE	*Telchinia rahira rahira*	Marsh telchinia	Least Concern (SABCA 2013)	2	1986/03/30

Family	Scientific name	Common name	Red list category	Number of records	Last recorded
NYMPHALIDAE	*Vanessa cardui*	Painted lady	Least Concern (SABCA 2013)	3	2011/05/02
PAPILIONIDAE	*Papilio dardanus cenea*	Mocker swallowtail	Least Concern (SABCA 2013)	3	2011/05/02
PAPILIONIDAE	*Papilio demodocus demodocus*	Citrus swallowtail	Least Concern (SABCA 2013)	3	2011/05/02
PAPILIONIDAE	*Papilio nireus lyaeus*	Narrow green-banded swallowtail	Least Concern (SABCA 2013)	2	2011/05/02
PIERIDAE	*Afrodryas leda*	Autumn-leaf vagrant	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Belenois aurota*	Pioneer caper white	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Belenois creona severina*	African caper white	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Belenois gidica abyssinica*	African veined white	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Belenois thysa thysa*	False dotted border	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Belenois zochalia zochalia*	Forest caper white	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Catopsilia florella*	African migrant	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Colias electo electo*	African clouded yellow	Least Concern (SABCA 2013)	2	1974/11/02
PIERIDAE	*Colotis antevippe gavisa*	Red tip	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Colotis erone*	Coast purple tip	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Colotis euippe omphale*	Southern round-winged orange tip	Least Concern (LC)	3	2011/05/02
PIERIDAE	*Dixeia pigea*	Small ant-heap white	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Eronia cleodora*	Vine-leaf vagrant	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Eurema brigitta brigitta*	Broad-bordered grass yellow	Least Concern (SABCA 2013)	8	2011/05/02
PIERIDAE	*Mylothris agathina agathina*	Eastern dotted border	Least Concern (SABCA 2013)	5	2013/05/03
PIERIDAE	*Nepheronia argia varia*	Large vagrant	Least Concern (SABCA 2013)	3	2011/05/02
PIERIDAE	*Nepheronia buquetii buquetii*	Buquet's vagrant	Least Concern (SABCA 2013)	2	2011/05/02
PIERIDAE	*Pontia helice helice*	Southern meadow white	Least Concern (SABCA 2013)	3	2011/05/02

Appendix 7 CV's of specialists

Appendix 8
Desktop Assessment Methodology and Information

EZEMVELO KZN WILDLIFE C-PLAN & SEA DATABASE

The C-Plan is a systematic conservation-planning package that runs with the GIS software ArcGIS, and which analyses biodiversity features and landscape units. C-Plan is used to identify a national reserve system that will satisfy specified conservation targets for biodiversity features (*Ezemvelo KZN Wildlife*, 2010). Biodiversity features can be land classes or species, and targets that are set within area units either for land classes, or as numbers of occurrences of species for species locality data sets (*Ezemvelo KZN Wildlife*, 2010). These units or measurements are used as **surrogates** for un-sampled data. The C-Plan is an effective conservation tool when determining priority areas at a **regional level** and is being used in South Africa to identify areas of high conservation value. The SEA (Goodman, 2004) modelled the distribution of a selection of 255 red data and endemic species that have the potential to occur in the area.

Irreplaceability Analysis

The following is referenced from Goodman (2004): "The first product of the conservation planning analysis in C-Plan is an irreplaceability map of the planning area, in this case the province of KwaZulu-Natal. This map is divided into grid cells called 'Planning Units'.

Each planning unit has associated with it an 'Irreplaceability Value', which is a reflection of the planning units' importance with respect to the conservation of biodiversity. Irreplaceability reflects the planning unit's ability to meet set 'targets' for selected biodiversity 'features'. The irreplaceability value is scaled between 0 and 1.

Irreplaceability value – 0. Where a planning unit has an irreplaceability value of 0, all biodiversity features recorded here are conserved to the target amount, and there is unlikely to be a biodiversity concern with the development of the site. This of course will be subject to ground truthing to determine the biodiversity features at a finer scale.

Irreplaceability value – 1. These planning units are referred to as totally irreplaceable and the conservation of the features within them is critical to meet conservation targets. (EIA very definitely required and depending on the nature of the proposal authorisation is unlikely to be granted).

Irreplaceability value > 0 but < 1. Some of these planning units are still required to meet biodiversity conservation targets. If the value is high (e.g. 0.9) then most units are required (few options available for alternative choices). If the value is low, then many options are available for meeting the biodiversity targets. (EIA required and depending on the nature of the proposed development, permission could be granted)."

The irreplaceability units have been optimised further to create various subcategories called *Critical Biodiversity Areas* and *Ecological Support Areas* (*Ezemvelo* KZN Wildlife, 2014).

Critical Biodiversity Areas

The Critical Biodiversity Areas (CBAs) can be divided into two subcategories, namely *Irreplaceable* and *Optimal*. Each of these can in turn be subdivided into additional subcategories (**Table 1**).

The CBA categories are based on the optimised outputs derived using systematic conservation planning software, with the Planning Units (PU) identified representing the localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved.

The distribution of the biodiversity features is not always applicable to the entire extent of the PU, but is more often than not confined to a specific niche habitat e.g. a forest or wetland reflected as a portion of the PU in question. In such cases, development could be considered within the PU if special mitigation measures are put in place to safeguard this feature(s) and if the nature of the development is commensurate with the conservation objectives. Obviously this is dependent on a site by site, case by case, basis.

Using C-Plan, these areas are identified through the MINSET analysis process and reflect the negotiable sites with an Irreplaceability score of less than 0.8. Within the C-Plan MINSET analysis this does not mean they are of a lower biodiversity value however, only that there are more alternate options available within which the features located within can be met. The determination of the spatial locality of these PU's is driven primarily by the Decision Support Layers.

Table 16. Summary of CBA Categories (from *Ezemvelo* KZN Wildlife, Biodiversity Spatial Planning Terms).

Category	C-Plan	MARXAN (statistical modelling package)	Expert Input/ Desktop	Biodiversity Sector and Regional Plans
CBA: Irreplaceable (SCA)	Irreplaceability = 1	No equivalent		CBA: Irreplaceable
CBA: High Irreplaceable (SCA)	Irreplaceability Score >= 0.8 and <1.0	Selection frequency value = 80% –100%		CBA: Irreplaceable
CBA: Irreplaceable Expert Input			Expert input	CBA: Irreplaceable
CBA: Irreplaceable Linkage			Desktop and expert input	CBA: Irreplaceable
CBA: Optimal (SCA)	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas		CBA: Optimal
CBA: Optimal, High Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Low Degradation	Irreplaceability Score > 0 and < 0.8	"Best" solution from MARXAN runs less the identified CBA High Irreplaceability areas	Field Assessment	CBA: Optimal
CBA: Optimal Expert Input			Expert input	CBA: Optimal

Ecological Support Areas

Ecological Support Areas (ESAs) are required to support and sustain the ecological functioning of Critical Biodiversity Areas (CBAs). For terrestrial and aquatic environments, these areas are functional but are not necessarily pristine natural areas. They are however, required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs, and contribute significantly to the maintenance of Ecological Infrastructure[2] (EI).

Landscape Corridors

[2] **A term referring to areas in the landscape which provide significant Ecosystem Services which contribute positively to the economy and human welfare. Examples include 'Flood mitigation' and 'Good Water Quality' (provided both by wetlands and well maintained water catchments). Ecological infrastructure is the stock of functioning ecosystems that provides a flow of essential system services to human communities – services such as the provision of fresh water, climate regulation and soil formation. Ecological infrastructure includes features such as healthy mountain catchments, rivers, wetlands, and nodes and corridors of natural grassland habitat which together form a network of interconnected structural elements within the landscape. If this ecological infrastructure is degraded or lost, the flow of ecosystem services will diminish and ecosystems will become vulnerable to shocks and disturbances, such as the impacts of climate change, unsustainable land use change and natural disasters like floods and droughts. It is important to note that when ecological infrastructure is degraded or fails, the direct monetary cost to society and government is often very high. Ecological infrastructure is, therefore, the nature-based equivalent of hard infrastructure, and is just as important for providing the vital services that underpin social development and economic activity.**

A series of bio-geographic corridors were developed in KZN to facilitate evolutionary, ecological and climate change processes to create a linked landscape for the conservation of species in a fragmented landscape.

Local Corridors

Corridors were developed at a district scale to create fine scale links within the landscape that facilitate ecological processes and ensure persistence of critical biodiversity features.

BIO RESOURCE UNITS (BRU)

A Bioresource Unit is a demarcated area in which the environmental conditions such as soil, vegetation, climate and, to a lesser degree, terrain form, are sufficiently similar to permit uniform recommendations of land use and farm practices to be made, to assess the magnitude of crop yields that can be achieved, to provide a framework in which an adaptive research programme can be carried out, and to enable land users to make correct decisions (Camp, 1998).

The environmental factors defined in a BRU should give an indication of habitat suitability for both plant and animal species. On the other hand, knowing the habitat requirements of any particular species, it should be possible to map locations suitable for such species. There are 590 BRUs in KwaZulu-Natal.

Environmental Potential Atlas

The following is referenced from the Department of Environmental Affairs and Tourism (2007): The Environmental Potential Atlas (ENPAT) developed from a single map of Gauteng to a complete spatial data set of the entire South Africa.

ENPAT was updated in July 2001 and is used by the National Department of Environmental Affairs and Tourism and various provincial environmental management departments as a decision-making tool in the process of environmental impact assessments. ENPAT includes the decision-making parameters such as: high-risk development category indications and potential impacts are linked to the 1:250 000 spatial databases on national and provincial level.

The main purpose of ENPAT is to proactively indicate potential conflicts between development proposals and critical or sensitive environments. ENPAT can also be used for development planning since it indicates the environment's potential for development.

ENPAT consists of two distinct, parallel sets of information: natural or environmental characteristics, and social-economic factors. The environmental character maps depict geology, land types, soils, vegetation, and hydrology. The socio-economic factors consist of land cover, cadastral aspects and infrastructure, land use and culture.
These two sets of information are combined and assessed in terms of their potential or latent environmental sensitivity. Sensitivity is assigned based on the ability of a resource to absorb change or impact. A value of **0** indicates a **low sensitivity** - thus a high ability to accept change and a value of **1** indicates a **high sensitivity**, or a low ability to accept change. Areas of low sensitivity are thus available or suitable for development.

Mucina and Rutherford National Vegetation Types

Mucina and Rutherford (2006**)** present an up-to-date and comprehensive overview of the vegetation of South Africa and the two small neighbouring countries of Lesotho and eSwatini. This account is based on vegetation survey using appropriate tools of contemporary vegetation mapping and vegetation description. They aimed at drawing a new vegetation map that depicts the complexity and **macro-scale** ecology and reflects the level of knowledge of the vegetation of the region. This is an extensive account of the vegetation of a complex and biologically intriguing part of the world, offering not only insights into structure and dynamics of the vegetation cover, but containing a wealth of base-line data for further vegetation- ecological, biogeographical, and conservation-oriented studies. The map and the descriptive account of the vegetation of South Africa, Lesotho and Swaziland offers a powerful decision-making tool for conservationists, land and resource planners, and politicians as well as the interested public at large.

KwaZulu – Natal Vegetation Types (KZN VT)

The KZN VT was created to provide an accurate representation of the **historical extent** of the vegetation types present in KZN with the most current available information. A key issue of concern is our current lack of knowledge regarding the historical extents of both our wetland and forest biomes. Almost all vegetation mapping conducted currently only displays the current extent of the feature in question. As such, no true understanding as to rates of loss and or minimum required habitat areas required to ensure persistence can be accurately determined. This issue further influences our understanding of the grassland/savannah/bushland matrix within which these features reside. The KZN VT map has undergone several changes since the publication of the Mucina and Rutherford (2006) national vegetation types.
Ezemvelo KZN Wildlife has, in association with various government departments, NGOs, Working Groups and Forums, municipalities and parastatals, refined the KZN VT to develop an accurate representation of the extent of the vegetation types present. As a result of the finer scale mapping and classification, KZN VT map has in some cases identified new vegetation types and or subtypes within the vegetation types identified at national level. These changes have been peer reviewed and adopted by the National Vegetation Committee, and have been incorporated into the revised South African Vegetation map.

National Freshwater Ecosystem Priority Areas (NFEPA)

NFEPA was a three-year partnership project between South African National Biodiversity Institute (SANBI), CSIR, Water Research Commission (WRC), Department of Environmental Affairs (DEA), Department of Water Affairs (DWA), Worldwide Fund for Nature (WWF), South African Institute of Aquatic Biodiversity (SAIAB) and South African National Parks (SANParks) (Van Deventer *et al.,* 2010). NFEPA map products provide strategic spatial priorities for conserving South Africa's freshwater ecosystems and supporting sustainable use of water resources. These strategic spatial priorities are known as Freshwater Ecosystem Priority Areas, or FEPAs.

FEPA maps and supporting information form part of a comprehensive approach to sustainable and equitable development of South Africa's scarce water resources. They provide a single, nationally consistent information source for incorporating freshwater ecosystem and biodiversity goals into (two) 2 planning and decision-making processes. For integrated water resource management, the maps provide guidance on how many rivers, wetlands and estuaries, and which ones, should remain in a natural or near-natural condition to support the water resource protection goals of the National Water Act (Act No. 36 of 1998; RSA, 1998a). FEPA maps are therefore directly applicable to the National Water Act, feeding into Catchment Management Strategies, classification of water resources, reserve determination, and the setting and monitoring of resource quality objectives. FEPA maps are also directly relevant to the National Environmental Management: Biodiversity Act (Act No. 10 of 2004; RSA, 2004) (hereafter referred to as the Biodiversity Act), informing both the listing of threatened freshwater

ecosystems and the process of bioregional planning provided for by this Act. FEPA maps support the implementation of the National Environmental Management: Protected Areas Act (Act No. 57 of 2003; RSA, 2003) (hereafter referred to as the Protected Areas Act) by informing the expansion of the protected area network. They also inform a variety of other policies and legislation that affect the management and conservation of freshwater ecosystems, including at the municipal level.
FEPAs are strategic spatial priorities for conserving freshwater ecosystems and supporting sustainable use of water resources. FEPAs were determined through a process of systematic biodiversity planning and were identified using a range of criteria for conserving ecosystems and associated biodiversity of rivers, wetlands and estuaries.

FEPAs are often tributaries and wetlands that support hard-working large rivers, and are an essential part of an equitable and sustainable water resource strategy. FEPAs need to stay in a good condition to manage and conserve freshwater ecosystems, and to protect water resources for human use. This does not mean that FEPAs need to be fenced off from human use, but rather that they should be supported by good planning, decision-making and management to ensure that human use does not impact on the condition of the ecosystem. The current and recommended condition for all river FEPAs is A or B ecological category (Nel et al, 2011). Wetland FEPAs that are currently in a condition lower than A or B should be rehabilitated to the best attainable ecological condition.

Appendix 8 Impact Methodology

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) METHODOLOGY

The Environmental Impact Assessment (EIA) Methodology assists in evaluating the overall effect of a proposed activity on the environment. Determining of the significance of an environmental impact on an environmental parameter is determined through a systematic analysis.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global), whereas intensity is defined by the severity of the impact e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence. Significance is calculated as shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System

The impact assessment must take account of the nature, scale and duration of effects on the environment and whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is also assessed according to the various project stages, as follows:

- Planning;
- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

The significance of Cumulative Impacts should also be rated (As per the Excel Spreadsheet Template).

Rating System Used to Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the possible mitigation of the impact. Impacts have been consolidated into one (1) rating. In assessing the significance of each issue the following criteria (including an allocated point system) is used:
Table 17: Rating of impacts criteria

ENVIRONMENTAL PARAMETER		
A brief description of the environmental aspect likely to be affected by the proposed activity (e.g. Surface Water).		
ISSUE / IMPACT / ENVIRONMENTAL EFFECT / NATURE		
Include a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity (e.g. oil spill in surface water).		
EXTENT (E)		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY (P)		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY (R)		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.
3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES (L)		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.

DURATION (D)		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
INTENSITY / MAGNITUDE (I / M)		
Describes the severity of an impact (i.e. whether the impact has the ability to alter the functionality or quality of a system permanently or temporarily).		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
SIGNIFICANCE (S)		
Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula: **Significance = (Extent + probability + reversibility + irreplaceability + duration) x magnitude/intensity.**		

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.

Points	Impact Significance Rating	Description
5 to 23	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
5 to 23	Positive Low impact	The anticipated impact will have minor positive effects.
24 to 42	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
24 to 42	Positive Medium impact	The anticipated impact will have moderate positive effects.
43 to 61	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
43 to 61	Positive High impact	The anticipated impact will have significant positive effects.
62 to 80	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
62 to 80	Positive Very high impact	The anticipated impact will have highly significant positive effects.