



Vegetation assessment for the proposed Maphumulo Integrated Energy Centre (IEC), Glendale, KwaMaphumulo, KwaZulu-Natal

19 June 2017

REFERENCE

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Reference	
Submitted to	
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CONDITIONS OF THIS REPORT

Even though every care is taken to ensure the accuracy of this report, ecological assessment studies are limited in scope, time and budget. Discussions and proposed mitigations are to some extent made on reasonable and informed assumptions built on *bone fide* information sources, as well as deductive reasoning. Deriving a 100% factual report based on field collecting and observations can only be done over several years and seasons to account for fluctuating environmental conditions.

Since environmental impact studies deal with dynamic natural systems, additional information may come to light at a later stage. The assessment team can thus not accept responsibility for conclusions and mitigation measures made in good faith based on own databases or on the information provided at the time of the directive.

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EXECUTIVE SUMMARY

Rautenbach Biodiversity Consulting was appointed by The Biodiversity Company to undertake a vegetation assessment for the proposed development of the Maphumulo Integrated Energy Centre (IEC) in Glendale, KwaMaphumulo, KwaZulu-Natal Province.

The project area is located within Glendale, KwaMaphumulo, KwaZulu-Natal Province and falls within the QDS 2931AC. The area falls within the 'Vulnerable' KwaZulu-Natal Coastal Belt ecosystem (NBA, 2011) and within an area designated as a Biodiversity area (KZN SCP 2012).

During a site visit it was noted that the project area and surrounding areas have been completely transformed by sugarcane farming and alien plant invasions. Natural species diversity was found to be very low.

However, three provincially plant species of conservation concern have been identified, one species on the project area, and two species on areas surrounding the project area. Permits will be required from KZN Wildlife for the removal of these species.

Provincially protected species (KZN Nature Conservation Management Act No. 5 of 1999; KZNEBPA, 2014):

- *Freesia laxa* var. *laxa* (GPS coords: S 29°16' 47.82"; E 31°6' 24.77;
- *Hypoxis hemerocallidae* – S 29°16' 50.17"; E 31°6' 25.31" ;
- *Crinum* sp. – S 29°16' 50.27"; E 31°6' 21.85".

Abundance of these species was found to be very low and since these species can be relocated with ease, the project area and surrounding areas are not considered to be sensitive. Therefore it is not anticipated that the intended development will have a detrimental effect on the floristic components of the project area and surroundings, nor of a loss/displacement of any other threatened or protected flora species previously recorded within the QDS 2931AC.



Table of Contents

1. INTRODUCTION	8
2. SCOPE AND OBJECTIVES OF THE STUDY	8
3. LIMITATIONS TO THE ASSESSMENT	9
4. KEY LEGISLATIVE REQUIREMENTS.....	9
5. PROJECT AREA	10
5.1 Climate and rainfall.....	11
5.2 Current land use and infrastructure.....	11
6. VEGETATION ASSESSMENT.....	12
6.1 Review of existing environmental information	12
6.2 Vegetation assessment	13
6.3 Sensitivity analysis	14
6.4 Assessment methodology for Red Listed and Protected flora species	15
7. RESULTS	18
7.1 Conservation context.....	18
7.1.1 National level conservation priorities	18
7.1.1.1 Protected areas and other conservation areas	18
7.1.1.2 National threatened ecosystems	19
7.1.2 Provincial and District Level Conservation Priorities (KZNSCP 2012 & KZNBSP 2014)	20
7.2 Vegetation assessment	23
7.2.1 Regional vegetation	23
7.2.2 General findings.....	25
7.2.3 Invasive Plants.....	29
8. IMPACT ASSESSMENT	30
9. MITIGATION MEASURES	32
9.1 Recommended mitigation measures for flora.....	32
9.2 General mitigation measures.....	33
10. CONCLUSIONS.....	34
11. REFERENCES	35



Tables

Table 1: A list of key legislative requirements relevant to biodiversity and conservation in KwaZulu-Natal.	10
Table 2: Summary of the CBA categories used in the KwaZulu-Natal Systematic Conservation Plan (KZNSCP 2012).	21
Table 3: Summary of the CBA and ESA categories used in the iLembe District Municipality: Biodiversity Sector Plan (KZNBSP 2014).	21
Table 4: A list of plant species identified in the sugarcane vegetation unit. Sensitive species are highlighted in red.	26
Table 5: A list of plant species encountered on areas adjacent to the project area. Sensitive species are highlighted in red.	27
Table 6: Impact description: Loss of sensitive ecosystems.	30
Table 7: Impact description: Loss of Red Listed and Protected flora species.	31
Table 8: Impact description: Invasion of IAPs and weeds.	32

Figures

Figure 1: Locality map of the proposed Maphumulo IEC development in KwaZulu-Natal Province.	11
Figure 2: Sugarcane field on the project area.	12
Figure 3: The extent of the Thukela NPAES areas in relation to the project area. The 20 km radius is indicated with a red circle.	19
Figure 4: The extent of National threatened ecosystems in relation to the project area.	20
Figure 5: The extent of Critical Biodiversity Areas in relation to the project area (KZNSCP 2012).	22
Figure 6: The extent of CBA Irreplaceable and CBA Optimal areas in relation to the project area (KZNBSP 2014).	23
Figure 7: The extent of the Eastern Valley Bushveld vegetation type in relation to the project area.	25
Figure 8: The location of the provincially protected plant species on the project area and surrounding areas. The project area is demarcated with a red line.	29

Appendices

Appendix 1: A checklist of plant species for the QDS 2931AC (http://posa.sanbi.org). Threatened and protected species are highlighted in red.	37
Appendix 2: Impact assessment methodology	42



Appendix 3. Development implications for areas with Red Listed/Protected plant species. . 48

Appendix 4: A collage of pictures from the project area and surroundings. 48



List of Abbreviations

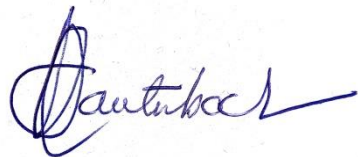
BGIS	Biodiversity Geographic Information System
CBA	Critical Biodiversity Areas
CITES	Convention on International Trade in Endangered Species of Fauna and Flora
DAFF	Department of Agriculture, Forestry and Fisheries
DWAF	Department of Water Affairs and Forestry
EIA	Environmental Impact Assessment
GIS	Geographic Information System
ha	Hectares
IUCN	International Union for the Conservation of Nature
Lat	Latitude
Long	Longitude
LUDS	Land Use Decision Support
MAP	Mean Annual Precipitation
m.a.s.l.	Meters above sea level
mm	Millimetres
NBA	National Biodiversity Assessment
NEMBA	National Environmental Management Biodiversity Act
NFEPA	National Freshwater Ecosystem Priority Areas
NPAES	National Protected Areas Expansion Strategy
PRECIS	National Herbarium Pretoria Computerized Information System
QDS	Quarter degree grid square
SANBI	South African Biodiversity Institute



DECLARATION

I, **Anita Rautenbach** declare that I:

- Am committed to biodiversity conservation, but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them.
- Am subcontracted as a specialist consultant by The Biodiversity Company to undertake a vegetation assessment for the proposed development of the Maphumulo Integrated Energy Centre (IEC) in Glendale, KwaMaphumulo, KwaZulu-Natal Province;
- Do not have or will not have any financial interest in the undertaking of the activity other than remuneration for work performed;
- Have not and will not engage in conflicting interests in the undertaking of the activity;
- Undertake to disclose to the Client and the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations of 2014;
- The intellectual property in this report will only be transferred to the Client (the party/company that commissioned the work) on full payment of the contract fee. Upon transfer of the intellectual property, I recognize that written consent of the Client will be required for me to release any part of this report to third parties.



Signature of the specialist:

Date: 19th June 2017



1. INTRODUCTION

Rautenbach Biodiversity Consulting was appointed by The Biodiversity Company to undertake a vegetation assessment for the proposed development of the Maphumulo Integrated Energy Centre (IEC) in Glendale, KwaMaphumulo, KwaZulu-Natal Province.

The development will comprise of the construction of the following facilities:

- Shop
- New canopy
- Internet café/computer room
- Library
- Boardroom and toilets
- Distribution area
- Underground storage tanks
- 43 parking bays
- Septic tank and soakaway

Primarily this report focuses on the identification of ecological sensitive areas, and the reigning status of flora species occurring, or is likely to occur on the project area and surrounding areas, and whose conservation status should be considered in the decision-making process.

This assessment is in accordance with the 2014 EIA Regulations (No. R. 982-985, Department of Environmental Affairs, 4 December 2014) emanating from Chapter 5 of the National Environmental Management Act (Act No. 107 of 1998).

2. SCOPE AND OBJECTIVES OF THE STUDY

Scope:

To conduct a vegetation assessment of the target area where the development of the proposed Maphumulo Integrated Energy Centre (IEC) in Glendale, KwaMaphumulo, KwaZulu-Natal Province is proposed, and provide a professional opinion on ecological issues pertaining to the target area to aid in future decision making regarding the proposed project.

Objectives:

- To qualitatively and quantitatively assess the significance of the flora habitat components and the current general conservation status of the project area;
- Identify and comment on ecological sensitive areas;
- Provide an inventory of the dominant flora species on the project area;
- To provide a list of flora species that may occur, and to identify species of conservation importance;
- To highlight the potential impacts of the proposed development on the flora species deemed present on the project area;
- Identification of sensitive habitats within the project area;
- Identify impacts upon habitat in terms of floral significance;



- Identification of conservation significant habitats around the project area which might be impacted by the proposed development;
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved;
- To identify any environmental fatal flaws or red flag issues.

3. LIMITATIONS TO THE ASSESSMENT

The following limitations apply to the studies undertaken for this report:

- This report deals exclusively with the defined area and the impacts associated with the proposed development on the flora and ecosystems of the area;
- Only a rapid assessment of the flora that may be potentially impacted on by the proposed development was conducted. Whilst species recorded during the site visit have been included in this report, this was based on site observations made during one site visit;
- The site visit was undertaken in winter (11 June 2017), and therefore does not cover the seasonal variation in conditions on the project area. A more detailed assessment would require that assessments take place in all seasons of the year. The species checklists provided in this report are reflective of only those species identified at the time of the site visit and cannot be regarded as exhaustive.
- As a result, it is unlikely that all flora species occurring on the project area would have been observed, specifically with regards to Red Listed/Protected flora species.
- Due to the dynamic nature of ecosystems, there is the likelihood that some aspects (of which some may be important) may have been overlooked.
- Information used to inform the assessment was limited to data and GIS coverage's available for the Province at the time of the assessment.

4. KEY LEGISLATIVE REQUIREMENTS

In South Africa, there are dedicated legal, policy and planning tools for biodiversity management and conservation, linked to broader environmental management on International, National and Provincial levels. Table 1 lists key legislation relevant to biodiversity conservation and management in KwaZulu-Natal Province.



Table 1. A list of key legislative requirements relevant to biodiversity and conservation in KwaZulu-Natal.

INTERNATIONAL	Convention on Biological Diversity (CBD, 1993) The United Nations Framework Convention on Climate Change (UNFCCC, 1994) The Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1973)
NATIONAL	Constitution of the Republic of South Africa (Act No. 108 of 2006) The National Environmental Management Act (NEMA) (Act No. 107 of 1998) The National Environmental Management Protected Areas Act (Act No. 57 of 2003) The National Environmental Management Biodiversity Act (Act No. 10 of 2004) National Protected Areas Expansion Strategy (NPAES) Environmental Conservation Act (Act No. 73 of 1983) Natural Scientific Professions Act (Act No. 27 of 2003) National Biodiversity Framework (NBF, 2009) National Forest Act (Act No. 84 of 1998) World Heritage Convention Act (Act No. 49 of 1999) Municipal Systems Act (Act No. 32 of 2000) Alien and Invasive Species Regulations, 2014 White Paper on Biodiversity (Notice 1095 of 1997)
PROVINCIAL	KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 KwaZulu-Natal Nature Conservation Management Act (No. 9 of 1997) KwaZulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) KwaZulu-Natal Planning and Development Act (No. 6 of 2008) Local Government Municipal System's Act (No 32 of 2000)

In addition to legal requirements (Table 1), the following National and Regional reviews, reports and guidelines were taken into consideration:

- Lexicon of Biodiversity Planning in South Africa (2016);
- Guidelines for Biodiversity Impact Assessments in KZN (2013);
- Ezemvelo KZN Wildlife Strategy (2009 – 2014);
- KwaZulu-Natal Systematic Conservation Plan (KZNSCP, 2012);
- iLembe District Municipality: Biodiversity Sector Plan (KZNBSP, 2014).

5. PROJECT AREA

The project area falls within the Maphumulo local municipal area of the iLembe district municipality in KwaZulu-Natal Province (GPS coordinates S 29°16' 48.40"; E 31°6' 23.19"; Figure 1), and is approximately 0.63 ha in extent. This area falls within the Quarter Degree Grid Square (QDS) 2931AC.

It should be noted that the boundaries of the project area depicted in Figure 1 is subjective, since only a single locality point was made available at the time of this directive.



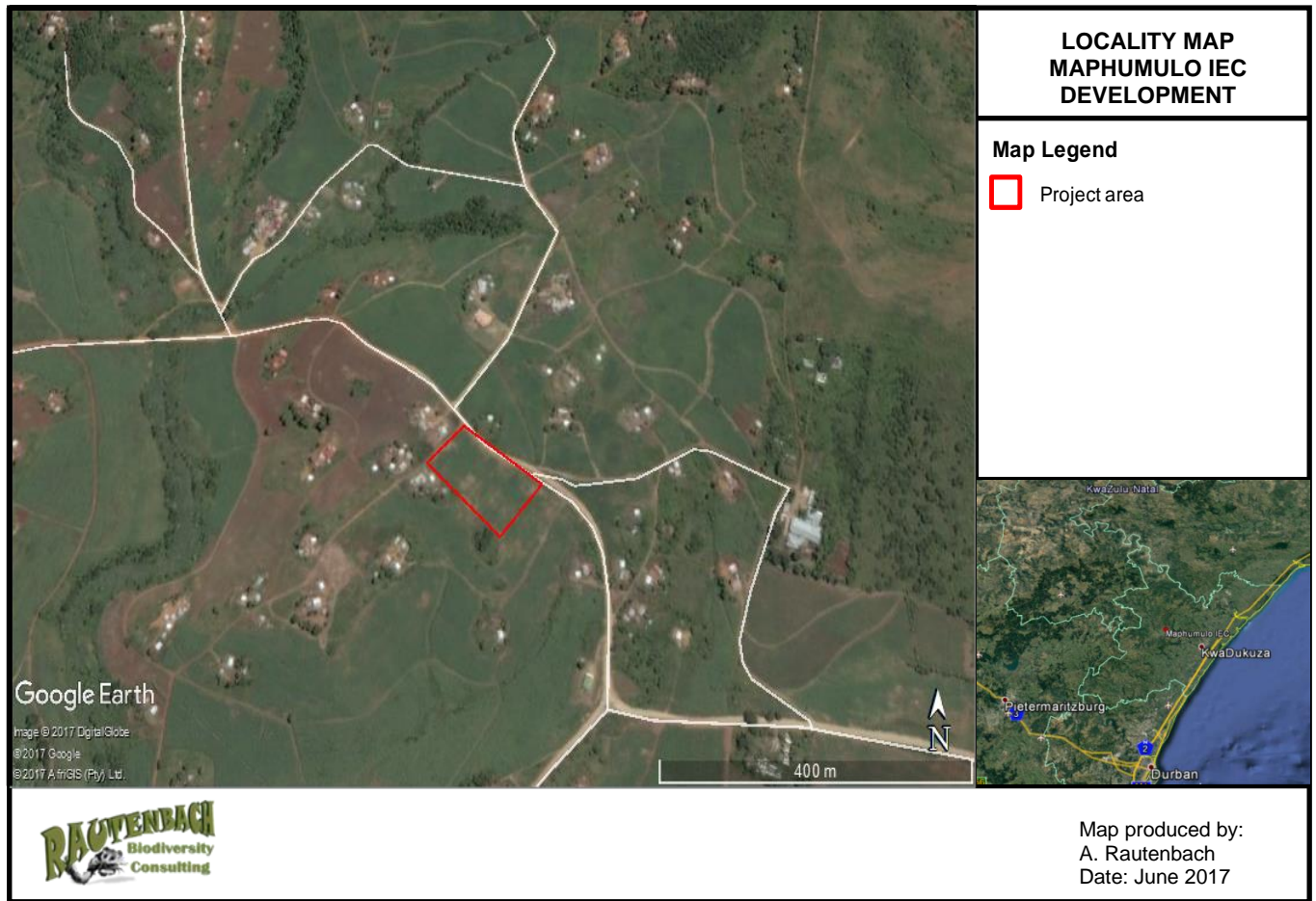


Figure 1: Locality map of the proposed Maphumulo IEC development in KwaZulu-Natal Province.

5.1 Climate and rainfall

The iLembe District has a moderate climate with a mean annual temperature ranging from 21° C at the coast to 16° C inland at higher altitudes, where the winter annual minimum temperatures approaches 12° C. The District falls within a summer rainfall area and has a mean annual precipitation (MAP) ranging from 650 mm to 1 200 mm, generally declining from coastal areas to inland areas (Ezemvelo KZN Wildlife (2013) iLembe BSP).

5.2 Current land use and infrastructure

The entire project area is currently under sugarcane cultivation (Figure 2). A dirt road borders the area on the east. The general area surrounding the project area is sparsely populated and comprise of a few homesteads with extensive sugarcane fields interspersed between homesteads (Figure 1).





Figure 2: Sugarcane field on the project area.

6. VEGETATION ASSESSMENT

6.1 Review of existing environmental information

Prior to the field assessment, a comprehensive desktop assessment was carried out to document all baseline ecological information relating to the project area and mapped at a desktop level. Mapping was informed by available digital imagery and other supporting datasets. The following spatial data sets were included (available from the SANBI BGIS website; www.sanbi.org):

National Biodiversity Assessment (NBA, 2011)

- NBA 2011 Terrestrial Ecosystem Protection Level – SANBI BGIS Terrestrial Ecosystem Protection Level [vector geospatial dataset];
- NBA 2011 Terrestrial Formal Protected Areas – SANBI BGIS [vector geospatial dataset];
- National List of Threatened Ecosystems 2011 – SANBI [vector geospatial dataset].

National Protected Areas Expansion Strategy (NPAES, 2010)

- NPAES Focus areas 2010 - North West Province of Rural, Environment and Agriculture Department [vector geospatial dataset];
- NPAES Protected Areas – Formal land-based 2010 - SANParks/SANBI [vector geospatial dataset];
- NPAES Protected Areas – Informal 2010 - SANParks/SANBI [vector geospatial dataset].

KwaZulu-Natal Systematic Conservation Plan (KZNSCP 2012)

- KZN Landscape Ecological Corridors 2010 - Ezemvelo KZN Wildlife (2010) Version 3.1. Unpublished GIS Coverage [kzncor05v3_1_10_wll.zip];



- KZNSCP: Vegetation types - Scott-Shaw, R. & Escott, B.J. (eds) (2011) KwaZulu-Natal Provincial PreTransformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_011_wll.zip];
- KwaZulu-Natal Systematic Conservation Plan (KZNSCP); KZNSCP conservation status of vegetation types - Scott-Shaw, R. & Escott, B.J. (eds) (2011) KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map – 2011. Unpublished GIS Coverage [kznveg05v2_011_wll.zip];

iLembe District Municipality: Biodiversity Sector Plan (KZNBSP 2014)

- Ezemvelo KZN Wildlife. KZN Biodiversity Sector Plans Local Corridors 2014 [Vector] 2014;
- KZN CBA Irreplaceable version 26012016 (2016). GIS Coverage [KZN_CBA_Irreplaceable_wll_26012016];
- KZN CBA Optimal version 03032016 (2016). GIS Coverage [KZN_CBA_Optimal_wll_03032016.zip];
- KZN ESA version 01022016 (2016). GIS Coverage [KZN_ESA_wll_01022016.zip];
- KZN ESA Species Specific version 01022016 (2016). GIS Coverage [KZN_ESA_Species_wll_01022016_01022016.zip];
- Ezemvelo Managed Protected Area Boundary – Areas recently acquired but not currently proclaimed (2016). Unpublished GIS Coverage [eKZNw_pabnd_owned_not_yet_proclaimed_2016_wll.zip];
- DAFF Managed Forest Wilderness Area Boundary - DEA Protected Area Database Extract (2016). Published GIS Coverage [DAFF_forest_wilderness_area_wll_2016.zip];
- Ezemvelo KZN Wildlife. KZN Landscape Corridors 2016 [Vector] 2016;
- Ezemvelo KZN Wildlife (2016). KZN Private Nature Reserves (2016). Unpublished GIS Coverage [KZN_Private_NR_wll_2016.zip];
- Ezemvelo KZN Wildlife Proclaimed Protected Area boundary (2015). Unpublished GIS Coverage [eKZNw_pabnd_2015_wdd.zip];
- Ezemvelo KZN Wildlife (2016) KZN Proclaimed Stewardship Sites (January 2016). Unpublished GIS Coverage [stewardship_wll_jan2016_draft.zip].

6.2 Vegetation assessment

A vegetation literature search was undertaken to document all known occurrences of plant species within the QDS 2931AC.

The following information sources were utilized:

- *The Vegetation of South Africa, Lesotho and Swaziland* (Mucina & Rutherford, 2006);
- National Red List of Threatened Plants of South Africa (Raimondo *et al.*, 2009);
- Plants of southern Africa: an annotated checklist (<http://posa.sanbi.org>);
- iLembe Biodiversity Sector Plan (KZNBSP 2014);
- KwaZulu-Natal Systematic Conservation Plan (KZNSCP 2012).



6.3 Sensitivity analysis

The determination of specific ecosystem services and the sensitivity of ecosystem components, both biotic and abiotic, is rather complex and no single overarching criterion will apply to all habitats studied. Sensitivity analyses do not only consider aspects that currently prevail on the area, but also take into account the possibility of full restoration of the original environment and its biota, or at least the rehabilitation of ecosystem services resembling the original state after an area has been significantly disturbed.

The main aspects of an ecosystem that need to be incorporated in a sensitivity analysis, however, include the following:

- A description of the nature and number of species present, taking into consideration their conservation value as well as the probability of such species to survive or re-establish itself following disturbances, and alterations to their specific habitats, of various magnitudes;
- An identification of the species or habitat features that are 'key ecosystem providers' and characterising their functional relationships (Kremen, 2005);
- A determination of the aspects of community structure that influence function, especially aspects influencing stability or rapid decline of communities (Kremen, 2005);
- An assessment of key environmental factors that influence the provision of services (Kremen, 2005);
- Gaining knowledge about the spatio-temporal scales over which these aspects operate (Kremen, 2005).

The sensitivity analyses are presented in the following categories:

High Sensitivity: Areas that are relatively undisturbed or pristine, and

- Either is very species-rich relative to immediate surroundings;
- Or have a very unique and restricted indigenous species composition;
- Or constitute specific habitats or a high niche diversity for fauna and/or flora species of conservation concern, and where the total extent of such habitats and associated species of conservation concern remaining in Southern Africa is limited;
- Where excessive disturbance of such habitats may lead to ecosystem destabilisation and/or species loss;
- This would also include areas where the abiotic environment is of such nature that the habitat and its niche-diversity are the main reason for a higher species diversity and cannot be reconstructed or rehabilitated once physically altered in any way.

Medium Sensitivity: Areas where disturbances are at most limited and

- Areas with a species diversity representative of its natural state, but not exceptionally high or unique compared to its surroundings;
- Areas of which the biotic configuration does not constitute a very specific or restricted habitat or very high niche diversity;
- Areas that provide ecosystem services needed for the continued functioning of the ecosystem and the continued use thereof (e.g. grazing);
- Although species of conservation concern may occur on the area, these are not restricted to these habitats only;



- Areas that need to remain intact to ensure the functioning of adjacent ecosystems, or wildlife corridors or portions of land that prevent the excessive fragmentation of natural fauna and flora populations, or areas that will be difficult or impossible to rehabilitate to a functional state after physical alteration.
 - **Medium high sensitivity** would include areas:
 - Where the landscape can be rehabilitated to allow the re-establishment of some of the original species composition after physical alteration, but some of the species of conservation concern or ecosystem functionality may be lost;
 - With a high species diversity and potentially higher number of species of conservation concern.
 - **Medium low sensitivity** would include areas:
 - With a high species diversity with few species of conservation concern;
 - This could also include areas with previous disturbance or transformation, where the impact of the development will lead to irreversible, unjustified degradation of the landscapes that will be difficult to prevent and mitigate;
 - Where the landscape can be rehabilitated to allow the re-establishment of most or all of the original species composition after physical alteration.

Low Sensitivity: Areas that have been previously transformed or disturbed or

- Areas that provide limited ecosystem services, or have a low ecological value;
- Species diversity may be low or all species present have a much wider distribution beyond this habitat or locality;
- Species of conservation concern may be present on such areas, but these are not restricted to these habitats and can be relocated with ease;
- Further arguments may include landscapes where the abiotic nature is such that it can be rehabilitated relatively easy to allow the re-establishment of the original species composition, and where the development will not lead to any unjustified degradation of landscapes or ecosystem services if adequately mitigated.

6.4 Assessment methodology for Red Listed and Protected flora species

South Africa uses the internationally endorsed IUCN Red List categories and criteria to measure a species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action.

The conservation status of species for all taxa was determined using categories described by the International Union for Conservation of Nature (IUCN), as well as the National Environmental Management Biodiversity Act, (No. 10 of 2004; hereafter referred to as NEMBA) regulations on Threatened and Protected species (updated species regulations of March 2015). The KwaZulu-Natal Environmental, Biodiversity and Protected Areas Management Bill, 2014 (hereafter referred to as KZNEBPA), and the KwaZulu-Natal Nature Conservation Management Amendment Act (No. 5 of 1999) was used to evaluate conservation status on a Provincial scale.

It is important to note that although the category names in the NEMBA list are similar to those in the IUCN Red List, and NEMBA category definitions are broadly similar to those of



the IUCN categories, they are not equivalent because different classification systems were used. Therefore, a species classification in NEMBA may differ from its Red List category.

The KZNEBPA stipulates how wild and wild sourced specimens are to be managed in terms of human use such as the harvesting, gathering, collecting, transportation, conveying, importing or exporting, have in possession or exercise physical control over or wilfully damage or destroy. Grow, breed or in any other way propagate or cause to multiply for commercial purposes, sell, trade in or buying of specimens listed under Schedules 7 and 8.

For the botanical assessment, the List of Protected tree species, Section 12 (1) (d) Schedule A (National Forest Act, No. 84 of 1998, Notice 1602 of December 2016), was included.

National IUCN Categories: (SANBI, 2015)

Categories marked with ^N are non-IUCN, National Red List categories for species not in danger of extinction, but considered of conservation concern. The IUCN equivalent of these categories is Least Concern (LC).

Extinct (EX) A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.

Extinct in the Wild (EW) A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.

Regionally Extinct (RE) A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.

Critically Endangered, Possibly Extinct (CR PE) Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.

Critically Endangered (CR) A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.

Endangered (EN) A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.

Vulnerable (VU) A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.

Near Threatened (NT) A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.

^N**Critically Rare** A species is Critically Rare when it is known to occur at a single site, but are not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.



^N**Rare** A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows:

- Restricted range: Extent of Occurrence (EOO) <500 km², OR
- Habitat specialist: Species are restricted to a specialized microhabitat so that it has a very small area of occupancy (AOO), typically smaller than 20 km², OR
- Low densities of individuals: Species always occur as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
- Small global population: Less than 10 000 mature individuals.

^N**Declining** A species is declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.

Least Concern A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. A species classified as Least Concern is considered at low risk of extinction. Widespread and abundant species are typically classified in this category.

Data Deficient - Insufficient Information (DDD) A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species are well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.

Data Deficient - Taxonomically Problematic (DDT) A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.

Not Evaluated (NE) A species is Not Evaluated when it has not been evaluated against the criteria. The National Red List of South African plants are a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in [Plants of southern Africa: an online checklist \(POSA\)](#) are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated.

Threatened species are species that are facing a high risk of extinction. Any species classified in the IUCN categories **Critically Endangered**, **Endangered** or **Vulnerable** are a threatened species.

Species of conservation concern are species that have a high conservation importance in terms of preserving South Africa's high floristic diversity and include not only threatened species, but also those classified in the categories **Extinct in the Wild (EW)**, **Regionally Extinct (RE)**, **Near Threatened (NT)**, **Critically Rare**, **Rare**, **Declining** and **Data Deficient - Insufficient Information (DDD)**.

NEMBA Categories:

Critically endangered (CR) – Indigenous species facing an extremely high risk of extinction in the wild in the immediate future.



Endangered species (EN) – Indigenous species facing a high risk of extinction in the wild in the near future, although they are not a critically endangered species.

Vulnerable Species (VU) – Indigenous species facing a high risk of extinction in the wild in the medium-term future, although they are not a critically endangered species or an endangered species.

Protected Species (PROT) – Indigenous species of high conservation value or national importance that require national protection.

KZNEBPA Categories:

Schedule 7 – KwaZulu-Natal Threatened Plant Species: Schedule 7 lists the threatened plant species and provides for certain prohibited and restricted activities with respect to such species.

Schedule 8 – KwaZulu-Natal Protected Plant Species: Schedule 8 lists the protected plant species and provides for certain prohibited and restricted activities with respect to such species. Restricted Activities requiring a permit involve wild or wild sourced plant specimens: harvest, gather, collect, and transport, convey or export, sell, or trade in.

7. RESULTS

7.1 Conservation context

The conservation importance of the project area was assessed on National (NBA, 2011), Provincial (KZNSCP, 2012) and District (KZNBSP, 2014) scales.

7.1.1 National level conservation priorities

7.1.1.1 Protected areas and other conservation areas

No National, Provincial, formal or informal protected areas lie within a 20 km radius of the project area. The Thukela NPAES areas lie within a 20 km radius of the project area (Figure 3).

NPAES areas are large, intact and unfragmented areas of high importance for biodiversity representation and ecological persistence, suitable for the creation or expansion of large protected areas. The focus areas were identified through a systematic biodiversity planning process undertaken as part of the development of the National Protected Area Expansion Strategy 2008 (NPAES).

They present the best opportunities for meeting the ecosystem-specific protected area targets set in the NPAES, and were designed with strong emphasis on climate change resilience and requirements for protecting freshwater ecosystems. These areas should not be seen as future boundaries of protected areas, as in many cases only a portion of a particular focus area would be required to meet the protected area targets set in the NPAES. They are also not a replacement for finescale planning which may identify a range of different priority sites based on local requirements, constraints and opportunities.



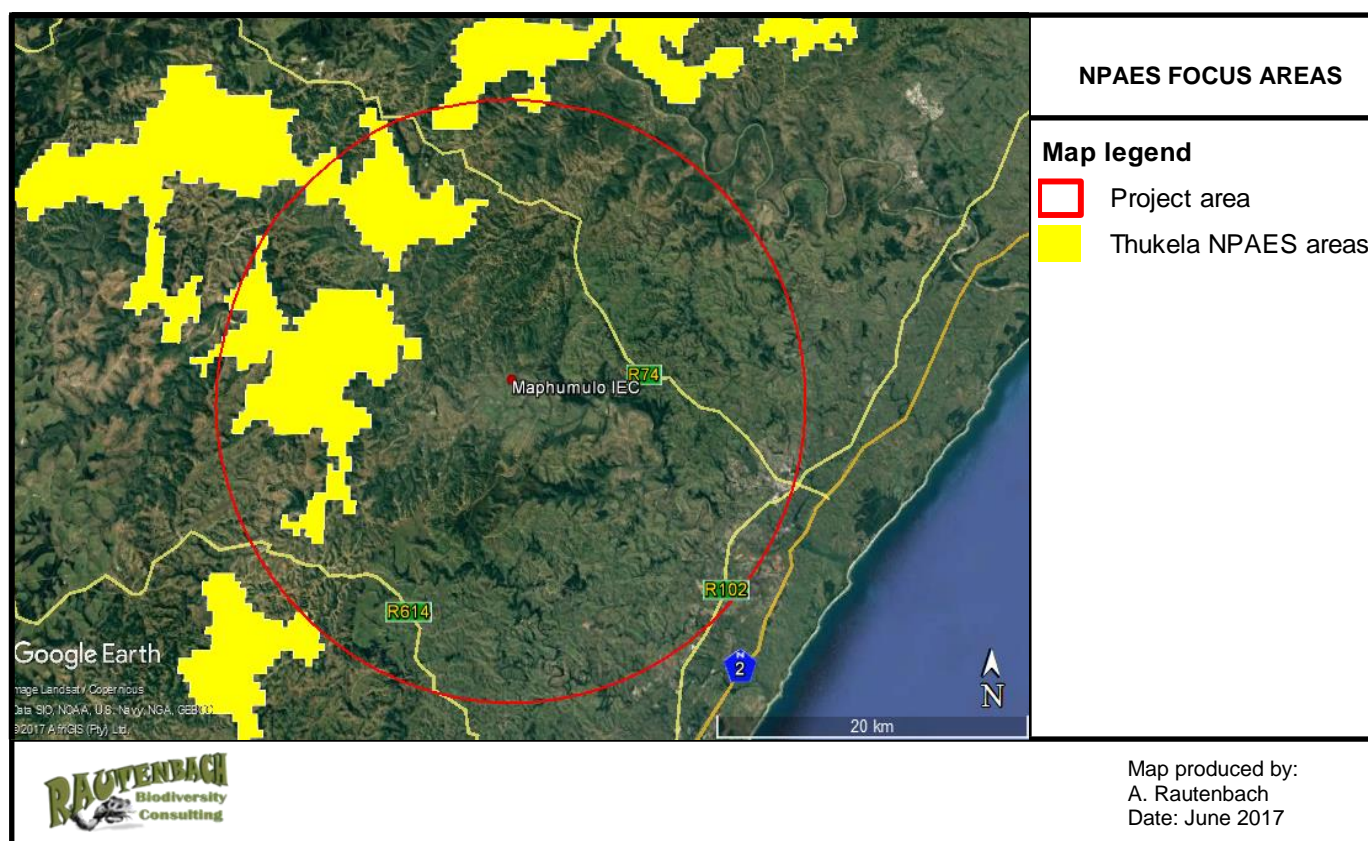


Figure 3: The extent of the Thukela NPAES areas in relation to the project area. The 20 km radius is indicated with a red circle.

7.1.1.2 National threatened ecosystems

The first list of nationally threatened terrestrial ecosystems in South Africa was gazetted in December 2011 (NEMBA: National List of ecosystems that are threatened and in need of protection, G34809, GoN 1002), with the aim of reducing the rate of ecosystem and species extinction by preventing further degradation and loss of structure, function and composition. This list also includes ecosystems outside of protected areas. Ecosystems are listed in one of four categories: critically endangered (CR), endangered, (EN), vulnerable (VU) or protected.

Ecosystem delineation was based on the South African Vegetation Map (Mucina & Rutherford, 2006); National Forest Types (DAAF), priority areas identified in Provincial Systematic Biodiversity Plans, and high irreplaceability forest patches or clusters systematically identified by DAAF.

The project area falls within the 'Vulnerable' KwaZulu-Natal Coastal Belt ecosystem (ecosystem code CB 3). This ecosystem extends in a long, and in places broad, coastal strip along the KwaZulu-Natal coast from near Mtunzini in the north, past Durban to Margate and just short of Port Edward in the south.

It typically occurs on highly dissected undulating coastal plains which presumably used to be covered to a great extent with various types of subtropical coastal forest. Some primary grassland dominated by *Themeda triandra* still occurs in hilly, high-rainfall areas where pressure from natural fire and grazing regimes prevailed. At present, the KwaZulu-Natal



Coastal Belt is affected by an intricate mosaic of very extensive sugarcane fields, timber plantations and coastal holiday resorts, with interspersed secondary *Aristida* grasslands, thickets and patches of coastal thornveld. At least three endemic plant species occur in the ecosystem.

Only a very small part of this ecosystem is protected in Ngoye, Mbumbazi and Vernon Crookes Nature Reserves.

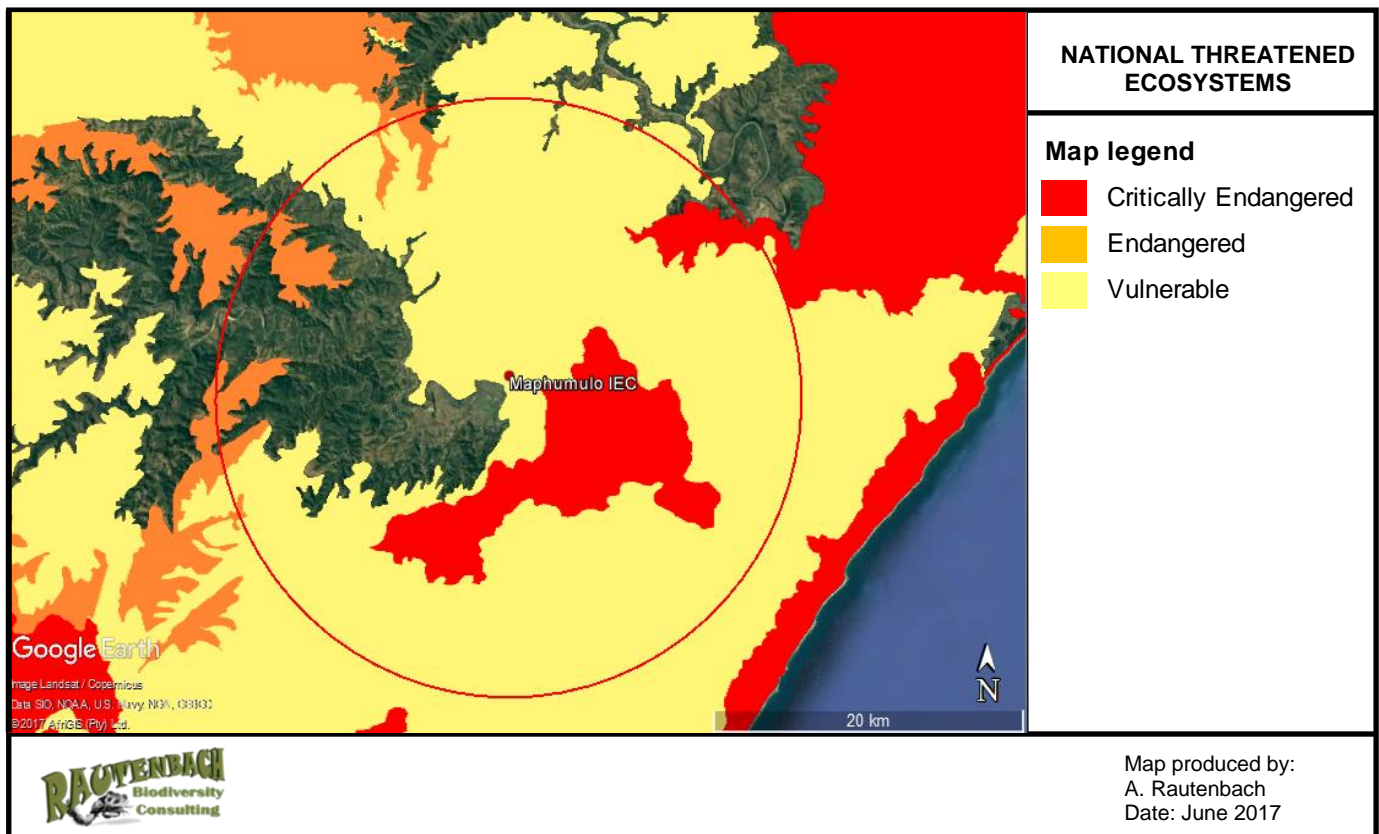


Figure 4: The extent of National threatened ecosystems in relation to the project area.

7.1.2 Provincial and District Level Conservation Priorities (KZNSCP 2012 & KZNBSP 2014)

The provincial scale KZN Systematic Conservation Plan (KZNSCP, 2012) and the district scale iLembe District Municipality: Biodiversity Sector Plan (KZNBSP, 2014) identifies and map critical biodiversity areas and ecological support areas within the Province. Biodiversity mapping covers terrestrial, aquatic and marine environs at Provincial and District scales.

It is important to note that categorical classes of CBAs and ESAs are reflected differently in the KZNSCP (2012; Table 2) and KZNBSP (2014; Table 3). The KZNSCP (2012) planning product highlights the key priority areas for biodiversity conservation as reflected against a uniform biome i.e. the marine, estuarine, freshwater and terrestrial biomes analyzed separately, while the KZNBSP (2014) is a higher order spatial planning tool which takes into consideration locally identified CBA and ESA localities, as well as incorporates priorities identified at a national level.



Table 2: Summary of the CBA categories used in the KwaZulu-Natal Systematic Conservation Plan (KZNSCP 2012).

CBA 1 (Mandatory)	Areas representing the only localities for which the conservation targets for one or more of the biodiversity features contained within can be achieved i.e. there are no alternative sites available.
CBA 2 (Mandatory)	Areas of significantly high biodiversity value. There are alternate sites within which the conservation targets can be met for the biodiversity features contained within, but not many.
CBA 3 (Optimal)	These areas are not necessarily of lower biodiversity value, but only indicate that there are more alternate options available within which the features located within can be met.
Biodiversity Areas/Other Natural Areas	Areas representing the natural and/or near natural environmental areas which still have biodiversity value, but it is preferred that development be focused within these areas.

The KZNBSP (2014) is reflected as biodiversity sector maps consisting of two main layers, namely Critical Biodiversity Areas (CBAs) and Ecological Support Areas (ESAs).

Table 3: Summary of the CBA and ESA categories used in the iLembe District Municipality: Biodiversity Sector Plan (KZNBSP 2014).

Critical Biodiversity Areas (CBAs) – Crucial for supporting biodiversity features and ecosystem functioning and are required to meet conservation targets.	
Critical Biodiversity Areas: Irreplaceable	Areas considered critical for meeting biodiversity targets and thresholds, and which are required to ensure the persistence of viable populations of species and the functionality of the ecosystems.
Critical Biodiversity Areas: Optimal	Areas that represent an optimized solution to meet the required biodiversity conservation targets while avoiding areas where the risk of biodiversity loss is high. Category driven primarily by process but is also informed by expert input.
Ecological Support Areas (ESAs) – Functional but not necessarily entirely natural areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBA areas.	
Ecological Support Areas (ESAs)	Functional but not necessarily entirely natural areas that are required to ensure the persistence and maintenance of biodiversity patterns and ecological processes within the CBAs. These areas also contribute significantly to the maintenance of ecological infrastructure.
Ecological Support Areas: Species Specific	Terrestrial modified areas that provide a support function to a threatened or protected species.



The project area falls within an area designated as a Biodiversity Area (KZNSCP 2012; Figure 5). An important biodiversity feature potentially contained within this area is the invertebrate species *Edouardia conulus*.

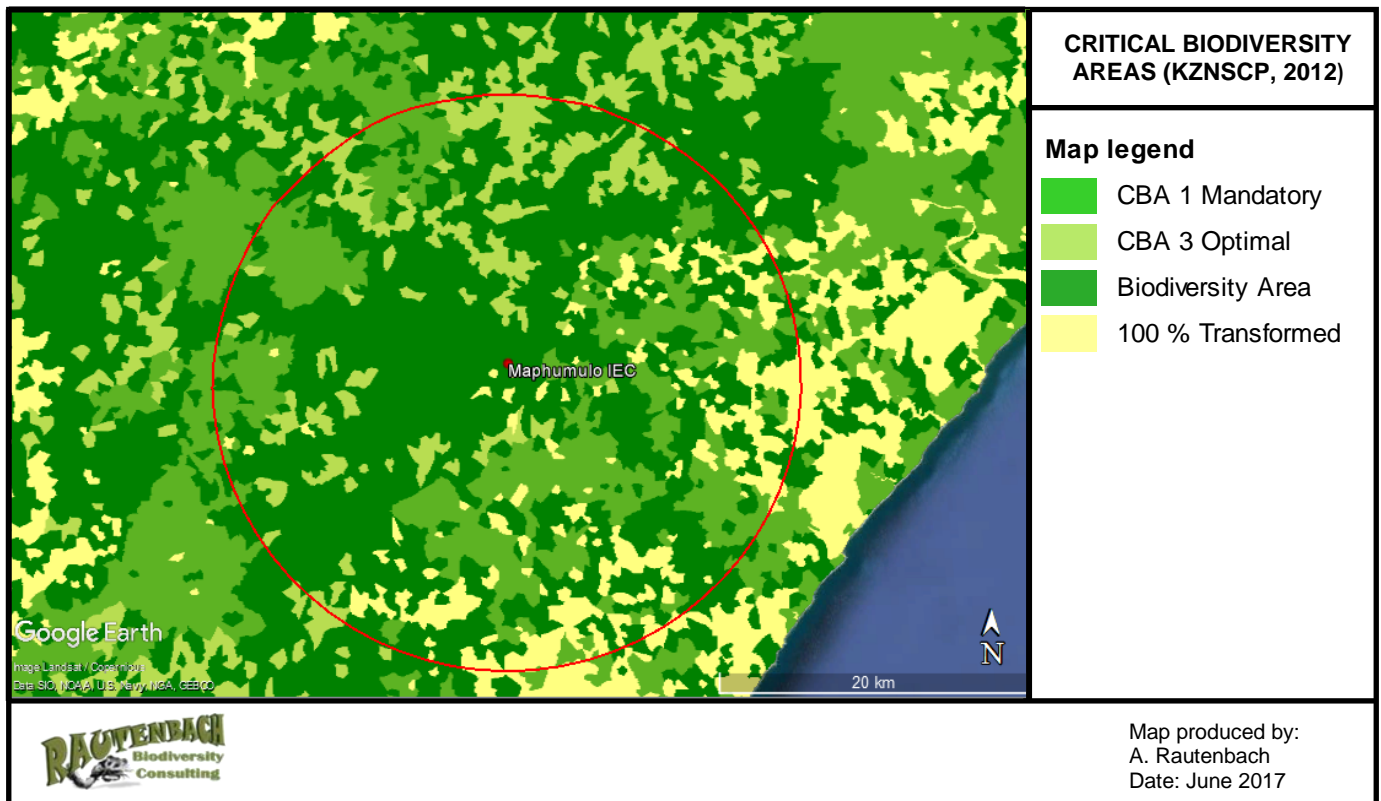


Figure 5: The extent of Critical Biodiversity Areas in relation to the project area (KZNSCP 2012).

Fine scale conservation planning does not identify the project area as being in a CBA designated area (KZNBSP 2014; Figure 6).

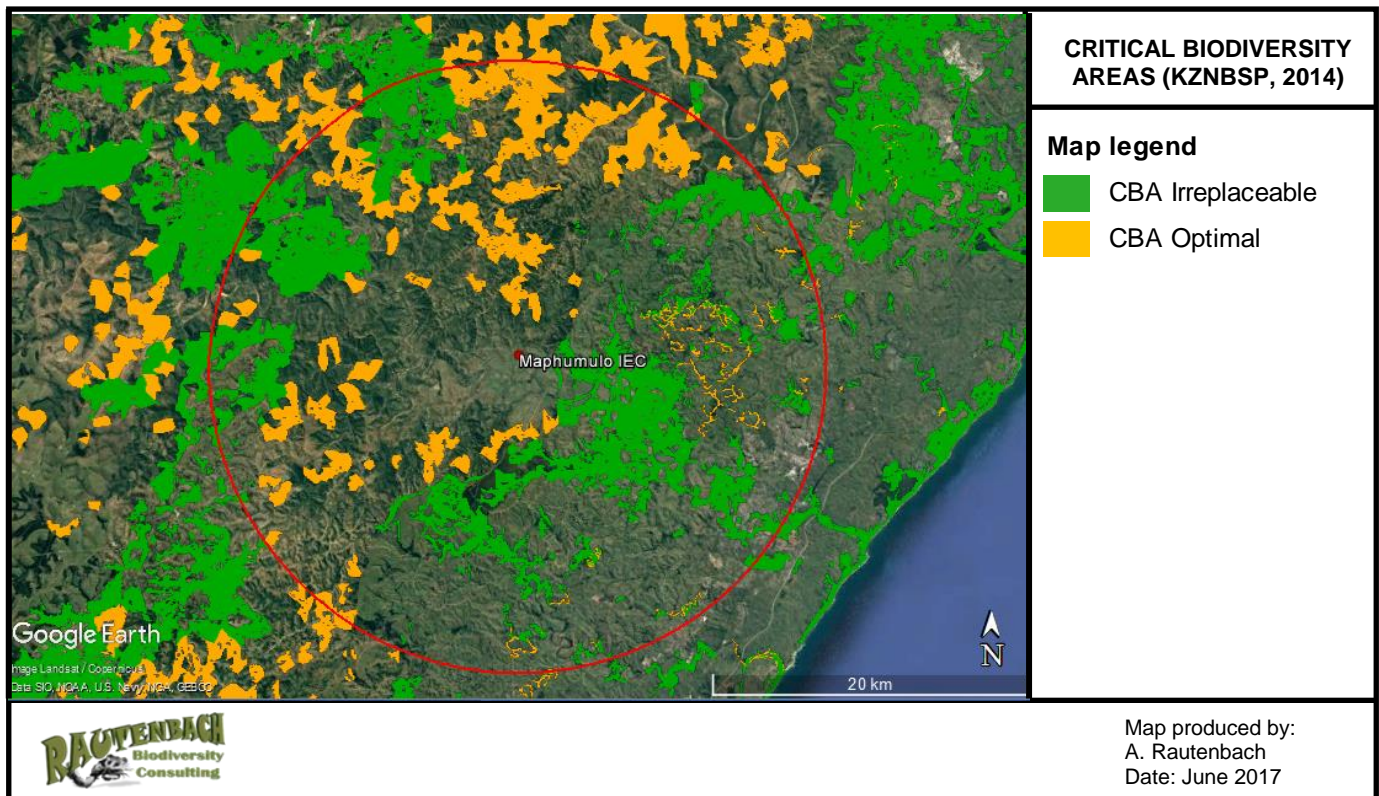


Figure 6: The extent of CBA Irreplaceable and CBA Optimal areas in relation to the project area (KZNBSP 2014).

7.2 Vegetation assessment

7.2.1 Regional vegetation

The project area falls predominantly within the Eastern Valley Bushveld vegetation type of the Savanna Biome in KwaZulu-Natal (Figure 7; Mucina & Rutherford, 2012 delineation). Features specific to this vegetation type is discussed below:

SVs 6 Eastern Valley Bushveld (KZN vegetation code of 35)

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. This vegetation type very seldom extends to the coast. Altitude ranges from 100 – 1 000 m.a.s.l.

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.



Geology & Soils: The area is underlain by the sediments of the Karoo Supergroup with the mudstones and lesser sandstones of the Adelaide and Tarkastad Subgroups (Beaufort Group) dominant, and some Ecca Group shale.

Climate: Summer rainfall with some rain in winter. MAP ranges from about 550 –1 000 mm. Frost is infrequent. Mean monthly maximum and minimum temperatures for Nagle Dam 36.9° C and 4.0° C for December and June, respectively.

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: *Aristida 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.



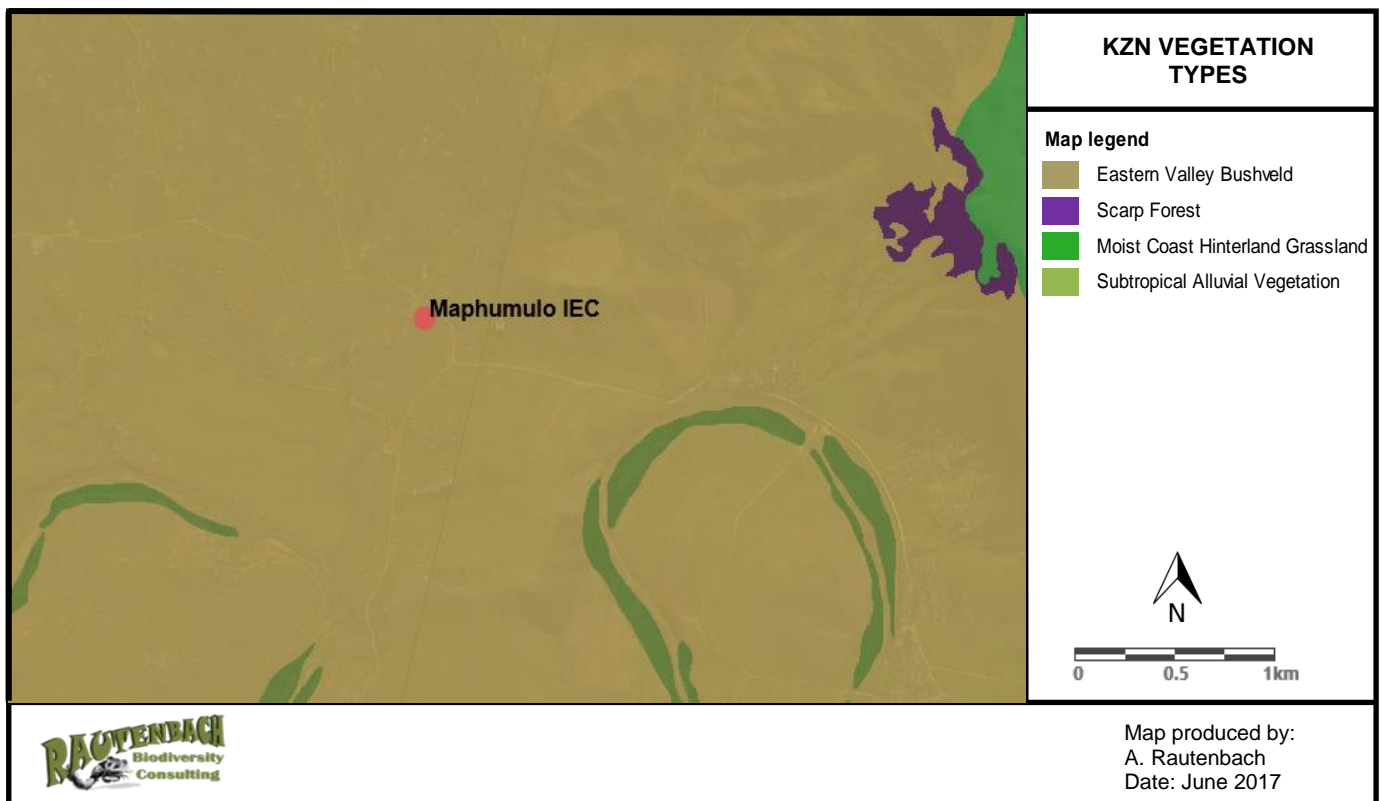


Figure 7: The extent of the Eastern Valley Bushveld vegetation type in relation to the project area.

7.2.2 General findings

Only one vegetation unit was identified on the project area, i.e. the sugarcane field.

The 200 m of surrounding areas were also investigated for the presence of Red Listed/Protected flora species.

7.2.2.1 Sugarcane field vegetation unit:

This vegetation unit comprises of sugarcane, with numerous weeds and alien and invasive plant species present between the cane rows. With the obvious exception of the sugarcane, dominant plant species are composed of weeds and alien and invasive plant species (Table 4).

Red Listed and Protected Species

Freesia laxa var. *laxa*, a provincially protected plant species (KZN Nature Conservation Management Act No. 5 of 1999) was identified on the area (GPS coords: S 29°16' 47.82"; E 31°6' 24.77"; Table 4; Figure 8). A permit will be required from KZN Wildlife for the removal of this species. No other Red Listed species have been observed, or are expected to be present in this vegetation unit since the area is too degraded, or does not offer suitable habitat (refer to Appendix 1 for a complete checklist of plant species previously recorded from the QDS 2931AC). No nationally protected trees are present.

Medicinal plant species

No medicinal plant species have been observed.



Sensitivity

Although the presence of *F. laxa* var. *laxa* has been confirmed, it is not restricted to this habitat and can be relocated with ease. The area is also extensively transformed, with exotic species being dominant. Therefore this area is considered to be of low sensitivity.

Table 4: A list of plant species identified in the sugarcane vegetation unit. Sensitive species are highlighted in red.

FAMILY	SCIENTIFIC NAME	INV CAT	COMMON NAME
ASPERAGACEAE	<i>Asparagus virgatus</i>		Broom asparagus
	* <i>Bidens pilosa</i>		Blackjack
	* <i>Bidens bipinnata</i>		Spanish needles
	* <i>Schkuhria pinnata</i>		Dwarf marigold
	* <i>Tagetes minuta</i>		Khaki-weed
COMMELINACEAE	* <i>Commelina benghalensis</i>		Wandering jew
CONVOLVULACEAE	* <i>Ipomoea purpurea</i>	1b	Morning glory
CYPERACEAE	* <i>Cyperus rotundus</i>		Nut sedge
	<i>Dichrostachys cinerea</i> seedlings		Sicklebush
IRIDACEAE	<i>Freesia laxa</i> var. <i>laxa</i>		Small red iris
	<i>Hibiscus trionum</i>		Bladder hibiscus
MELIACEAE	* <i>Melia azedarach</i> seedlings	1b	Syringa
OXALIDACEAE	* <i>Oxalis latifolia</i>		Pink garden sorrel
PAPAVERACEAE	* <i>Argemone mexicana</i>	1b	Mexican poppy
POACEAE	<i>Cloris gayana</i>		Rhodes grass
	<i>Eleusine coracana</i>		Goose grass
	<i>Melinis repens</i>		Natal red top
	<i>Paspalum dilatatum</i>		Dallis grass
	<i>Panicum maximum</i>		Guinea grass
	<i>Sporobolus africanus</i>		Rats tail grass
	* <i>Solanum elaeagnifolium</i>	1b	Silverleaf nightshade
	* <i>Solanum mauritianum</i>	1b	Bugweed
	* <i>Solanum nodifolium</i>		Black nightshade
	* <i>Solanum panduriforme</i>		Bitter apple
VERBENACEAE	* <i>Lantana camara</i>	1b	Lantana

* Exotics

INV CAT = Invasive category

7.2.2.2 Adjacent areas

Areas adjacent to the project area are characterized by the presence of sugarcane fields with homesteads interspersed between fields. Areas surrounding the homesteads are invaded by *Melia azedarach*, *Lantana camara*, *Chromolaena odorata* and weeds. A list of plant species encountered on these areas is presented in Table 5.

Red listed and protected species



Maphumulo IEC

A single *Hypoxis hemerocallidae* specimen and three *Crinum* sp. specimens are present to the southeast and southwest of the project area (Table 5; Figure 8). It is difficult to tell *Crinum* spp. apart without flowering material; therefore the identification is limited to genus level. GPS coordinates for the individual species are listed below.

H. hemerocallidae is listed as 'Declining' in the IUCN Red List of Plant Species for South Africa, and appear under Schedule 8 of the KZNEBPA, 2014. All *Crinum* spp. are protected under the KwaZulu-Natal Nature Conservation Management Act, No 5 of 1999.

- *H. hemerocallidae* – S 29°16' 50.17"; E 31°6' 25.31"
- *Crinum* sp. – S 29°16' 50.27"; E 31°6' 21.85"

Table 5: A list of plant species encountered on areas adjacent to the project area. Sensitive species are highlighted in red.

FAMILY	SCIENTIFIC NAME	INV CAT	COMMON NAME
ACANTHACEAE	<i>Justicia flava</i>		Yellow justicia
	<i>Senecio deltoideus</i>		Canary creeper
AMARYLIDACEAE	<i>Crinum</i> sp.		
ANACARDIACEAE	* <i>Mangifera indica</i>		Mango tree
APOCYNACEAE	* <i>Cathartus roseus</i>		Madagascar periwinkle
ASCLEPIADACEAE	<i>Xysmalobium undulatum</i>		Milkwort
ASPALANTHUS	<i>Crotolaria</i> sp.		
ASPERAGACEAE	<i>Asparagus virgatus</i>		Broom asparagus
ASPHODELACEAE	<i>Aloe marlothii</i>		
ASTERACEAE	* <i>Ageratum conyzoides</i>	1b	Invading ageratum
	* <i>Bidens pilosa</i>		Blackjack
	* <i>Bidens bipinnata</i>		Spanish needles
	* <i>Chromolaena odorata</i>	1b	Parrafin weed
	<i>Helichrysum ruderale</i>		Yellow everlasting
	* <i>Schkuhria pinnata</i>		Dwarf marigold
	* <i>Senecio madagascariensis</i>		Canary weed
	<i>Senecio pleistocephalis</i>		
	* <i>Tagetes minuta</i>		Khaki-weed
	* <i>Taraxacum officinale</i>		Common dandelion
BIGNONIACEAE	* <i>Spathodea campanulata</i>	3	African flame tree
BORAGINACEAE	<i>Stachys natalensis</i>		White stachys
BRASSICACEAE	* <i>Coronopus didymus</i>		Carrot weed
CELTIDACEAE	<i>Celtis africana</i>		Stinkwood
COMMELINACEAE	* <i>Commelina benghalensis</i>		Wandering jew
CONVOLVULACEAE	* <i>Ipomoea purpurea</i>	1b	Morning glory
CYPERACEAE	* <i>Cyperus rotundus</i>		Nut sedge
EUPHORBIACEAE	* <i>Ricinus communis</i>	2	Castor oil plant
FABACEAE	<i>Acacia sieberiana</i> var. <i>woodii</i>		Paperbark acacia
	<i>Dichrostachys cinerea</i>		Sicklebush
HYPOXIDACEAE	<i>Hypoxis hemerocallidae</i>		Star flower



MALVACEAE	<i>Abutilon grantii</i>		
	<i>Hibiscus trionum</i>		Bladder hibiscus
MELIACEAE	* <i>Melia azedarach</i>	1b	Syringa
MYRTACEAE	* <i>Psidium guajava</i>	1b	Guava
NYCTAGINACEAE	* <i>Bougainvillea</i> sp.		Bougainvillea
OXALIDACEAE	* <i>Oxalis latifolia</i>		Pink garden sorrel
PAPAVERACEAE	* <i>Argemone mexicana</i>	1b	Mexican poppy
POACEAE	<i>Cloris gayana</i>		Rhodes grass
	<i>Eleusine coracana</i>		Goose grass
	<i>Melinis repens</i>		Natal red top
	<i>Paspalum dilatatum</i>		Dallis grass
	<i>Panicum maximum</i>		Guinea grass
	<i>Sporobolus africanus</i>		Rats tail grass
	<i>Zea</i> sp.		Maize
RUTACEAE	* <i>Citrus limon</i>		Lemon tree
SAPINDACEAE	* <i>Cardiospermum halicacabum</i>	3	Lesser balloon vine
SOLANACEAE	* <i>Physalis viscosa</i>		Wild gooseberry
	* <i>Solanum elaeagnifolium</i>	1b	Silverleaf nightshade
	* <i>Solanum mauritianum</i>	1b	Bugweed
	* <i>Solanum nodifolium</i>		Black nightshade
	* <i>Solanum panduriforme</i>		Bitter apple
VERBENACEAE	* <i>Lantana camara</i>	1b	Lantana
	<i>Privia cordifolia</i>		Blaasklits
	* <i>Verbena officinalis</i>		European verbena
ZYGOPHYLLACEAE	* <i>Tribulus terrestris</i>		Devil's thorn

* Exotics

INV CAT = Invasive category

Medicinal plant species

The following medicinal plant species were encountered:

FAMILY	SCIENTIFIC NAME	MEDICINAL USE
AMARYLIDACEAE	<i>Crinum</i> sp.	Wide variety of uses depending on the species.
ASCLEPIADACEAE	<i>Xysmalobium undulatum</i>	Powdered roots or infusions are used for indigestion, fever, colds, diarrhoea, dysentery and abdominal discomfort
HYPOXIDACEAE	<i>Hypoxis hemerocallidae</i>	The tuber has been traditionally used for benign prostate hypertrophy, urinarytract infections and testicular tumours. They can also be used to treat dizziness, heartweakness, nervous and bladder disorder as well as depression.

Sensitivity



Although the presence of *H. hemerocallidae* and *Crinum* sp. has been confirmed, it is not restricted to this habitat and can be relocated with ease. The area is also extensively transformed, with exotic species dominant. Therefore this area is considered to be of low sensitivity.

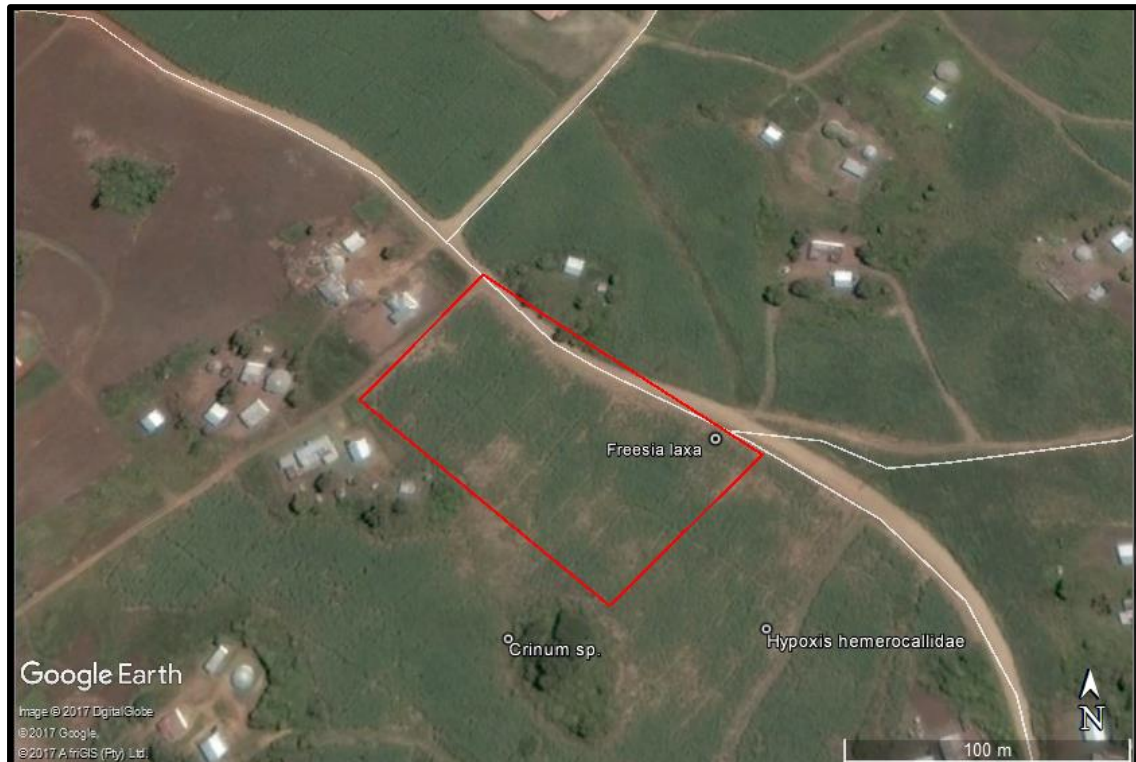


Figure 8: The location of the provincially protected plant species on the project area and surrounding areas. The project area is demarcated with a red line.

7.2.3 Invasive Plants

Invasive alien plants are widely considered as a major threat to biodiversity, human livelihoods and economic development. On 1 August 2014, the Minister of Environmental Affairs published *the Alien and Invasive Species Regulations*, which came into effect on the 1st of October 2014 in a bid to curb the negative effects of alien invasive plants and other alien invasive species. The Regulations call on land owners and sellers of land alike to assist the Department of Environmental Affairs to conserve our indigenous fauna and to foster sustainable use of our land. Non-adherence to the Regulations by a land owner or a seller of land can result in a criminal offence punishable by a fine of up to R5 million (R10 million in case of a second offence) and / or a period of imprisonment of up to 10 years.

Alien invasive species listed in the NEMBA Alien and Invasive species regulations (updated species list of 2016) are present on the project area and have been listed in their relevant categories in Tables 4 and 5.

Category 1b Listed Invasive Species

- Listed Invasive Species which must be controlled removed or destroyed.



- These species may also not be imported, in any way propagated or allowed to multiply, be translocated, or in any way traded or donated.

Category 2 Listed Invasive Species

- Listed Invasive Species are those species that can only be imported, propagated, traded or translocated with a permit within an area specified in the Notice or an area specified in the permit, as the case may be.
- A landowner on whose land a Category 2 Listed Invasive Species occurs or person in possession of a permit must ensure that the specimens of the species do not spread outside of the land or the area specified in the Notice or permit.
- Depending on the specific species, plants in riparian-, protected- or threatened ecosystem areas may be reclassified Category 1b.

Category 3 Listed Invasive Species

- Listed Invasive species which may remain in prescribed areas or provinces. Further planting, propagation or trade is however prohibited.
- Depending on the specific species, plants in riparian-, protected- or threatened ecosystem areas may be reclassified Category 1b.

8. IMPACT ASSESSMENT

This section describes the potential impacts that may emanate from the activities on the receiving environment. It should be noted that the impacts described is not exhaustive, and more impacts may be identified at a later stage.

The construction phase impacts of the proposed Maphumulo IEC development are discussed and assessed in terms of the 'Guideline Documentation on EIA Regulations (DEAT, 2014). The methodology for the impact assessment is provided in Appendix 2.

Impact description: Loss of sensitive ecosystems

The project area falls within the 'Vulnerable' KwaZulu-Natal Coastal Belt ecosystem (NBA, 2011) and within an area designated as a Biodiversity area (KZNSCP 2012). However, the project area and surrounding areas has already been severely transformed by sugarcane cultivation. Furthermore, all areas investigated are severely degraded by alien plant invasions and the area is thus not considered to be sensitive. Subsequently, it is not anticipated that the proposed development will have a significant negative impact on the environment.

Table 6: Impact description: Loss of sensitive ecosystems.

IMPACT DESCRIPTION: Loss of sensitive ecosystems				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent (5)	The area is already severely degraded.	Consequence: Slightly detrimental (-8)	Significance: No Impact(-8)
Extent	Footprint (5)	Intended activities are limited to the footprint area.		
Intensity x type of impact	Low - negative (-2)	The area is already severely degraded.		



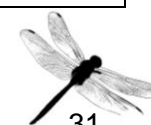
Probability	Unlikely (1)	The area is already severely degraded.	
POST-MITIGATION			
Duration	Permanent (5)	As for pre-mitigation	Significance: No Impact(-8)
Extent	Footprint (1)	As for pre-mitigation	
Intensity x type of impact	Low - negative (-2)	The area is already severely degraded.	
Probability	Unlikely (1)	The area is already severely degraded.	
Level of Confidence in Impact	Judgement is based on scientific and/or proven information.		
Reversibility	The affected environment will be unable to recover from the impact that is permanently modified.		
Replaceability	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).		

Impact description: Loss of Red Listed/Protected fauna and flora species

Floral diversity on the project area and surrounding areas was considered to be low when compared to the Eastern Valley Bushveld vegetation type description (Mucina & Rutherford, 2006). Although species of conservation concern are present (Tables 4 & 5), abundance is very low and these species are not restricted to the specific vegetation units. Since these species can be relocated with ease, this area is not considered to be sensitive and therefore it is not expected that the proposed activities will have a negative effect on these plant populations should the proposed mitigation measures be accepted.

Table 7: Impact description: Loss of Red Listed and Protected flora species.

IMPACT DESCRIPTION: Loss of Red Listed and Protected flora species				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Permanent (5)	The area is already severely degraded	Consequence: Moderately detrimental (-11)	Significance: Medium negative(-33)
Extent	National (5)	Nationally protected plant species are present		
Intensity x type of impact	Low - negative (-2)	Due to the very low abundance of protected species present, it is not anticipated that the development will have a detrimental effect on local populations should the proposed mitigation measures be accepted.		
Probability	Likely (3)	The impact is very likely to occur should the proposed mitigation measures not be accepted.		
POST-MITIGATION				
Duration	Permanent (5)	As for pre-mitigation	Consequence: Slightly detrimental (-9)	Significance: No Impact(-9)
Extent	Site (1)	As for pre-mitigation		
Intensity x type of impact	Low - negative (-2)	Should the proposed mitigation measures be accepted, the impact will be very low.		
Probability	Unlikely (1)	The impact will be very low should the proposed mitigation measures be accepted.		
Level of Confidence in Impact	Judgement is based on scientific and/or proven information.			
Reversibility	The affected environment will be able to recover from the impact.			



Replaceability	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).
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Impact description: Colonization by IAPs and weeds

The colonization of areas by weeds and IAPs (Invasive Alien Plants) poses a risk to indigenous plant species and would be facilitated by disturbance of natural vegetation and surface soil layers during construction. The project area and surrounding areas are already invaded by several IAPs and care should be taken to avoid further spread.

Table 8: Impact description: Invasion of IAPs and weeds.

IMPACT DESCRIPTION: Invasion of IAPs and weeds				
Predicted for project phase:	Pre-construction	Construction	Operation	Decommissioning
Dimension	Rating	Motivation		
PRE-MITIGATION				
Duration	Long Term (4)	Colonization by IAPs replace natural flora completely.	Consequence: Highly detrimental (-17)	Significance: High negative (-68)
Extent	Regional (4)	IAPs have the ability to spread rapidly over large areas if left uncontrolled.		
Intensity x type of impact	High - negative (-10)	Ecosystem functioning will be severely compromised		
Probability	Highly likely (4)	Without appropriate mitigation, impacts can be devastating.		
POST-MITIGATION				
Duration	Short to medium Term (2)	If properly mitigated the impact will be limited to the duration of the construction phase	Consequence: Slightly detrimental (-6)	Significance: No impact (-6)
Extent	Site (1)	Impacts will be relevant to the project area.		
Intensity x type of impact	Low - negative (-2)	Mitigation will significantly reduce the intensity of the impact.		
Probability	Unlikely (1)	Should the proposed mitigation measures be accepted the impact can be significantly reduced and it is unlikely to have an impact on the environment.		
Level of Confidence in Impact	Judgement is based on scientific and/or proven information.			
Reversibility	The affected environment will be able to recover from the impact.			
Replaceability	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).			

9. MITIGATION MEASURES

9.1 Recommended mitigation measures for flora

- Prior to vegetation clearance, the construction site and the 200 m of adjoining areas must be scanned for the presence of protected flora species.
- Any Red Listed/Protected plant species must be removed prior to construction. Rescued plants must either be housed within a temporary nursery on site/or at the main site office, or immediately re-planted back in the wild, and should be placed as close as possible to where they were originally removed (refer to Appendix 4 with development implications for areas with Red Listed/protected flora species);
- If planted into natural habitat, the position must be marked to aid in future monitoring of those plants;



- Rescued plants housed in the temporary nursery maybe used in one of two ways: (1) transplanted into suitable natural habitats near to where they were rescued, or (2) used for replanting in rehabilitation areas. Receiver sites must be matched as closely as possible with the origin of the plants, and where possible, be placed as near as possible to where they originated;
- Any protected plants close to the site that will remain in place must be clearly marked and may not be defaced, disturbed, destroyed or removed. They must be cordoned off with construction tape or similar barriers and marked as no-go areas;
- Where feasible and when removal is not required, buffer zones must be implemented and maintained on areas surrounding protected plant species.
- Clearing of vegetation in preparation for construction should be carried out in such a way that the area cleared is minimized;
- The timing between clearing of an area and subsequent development must be minimized.
- The removal of vegetation will result in the disturbance of soil surfaces. The exposed soil surfaces will potentially be open to invasion by alien plant species. A detailed alien invasive species management plan will have to be implemented and maintained during the construction and operational phases.
- Any post-development re-vegetation should use species indigenous to South Africa. Plant species locally indigenous to the area are preferred. As far as possible, indigenous plants naturally growing along the route, but would otherwise be destroyed during construction, should be used for re-vegetation.
- The collecting and/or destruction of plants by unauthorized persons must be prevented and signs stating so must be placed at the entrance to main site camp and clearly communicated to all employees.

9.2 General mitigation measures

- Adequate characterization of the natural soil catena through detailed mapping, soil classification and profile descriptions are necessary to provide background data required for restoration of ecological gradients and surface drainage characteristics.
- Site-specific plans for site erosion and sediment control should be developed and implemented.
- Topsoil, leaf and plant litter as well as subsoil removed during the construction of roads and building platforms must be stockpiled separately in low heaps, less than 1.5 m high. Microbial activity, seed viability and soil fertility are adversely affected by long periods of stockpiling when high temperatures can be generated in thick deposits, therefore the topsoil should be restored as soon as possible. An alternative is to aerate the stockpiled topsoil regularly (as a minimum every six months). Vegetate with a grass mix natural to the area to control erosion. Do not use these stockpiles as storm water control features.
- In the case of petrochemical spillages, the spill should be collected immediately and stored in a designated area until it can be disposed of at a registered waste disposal facility.
- Coordinate work schedules, if more than one contractor is working on a site, so that there are no delays in construction activities resulting in disturbed land remaining unestablished.



10. CONCLUSIONS

The project area is located within Glendale, KwaMaphumulo, KwaZulu-Natal Province and falls within the QDS 2931AC. The area falls within the 'Vulnerable' KwaZulu-Natal Coastal Belt ecosystem (NBA, 2011) and within an area designated as a Biodiversity area (KZN SCP 2012).

During a site visit it was noted that the project area and surrounding areas have been completely transformed by sugarcane farming and alien plant invasions. Natural species diversity was found to be very low. However, three plant species of conservation concern have been identified, one on the project area, and two species on areas surrounding the project area. Abundance of these species was found to be very low and since these species can be relocated with ease, the project area and surrounding areas are not considered to be sensitive. Therefore it is not anticipated that the intended development will have a detrimental effect on the floristic components of the project area and surroundings.

However, it should be noted that the timing of vegetation assessments are very important as several plant species enters a state of dormancy over autumn/winter and are likely to lose their floristic components which assist in distinguishing species from one another. Many plant groups of which the species within a genus look vegetatively very similar can only be told apart if flowering or fruiting. Most species of conservation concern are from such groups. Given this temporal element to species identification, it is vital that specialist surveys are conducted in the appropriate season, preferably during the flowering time (between October and April) of the species expected to occur in the local area.



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Appendix 1: A checklist of plant species for the QDS 2931AC (<http://posa.sanbi.org>). Threatened and protected species are highlighted in red.

FAMILY	SPECIES	THREAT STATUS	KZNEBPA (2014)	GROWTH FORMS
ACANTHACEAE	<i>Adhatoda densiflora</i> (Hochst.) J.C.Manning	LC	Sched 8	Herb
ACANTHACEAE	<i>Asystasia gangetica</i> (L.) T.Anderson subsp. <i>micrantha</i> (Nees) Ensermu	LC		Herb
ACANTHACEAE	<i>Barleria obtusa</i> Nees	LC		Dwarf shrub, herb, shrub
ACANTHACEAE	<i>Rhinacanthus gracilis</i> Klotzsch var. <i>gracilis</i>	LC		Herb
AMARANTHACEAE	<i>Celosia trigyna</i> L.	LC	Sched 8	Herb
AMARYLLIDACEAE	<i>Crinum macowanii</i> Baker	Declining	Sched 8	Geophyte
ANACARDIACEAE	<i>Schinus terebinthifolius</i> Raddi	Not Evaluated		Shrub, tree
ANNONACEAE	<i>Uvaria caffra</i> E.Mey. ex Sond.	LC		Climber, shrub, tree
APOCYNACEAE	<i>Acokanthera oblongifolia</i> (Hochst.) Codd	LC		Shrub, tree
APOCYNACEAE	<i>Cynanchum natalitium</i> Schltr.	LC		Climber
APOCYNACEAE	<i>Rauvolfia caffra</i> Sond.	LC		Tree
APOCYNACEAE	<i>Riocreuxia torulosa</i> (E.Mey.) Decne. var. <i>torulosa</i>	LC		Climber
APOCYNACEAE	<i>Tabernaemontana ventricosa</i> Hochst. ex A.DC.	LC		Tree
ASPARAGACEAE	<i>Asparagus falcatus</i> L.	LC		Climber
ASPLENIACEAE	<i>Asplenium prionitis</i> Kunze	LC		Epiphyte, geophyte, herb, lithophyte
ASTERACEAE	<i>Blumea dregeanoides</i> Sch.Bip. ex A.Rich.	LC		Herb
ASTERACEAE	<i>Chromolaena odorata</i> (L.) R.M.King & H.Rob.	Not Evaluated		Shrub
ASTERACEAE	<i>Distephanus angulifolius</i> (DC.) H.Rob. & B.Kahn	LC		Climber, shrub
ASTERACEAE	<i>Eclipta prostrata</i> (L.) L.	Not Evaluated		Herb
ASTERACEAE	<i>Helichrysum kraussii</i> Sch.Bip.	LC		Shrub
ASTERACEAE	<i>Helichrysum spiralepis</i> Hilliard & B.L.Burt	LC		Herb
ASTERACEAE	<i>Sphaeranthus peduncularis</i> DC. subsp. <i>peduncularis</i>	LC		Herb
BLECHNACEAE	<i>Stenochlaena tenuifolia</i> (Desv.) T.Moore	LC		Climber, herb
BRASSICACEAE	<i>Coronopus didymus</i> (L.) Sm.	Not Evaluated		Herb
CAMPANULACEAE	<i>Wahlenbergia undulata</i> (L.f.) A.DC.	LC		Herb



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CELASTRACEAE	<i>Maytenus peduncularis</i> (Sond.) Loes.	LC		Shrub, tree
CONVOLVULACEAE	<i>Ipomoea pes-caprae</i> (L.) R.Br. subsp. <i>brasiliensis</i> (L.) Ooststr.	LC		Herb
CYPERACEAE	<i>Cyperus brevis</i> Boeckeler	LC		Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	<i>Cyperus cyperoides</i> (L.) Kuntze subsp. <i>cyperoides</i>	LC		Cyperoid, herb, mesophyte
CYPERACEAE	<i>Cyperus difformis</i> L.	LC		Cyperoid, helophyte, herb, mesophyte
CYPERACEAE	<i>Cyperus distans</i> L.f.	LC		Cyperoid, herb, mesophyte
CYPERACEAE	<i>Cyperus dubius</i> Rottb. var. <i>dubius</i>			[No lifeform defined]
CYPERACEAE	<i>Cyperus macrocarpus</i> (Kunth) Boeck.	LC		Cyperoid, herb, mesophyte
CYPERACEAE	<i>Cyperus prolifer</i> Lam.	LC		Cyperoid, emergent hydrophyte, helophyte, herb
CYPERACEAE	<i>Cyperus rotundus</i> L. subsp. <i>rotundus</i>	LC		Cyperoid, herb, mesophyte
CYPERACEAE	<i>Cyperus sphaerospermus</i> Schrad.	LC		Cyperoid, herb, mesophyte
CYPERACEAE	<i>Pycnus mundii</i> Nees	LC		Cyperoid, emergent hydrophyte, helophyte, herb, sudd hydrophyte
CYPERACEAE	<i>Schoenoplectus paludicola</i> (Kunth) Palla	LC		Cyperoid, emergent hydrophyte, helophyte, herb
DIOSCOREACEAE	<i>Dioscorea cotinifolia</i> Kunth	LC		Climber, geophyte, succulent
EUPHORBIACEAE	<i>Acalypha glabrata</i> Thunb. var. <i>glabrata</i>	LC		Shrub, tree
EUPHORBIACEAE	<i>Ricinus communis</i> L. var. <i>communis</i>	Not Evaluated		Shrub, tree
FABACEAE	<i>Acacia nilotica</i> (L.) Willd. ex Delile subsp. <i>kraussiana</i> (Benth.) Brenan	LC		Tree
FABACEAE	<i>Albizia lebbbeck</i> (L.) Benth.	Not Evaluated		Tree
FABACEAE	<i>Argyrolobium marginatum</i> Bolus	LC		Herb
FABACEAE	<i>Cajanus cajan</i> (L.) Millsp.	Not Evaluated		Dwarf shrub, shrub
FABACEAE	<i>Canavalia bonariensis</i> Lindl.	LC		Climber
FABACEAE	<i>Chamaecrista mimosoides</i> (L.) Greene	LC		Herb
FABACEAE	<i>Desmanthus virgatus</i> (L.) Willd.	Not Evaluated		Herb, shrub
FABACEAE	<i>Eriosema cordatum</i> E.Mey.	LC		Herb
FABACEAE	<i>Eriosema parviflorum</i>	LC		Dwarf shrub



	<i>E.Mey. subsp. parviflorum</i>			
FABACEAE	<i>Indigofera hendecaphylla</i> Jacq.	LC		Herb
FABACEAE	<i>Lotus discolor</i> E.Mey. subsp. <i>discolor</i>	LC		Herb
FABACEAE	<i>Mimosa pudica</i> L. var. <i>hispida</i> Brenan	Not Evaluated		Herb
FABACEAE	<i>Neonotonia wightii</i> (Wight. ex Arn.) J.A.Lackey	LC		Climber
FABACEAE	<i>Schotia brachypetala</i> Sond.	LC		Tree
FABACEAE	<i>Sesbania macrantha</i> Welw. ex E.Phillips & Hutch. var. <i>levis</i> J.B.Gillett	LC		Herb
FABACEAE	<i>Vigna unguiculata</i> (L.) Walp. subsp. <i>unguiculata</i> var. <i>unguiculata</i>	LC		Climber, herb
FABACEAE	<i>Zornia milneana</i> Mohlenbr.	LC		Herb
GESNERIACEAE	<i>Streptocarpus confusus</i> Hilliard subsp. <i>confusus</i>	LC	Sched 8	Herb, lithophyte
HALORAGACEAE	<i>Myriophyllum aquaticum</i> (Vell.) Verdc.	Not Evaluated		Herb, hydrophyte
HETEROPYXIDACEAE	<i>Heteropyxis natalensis</i> Harv.	LC	Sched 8	Shrub, tree
HYDROSTACHYACEAE	<i>Hydrostachys polymorpha</i> Klotzsch ex A.Br.	VU	Sched 7	Herb, hydrophyte
LAURACEAE	<i>Cryptocarya woodii</i> Engl.	LC		Tree
LYTHRACEAE	<i>Nesaea schinzii</i> Koehne	LC		Dwarf shrub
MALVACEAE	<i>Abutilon sonneratianum</i> (Cav.) Sweet	LC		Shrub
MALVACEAE	<i>Dombeya cymosa</i> Harv.	LC		Shrub, tree
MALVACEAE	<i>Hibiscus fuscus</i> Garcke	LC		Shrub
MALVACEAE	<i>Hibiscus surattensis</i> L.	LC		Climber, herb
MALVACEAE	<i>Pavonia burchellii</i> (DC.) R.A.Dyer	LC		Dwarf shrub
MALVACEAE	<i>Sida pseudocordifolia</i> Hochr.	LC		Herb, shrub
MELIACEAE	<i>Trichilia emetica</i> Vahl subsp. <i>emetica</i>	LC	Sched 8	Tree
MELIACEAE	<i>Turraea floribunda</i> Hochst.	LC		Shrub, tree
MORACEAE	<i>Ficus natalensis</i> Hochst. subsp. <i>natalensis</i>	LC		Tree
MYRSINACEAE	<i>Embelia ruminata</i> (E.Mey. ex A.DC.) Mez	LC		Climber, shrub, tree
MYRTACEAE	<i>Eugenia albanensis</i> Sond.	LC		Dwarf shrub
MYRTACEAE	<i>Eugenia natalitia</i> Sond.	LC		Shrub, tree
MYRTACEAE	<i>Syzygium cordatum</i> Hochst. ex C.Krauss subsp. <i>cordatum</i>	LC		Shrub, tree
ONAGRACEAE	<i>Ludwigia octovalvis</i> (Jacq.) P.H.Raven	LC		Herb, hydrophyte
ORCHIDACEAE	<i>Eulophia cucullata</i> (Afzel. ex Sw.) Steud.	LC		Geophyte, herb
ORCHIDACEAE	<i>Eulophia hians</i> Spreng. var.	LC		Geophyte, herb



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	<i>nutans</i> (Sond.) S.Thomas			
ORCHIDACEAE	<i>Mystacidium aliceeae</i> Bolus	VU	Sched 7	Epiphyte, herb
ORCHIDACEAE	<i>Satyrium sphaerocarpum</i> Lindl.	LC		Geophyte, herb
PHYLLANTHACEAE	<i>Antidesma venosum</i> E.Mey. ex Tul.	LC		Shrub, tree
PHYLLANTHACEAE	<i>Bridelia micrantha</i> (Hochst.) Baill.	LC		Shrub, tree
POACEAE	<i>Brachiaria brizantha</i> (A.Rich.) Stapf	LC		Graminoid
POACEAE	<i>Digitaria ciliaris</i> (Retz.) Koeler	Not Evaluated		Graminoid
POACEAE	<i>Digitaria longiflora</i> (Retz.) Pers.	LC		Graminoid
POACEAE	<i>Digitaria natalensis</i> Stent	LC		Graminoid
POACEAE	<i>Echinochloa crus-pavonis</i> (Kunth) Schult.	LC		Graminoid
POACEAE	<i>Eragrostis curvula</i> (Schrad.) Nees	LC		Graminoid
POACEAE	<i>Eragrostis pilosa</i> (L.) P.Beauv.	LC		Graminoid
POACEAE	<i>Eragrostis tenuifolia</i> (A.Rich.) Steud.	LC		Graminoid
POACEAE	<i>Imperata cylindrica</i> (L.) Raeusch.	LC		Graminoid
POACEAE	<i>Panicum deustum</i> Thunb.	LC		Graminoid
POACEAE	<i>Panicum maximum</i> Jacq.	LC		Graminoid
POACEAE	<i>Paspalum notatum</i> Flügge	Not Evaluated		Graminoid
POACEAE	<i>Prospyrtichloa prehensilis</i> (Nees) Schweick.	LC		Climber, graminoid
POACEAE	<i>Setaria sphacelata</i> (Schumach.) Stapf & C.E.Hubb. ex M.B.Moss var. <i>sericea</i> (Stapf) Clayton	LC		Graminoid
POACEAE	<i>Sorghum bicolor</i> (L.) Moench subsp. <i>arundinaceum</i> (Desv.) de Wet & Harlan	LC		Graminoid
POACEAE	<i>Sporobolus pyramidalis</i> P.Beauv.	LC		Graminoid
POACEAE	<i>Stenotaphrum secundatum</i> (Walter) Kuntze	LC		Graminoid
POLYGALACEAE	<i>Polygala producta</i> N.E.Br.	LC		Dwarf shrub, herb
POLYPODIACEAE	<i>Microgramma mauritiana</i> (Willd.) Tardieu	LC		Epiphyte, herb, lithophyte
POLYPODIACEAE	<i>Microsorium punctatum</i> (L.) Copel.	LC		Epiphyte, herb, lithophyte
POLYPODIACEAE	<i>Microsorium scolopendria</i> (Burm.f.) Copel.	LC		Geophyte, herb, lithophyte
RANUNCULACEAE	<i>Ranunculus multifidus</i> Forssk.			Herb
RUBIACEAE	<i>Oldenlandia corymbosa</i> L. var. <i>caespitosa</i> (Benth.) Verdc.	LC		Herb



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RUBIACEAE	<i>Pavetta lanceolata</i> Eckl.	LC		Shrub, tree
RUBIACEAE	<i>Pavetta revoluta</i> Hochst.	LC		Shrub, tree
RUBIACEAE	<i>Tarenna pavettoides</i> (Harv.) Sim subsp. <i>pavettoides</i>	LC		Shrub, tree
RUBIACEAE	<i>Tricalysia lanceolata</i> (Sond.) Burt Davy	LC		Shrub, tree
SALICACEAE	<i>Dovyalis caffra</i> (Hook.f. & Harv.) Warb.	LC		Shrub, tree
SAPINDACEAE	<i>Cardiospermum halicacabum</i> L. var. <i>microcarpum</i> (Kunth) Blume	LC		Climber, shrub
SCROPHULARIACEAE	<i>Lindernia parviflora</i> (Roxb.) Haines	LC		Herb
SINOPTERIDACEAE	<i>Cheilanthes viridis</i> (Forssk.) Sw. var. <i>viridis</i>	LC		Geophyte, herb, lithophyte
THELYPTERIDACEAE	<i>Cyclosorus interruptus</i> (Willd.) H.Itô	LC		Herb, hydrophyte
THYMELAEACEAE	<i>Gnidia splendens</i> Meisn.	LC		Dwarf shrub, shrub
TYPHACEAE	<i>Typha capensis</i> (Rohrb.) N.E.Br.	LC		Herb, hydrophyte, hyperhydrite
VERBENACEAE	<i>Lantana camara</i> L.	Not Evaluated		Shrub
VITACEAE	<i>Rhoicissus digitata</i> (L.f.) Gilg & M.Brandt	LC		Climber
VITACEAE	<i>Rhoicissus tridentata</i> (L.f.) Wild & R.B.Drumm. subsp. <i>tridentata</i>	Not Evaluated		Shrub



Appendix 2: Impact assessment methodology

The methodology described herein complies with the requirements of the EIA Regulations (2014), promulgated in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998).

Each issue identified during the EIA process consists of components that on their own or in combination with each other give rise to potential impacts, either positive or negative from the project onto the environment or from the environment onto the project. The significance of the potential impacts for the project area will be considered before and after identified mitigation is implemented.

Impact Assessment Criteria

The criteria used for the assessment of the potential impacts of the proposed project are described below.

Impact Assessment Criteria

CRITERIA	DESCRIPTION
NATURE	Includes a description of what causes the effect, what will be affected and how it will be affected.
DURATION	Lifetime of the impact is measured in relation to the lifetime of the project.
EXTENT	Physical and spatial scale of the impact.
INTENSITY	Examining whether the impact is destructive or benign, whether it destroys the impacted environment, alters its functioning, or slightly alters the environment.
TYPE	Description of the impact as positive, negative or neutral, and direct or indirect.
CONSEQUENCE	Combination of duration, extent and intensity of impact in relation to the type.
PROBABILITY	This describes the likelihood of the impacts actually occurring. The impact may occur for any length of time during the lifecycle of the activity, and not at any given time.
SIGNIFICANCE	Synthesis of the characteristics described above and assessed as low, medium or high. Distinction will be made for the significance rating without the implementation of mitigation measures and with the implementation of mitigation measures.

Duration

The lifetime of the impact is measured in relation to the lifetime of the proposed project (**Error! Reference source not found.**).

Description of Duration Criteria

DESCRIPTION	EXPLANATION	SCORING
SHORT TERM	Impact will either disappear with mitigation or will be mitigated through a natural process in a period shorter than any of the development phases.	1
SHORT TO MEDIUM TERM	Impact will be relevant through to the end of the construction phase.	2
MEDIUM	Impact will last up to the end of the development phases, where after it	3



TERM	will be entirely negated.	
LONG TERM	Impact will continue or last for the entire operational lifetime of the development, but will be mitigated by direct human action or by natural processes thereafter.	4
PERMANENT	The only impact class that is non-transitory. Mitigation by man or natural process will not occur in such a way or time span that the impact can be considered transient.	5

Extent

The physical and spatial scale of the impact is classified below (**Error! Reference source not found.**).

Description of Extent Criteria

DESCRIPTION	EXPLANATION	SCORING
FOOTPRINT	Impacted area extends only as far as the activity, such as footprint occurring within the total site area.	1
SITE	Impact could affect the whole, or a significant portion of the site.	2
REGIONAL	Impact could affect the area around the site including neighbouring farms, transport routes and adjoining towns.	3
NATIONAL	Impact could have an effect that expands throughout the country (South Africa).	4
INTERNATIONAL	Impact has international ramifications that go beyond the boundaries of South Africa	5

Intensity

The assessment of the intensity of the impact will be a relative evaluation within the context of all the activities and the other impacts within the framework of the project. The intensity will be measured using the criteria listed in **Error! Reference source not found.**

Description of Intensity Criteria

DESCRIPTION	EXPLANATION	SCORING
LOW	Impact alters the affected environment in such a way that the natural processes or functions are not affected.	2
LOW-MEDIUM	Impact alters the affected environment in such a way that the natural processes or functions are slightly affected.	4
MEDIUM	Affected environment is altered, but functions and processes continue, albeit in a modified way.	6



MEDIUM-HIGH	Affected environment is altered, and the functions and processes are modified immensely.	8
HIGH	Function or process of the affected environment is disturbed to the extent where the function or process temporarily or permanently ceases.	10

Consequence

Based on the above criteria, the consequence of issues will be determined using the following formula:

$$\text{Consequence} = \text{Type} \times (\text{Duration} + \text{Extent} + \text{Intensity})$$

This is the consequence of the impact is rated as follows (**Error! Reference source not found.**):

Description of Consequence Criteria

DESCRIPTION	EXPLANATION	SCORING
EXTREME DETRIMENTAL	A very serious negative impact which may be sufficient by itself to prevent implementation of the Project. The impact may result in permanent change. Very often these impacts are immitigable and usually result in very severe effects. The impacts will be irreplaceable and irreversible should adequate mitigation and management measures not be successfully implemented.	-18 to-20
HIGH DETRIMENTAL	A serious negative impact which may prevent the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term change to the (natural and/or social) environment and result in severe effects. The impacts may result in the irreversible damage to irreplaceable environmental or social aspects should mitigation measures not be implemented.	-14 to > - 17
MODERATE DETRIMENTAL	An important negative impact which requires mitigation. The impact is insufficient by itself to prevent the implementation of the Project but which in conjunction with other impacts may prevent its implementation. These impacts will usually result in negative medium to long-term effect on the social and/or natural environment.	-10 to -13
SLIGHT DETRIMENTAL	A small negative impact. The impact will result in medium to short term effects on the social and/or natural environment.	-6 to -9
NEGLIGIBLE	An acceptable negative/positive impact for which mitigation is desirable but not essential. The impact by itself is insufficient even in combination with other low impacts to prevent the development being approved. These impacts will result in negative/positive medium to short term effects on the social and/or natural environment. The impacts are reversible and will not result in the loss of irreplaceable aspects.	-5 to 5



SLIGHT BENEFICIAL	A small positive impact. The impact will result in medium to short term effects on the social and/or natural environment.	6 to 9
MODERATE BENEFICIAL	An important positive impact. The impact is insufficient by itself to justify the implementation of the Project. These impacts will usually result in positive medium to long-term effect on the social and/or natural environment.	10 to 13
HIGH BENEFICIAL	A beneficial impact which may help to justify the implementation of the Project. These impacts would be considered by society as constituting a major and usually a long-term positive change to the (natural and/or social) environment.	14 to 17
EXTREME BENEFICIAL	A very beneficial impact which may be sufficient by itself to justify implementation of the Project. The impact may result in permanent positive change.	18 to 20

Probability

Probability describes the likelihood of the impact(s) occurring for any length of time during the lifecycle of the activity, and not at any given time. **Error! Reference source not found.** shows the classes.

Description of Probability Criteria

DESCRIPTION	EXPLANATION	SCORING
IMPROBABLE	Possibility of the impact occurring is none, due either to the circumstances, design or experience. The chance of this impact occurring is thus zero (0%).	1
POSSIBLE	Possibility of the impact occurring is very low, either due to the circumstances, design or experience. The chances of this impact occurring is defined as 25%.	2
LIKELY	There is a possibility that the impact will occur to the extent that provisions must therefore be made. The chances of this impact occurring is defined as 50%.	3
HIGHLY LIKELY	It is most likely that the impacts will occur at some stage of the Development. Plans must be drawn up before carrying out the activity. The chances of this impact occurring is defined as 75%.	4
DEFINITE	Impact will take place regardless of any prevention plans, and only mitigation actions or contingency plans to contain the effect can be relied upon. The chance of this impact occurring is defined as 100%.	5

Confidence



The level of knowledge or information that the EAP or a specialist had in their judgement is rated as shown in **Error! Reference source not found.**. Note that this criterion is not given a numerical value.

Description of Confidence Criteria

CRITERIA	DESCRIPTION
LOW	Judgement is based on intuition and not on knowledge or information.
MEDIUM	Judgement is based on common sense and general knowledge.
HIGH	Judgement is based on scientific and/or proven information.

Reversibility

Reversibility is the ability of the affected environment to recover from the impact, with or without mitigation (**Error! Reference source not found.**). Note that this criterion is not given a numerical value.

Description of Reversibility Criteria

CRITERIA	DESCRIPTION
YES	The affected environment will be able to recover from the impact.
NO	The affected environment will be unable to recover from the impact that is permanently modified.

Replaceability

Replaceability is an indication of the scarcity of the specific set of parameters that make up the affected environment (**Error! Reference source not found.**). That is, if lost can the affected environment be (a) recreated, or (b) is it a common set of characteristics and thus if lost is not considered a significant loss. Note that this criterion is not given a numerical value.

Description of Replaceability Criteria

CRITERIA	DESCRIPTION
YES	Affected environment is replaceable, that is, an irreplaceable resource is not damaged, or the resource is not irreplaceable (not scarce).
NO	Affected environment is irreplaceable.

Level of Significance

Based on the above criteria, the significance of issues will be determined using the following formula:

$$\text{Significance} = \text{Consequence} \times \text{Probability}$$

The significance of the impact is rated as follows:



Impact Assessment Significant Rating

DESCRIPTION	EXPLANATION	SCORING
NO IMPACT	There is no impact	0 – 10
LOW	Impacts are less important. Some mitigation is required to reduce the negative impacts.	11 – 30
MEDIUM	Impacts are important and require attention. Mitigation is required to reduce the negative impacts.	31 – 60
HIGH	Impacts are of high importance. Mitigation is essential to reduce the negative impacts.	61 – 89
FATAL FLAW	Impacts present a fatal flaw, and alternatives must be considered	90 – 100



Appendix 3. Development implications for areas with Red Listed/Protected plant species.

(after Raimondo *et al.*, 2009)

Critically Endangered (CR):

Implications for development: RED LIST SPECIES: No further loss of natural habitat should be permitted as the species is on the verge of extinction. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Endangered (EN):

Implications for development: RED LIST SPECIES:

Case A: If the species has a restricted range (EOO < 2 000 km²), recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the National Environmental Management: Protected Areas Act (Act 57 of 2003), and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.

Case B, C, D: No further loss of habitat should be permitted as the species is likely to go extinct in the near future if current pressures continue. All remaining subpopulations have to be conserved if this species is to survive in the long term.

Vulnerable (VU):

Implications for development: RED LIST SPECIES:

Case D: This species either constitutes less than 1 000 individuals or is known from a very restricted range. No further loss of habitat should be permitted as the species' status will immediately become either Critically Endangered or Endangered, should habitat be lost. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Case B, C: The species is approaching extinction but there are still a number of subpopulations in existence. Recommend no further loss of habitat as this will increase the extinction risk of the species.

Case A: If the species has a restricted range, EOO < 2 000 km², recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered under certain circumstances, such as the implementation of an offset whereby another viable, known subpopulation is formally conserved in terms of the Protected Areas Act, and provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for



biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.

Near Threatened (NT):

Implications for development: ORANGE LIST SPECIES:

Case D: Currently known from fewer than 10 locations, therefore preferably recommend no loss of habitat. Should loss of this species' habitat be considered, then an offset that includes conserving another viable subpopulation (in terms of the Protected Areas Act) should be implemented, provided that the subpopulation to be destroyed does not occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Case B, C: The species is approaching thresholds for listing as threatened but there are still a number of subpopulations in existence and therefore there is need to minimise loss of habitat. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant spatial biodiversity plan or (iii) on a site associated with additional ecological sensitivities.

Case A: If the species has a restricted range, $EOO < 2\,000\text{ km}^2$, then recommend no further loss of habitat. If range size is larger, the species is possibly long-lived but widespread, and limited habitat loss may be considered. Conservation of subpopulations is essential if they occur (i) within a threatened ecosystem or (ii) within an area required for biodiversity conservation in terms of a relevant biodiversity conservation plan or (iii) on a site associated with additional ecological sensitivities.

Critically Rare:

Implications for development: ORANGE LIST SPECIES: This is a highly range-restricted species, known from a single or isolated sites, and therefore no loss of habitat should be permitted as it may lead to extinction of the species. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Rare:

Implications for development: ORANGE LIST SPECIES: The species is likely to have a restricted range, or be highly habitat specific, or have small numbers of individuals, all of which makes it vulnerable to extinction should it lose habitat. Recommend no loss of habitat. The Threatened Species Programme is not aware of any current threats to this species and should be notified without delay. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Declining:



Implications for development: ORANGE LIST SPECIES: The species is declining but the population has not yet reached a threshold of concern; limited loss of habitat may be permitted. Should the species is known to be used for traditional medicine and if individuals will not be conserved in situ, plants should be rescued and used as mother stock for medicinal plant cultivation programmes.

Data Deficient - Insufficient Information (DDD)

Implications for development: ORANGE LIST SPECIES:

Case D: This species is very poorly known, with insufficient information on its habitat, population status or distribution to assess it. However, it is highly likely to be threatened. If a Data Deficient species will be affected by a proposed activity, the subpopulation should be well surveyed and the data sent to the Threatened Species Programme. The species will be reassessed and the new status of the species, with a recommendation, will be provided within a short timeframe. The Threatened Species Programme must be informed immediately, providing details of the location, size and threats to the subpopulation.

Case T: There is uncertainty regarding the taxonomic status of this species, but it is likely to be threatened. Contact the taxonomist working on this group to resolve its taxonomic status; the species will then be reassessed by the Threatened Species Programme.

Data Deficient - Taxonomically Problematic (DDT):

Implications for development: GREEN LIST SPECIES: Implications for development: GREEN LIST SPECIES: Development is not expected to affect the conservation status of this species. Species removal may still be subject to provincial or national legislation.



Appendix 4: A collage of pictures from the project area and surroundings.

