?. FLORISTIC ASSESSMENT

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?.1. Introduction

The increase in human demand for space and life-supporting resources results in the rapid loss of natural open space in South Africa. When natural systems are rezoned for development, indigenous flora are replaced by exotic species and converted to sterile landscapes with no dynamic propensity or intrinsic ecological value (Wood *et al.,* 1994). Additionally, development rarely focus on decisive planning to promote and conserve natural environments, while little thought are given to the consequences on the ecological processes of development in highly sensitive areas.

Transformation and fragmentation are not the only results of unplanned and intended developments, the loss of ecosystem functioning and ultimately the local extinction of species also frequently result. Therefore, careful planning will not only preserve rare and endemic flora, but also the ecological integrity of ecosystems of the landscape level which is imperative for the continuation of natural resources, such as fossil fuels, water and soils with high agricultural potential.

In 1992, the Convention of Biological Diversity, a landmark convention, was signed by more than 90% of all members of the United Nations. The enactment of the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004), together with the abovementioned treaty, focuses on the preservation of biological diversity in its totality, including genetic variability, natural populations, communities, ecosystems up to the scale of landscapes. Hence, the local and global focus changed to the sustainable utilisation of biological diversity.

The proposed development is expected to result in the loss of approximately 100ha of grassland of varying status, depending on the final site selection. This chapter will focus on highlighting areas that are regarded sensitive and therefore not suitable for the proposed development. Aspects of the proposed development that will contribute to a loss of biodiversity and habitat include:

- approximately 100 ha that will be used for the CCGT plant;
- a gas pipeline from the UCG plant to the CCGT plant;
- a water pipeline from the Rietpoort Balancing Dam;
- water treatment plant;
- sewage treatment plant; and
- borrow pits (approximately 1.5ha each).

?.2. Methodology

Six separate sites were evaluated in this report, including:

- Site 1 (Portions 1, 3 and 7 of the farm Palmietspruit 68 HS; Portion 6 of the farm Strydkraal 53 HS; Portion 1 of the farm Roodekopjes 67 HS)
- Site 2, including:
  - Site 2a (Portion 7 of the farm Bergvliet 65 HS; Portion 4 of the farm Rietpoort 83 HS; Werda 116 HS)
  - Site 2b (Portions 3 and 4 of the farm Rietpoort 83 HS and Werda 116 HS)
- Site 3, including:
  - Site 3a (Portions 1, 2, 6, 10 and 11 of the farm Witkoppies 81 HS)
  - Site 3b (Portions 1, 5 and 6 of the farm Witkoppies 81 HS)
  - Site 3c (Portions 4, 5, 8, 9, 12, 13 and 14 of the farm Witkoppies HS).

?.2.1. Floristic Habitat Attributes and Status

The physical environment was briefly inspected during a site visit in November 2007 and visual observations pertaining to the various ecological attributes of the proposed sites and surrounding habitat were made. Part of the results presented in this chapter is based on available GIS information and reflects a low level of available detail for the study area. The objectives of this study are therefore to obtain a basic overview of floristic variations and the general status of habitat types likely to be affected by the proposed development.

A desktop analysis of available biotic and biophysical attributes of the proposed corridors (and alternative alignments) was performed whereby the following databases were consulted:

- Regional vegetation (Mucina and Rutherford, 2006);
- Land cover classes (2001);
- Relief (20 m contour interval);
- Wetlands, rivers, drainage lines and other impoundments (based on ENPAT, 2001);
- Protected and conservation areas; and
- Settlement and transformed areas.

These databases were utilised to identify areas that constitute:

- natural vegetation;
- areas of environmental sensitivity;
- areas likely to sustain floristic species of importance; and
- protected areas.

The likely presence of threatened, near-threatened and conservation important taxa were based on the presence of suitable habitat and through various field guides and atlases. Distribution records, obtained from SANBI (2007) were also consulted.

The Probability of Occurrence of conservation important taxa was based on their respective geographical area of occupancy (rather than the extent of occupancy) and habitat suitability.

?.2.2. Assessment Criteria - Flora

A subjective impact rating was attributed to each of the sites for the expected significance of potential impacts, based on the status and conservation potential of the observed floristic attributes present on the site and in the immediate surrounds. These ratings were:

High	1 (severe impacts, not mitigatable[1]);
Medium-high	2 (severe impacts, intensive/ costly mitigations measures);
Medium	3 (moderate impacts, mitigatable);
Medium-low	4 (moderate impacts, highly mitigatable); and
Low	5 (low/ no impacts)

Averaging the estimated impacts for each site result in a Site Preference Ranking (SPR) that will highlight areas that are regarded more or less ideal for the proposed development. The suitability of respective sites will generally exhibit the following characteristics:

Table 1: Habitat characteristics for Site Preference Ranking

Site Preference	SPR (general flora description)	Floral score equating to SPR class
Ideal (5)	Vegetation is entirely transformed or in a degraded state, exhibiting low species diversity/ extensive weeds and aliens, low RD probability. The area has little inherent ecological functionality left and is entirely fragmented and isolated. Low/ no conservation value with low potential for successful rehabilitation.	21-25
Preferred (4)	Vegetation is largely transformed and degraded, exhibiting low floristic species diversity, weeds and invasive plants present, low RD probabilities. The ecological function is compromised and a low conservation value is attributed. The potential for successful rehabilitation is however moderate-low. High fragmentation and isolation factors are attributed.	17-20

[1] "not mitigatable' impacts generally deals with the complete transformation of habitat or destruction of red data species that cannot be reversed, even with the implementation of costly, intensive and detailed rehabilitation programmes

Acceptable (3)	Vegetation is moderately degraded, but natural vegetation does occur in some places. Medium floristic species diversity is present with moderate RD probabilities. Invasive plants are present but at low densities. The inherent ecological function is still intact but may be compromised by the current levels of degradation if not managed. Successful rehabilitation of the area is possible, but costly. Moderate fragmentation and isolation factors are attributed. The conservation value is regarded moderate.	13-16
Not Preferred (2)	The vegetation is in a good condition with little evidence of disturbances/ degradation. Species diversity is high and moderately high RD probabilities are attributed. The ecological functioning is intact and very little rehabilitation is needed. Low fragmentation and isolation factors are attributed. The area is of medium conservation importance.	9-12
Sensitive (1)	The vegetation is in pristine or near pristine state. Very little/ no signs of disturbance are present. The floristic diversity is high with several species of concern known to be present/ potentially present. Ecological functioning is intact and low fragmentation and isolation factors are attributed. The conservation importance is high.	5-8

No impacts were identified that are regarded beneficial to the floristic environment of the study area since the proposed development is largely destructive. Impacts identified are similar for all sites investigated during this investigation.

The following impacts were identified that could potentially affect the floristic environment adversely:

- Destruction of threatened species and habitat;
- Destruction of sensitive habitat types (outcrops, riparian fringes, non-perennial streams, river, etc.);
- Destruction of pristine habitat;
- Changes in the local and regional biodiversity; and
- Impacts on surrounding natural habitat and species.

a. Destruction of Threatened & Protected Species & Habitat

The loss of threatened/ protected species or habitat that is regarded suitable for these species is a significant impact on the biodiversity of a region. Threatened species, in most cases, do not contribute significantly to the biodiversity of an area in terms of sheer numbers as they generally occur in low numbers, but they are extremely important in terms of the biodiversity of an area and a high conservation value is placed on the presence of such species.

Threatened species are particularly sensitive to changes in their environment, having adapted to specific habitat requirements. Habitat changes, mostly a result of human interferences and activities, are one of the greatest reasons for these species having a threatened status. Effects of surface impacts are often permanent and recovery or mitigation is generally not perceived as possible.

b. Destruction of Sensitive Habitat

Sensitive habitat types include ridges, outcrops, riparian habitat and localised floristic variations of significant physiognomic variation and species composition. These areas represent centres of atypical habitat and comprising biological attributes that are not frequently encountered in the greater surrounds. A high conservation value is attributed to the floristic communities of these areas as they contribute significantly to the biodiversity of a region. Furthermore, these habitat types are generally isolated and are frequently linear in nature, such as rivers and ridges. Any impact that disrupts this continuous linear nature (fragmentation) will result in further isolation of existing ecological units, affecting the migration potential of some fauna species adversely, pollinator species in particular.

c. Destruction of Pristine Habitat Types

The largest extent of the study area comprises natural grassland habitat. It is however not considered pristine throughout the area and over utilisation, high grazing pressure and poor management strategies led to changes in species composition and depletion of the herbaceous layer. Aspects such as the degree of grazing, visible erosion and infestation by alien plant species are taken into account in this section.

d. Changes to Habitat & Regional Biodiversity

Transformation of grassland habitat during the construction process will inevitably result in the creation of atypical and artificial habitat types that are not considered representative of the regional vegetation. Due to the severity of transformation, surrounding areas are frequently invaded by shrubs and alien species not generally associated with the area.

Furthermore, as a result of decreased habitat, increased competition and lower numbers of endemic biota, the genetic pool of species might eventually be influenced by the introduction and proliferation of non-endemic species. Floristic communities and variations have developed separate gene structures as a result of habitat selection and geographical separation and the introduction of plants of the same species that might be genetically dissimilar to the endemic species

might lead to different genetic selection structures, eventually affecting the genetic structure of current populations.

e. Impacts on Surrounding Natural Habitat & Species

A possibility exists that surrounding areas and species present in surrounding areas could be affected by impacts resulting from construction and operational activities. These impacts could include all of the above impacts, depending on the sensitivity and status of surrounding habitat and species. Areas that are particularly prone to this impact include riparian zones where impacts that affect the water quality results in impacts further downstream.

?.3. Floristic Attributes

?.3.1. Regional Flora

The vegetation of the region is described in the VEGMAP database as Amersfoort Highveld Clay Grassland. This vegetation type extends in a north-south band from just south of Ermelo, down through Amersfoort to the Memel area in the south. It comprises undulating grassland plains, with small scattered patched of dolerite outcrops in areas. The vegetation is characterised by a short closed grassland cover; largely dominate by a dense *Themeda triandra* sward, often severely grazed.

The conservation status of this vegetation type is regarded as Vulnerable, no area is formally protected. Some 25% of the unit is transformed, predominantly by cultivation (22%). The area is not suited to afforestation. Silver and black wattle (*Acacia* species) and *Salix babylonica* invade the drainage lines. Erosion potential is generally low.

Over grazing frequently leads to invasion of *Stoebe vulgaris*. Parts of this unit were once cultivated and now lies fallow and have been left to re-vegetate with pioneer species. These transformed areas are not picked up b satellite for transformation coverage and the percentage of grasslands still in a natural state may be underestimated.

The Wakkerstroom region (Maputuland – Pondoland region) is considered an area of sensitive vegetation and is situated approximately 25km towards the east and southeast of the study area, (ENPAT, 2001). This area of sensitive vegetation is not considered to be threatened by the proposed development. The study area is situated with the African Grasslands/ Ekengela Initiative Transition Zone, rendering all areas of natural grassland sensitive (ENPAT, National Database, Biosphere).

?.3.1. Regional Floristic Diversity

PRECIS information from SANBI indicates a total of 271 plant species within the ¼ degree grid 2729BB in which the study area is situated. This list is not presented in this report, but can be provided on request.

?.3.1. Rare and Threatened Flora Species

The Interim Red Data List of South African Plant Species (Threatened Species Programme, 2004) indicates a total of 335 potential Red Data flora species for the Mpumalanga Province. PRECIS data indicate the presence of 6 Red Data flora species within the 2729BB grid in which the study area is situated, as indicated in Table 2.

Table 2: Red Data plants of the region

Taxon	Family	Description
Jamesbrittenia silenoides	Scrophulariaceae	Not threatened
Kniphofia typhoides	Asphodelaceae	Insufficiently known
Lobelia erinus	Lobeliaceae	Not threatened
Nemesia fruticans	Scrophulariaceae	Not threatened
Nerine platypetala	Amaryllidaceae	Insufficiently known
Sisymbrium turczaninowii	Brassicaceae	Not threatened

These species occur sporadically in terrestrial and moist grassland conditions. Both these habitat types are present in the study area and a moderate likelihood of occurrence is estimated for these species.

No Threatened species are known to occur in the study area or immediate surrounds, but it should be noted that other species groups that are included in the Mpumalanga Red Data list, but not necessarily included in the Red Data list for this particular area are considered likely inhabitants of the area. Seasonal and project constraints placed severe restrictions on the search for these species. These groups include, but are not necessarily limited to:

- *Aloe* genus;
- *Asclepias* genus*;*
- *Gladiolus* genus;
- Orchideacea family
- *Cyrtanthus* genus; and
- *Watsonia* genus;

?.3.1. Habitat Types in the Study area

a. Natural Grassland

These areas comprise terrestrial grassland that is representative of the regional vegetation type. Soils are generally deep and rocks are absent. Terrain types that are frequently encountered include crests (terrain type 1) and midslopes (terrain type 3). The physiognomy, being in the Grassland Biome, is dominated by the grass sward with a diverse herbaceous layer with numerous geophyte species. Woody species are generally absent, or occur at extremely low densities.

Some parts are moderately degraded as a result of high grazing pressure, but the general status of these grasslands varies between moderately pristine and pristine.

The likelihood of encountering flora species of importance in these areas is estimated at moderate. Aspects that contribute to a moderate-high conservation status of natural grasslands include, but are not necessarily limited to:

- The area is situated within the African Grasslands/ Ekengela Initiative Transition Zone;
- The Vulnerable status of the regional vegetation type;
- The moderately pristine status of natural grasslands; and
- The diverse nature of the species composition.

A high sensitivity level is afforded to this habitat type: 1

b. Transformed and Degraded Grassland

Areas that were subjected to cultivation, fallow or active, as well as areas where infrastructure exist from recent or historic developments, constitute this habitat type. All natural vegetation was removed and the current vegetation, where present, comprises a high degree of pioneer species or species that are not associated with a pristine grassland conditions.

A low sensitivity level is afforded to this habitat type (3), but areas where moderate levels of degradation are noted will be afforded a sensitivity level of 2.

c. Riparian Zones

Numerous small, non-perennial drainage lines and streams occur within the study area and in close proximity to the proposed site locations. The floristic status of these drainage lines and streams are regarded as moderately pristine. Aspects that affect the floristic status of this habitat type adversely include, but are not necessarily limited to:

- High grazing pressures;
- Infestation by alien plant species;
- Poor water quality from upstream parts; and
- Impacts within the catchment basins of the streams.

A high sensitivity level is afforded to this habitat type: 1

d. Rocky Outcrops

Localised rocky outcrops occur scattered in the terrestrial grassland as well as the riparian zones. These areas are difficult to identify without intensive surveys as they are frequently extremely small and can therefore not be indicated on maps.

The physiognomy is similar to the surrounding vegetation, but the species composition is different, contributing significantly to the diversity of the region. A high conservation value is placed on these areas as they are also suitable habitat for a number of Red Data plant species.

A high sensitivity level is afforded to this habitat type: 1

?.5. Results

Table 3: Site Preference Ranking according to floristic sensitivity

Criteria	Threatened species	Landscape sensitivity	Pristine habitat	Habitat Transformation	Surrounding habitat	SPR	Development Suitability
Site	**Criteria Ranking**						
1	3	2	3	4	5	17	**Preferred**
2a	3	3	2	2	2	12	**Not preferred**
2b	2	3	2	2	2	11	**Not preferred**
3a	4	3	4	4	5	20	**Preferred**
3b	4	4	4	5	5	22	**Ideal**
3c	3	3	2	2	3	13	**Acceptable**

Please note that the Mpumalanga Biodiversity Conservation Plan was also consulted in estimating these results.

?.6. Conclusions & Recommendations

Areas that constitute pristine natural grasslands, rocky outcrops and riparian are not regarded suitable for the proposed development. Conversely, the proposed sample plots that are characterised by, or situated in close proximity to transformed and degraded habitat will be regarded more suitable for the proposed development.

Biodiversity aspects that should be taken into account in selecting a suitable site include environmental attributes that renders an area sensitive, including:

- the potential/ confirmed presence of Red Data flora or fauna species;
- the presence of sensitive habitat types;
- untransformed regional vegetation types;
- areas that are generally regarded as sensitive (ridges, outcrops, rivers, wetlands, etc.); and

Conversely, utilising areas that are already transformed, or situated in close proximity to such areas, is regarded a good approach.

By eliminating biologically sensitive areas, likely impacts on the biological environment will be minimised to a large extent.

In selected cases it is unavoidable to impact on sensitive areas, such riparian zones. In this case the use of buffer zones, strict mitigation measures and monitoring programmes are recommended.