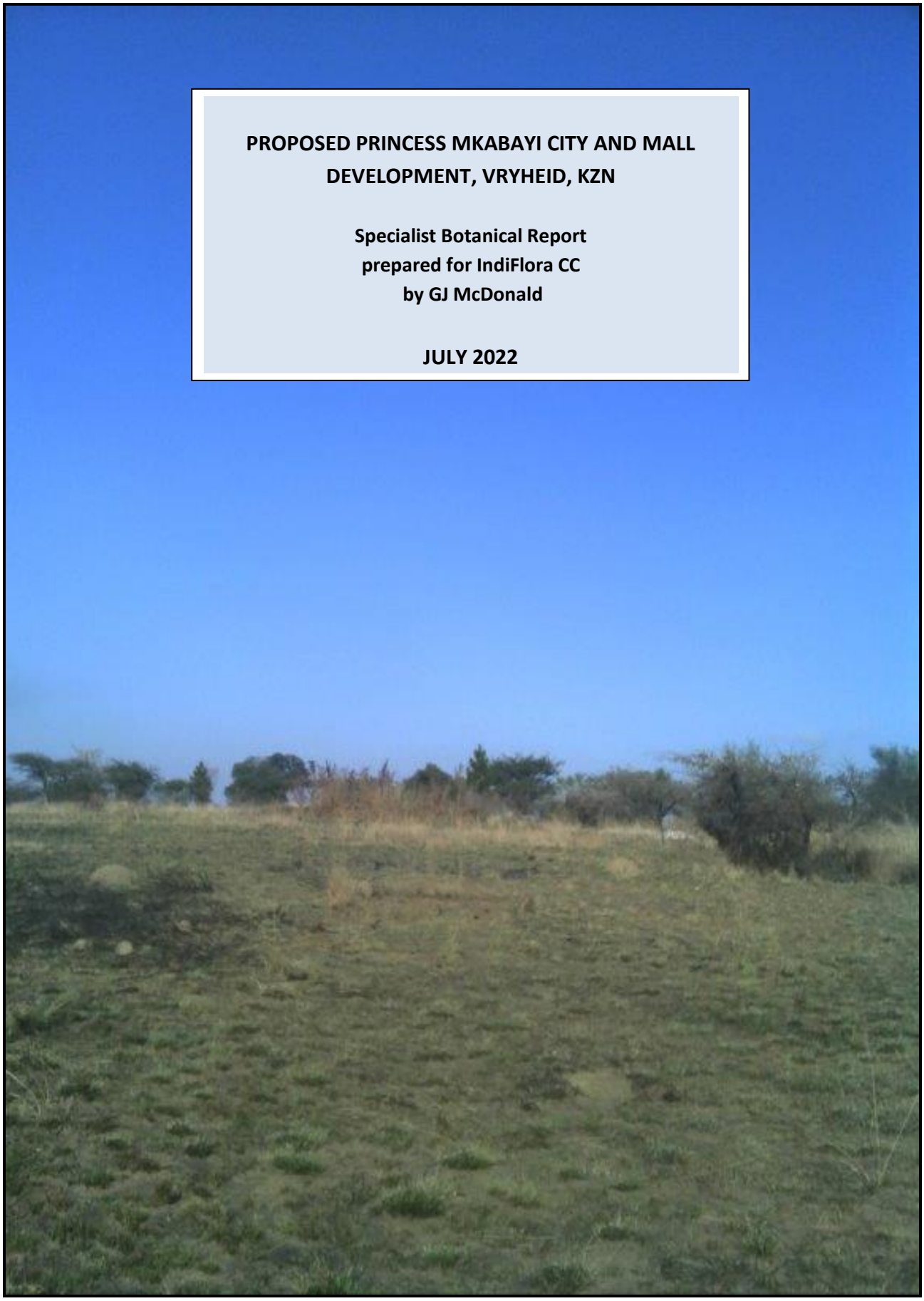
PROPOSED PRINCESS MKABAYI CITY AND MALL DEVELOPMENT, VRYHEID, KZN

Specialist Botanical Report
prepared for IndiFlora CC
by GJ McDonald

JULY 2022



Executive summary

Princess Mkabayi City Pty (Ltd) propose to build a multi-use development in Vryheid, KZN. The general location of the site of the proposed activity is indicated below.

The figure below indicates the main features of the proposed development, including a tentative schematic for the layout.

GJ McDonald Consulting was contracted to assess the likely impacts of the proposed activity on the vegetation of the area. A field visit was conducted on 16th July 2022.

Local sensitivities

Vegetation

From a floral point of view the sensitivities relating to the proposed site are minimal and include the presence of a number of *Agapanthus praecox* (Liliaceae), *Aloe maculata* (Asphodelaceae) and *Boophone disticha* (Amaryllidaceae). Limited numbers of *Aristea* and *Dietes grandiflora* (Iridaceae), and *Bulbine asphodeloides* (Liliaceae *sensu lato*) were also encountered. All LILIACEAE, IRIDACEAE, AMARYLLIDACEAE and ALOE are SPECIALLY PROTECTED species according to the ordinance, despite these species being Red Listed as of Least Concern by Raimondo *et al.* (2009). No plants protected by the National Forests Act were encountered during the study, nor were any Rare, Red Listed or Endemic species.

According to Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011), the vegetation type at the proposed site is Northern KZN Moist Grassland which is considered Vulnerable. However, the site is transformed due to human activities such as grazing of cattle, excessive burning, and illegal dumping and sand-mining, therefore, the proposed activity is unlikely to result in the loss of conservation significant habitat or species. The major impacts will be habitat destruction, disturbance during and post-construction, the possibility of soil compaction, hardening of surfaces and erosion, and alien plant invasion.

Floral Impact Assessment summary

IMPACT TYPE	IMPACT SIGNIFICANCE	
	Unmitigated	With mitigation
Habitat destruction	HIGH	MEDIUM
Disturbance	HIGH	MEDIUM
Soil compaction, hardening of surfaces and erosion	MEDIUM	INSIGNIFICANT
Alien plant invasion	MEDIUM	INSIGNIFICANT

Permit requirements

It will be necessary to apply to eKZN Wildlife for a permit to translocate, damage or destroy any of the Specially Protected species occurring on the site. There are large numbers of *Aloe maculata* (~100 or more) and perhaps the same number of *Agapanthus praecox*. Seven *Boophone disticha* were encountered, but there may be more as they are currently dormant. There was a single clump of around 10 individual plants of *Crocosmia aurea*, a single clump each of *Dietes grandiflora* and *Bulbine asphodeloides* and a single plant of *Chlorophytum krookianum*. Wherever possible, and particularly in the case of *Aloe* and *Agapanthus*, these should be included in the planting palette for the landscaping of the complex, which should be indigenous and water-wise as far as practical.

Recommendation

It is my opinion that the impacts on the environment of the proposed development as currently envisaged can be mitigated to within acceptable limits if mitigation measures in this report are adopted. Therefore, I do not anticipate opposition to the proposed activity from a botanical standpoint.

I, **GJ McDonald** *Pr. Sci. Nat*. (400083/97), declare that --

General declaration:

- I act as the independent specialist in this application;
- do not have and will not have any vested interest (either business, financial, personal or other) in the undertaking of the proposed activity, other than remuneration for work performed in terms of the Environmental Impact Assessment Regulations, 2010;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

Name of company (if applicable):

Date: 24th July 2022

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Terms of reference

Princess Mkabayi City Pty (Ltd) propose to develop a multi-use development in Vryheid, KZN. GJ McDonald Consulting was contracted to assess the likely impacts of the development on the vegetation of the area. This is a Basic Assessment.

Constraints of fieldwork

The major constraint in any botanical survey is time in the field and the season in which the survey is carried out. Given time for more extensive/intensive field work it is possible that rare and more cryptic species may be encountered.

Scope of work – General

To undertake a study at the proposed site and to:

- Indicate study limitations and assumptions
- Identify impacts upon the habitat
- Describe the current land use of the area
- Indicate existing constraints in relation to the proposed development
- Identification of conservation significant habitats possibly impacted by the proposed activity
- Describe the species most likely to be impacted
- Recommend actions that could mitigate against potential impacts
- Provide an impact rating schedule showing expected impacts before and after mitigation

Scope of work – Vegetation

To undertake a botanical study at the proposed site and to:

- Provide an inventory of the plant species at the site
- Describe the habitats associated with the site
- Identification of sensitive habitats within the site
- Identify threatened, vulnerable, endangered and protected species from the site
- Describe potential impacts of the proposed project on the vegetation

Methodology

- GIS study undertaken to generate overlays of the site taking into account, amongst others:
  - Vegetation type (Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011))
  - Geology and soils
  - Wetlands and watersheds
  - eKZNWildlife's C-Plan
- Desktop study using Google Earth to determine areas of interest such as wetlands and changes in vegetation
- Ground study to determine the likely impact of the proposed development on the vegetation at the proposed site
- Identification of impacts and mitigations
- Generation of recommendations

Data for the vegetation study were accessed from:

- Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011) – to determine the vegetation types in the study area
- BGIS LUDS tool for details of the study area

- DEA online Screening Tool
- Google Earth™ satellite imagery
- Field visit conducted on 6th July 2022

Limitations and assumptions

- The use of Google Earth™ imagery as well as the accuracy of hand-held GPS units means that co-ordinates cannot be guaranteed beyond a certain degree of accuracy on the ground. Should greater accuracy of any data be required, the points of interest will need to be pegged and surveyed using conventional surveying techniques.
- In general, time of year can affect the ease of locating and identifying plant species, especially geophytes species which tend to become dormant in winter.
- Recent burns can make it difficult to generate a fully inclusive list of species unless persistent plant parts remain after a fire.

This survey was carried out in winter and the area had been fairly recently burned. Given the grazed nature of the area and the frequent burning regime it is likely to endure, the results are unlikely to differ should the survey have taken place in summer. Furthermore, sufficient time had elapsed since the fire to allow the emergence of flowering species, and the removal of moribund material may actually have simplified the survey by exposing some species.

Impact rating

The methodology adopted for calculating the impact rating is that of Smallie and Steytler (2011) as described below.

The extent, intensity and duration of the impact are scored according to the following criteria:

Rating	Definition of Rating	Score
A. *Extent*– *the area over which the impact will be experienced*		
Local	Confined to project or study area or part thereof (e.g. site)	1
Regional	The region, which may be defined in various ways, e.g. cadastral, catchment, topographic	2
(Inter) national	Nationally or beyond	3
B. *Intensity*– *the magnitude of the impact in relation to the sensitivity of the receiving environment, taking into account the degree to which the impact may cause irreplaceable loss of resources*		
Low	Site-specific and wider natural and/or social functions and processes are negligibly altered	1
Medium	Site-specific and wider natural and/or social functions and processes continue albeit in a modified way	2
High	Site-specific and wider natural and/or social functions or processes are severely altered	3
C. *Duration*– *the timeframe over which the impact will be experienced and its reversibility*		
Short-term	Up to 2 years	1
Medium-term	2 to 15 years	2
Long-term	More than 15 years	3

Once established, the above factors are used to calculate the Consequence Rating as tabled below.

***Combined Score* (A+B+C)**	3 – 4	5	6	7	8 – 9
Consequence Rating	Very low	Low	Medium	High	Very high

After the Consequence Rating has been established, the probability of the impact occurring is

determined according to the following criteria.

Probability *– the likelihood of the impact occurring*	
Improbable	< 40% chance of occurring
Possible	40% - 70% chance of occurring
Probable	> 70% - 90% chance of occurring
Definite	> 90% chance of occurring

Using a combination of Consequence Rating and probability it is possible to determine the Significance rating.

Significance Rating	***Possible Impact Combinations***		
	Consequence		***Probability***
Insignificant	Very Low	&	Possible
	Very Low	&	Improbable
Very Low	Very Low	&	Definite
	Very Low	&	Probable
	Low	&	Possible
	Low	&	Improbable
Low	Low	&	Definite
	Low	&	Probable
	Medium	&	Possible
	Medium	&	Improbable
Medium	Medium	&	Definite
	Medium	&	Probable
	High	&	Possible
	High	&	Improbable
High	High	&	Definite
	High	&	Probable
	Very High	&	Possible
	Very High	&	Improbable
Very High	Very High	&	Definite
	Very High	&	Probable

The final determinations are the status of the impact (+ve or –ve) and the confidence level.

Status of impact	
Indication whether the impact is adverse (negative) or beneficial (positive).	+ ve (positive – a 'benefit')
	– ve (negative – a 'cost')
Confidence of assessment	
The degree of confidence in predictions based on available information,	Low
	Medium
	High

The above methodology was used to generate the impact schedules.

Study area

The proposed development falls within the Quarter Degree Grid Square 2730 DD in the Abaqulusi Municipality which is 418462.8 hectares in extent. Within the municipality, areas remaining natural constitute some 302977.6 hectares (72.4% of municipality), while areas where no natural habitat remains constitute 115484 hectares (27.6% of municipality).

Figure 1: Location of study site

Formal land-based protected areas

There are two formal land-based protected areas covering 3943.4 hectares (0.9% of municipality) and includes Ithala Game Reserve Provincial Nature Reserve of 3199.4 hectares (0.76% of municipality) and Vryheid Mountain Provincial Nature Reserve of 744.1 hectares (0.18% of municipality).

River, wetlands and estuaries

The 13 rivers in the municipality include the aMagoda, Black Mfolozi, Bloed, Hlonyane, KwaMbizankulu, Manzana, Mkuze, Mvunyane, Sandspruit, Sihlengeni, Sikwebezi, Unknown and White Mfolozi Rivers. There are wetlands covering 14139.5 ha (3.38 %) of the Municipality. There are no RAMSAR sites and no estuaries present.

Vegetation types

The Municipality falls within three Biomes, namely Forests of 3658.5 hectares (0.87% of municipality), Grassland of 335005.2 hectares (80.06% of municipality) and Savanna of 79798.7 hectares (19.07% of municipality) and has 12 vegetation types, namely:

Eastern Temperate Freshwater Wetlands 374.4ha (0.09% of municipality)
Income Sandy Grassland 203423.2ha (48.61% of municipality)
Ithala Quartzite Sourveld 7521.1ha (1.8% of municipality)
KwaZulu-Natal Highland Thornveld 36956ha (8.83% of municipality)
Northern Afrotemperate Forest 76.9ha (0.02% of municipality)
Northern KwaZulu-Natal Shrubland 4366.9ha (1.04% of municipality)

Northern Zululand Mistbelt Grassland 64424.2ha (15.4% of municipality)
Northern Zululand Sourveld 71551ha (17.1% of municipality)
Paulpietersburg Moist Grassland 18123.5ha (4.33% of municipality)
Southern Mistbelt Forest 4829.3ha (1.15% of municipality)
Swaziland Sour Bushveld 4659.8ha (1.11% of municipality)
Zululand Lowveld 2156.1ha (0.52% of municipality)

Threatened Terrestrial Ecosystems

Critically Endangered (CR)

There are no critically endangered habitats in Abaqulusi Municipality

Endangered (EN)

Ngome Mistbelt Grassland and Forest - KZN 31 14071.2ha (3.36% of municipality)

Vulnerable (VU)

Eastern Temperate Freshwater Wetlands – (Azf 3) 316.1ha (0.08% of municipality)
eMondlo Sandy Moist Grassland – (KZN 51) 16748.8ha (4% of municipality)
Louwsberg Mistbelt Grassland – (KZN 65) 2510.2ha (0.6% of municipality)
Low Escarpment Mistbelt Forest – (FOz 2_4) 1175.3ha (0.28% of municipality)
Paulpietersburg Moist Grassland – (Gm 15) 8912.5ha (2.13% of municipality)

According to the BGIS LUDS tool, only Northern KwaZulu-Natal Moist Grassland (Gs 4 = KZN_25) is present at the proposed site as described later.

Vegetation type

According to Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011), Northern KwaZulu-Natal Moist Grassland is found at the study site as indicated below.

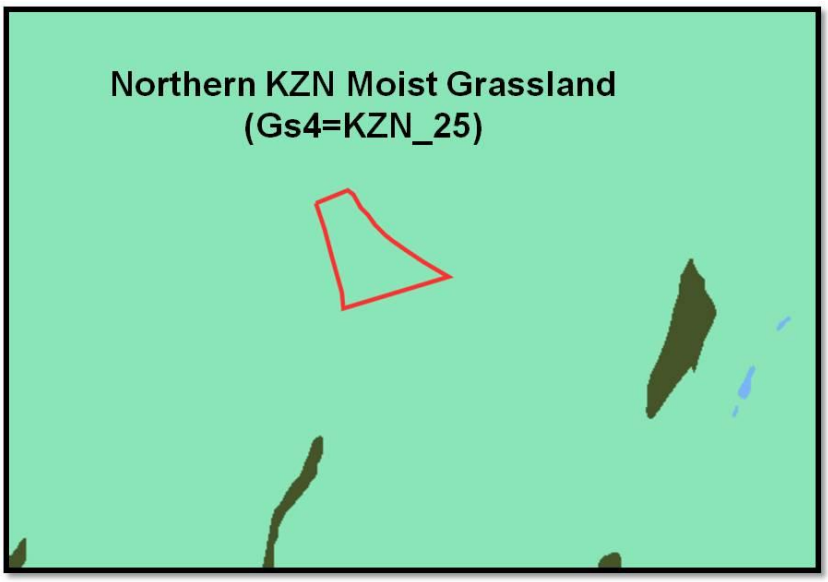


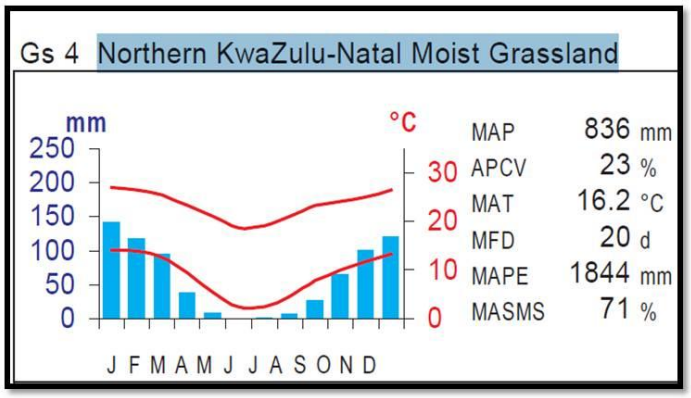
Figure 2: Vegetation type at the site

Mucina and Rutherford (2006) report**:**

"Distribution: KwaZulu-Natal Province: Northern and north-western regions of the Province, where it forms a discontinuous rim around the upper Thukela Basin and is situated almost entirely within the catchment of the Thukela River. It lies between the drier Gs 6 (KwaZulu-Natal Highland Thornveld) and the moist upland vegetation of mainly Gs 3 (Low Escarpment Moist Grassland) to the north and Gs 10 (Drakensberg Foothill Moist Grassland) to the west. The most extensive areas are in the vicinity of Winterton, Bergville, Fort Mistake, Dannhauser, Dundee, north of Ladysmith and west of Newcastle. At higher altitudes this unit is usually surrounded by Gs 3 (Low Escarpment Moist Grassland) in the north and Gs 10 (Drakensberg Foothill Moist Grassland) in the west and south. At lower altitudes Gs 6 (KwaZulu-Natal Highland Thornveld) and SVs 2 (Thukela Thornveld) usually occur to the east. Altitude 1040-1440m.

Vegetation and Landscape Features: Hilly and rolling landscapes supporting tall tussock grassland usually dominated by *Themeda triandra* and *Hyparrhenia hirta*. Open *Acacia sieberiana* var. *woodii* savannoid woodlands encroach up the valleys, usually on disturbed (strongly eroded) sites**.**

Climate: Summer rainfall, with overall MAP of 840mm (710-1120mm), mainly as summer thunderstorms. Mist occurs frequently on hilltops in spring and early summer, but summer droughts are also frequent. Summers are warm to hot, with maximum temperature recorded in the hottest month of January (Bergville MAT 27.8°C). MAT is around 16°C, but some localities may reach 17°C. Frosts are severe and occur about 20 days per year. Mean annual evaporation recorded at Bergville is 1895 mm.



Important Taxa

Graminoids: *Alloteropsis semialata* subsp. *eckloniana*, *Aristida congesta*, *Cynodon dactylon*, *Digitaria tricholaenoides*, *Elionurus muticus*, *Eragrostis patentissima*, *E. racemosa*, *Harpochloa falx*, *Hyparrhenia hirta*, *Themeda triandra*, *Tristachya leucothrix*, *Abildgaardia ovata*, *Andropogon appendiculatus*, *A. eucomus*, *A. schirensis*, *Aristida junciformis* subsp. *galpinii*, *Brachiaria serrata*, *Cymbopogon caesius, C. pospischilii, Cynodon incompletus, Digitaria monodactyla, D. sanguinalis, Diheteropogon amplectens, D. filifolius, Eragrostis chloromelas, E. plana, E. planiculmis, E. sclerantha, Festuca scabra, Heteropogon contortus, Hyparrhenia dregeana, Melinis nerviglumis, Microchloa caffra, Panicum natalense, Paspalum scrobiculatum, Setaria nigrirostris, Sporobolus africanus.*

***Herbs**: Acanthospermum australe, Argyrolobium speciosum, Eriosema kraussianum, Geranium wakkerstroomianum, Pelargonium luridum, Acalypha peduncularis, Chamaecrista mimosoides, Dicoma anomala, Euryops transvaalensis* subsp*. setilobus, Helichrysum caespititium, H. rugulosum, Hermannia depressa, Ipomoea crassipes, Pearsonia grandifolia, Pentanisia prunelloides* subsp*. latifolia, Sebaea grandis, Senecio inornatus, Thunbergia atriplicifolia, Zaluzianskya microsiphon.*
***Geophytic Herbs**: Chlorophytum haygarthii, Gladiolus aurantiacus, Asclepias aurea, Cyrtanthus tuckii* var*. transvaalensis, Gladiolus crassifolius, Hypoxis colchicifolia, H. multiceps, Moraea brevistyla, Zantedeschia rehmannii.*
***Succulent Herbs**: Aloe ecklonis, Lopholaena segmentata.*
***Low Shrubs**: Anthospermum rigidum* subsp*. pumilum, Erica oatesii, Hermannia geniculata.*
Succulent Shrub: *Euphorbia pulvinata*.
Biogeographically Important Taxa (both Low Escarpment endemics)
Succulent Herb: *Aloe modesta*.
Low Shrub: *Bowkeria citrina*.

Conservation status: Vulnerable.
Target 24%. Only about 2% statutorily conserved in the uKhahlamba Drakensberg Park as well as in the Chelmsford, Spioenkop, Moor Park, Wagendrift, Ncandu Nature Reserves. More than a quarter has already been transformed either for cultivation, plantations and urban sprawl or by building of dams (Chelmsford, Driel, Kilburn, Mtoti, Wagendrift, Windsor and Woodstock). Alien *Acacia dealbata*, *Rubus*, *Eucalyptus* and *Populus* are invasive in places. Bush encroachment is common".

Land use

The study area is an open area of veld which is used for grazing cattle. Illegal dumping of construction and garden waste on the site is a feature (below, upper). This has led to the colonization of a number of garden escapee species both indigenous (eg. *Agapanthus, Dietes, Bulbine*), and exotic (eg. *Agave, Yucca*). The grassland currently supports a very low biodiversity. The site is also used for cultural/religious purposes (below, lower).

Figure 3: Land use at the site

Climate diagrams for Vryheid (Source: WeatherSpark.com]

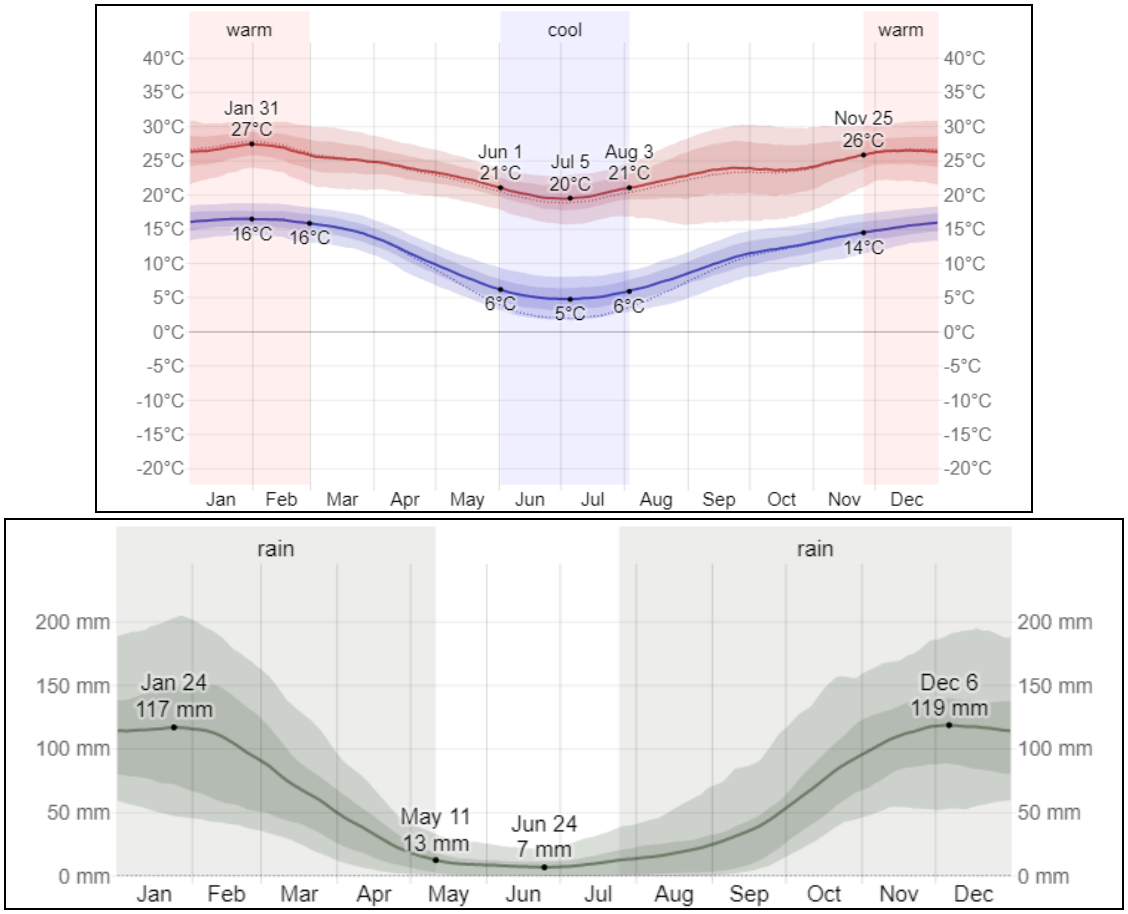


Figure 4: Vryheid temperature (upper) and rainfall (lower) [Source: WeatherSpark.com]

General mapping results

Proposed development site as provided

The extent of the proposed development site is approximately 22.6 hectares.

Figure 5: The proposed development site

A contour diagram of the site is presented below and indicates that the site is situated between 1120 and 1160m above msl.

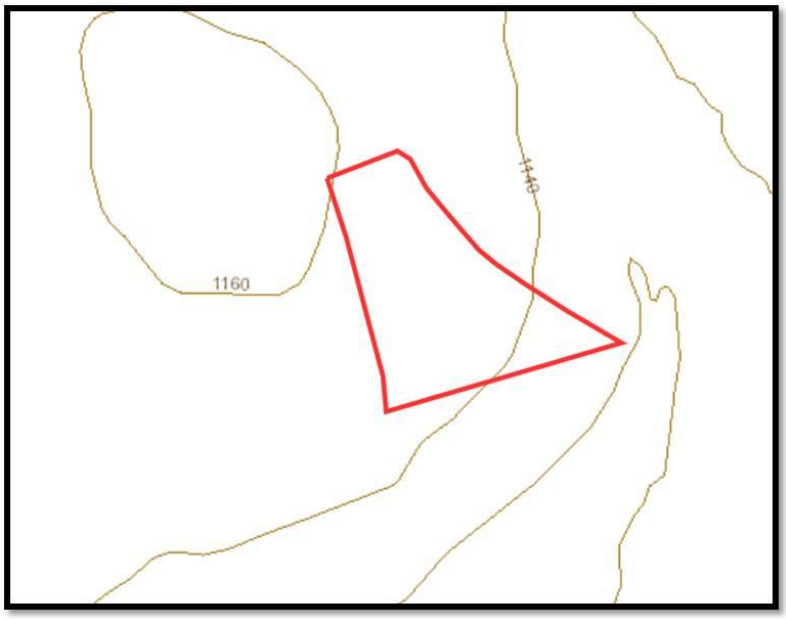


Figure 6: Contour diagram of the proposed site

Local sensitivities

According to the Sensitivity Report generated from the National web-based Environmental Screening Tool, the area has terrestrial biodiversity and plant species theme sensitivities as indicated below.

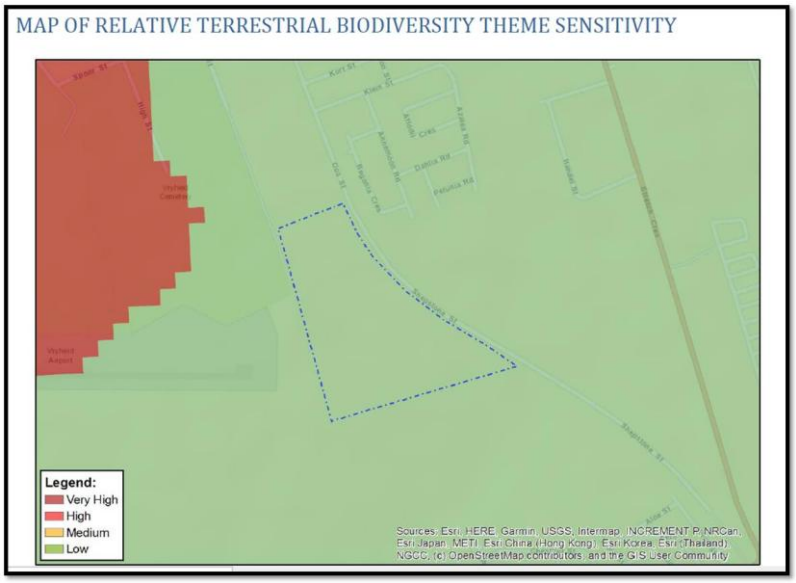


Figure 7: Map of relative terrestrial biodiversity theme sensitivity

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
			X

Sensitivity	Feature(s)
Low	Low sensitivity

The site has a low overall terrestrial biodiversity theme sensitivity.

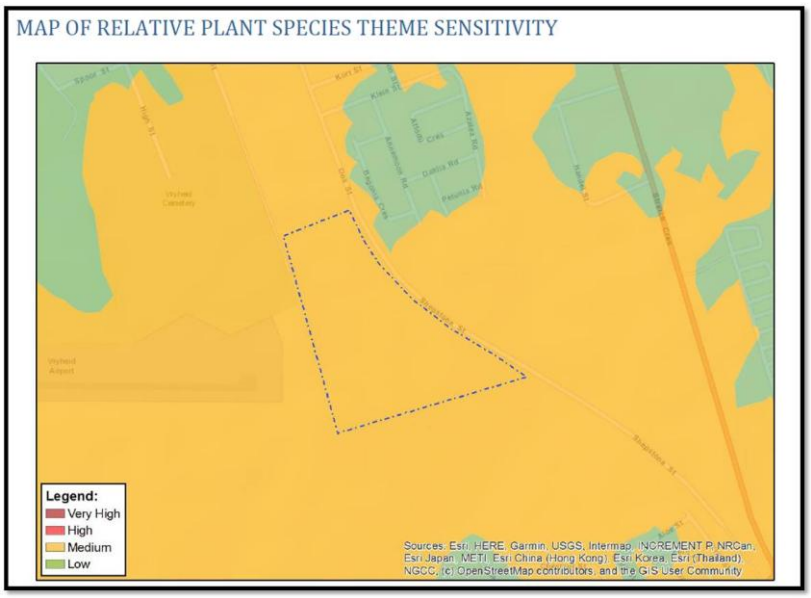


Figure 8: Map of relative plant species theme sensitivity

Very High sensitivity	High sensitivity	Medium sensitivity	Low sensitivity
		X	

Sensitivity	Feature(s)
Medium	Sensitive species 998
Medium	Sensitive species 1152
Medium	Sensitive species 1252
Medium	*Dierama erectum*

The plant theme sensitivity is listed as Medium because of the potential presence of four species of conservation concern which are known to occur in the vegetation type. Sensitive species 1252 is unlikely to find suitable habitat, while Sensitive species 1152 would have been conspicuous, but was not encountered. Sensitive species 998 could presumably be present, but was not seen either as a result of absence or it was dormant. The latter species usually has some persistent plant parts even when dormant. *Dierama erectum* (Iridaceae) perrenates from an underground corm and may have been dormant. Again, the species usually has some persistent plant parts even when dormant. Because of the grazing and burning pressure experiences at the site, these species are not likely to exist, and during the walk-down survey of the site, none of the species of conservation significance indicated above were encountered. This was not unexpected as the area has been transformed by current land-use practices.

Vegetation type Conservation Status

Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011) indicate a single vegetation type *viz.* Northern KZN Moist Grassland (Gs 4 = KZN_25) considered as Vulnerable. On the site, however, the vegetation type has been impacted by grazing, burning, dumping, alien plant invasion and sand mining from the site which has resulted in dug pits.

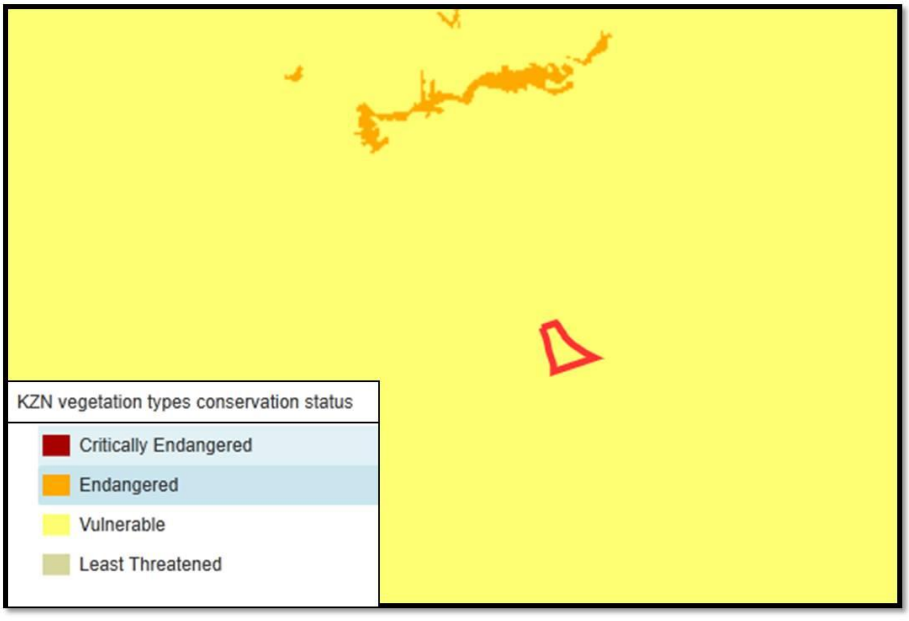


Figure 9: Conservation status of KZN vegetation types

Wetlands, impoundments and watercourses

The site is removed from any NFEPA wetlands as indicated below.

Figure 10: Wetlands in the study area

C-Plan impacts

The proposed development falls outside of any area designated by the eKZN Wildlife C-Plan as having either a high Irreplaceability Score (indicated in green) or CBA Optimum (indicated in blue) as seen below.

Figure 11: eKZNWildlife C-plan impacts of the proposed development (in red) with CBA Irreplaceable (green) and CBA Optimal (blue)

Geology, soils and soil erodibility

According to Mucina and Rutherford (2009), mudstones, sandstones and shales of the Beaufort and Ecca groups of the Karoo Supergroup predominate and are intruded by dolerites of Jurassic age. Soils at the site are uniformly undifferentiated or structureless soils which are red, yellow and/or grayish in colour with low to medium base status.

Figure 12: Soils of the area

Soil erodibility (K) is the intrinsic susceptibility of a soil to erosion by runoff and raindrop impact. Values of K range from the lowest erodibility, 0.02, to the highest, 0.69. All other factors being equal the higher the K value, the greater the susceptibility of the soil to rill and sheet erosion by rainfall. K values are dependent upon the soil texture, structure, permeability, and organic matter content. In general, soils with greater permeability, higher levels of organic matter and improved soil structure have a greater resistance to erosion and, therefore, a lower K value. The presence of silt, very fine sand, and clays with a high shrink-swell capacity tend to increase the K value, whereas sand, sandy loam and loam textured soils tend to be less erodible.

Soils high in clay (other than smectic clays) have low K values, about 0.05 to 0.15, because they resistant to detachment. Coarse textured soils, such as sandy soils, have low K values, about 0.05 to 0.2, because of low runoff even though these soils are easily detached. Medium textured soils, such as the silt loam soils, have a moderate K values, about 0.25 to 0.4, because they are moderately susceptible to detachment and they produce moderate runoff. Soils having a high silt content are the most erodible of all soils. They are easily detached, tend to crust, and produce high rates of runoff. K values for these soils tend to be >0.4. As can be seen below, the soil erodibility factor at the study site is K=0.45, indicating their susceptibility to erosion.

Figure 13: Soil K-factors for the area (upper) and eroded footpaths (lower)

eKZNWildlife biodiversity corridors

The Biodiversity Conservation Planning Division of eKZNWildlife has identified a series of altitudinal and biogeographic corridors in KZN which create a linked landscape for the conservation of species in a fragmented landscape and to facilitate evolutionary, ecological and climate change processes (*Ezemvelo* KZN Wildlife 2010). This system of corridors in the region of the proposed activity indicates that no impacts are expected.

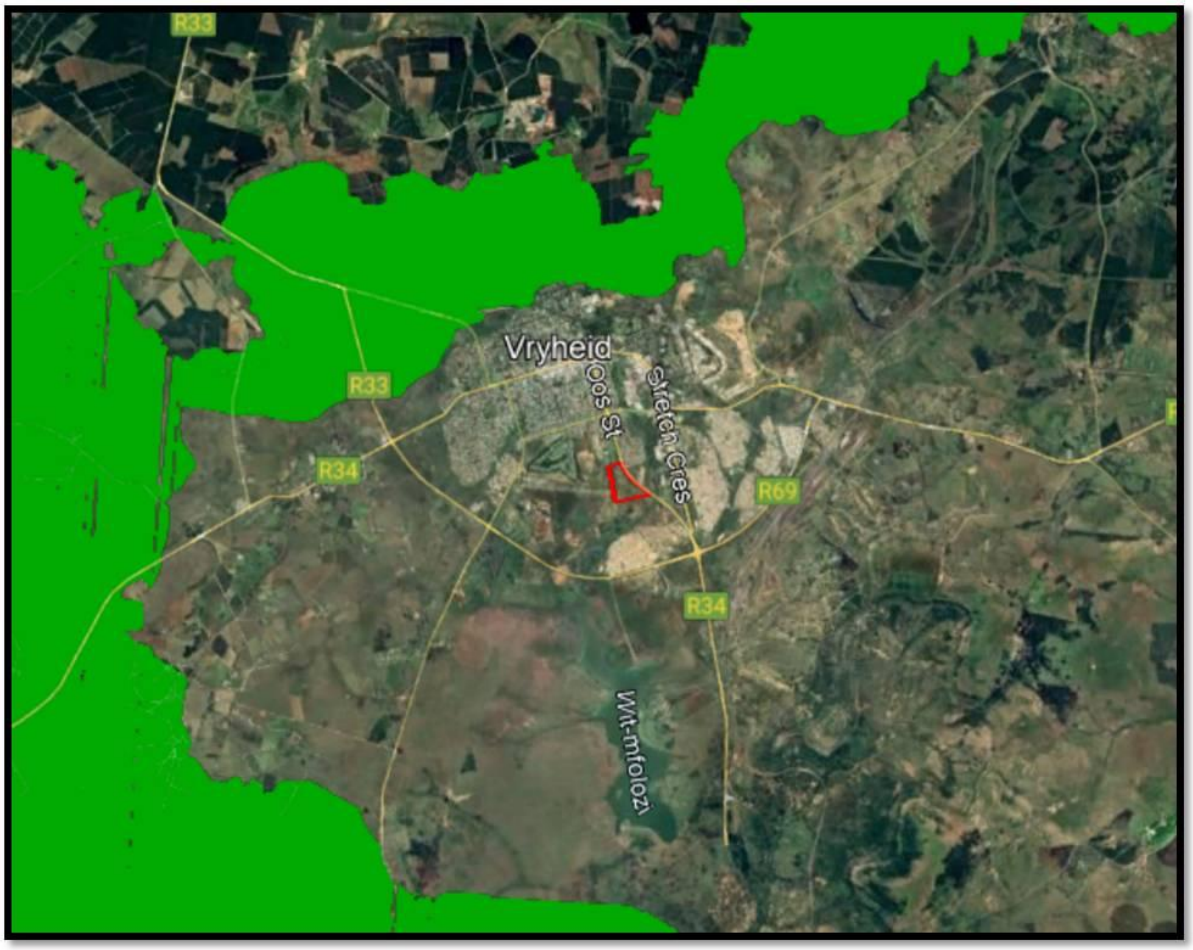


Figure 14: eKZNWildlife biodiversity corridors

General findings

Vegetation

The flora of the general area has suffered a number of anthropogenic impacts, more especially from clearing, dumping, burning and grazing by livestock. Whether natural or of anthropogenic origin resulting from excessive grazing and burning, the grassland has a low diversity and geophytes are generally conspicuously absent. Invasion by woody species such as *Acacia sieberiana* and the alien *Melia azedarach* is common, as is invasion by alien weeds. Inadequate control efforts aimed at removing *Melia* (Syringa) has led to extensive coppicing, and most trees of this species are now multi-stemmed.

Figure 15: Vegetation at the site

Indigenous species encountered on field visit

PLANT SPECIES
Acacia sieberiana ssp. *woodii*
Acalypha peduncularis
**Agapanthus praecox*
**Aloe maculata*
**Aristea* spp.
Aristida junciformis
Asparagus densiflorus
Asparagus sp.
**Boophone disticha*
**Bulbine asphodeloides*
Chlorophytum krookianum
Combretum kraussii
**Crocosmia aurea*
Cussonia spicata
Cymbopogon caesius
Cyperus albostriatus
Cyperus textilis

Dichrostachys cinerea
Dicoma anomala
Gazania krebsiana
Gerbera ambigua
Gerbera piloseloides
Helichrysum caespititium
Helichrysum nudifolium
Helichrysum rugulosum
Hermannia sp.
Hibiscus trionum
Hirpicium armerioides
Hyparrhenia hirta
Hypoxis rigidula

Imperata cylindrica
Indigofera sp.
Melinus repens
Panicum maximum
Phytolacca octandra
Plantago major
Searsia lancea
Senecio glaberrimus
Senecio inornatus
Sporobolus africanus
Stoebe vulgaris
Themeda triandra

***=SPECIALLY PROTECTED**

Alien/invasive species encountered on field visit

PLANT SPECIES
Acacia spp.
Agave spp.
Ananas commosus
Argemone mexicana
Argemone ochroleuca
Argyranthemum sp.
Bidens pilosa
Brassica sp.
Canna indica and *C.indica* 'Variegata'
Cinnamomum camphora
Conyza spp.
Coryopsis lanceolatus
Cotoneaster glaucophyllus
Datura stramoneum
Emex australis
Eucalyptus spp.

Jacaranda mimosifolia
Lactuca sp.
Ligastrum sp.
Melia azedarach
Nicandra physalodes
Oxalis corniculata
Pennisetum purpureum
Pinus sp.
Richardia brasiliensis
Ricinus communis
Schefflera arboricola
Solanum mauritianum
Solanum sp.
Tagetes minuta
Verbena aristigera
Verbena brasiliensis
Yucca sp.

Plants protected under the Provincial conservation ordinance

From a floral point of view the sensitivities relating to the proposed site are minimal and include the presence of a number of *Agapanthus praecox* (Amaryllidaceae *sensu lato*), *Aloe maculata* (Asphodelaceae) and *Boophone disticha* (Amaryllidaceae). Limited numbers of *Aristea* and *Dietes grandiflora* (Iridaceae), and *Bulbine asphodeloides* (Liliaceae *sensu lato*) were also encountered. All LILIACEAE, IRIDACEAE, AMARYLLIDACEAE and ALOE are SPECIALLY PROTECTED species according to the ordinance, despite these species being Red Listed as of Least Concern by Raimondo *et al.* (2009). Permits to move, damage or destroy these Specially Protected species will be required (see later under Permit requirements).

The location of various Specially Protected species on the site is indicated below in Figure XX (a)-(d).

(a) Agapanthus praecox ***(b) Aloe maculata***

(c) Boophone disticha ***(d) Chlorophytum, Crocosmia, Bulbine* and *Aristea***

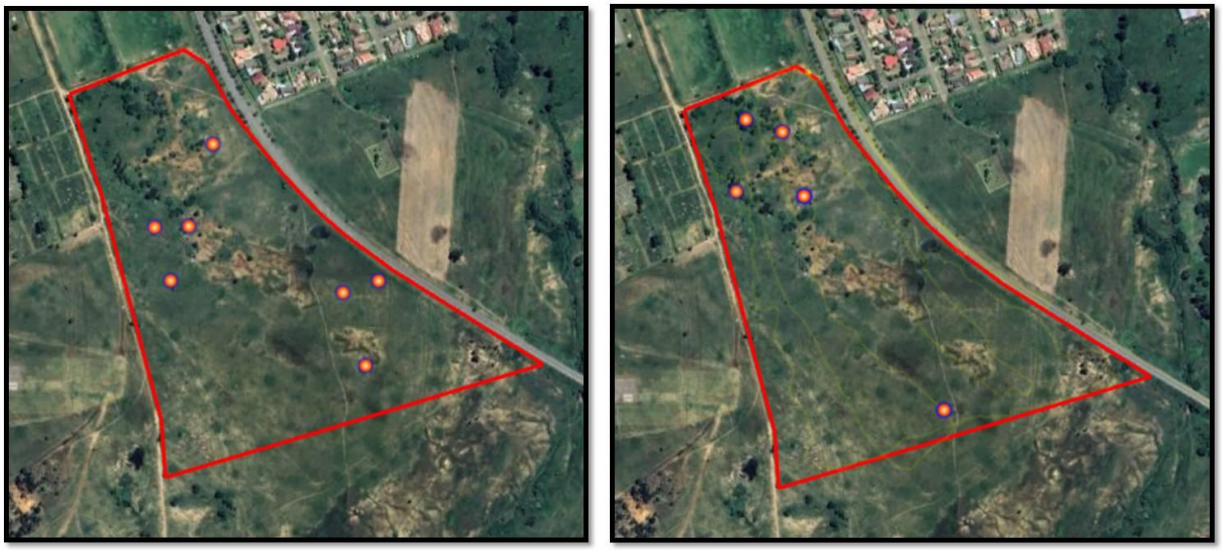


Figure 16: Distribution of Specially Protected species on the site

Plants protected by the National Forests Act
None encountered at the site.

Rare, Red Listed and Endemic Species
None encountered at the site.

Potentially sensitive habitats

Termitaria

The site has termitaria in the grassland as seen below. These mounds are often utilized by herpetofauna as refugia and are well utilized in winter. Should the development proceed, these termitaria should be checked for fauna during the site clearing and any animals found should be released into the nearest safe habitat.

Figure 17: Termitaria present on site

Rocky areas

Rock pavements with shallow soils often harbour plants which handle drought by becoming dormant in winter, but shoot in spring when the rains provide sufficient moisture trapped by the rock or from seepage over the rocks. These species were not present (eg. *Brachystelma, Selaginella, Ornithogallum, Crassula*), but this may be due to the season, and these species will need to be sought out and re-located, if present, during construction should the project receive approval.

Figure 18: Location of rock sheets on the site

Seasonally wet areas

There are a number of depressions on the site containing hygrophilous species (eg. *Imperata cylindrica*) and cattle spoor in the mud indicates these may contain water beyond the rainy season. Some of these depressions are indicated below (left). They are often encircled by rock (below, right).

Figure 19: Location of seasonally wet areas on the site

Permit requirements

It will be necessary to apply to eKZN Wildlife for a permit to translocate, damage or destroy any of the Specially Protected species occurring on the site. There are large numbers of *Aloe maculata* (~100 or more) and perhaps the same number of *Agapanthus praecox*. Seven *Boophone disticha* were encountered, but there may be more as they are currently dormant. There was a single clump of around 10 individual plants of *Crocosmia aurea*, a single clump each of *Dietes grandiflora* and *Bulbine asphodeloides* and a single plant of *Chlorophytum krookianum*. Wherever possible, and particularly in the case of *Aloe* and *Agapanthus*, these should be included in the planting palette for the landscaping of the complex, which should be indigenous and water-wise as far as practical.

Assessment of impacts

General description of impacts

One of the impacts of the proposed development will be loss of habitat due to construction activities. Furthermore, the disturbance created could lead to alien plant invasion if not managed. Construction activities could result in soil compaction and erosion if uncontrolled movement of vehicles and construction staff is allowed. Hardened surfaces could lead to wash-aways if runoff is not controlled.

- **Potential Impact 1: Habitat Destruction**

Habitat destruction during the construction phase of the project should be restricted to the development footprint. This is a high impact land-use activity which can be mitigated by planting indigenous trees, shrubs and herbs during the rehabilitation and landscaping phase.

Potential Impact 1: Habitat destruction

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local	High	Long term	High	Definite	High	-ve	High
Mitigation measure	Construction and maintenance activities should be carried out according to accepted environmental best practice with the minimum removal of indigenous vegetation. Existing access should be utilised wherever possible Indigenous planting must be undertaken during rehabilitation and landscaping, including the re-planting of suitable species removed during site clearing (eg. *Aloe*, *Agapanthus*). Create a nursery for rescued plants and to propagate local species (collected under permit) for use in rehabilitation.							
With mitigation	Local	Medium	Long term	Medium	Probable	Medium	-ve	High

- **Potential Impact 2: Disturbance**

The above mentioned construction activities as well as the operation phase of the development will impact additionally through disturbance. This disturbance may be of high impact during construction and then somewhat lower impact during operation and maintenance. Construction activities are associated with high levels of human and vehicular activity including earth moving equipment, while the operational stage will also be associated with human and vehicular activity, but less disruptive than earth-moving and construction. Disturbance during construction can be reduced to a minimum, but disturbance during the operational phase is a part of the nature of the development.

Potential Impact 2: Disturbance

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local	High	Long term	High	Definite	High	-ve	High
Mitigation measure	Construction and maintenance vehicles should be restricted to existing roads and access points where practical and access of machinery and vehicles should be carefully controlled. Little can be done about the disturbance which will occur during the operational phase of the project as this is a high impact land-use option.							
With mitigation	Local	Medium	Long term	Medium	Probable	Medium	-ve	High

- **Potential Impact 3: Soil compaction, hardening of surfaces and erosion**

The clearing of vegetation during construction and operation, the operation of earth moving equipment and stockpile areas during construction will result in increased levels of disturbance, removal of protective plant cover and compaction of soils. Habitat quality could be degraded by soil erosion and siltation of down-slope areas. Negative ecological impacts can operate long after construction is complete if soil erosion remains uncontrolled. Provided the soil erosion and compaction issues produced by the construction phase are dealt with, the operation and maintenance phase will have a lesser effect. Control of runoff from hardened surfaces will be required to prevent erosion.

Potential Impact 3: Soil compaction, hardening of surfaces and erosion

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local	Medium	Long-term	Medium	Definite	Medium	-ve	High
Mitigation measure/s	The movement of construction and maintenance vehicles and personnel should be restricted as far as possible and where practical and access of machinery and vehicles should be carefully controlled. Compaction from human and vehicular traffic will result in higher runoff and erosion leading to loss of topsoil and delayed rehabilitation. Hardening of surfaces will require suitable drainage infrastructure to prevent wash-aways.							
With mitigation	Local	Low	Short term	Very Low	Possible	Insignificant	-ve	High

- **Potential Impact 4: Alien plant invasion**

The clearing of vegetation during construction and the operation of earth moving equipment and stockpile areas during construction will result in increased levels of disturbance as indicated above. Alien invasive plants often out-compete indigenous plants and will become established in disturbed areas, thereby reducing habitat quality, altering species composition and impacting on biodiversity. The establishment of a reliable alien plant programme would mitigate this.

Potential Impact 4: Alien plant invasion

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without mitigation	Local	Medium	Long term	Medium	Definite	Medium	-ve	High
Mitigation measure/s	Disturbance will lead to alien plant invasion. Initially a high intensity control programme should be implemented in order to remove competition with indigenous vegetation and then routine follow-up control until rehabilitation is complete.							
With mitigation	Local	Low	Short term	Very low	Possible	Insignificant	-ve	High

A summary of the potential impacts of the proposed development on the vegetation is presented below.

Table 1: Summary of potential impacts on vegetation

IMPACT TYPE	IMPACT SIGNIFICANCE	
	Unmitigated	With mitigation
Habitat destruction	HIGH	MEDIUM
Disturbance	HIGH	MEDIUM
Soil compaction, hardening of surfaces and erosion	MEDIUM	INSIGNIFICANT
Alien plant invasion	MEDIUM	INSIGNIFICANT

Mitigations relating to the impact assessment

- *Habitat destruction*

Construction and maintenance activities should be carried out according to accepted environmental best practice with the minimum removal of indigenous vegetation. Existing access should be utilised wherever possible. Indigenous planting must be undertaken during rehabilitation and landscaping, including the re-planting of suitable species removed during site clearing (eg. *Aloe, Agapanthus*). Create a nursery for rescued plants and to propagate local species (collected under permit) for use in rehabilitation.

- *Disturbance*

Construction and maintenance vehicles should be restricted to existing roads and access points where practical and access of machinery and vehicles should be carefully controlled. Little can be done about the disturbance which will occur during the operational phase of the project as this is a high impact land-use option.

- *Soil compaction, hardening of surfaces and erosion*

The movement of construction and maintenance vehicles and personnel should be restricted as far as possible and where practical and access of machinery and vehicles should be carefully controlled. Compaction from human and vehicular traffic will result in higher runoff and erosion leading to loss of

topsoil and delayed rehabilitation. Hardening of surfaces will require suitable drainage infrastructure to prevent wash-aways.

- *Alien plant invasion*

Disturbance will lead to alien plant invasion. Initially a high intensity control programme should be implemented in order to remove competition with indigenous vegetation and then routine follow-up control until rehabilitation is complete.

General mitigations

- The apparent absence of species of conservation significance and the transformed nature of the study site indicate that a final walk-through should not be required, although a thorough searching of termitaria is recommended before construction takes place;
- The extent of the construction sites should be demarcated on site layout plans and no construction personnel or vehicles should leave the demarcated area except those authorised to do so. Those areas surrounding the construction site that are not part of the demarcated development area should be considered as "zero-access" areas for employees and machinery in order to reduce unnecessary habitat loss and disturbance;
- During construction, sensitive habitats must be avoided by construction vehicles and equipment wherever possible, in order to reduce potential impacts. Only necessary damage must be caused and, for example, unnecessary driving around in the veld must not take place as this can result in compaction resulting in increased runoff and slower rehabilitation of the area;
- Checks must be carried out at regular intervals to identify areas where erosion is occurring. Appropriate remedial action, including the rehabilitation of the eroded areas should be undertaken;
- No plants should be collected, nor animals intentionally killed or destroyed and poaching and hunting should not be permitted on the site and severe contractual fines must be imposed and immediate dismissal of any contract employee who is found attempting to snare or otherwise harm wild animals or collect plants or plant parts;
- The presence of construction workers and construction camps may result in an increased fire risk during construction. No open fires shall be allowed on site under any circumstance. The Contractor shall have fire-fighting equipment available on all vehicles working on site, especially during the winter months;
- Vegetation cleared should be removed from site so as to prevent a fire hazard, notwithstanding the fact that occasional use of brush-packing may be required to counter potential soil erosion in specific areas;
- An ongoing monitoring programme must be implemented to enforce the continual eradication of alien and invasive species during and post-construction as this is a permanent impact of the proposed activity and poses a potential long-term impact to the local habitat and its biota;
- Construction related (solid and hazardous) and general waste must be collected regularly from the site and disposed of at an appropriate registered landfill site;
- Construction waste must not be stored more than 30 days on site;
- Management of oil and other spillages and leakages must be minimized and hydrocarbon spills should be dealt with immediately to prevent contamination of ground water;
- The operation of vehicles, construction equipment, and use of construction materials and on-site

sanitation could result in pollution spills and the introduction of contaminants (eg. hydrocarbons and solid waste) into natural habitats. This will increase levels of disturbance and encourage the invasion of early successional 'weeds'and alien invasive species. Both of these impacts can lead to degradation of habitat quality during construction and must be controlled; and

- Dust suppression on the construction site and access roads will need to be controlled and can be achieved using water sprayers as necessary, since dust may become deposited on vegetation leading to impaired photosynthesis, potentially causing damage to individual plants.

Mitigation hierarchy

As stated by DEA *et al.* (2013), "the mitigation of negative impacts on biodiversity and ecosystem services is a legal requirement for authorisation purposes and must take on different forms depending on the significance of the impact and the area being affected. Mitigation requires proactive planning that is enabled by following the mitigation hierarchy [Figure 20, below]. Its application is intended to strive to first avoid disturbance of ecosystems and loss of biodiversity, and where this cannot be avoided altogether, to minimise, rehabilitate, and then finally offset any remaining significant residual negative impacts on biodiversity".

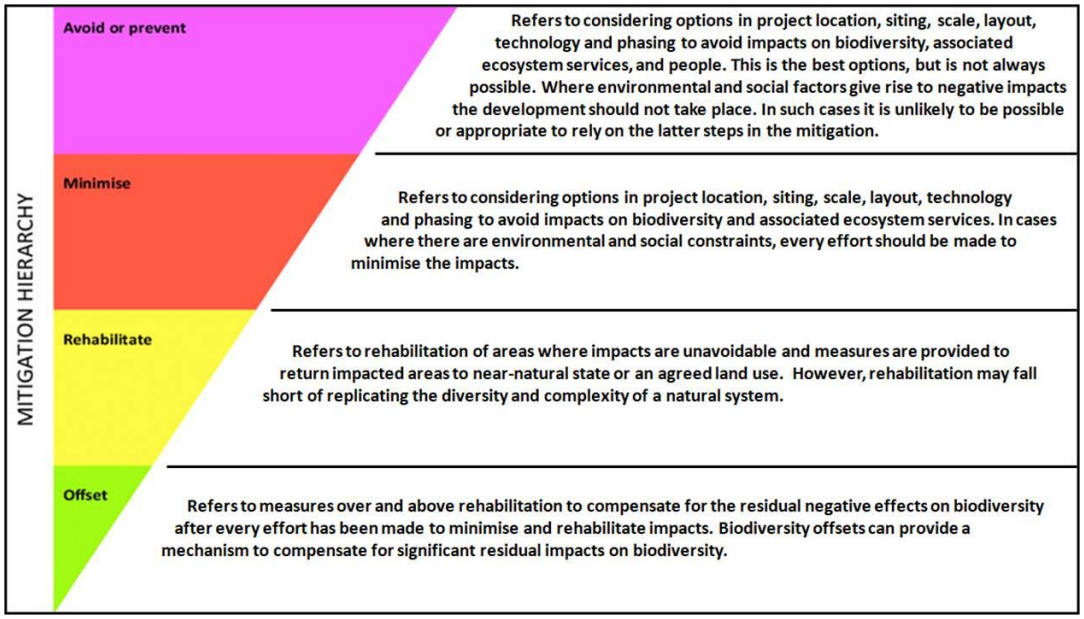


Figure 20: Mitigation hierarchy (Source: modified after DEA *et al.* 2013)

In the case of the proposed development, it will not be possible to avoid habitat loss and disturbance, which are features of such a land-use option. Therefore, such loss should be minimized and rehabilitation of remaining open space should be a priority. This should include indigenous landscaping throughout the proposed development and the re-planting of suitable plants removed during site clearing.

The option of an offset can be investigated by the developers and the competent authority.

Conclusions

The flora of the general area has suffered a number of anthropogenic impacts, more especially from clearing, dumping, burning and grazing by livestock. Whether natural or of anthropogenic origin resulting from excessive grazing and burning, the grassland has a low diversity and geophytes are generally conspicuously absent. Invasion by woody species such as *Acacia sieberiana* and the alien *Melia azedarach* is common, as is invasion by alien weeds.

Vegetation

From a floral point of view the sensitivities relating to the proposed site are minimal and include the presence of a number of *Agapanthus praecox* (Liliaceae), *Aloe maculata* (Asphodelaceae) and *Boophone disticha* (Amaryllidaceae). Limited numbers of *Aristea* and *Dietes grandiflora* (Iridaceae), and *Bulbine asphodeloides* (Liliaceae *sensu lato*) were also encountered. All LILIACEAE, IRIDACEAE, AMARYLLIDACEAE and ALOE are SPECIALLY PROTECTED species according to the ordinance, despite these species being Red Listed as of Least Concern by Raimondo *et al.* (2009). No plants protected by the National Forests Act were encountered during the study, nor were any Rare, Red Listed or Endemic species.

According to Mucina and Rutherford (2006) and Scott-Shaw and Escott (2011), the vegetation type at the proposed site is Northern KZN Moist Grassland which is considered Vulnerable. However, the site is transformed due to human activities such as grazing of cattle, excessive burning, illegal dumping and sand mining, therefore, the proposed activity is unlikely to result in the loss of conservation significant habitat or species. The major impacts will be habitat destruction, disturbance during construction and post-construction, the possibility of soil compaction, hardening of surfaces and erosion, and alien plant invasion.

Recommendation

It is my opinion that the impacts on the environment of the proposed development as currently envisaged can be mitigated to within acceptable limits if mitigation measures in this report are adopted. Therefore, I do not anticipate opposition to the proposed activity from a botanical standpoint.

References and resources

- Acocks, J.P.H. (1988). Veld Types of South Africa. *Memoirs of the Botanical Survey of South Africa*, No.57: 1-146. Botanical Research Institute, Pretoria.
- Boon, R. 2010. *Pooley's Trees of Eastern South Africa: a Complete Guide*. Flora and Fauna Publications Trust, Durban.
- Bromilow, C. (2001). *Problem Plants of South Africa*. Briza Publications, Pretoria South Africa.
- Burger, B.J. 2010. Distribution Environmental Screening Document. ESKOM internal report.
- Department of Environmental Affairs, Department Of Mineral Resources, Chamber Of Mines, South African Mining And Biodiversity Forum, And South African National Biodiversity Institute (2013) *Mining and Biodiversity Guideline: Mainstreaming biodiversity into the mining sector*. Pretoria.

- EKZNW (2010) Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
- EKZNW (2010) Terrestrial Systematic Conservation Plan: Minimum Selection Surface (MINSET). Unpublished GIS Coverage [tscp_minset_dist_2010_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
- EKZNW 2009. *Draft Biodiversity Guidelines for Ecosystems in KwaZulu-Natal*. Ezemvelo KwaZulu-Natal Wildlife, Pietermaritzburg.
- EKZNW 2009. *Draft Biodiversity Guidelines for Ecosystems in KwaZulu-Natal*. Ezemvelo KwaZulu-Natal Wildlife, Pietermaritzburg.
- Ezemvelo KZN Wildlife (2010) KZN Landscape Ecological Corridors, Version 3.1. Unpublished GIS Coverage [kzncor05v3_1_10_wll .zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
- Goodman, P.S. 2007. KwaZulu-Natal Terrestrial Conservation Plan (C-Plan), Version 4. Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife.
- Lochner, P. 2005. *Guideline for Environmental Management Plans*. CSIR Report No ENV-S-C 2005-053 H. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.
- Low, A.B. and Rebelo, A.G. (1998). *Vegetation of South Africa, Lesotho and Swaziland*. D.E.A.&T., Pretoria.
- Mucina, L. and Rutherford, M.C. 2006. The Vegetation of South Africa, Lesotho and Swaziland. *Strelitzia 19.* South African National Biodiversity Institute, Pretoria.
- Pooley, E. 1998. *A field guide to Wild Flowers, KwaZulu-Natal and the Eastern Region.* Natal Flora Publications Trust, Durban.
- Raimondo, D., Von Staden, L., Foden, W., Victor, J.E., Helme, N.A., Turner, R.C., Kamundi, D.A. and Manyama, P.A. 2009. Red List of South African plants. *Strelitzia 25*. South African National Biodiversity Institute (SANBI), Pretoria.
- Scott Shaw 2011. *Descriptions of New Vegetation Types for KwaZulu-Natal*. Ezemvelo KZN Wildlife Biodiversity Research Division Internal Report, QEP.
- Scott-Shaw, C.R and Escott, B.J. (Eds) (2011) *KwaZulu-Natal Provincial Pre-Transformation Vegetation Type Map* – 2011. Unpublished GIS Coverage [kznveg05v2_1_11_wll.zip], Biodiversity Conservation Planning Division, Ezemvelo KZN Wildlife, P. O. Box 13053, Cascades, Pietermaritzburg, 3202.
- Scott-Shaw, R.C. 1999. *Rare and threatened plants of KwaZulu-Natal and neighbouring regions.* KwaZulu-Natal Nature Conservation Service, Cascades.
- Smallie, J and Steytler, B. 2011. ESKOM distribution Nondabuya-Ndumo 132kv powerline and 132/22 kV Ndumo substation. EWT Avifaunal Specialist report.
- Soil Classification Working Group, 2006. *Soil Classification – A Taxonomic System for South Africa, Memoirs on the Agricultural Natural Resources of South Africa, No. 15.* The Department of Agricultural Development, Pretoria, South Africa.
- South African National Biodiversity Institute SANBI (2009*) Threatened Ecosystems in South Africa: Descriptions and Maps*. Department of Environment Affairs and Tourism, Pretoria, South Africa.