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BELMONT VALLEY

Botanical Survey for a proposed new Golf course in the Belmont Valley, Grahamstown, Eastern Cape.

17 September 2011

Executive summary

Hort-Couture was contracted by the Belmont Valley development company to conduct a botanical survey of the site for a proposed new golf course in the Belmont Valley. The study area lies within a fertile valley just outside the town of Grahamstown namely the 'Belmont Valley'. The valley is used primarily for agricultural purposes with crop and dairy being the predominate farming methods.

A stream that forms part of the upper catchment of the Blaaukranz River, a tributary of the Kowie River, dissects the valley. The disused Port Alfred to Grahamstown railway line also dissects the site and runs more or less parallel to the Blaaukranz River to the Northern side of the river. The purpose of this study is to assess the current Botanical significance of the existing flora and the potential impact that a golf course development may have on the site and area in general. The new golf course is intended as a new home for the existing Grahamstown Golf Club. A new residential, commercial and retail development is proposed for the existing course site.

The site comprises three portions namely:

PORTION 1 OF FARM NO 445, DIVISION OF ALBANY, PROVINCE OF THE EASTERN CAPE, IN EXTENT: 87,2991 HECTARES
Co-ordinates as follows:

East	South
26.60828	-33.32218
26.61463	-33.32235
26.61973	-33.31019
26.61693	-33.30810
26.61521	-33.31256
26.61131	-33.31043

PORTION 2 OF FARM NO 445, DIVISION OF ALBANY, PROVINCE OF THE EASTERN CAPE, IN EXTENT: 64,0972 HECTARES
Co-ordinates as follows:

East	South
26.60834	-33.32242
26.61457	-33.32248
26.61084	-33.33171
26.60299	-33.33213
26.60347	-33.32899
26.60733	-33.32906

PORTION 6 OF FARM NO 332, DIVISION OF ALBANY, PROVINCE OF THE EASTERN CAPE, IN EXTENT: 70, 6639 HECTARES
Co-ordinates as follows:

East	South
26.60834	-33.32242
26.60347	-33.32899
26.60733	-33.32906
26.60828	-33.32218
26.61131	-33.31043
26.60690	-33.30874
26.60615	-33.32284
26.60659	-33.32302

The field study areas included most of the Riparian zone, certain areas of the upland zone and some of the previously cultivated and now fallow lands. The focus areas were specifically selected as they fell within the general proposed footprint of the new golf course layout. A broader zone around the footprint was also chosen to be briefly included, as these areas would be affected to a greater of lesser degree during initial construction, as well as long-term operational phases of the site.

The field study helped identify vegetation types and heralded specific observations relevant to this study. Of the vegetation types identified, the Albany Thicket and grassy fynbos were the most dominant, along with the pioneer species found in the previously cultivated but now fallow lands. The Albany Thicket, comprising Great Fish Thicket, Great Fish Noorsveld, Kowie Thicket, Eastern Cape Thornveld and Albany Broken Veld, is considered as the most important vegetation unit in Makana district (Palmer 2004).

The thicket biome has historically not been recognised as a distinct biome, but was previously believed to be a transitional interface between a number of different vegetation types, namely subtropical forest, Afromontane forest, fynbos, Karoo and grassland (Cowling 1984; Lubke et al. 1986; Everard 1987; Low and Rebelo 1998). Following White & Moll (1978) and Cowling (1984), evidence for its classification as a distinct structural and floristic unit was presented, and this provided justification for the formation of the thicket biome (Low & Rebelo 1996). Scholes (1997) continued with the earlier approach and referred to it as part of the broad leaved savanna. Recent analyses and the STEP project have confirmed that the climatic uniqueness (Robertson & Palmer 2002) and floristic diversity justify its recognition as a biome.

Within the STEP planning domain, the conservation status of thicket is broken into the following; Type 1 protected areas include provincial protected areas run by the state, Province or Local authority, Type 2 protected areas include conservancies of either public or private in nature, and Type 3 protected areas made up primarily of private game farms (Lombard *et al.* 2003). This vegetation type can be considered as sensitive as its relative pristine state shows evidence of diverse habitat sustainability for both fauna and flora. Scattered exotics were also identified in these areas, particularly habiting the riparian zone close to the river course. These included *Acaia mearnsii, Solanum mauritanicum* and *Lantana camara* with some invasives identified listed on the NEMBA act of 2004 as category 1a and 1b.

Palmer (1982, Palmer *et al.* 1988) identified gradients in species composition and structure which was further expanded upon by Evans et al (1997) providing spatial landscape scale descriptions of the vegetation units, thus creating the need to

specifically identify thicket types. The diversity of taxa is generally higher in the Kowie thicket than the succulent forms of the Great Fish thicket and the Great Fish Norsveld. Field studies have identified 43 taxa per 100m2 releve sample (data from Everard, 1987). The study areas displays this predominant characteristic of the Kowie Thicket, especially evident in the moister south facing slopes which is dominated by low growing evergreen trees and the lack of succulent type taxa. This includes genera such as *Cussonia, Pappea, Ptaeroxylon, Euclea, Hippobromu*s and *Schotia*. The vegetation is thick and generally impenetrable with a well-developed vertical structure.

The Grassland Fynbos vegetation can be found mainly on the infertile soils of the north facing slopes, and comprises typical C4 grasses such as *Heteropogon contortus*, *Themeda triandra* and *Tristachya leucothrix* and C3 grasses such as *Panicum aequinerve* with scattered fynbos including Erica species. Proteoid components have been identified in the region and often dominate the overstorey in Fynbos.

Previously cultivated lands constitute a large component of the site and study area. Fallow lands develop secondary grassland-type vegetation cover that within a season or two becomes spectrally indistinguishable from adjacent natural grasslands. Exotic species contribute a large proportion of the aerial cover of the vegetation in these grasslands. Tilman (1999) states that invasive ability is equally dependent on species composition, disturbance and other factors as on species' richness. Species found in these areas include *Pennisetum clandestinum, senicio inadequens,* Themeda triandra and *Watsonia spp.*

Although the proposed course layout appears sympathetic to the existing vegetation by primarily being positioned on previously cultivated lands, some holes, inter hole pathways, some tee boxes, rough areas and out of bounds areas were sited in riparian and upland zones. The re-siting of certain aspects of the proposed golf course was recommended so as to retain sensitive ecozones in as a pristine state as possible.

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1. INTRODUCTION

The purpose of this report is to provide an objective overview of the ecological state of the study area with particular reference to vegetation conditions and its long term sustainable relationship within the context of a proposed new golf course on the site. Although this specialist study pertains primarily to the study area , the broader environment including systems and processes were considered to understand the relationships on the holistic level.

Vegetation types and plant communities were identified with further reference to species of special concern. These species relate to those with rare, threatened and endangered conservation status. Additionally, Ecological habitats, systems and processes were noted. Arguments in mitigation were presented with recommendations on future developments maintaining ecological intactness.

1.1 Indemnity and conditions relating to this project

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge, as well as available information provided by the client and obtainable through available public information. This report is based on a site survey with site assessment techniques relevant to the site areas affected by the proposed new golf course, and have limitations primarily in the way of time and budgetary constraints.
The author reserves the right to alter or modify certain aspects of this report if and when any new information pertaining directly to the area of study may become available. Although the author has exercised due diligence and care in completing this report, no liability is accepted by him. The client further indemnifies the author against all actions, demands, costs and claims arising directly or indirectly from or in connection with services rendered by the author and by the use of this report.

1.2 Copyright

1.3 Methodology and Approach

The approach was implemented along the following basic tasks:
· A Desktop assessment – obtaining relevant information
· Conduct a field survey identify and classify general botanical species and the likely presence of important ecological attributes (e.g. biodiversity patterns and processes);
· Analyses of results and data interpretation involving the following:

1. Classification of veld types and biomes
2. Classification of Soils
3. Classification and identification of noted species

· Overlay proposed development footprints on important ecological attributes and assess likely impact significance;
· Generation of mitigation measures with the guiding principal of deferring impacts to ecosystem units with low integrity and services;

Report the outcome.

1) Desktop Assessment:

All relevant information pertaining to the study area was obtained through both hard copy and electronic means for the purpose of understanding the stratification of the site. These included previous studies, maps, plans and available photographic records. Proposed development layouts were also analysed in order to identify the areas of the site which indicated being directly affected by the proposed golf course layout as well as those areas potentially or

likely to be affected. By identifying the area's most likely to be affected by the proposed course layout, it was determined that such areas be made the primary focus of this study. Aerial photography provided the opportunity to broadly identify the various vegetation patterns and patches, including previously farmed land and the study areas general topography.

2) Field Survey

The purpose of this study is not to conduct a detailed ecological classification of the site, but rather to conclude the characterictics of the study area through random sampling. The outcomes of the desktop assessment provided the basis and outline of the primary focus areas being those that lie within the footprint of the new proposed golf course, club house and driving range. The study areas also included peripheral areas, all with particular attention to the following:

- Ecological zones
- Vegetation types with attention to habitat
- Wetland and riverine areas
- Occurrence of plant species of special concern
- Occurrence of Alien and invasive species
- Areas of high biodiversity
- Geological and topographical features

A field survey of the site was conducted where a stratified random sampling method was used to ascertain representative characteristics. Sample blocks were chosen at random so as to identify dominant species as well as alien taxa, with the purpose of vegetation mapping. Although sampling occurred on a random basis, it was not always possible to access all areas within the study area due to vegetation density and certain topographical features. Although certain outcomes of such surveys can result in bias, it offers a more economical means of assessing the true ecological nature of the site. Additional to the sampling method used, general observations made on site provide more information useful in classification.

3) Analysis and data interpretation

The information obtained from the field survey was interpreted, analyzed and collated. This provided the basis for the following:

- Classification of veld types and biomes
- Classification of Soils
- Classification and identification of noted species

4) Overlaying of data

Results from both the desk top evaluation and the field survey were overlayed in order to achieve a sensitivity and impact assessment. This is done so as to cross check certain assumptions that may arise during desk top evaluation. These assumptions are often based on outdated information, reports encompassing distant geographical areas and may not be site specific. The comparison of the proposed golf course layout over the vegetation map further leads to sensitivity and expected impact on the existing vegetation of the area.

5) Generation of mitigation measures

The retention of endemic ecozones is critical to the sustainability of not just the study area, but to the broader region in general. Any development, even in areas of non threatened vegetation types, can have devastating disturbances and consequences to all levels of any ecosystem, localized and wider afield. The outcome here is to understand the sensitivity of not just the broader ecology, but to also view the variety of ecosystems as site specific and in so doing mitigate measures to retain any endemic integrity where possible.

6) Reporting

The report offers the final overview of researched, assumed, sampled and observed information gathered. It provides for an objective platform for making informed decisions.

1.4 Limitations of the study

The following list refers specifically to limitations affecting this study and consequential report:

1. Although the field study was done in mid September 2011, the spring/summer rains had not yet fallen which will have an effect on the visual presence of certain species, especially bulbs, annuals and certain perennials. Although many species do flower sporadically throughout the year, species identification was in some cases not possible. Relevé sampling during non-flowering season is time-consuming and therefore a random sampling was favoured which limits the quantitative value of the final assessment.
2. The time frame in which all the field survey was conducted was very limited where visual and photographic methods of general identification of the floral composition of the study area were employed.
3. Such localized vegetation sampling can often constitute bias conclusions due to ignorance of the system functioning on a larger more holistic scale.
4. Certain areas of the study area were inaccessible, especially those areas in the in the Riparian Vegetation zones. This inaccessibility due to dense impenetrable vegetation may have resulted in skewed results being obtained.

1.5 Definitions and terminology used in this report:

- **Annual:** Completing the cycle from seed to death in one year or season.
- **Arboreal:** Living in trees
- **Biennial:** Completing the cycle from seed to death in two years or seasons.
- **Biome:** The major communities of the world classified according to their predominant vegetation and characterised by adaptations organisms to that particular environment.
- **Boundary:** Landscape patches have a boundary between them, which can be defined or fuzzy (Sanderson and Harris 2000). The zone composed of the edges of adjacent ecosystems is the boundary.
- **Composition:** refers to the number of patch types (see below) represented on a landscape, and their relative abundance.
- **Connectivity:** the measure of how connected or spatially continuous a corridor, network, or matrix is. For example, a forested landscape (the matrix) with fewer gaps in forest cover (open patches) will have higher connectivity.
- **Corridors:** have important functions as strips of a particular type of landscape differing from adjacent land on both sides.
- **Disturbance:** an event that significantly alters the pattern of variation in the structure or function of a system, while fragmentation is the breaking up of a habitat, ecosystem, or land-use type into smaller parcels. Disturbance is generally considered a natural process.
- **ECO/ESO**: Environmental Site/Control Officer – person responsible for the Day-to-Day Environmental Management on-site during construction.
- **Ecosystem:** All of the organisms of a particular habitat, such as a lake or forest, together with the physical environment in which they live
- **Edge:** the portion of an ecosystem near its perimeter, where influences of the adjacent patches can cause an environmental difference between the interior of the patch and its edge. This edge effect includes a distinctive species composition or abundance in the outer part of the landscape patch. For example, when a landscape is a mosaic of perceptibly different types, such as a forest adjacent to a grassland, the edge is the location where the two types adjoin. In a continuous landscape, such as a forest giving way to open woodland, the exact edge location is fuzzy and is sometimes determined by a local gradient exceeding a threshold, such as the point where the tree cover falls below thirty-five percent.

- **Emergent trees:** Trees that grow above the top of the canopy
- **Endemic:** Referring to a species that is native to a particular place and found nowhere else.
- **Exotic:** Non-Native; introduced from elsewhere, may also be a *weed* or *invasive* species.
- **Fragmentation:** causes land transformation, an important current process in landscapes as more and more development occurs.
- **Function:** refers to how each element in the landscape interacts based on its life cycle events.
- **Gallery forest:** A forest along a river or stream.
- **Ground cover:** low-growing plants planted in deep shade or on a steep slope.
- **Heterogeneity:** A landscape with structure and pattern implies that it has spatial heterogeneity or the uneven, non-random distribution of objects across the landscape.
- **Indigenous:** Native; naturally occurring.
- **Invasive:** a non-indigenous plant or animal species that adversely affect the habitats it invades economically, environmentally or ecologically.
- **Matrix:** the "background ecological system" of a landscape with a high degree of connectivity.
- **Network:** an interconnected system of corridors while mosaic describes the pattern of patches, corridors and matrix that form a landscape in its entirety.
- **Patch:** a term fundamental to landscape ecology, is defined as a relatively homogeneous area that differs from its surroundings. Patches are the basic unit of the landscape that change and fluctuate, a process called patch dynamics. Patches have a definite shape and spatial configuration, and can be described compositionally by internal variables such as number of trees, number of tree species, height of trees, or other similar measurements.
- **Pattern:** is the term for the contents and internal order of a heterogeneous area of land.
- **Refuge:** a location of an isolated or relict population of a once widespread animal or plant species
- **Riparian:** pertaining to, situated on or associated with a river bank
- **Phytochoria:** Adjacent areas that do not usually have a sharp boundary, but rather a soft one
- **Shrub:** A woody plant that produces no trunk but branches from the base.
- **Speciation:** is the evolutionary process by which new biological species arise
- **SSC:** Species of special concern are those that are considered as rare, endangered or threatened.
- **Understory:** the area of a forest which grows in the shade of the canopy. Plants in the understory consist of a mixture of seedlings and saplings of canopy trees together with understory shrubs and herbs. Young canopy trees often persist as suppressed juveniles for decades while they wait for an opening in the forest over story, which will enable their growth into the canopy. On the other hand, understory shrubs are able to complete their life cycle in the shade of the forest canopy.
- **Structure:** is determined by the composition, the configuration, and the proportion of different patches across the landscape.
- **Tributary/Drainage line:** A small stream or river flowing into a larger one.
- **Vegetation Dense/Forest *(Fr)***: Dense Forest Savannah
- **Weed:** a native or non-native plant that grows and reproduces aggressively. Weeds may be unwanted because they are unsightly, or they limit the growth of other plants by blocking light or using up nutrients from the soil. They also can harbour and spread plant pathogens.

2. DESCRIPTION OF STUDY AREA

2.1 Soils and Geology

The underlying geology of the greater area is the Enon Fm conglomerates of the Uitenhage and Suurberg groups with the dominant rock or material type being silctere. (Colin A. Lewis 1996)

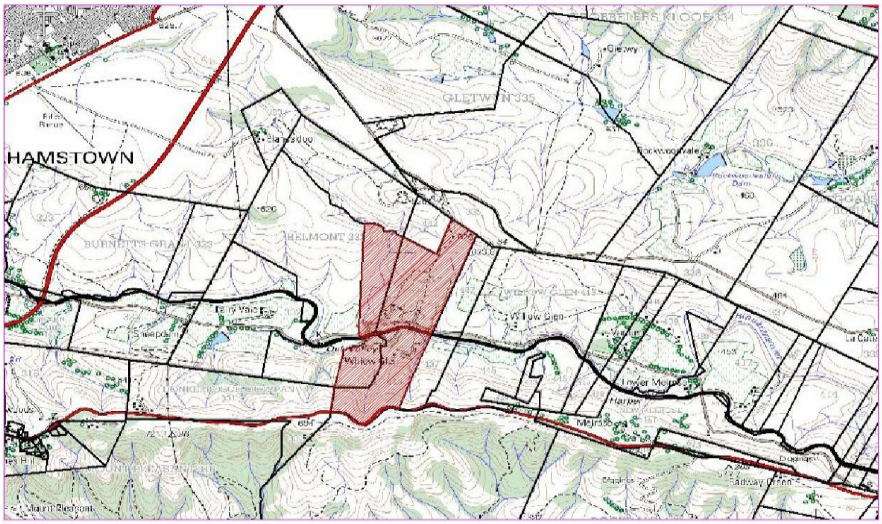
The sites main topographical feature is the Blaaukranz River flanked on either sides by elevated areas. The river forms the lowest point of the site with floodplain zones along the river banks. Typical of such features are alluvial and clayey soils. The dominant soil type though is clay, which is relatively infertile, shifting into acid soils in the surrounding hills - home of the Grassy Fynbos.

Soil type can be classified as Tukulu which have a dark greyish orthis horizon and brown to dark brown neocutanic surface horizon. The surface horizon has an apodal structure while the subsurface layer has moderately developed sub angular blocky structure. The clay percentage on the forme layer is between 15-20% while it is between 22-30% on the latter. The underlying layer is an unspecified material with signs of wetness. The clay content of this material is more than 35% which indicates limited porosity (AGIS – Agricultural geo-referenced information system).

Plate 1. Cross section of the soil horizon from an eroded riverbank

2.2 Climate

The Grahamstown normally receives about 466mm of rain per year, and because it receives most of its rainfall during winter, it has a Mediterranean climate. It receives the lowest rainfall (16mm) in July with its highest (57mm) in March. The monthly distribution of average daily maximum temperatures shows that the average midday temperatures for Grahamstown range from 18.9°C in July to 26.8°C in February. The region is the coldest during July when the mercury drops to 5.6°C on average during the night.



The study area in relation to Grahamstown and the Belmont valley.

2.3 Water quality

The water quality in the Blaaukranz River is of general concern. (RU *et al.* **Makana Municipality Local Environmental Action Plan Monitoring Framework 2004**). Pollution from both urban environments as well as the sewerage treatment works just upriver from the study area are the main contributors to this. For example, sludge disposal from the Belmont Valley sewerage treatment works takes place on an embankment 50m from the Blaaukranz River. Although sludge samples collected from the sewerage treatment works met the requirements set out in the guideline document Permissible Utilisation and Disposal of Sewage Sludge - PUDSS (Department of Agriculture *et al*. 1997), the excess of nutrients resulting from sludge disposed by the sewerage treatment works still needs to be studied further and prevented from reaching surface waters if water quality objectives are to be met.

These results indicated that sludge disposal by the Belmont River sewerage treatment works did not pose a significant threat to the Blaaukranz River in terms of nutrient loads. This sludge is often fully or partially stabilised and should not cause significant odour nuisances and fly breeding. It contains pathogenic organisms and must meet standards for metal and inorganic contents set out in the PUDSS guideline document. (Keirungi May 2006) The samples further exhibited heavy metal concentrations within acceptable limits (Department of Agriculture *et al*., 1997). Heavy metals tend to accumulate in the soil particularly when large volumes of sludge are disposed of over an extended period of time.

The general visual observation is that the river appears to be low or possibly lacking in fish and herpitile life. Algal blooms are evidenced within the river course and long-lasting foamy residues are present in areas of turbulent water. This is indicative of increased nutrient load and heightened algal blooms which produce organic compounds with surfactant properties. Surfactant properties can also be caused by urban surface runoff and industrial activities upstream.

It was however noted that in the small feeder streams leading into the Blaaukranz River, aquatic water quality improved dramatically. These feeder streams are free of the typical algal blooms and harbor more aquatic life where amphibians and crustaceans were observed.

2.4 Fauna

Both direct and indirect interaction with invertebrates and vertebrates was noted. Bird life is in abundance with the presence of the Knysna Loerie - *Tauraco corythaix* observed. Other birds occurring in this area include Speckled Mousebird - *Colius striatus*, Southern double collared Sunbird - *Cinnyris chalybeusand* and Olive Woodpecker - *Mesopicos griseocephalus*. (Adrian Craig Southern African birding website 2001). Larger vertebrates such as Porcupines - *Hystrix Africaeaustralis*, Blue Duiker - *Philantomba monticola*, Bushbuck - *Tragelaphus sylvaticus* and Bushpigs - *Potamochoerus larvatus* are also to be found. Evidence of such animals can be seen along the water's edge with spoor, animal trails down to the water's edge and observations of porcupine quills and porcupine hair found.

As mentioned in the section on water quality, the smaller feeder streams harbor aquatic life where amphibians and crustaceans were observed. No visible life was however observed in the Blaaukranz River.

Plate 2. Porcupine quills and animal trails through the Thicket vegetation

2.5 Vegetation and Flora

Vegetation Types:

a*)* **Kowie River Thicket** - Riparian and Upland zones

This vegetation type comprises approximately 50% of the entire property. A cause of concern for this floral zone is that in general, more than half of this ecoregion has been damaged or destroyed as a result of agriculture and development in the past. This ecozone contains high plant diversity and richness due to the presence of different phytochoria and species at the ends of their distribution ranges. Within the Eastern Cape, the Albany Thicket is the only area to have a high level of plant endemism as a result of speciation. It accommodates important centers of endemism for Karooid succulent flora and succulent *Euphorbia* species due to its richness in species diversity. (Lubke *et al.* 1986).

The thicket vegetation of the intermontane valleys to the north and west of the ecoregion is generally descried as a dense shrubland dominated by *Portulacaria afra*. Other species include *Crassula ovata, Lycium austrinum, Pappea capensis, Euclea undulata, Rhizogum obovatum, Grewia robusta, Aloe spp., Rhus spp.,* and *Schotia afra*. Many species of *Crassula spp*. as well as succulent herbs and grasses also occur. Towards the western limits of the ecoregion Spekboom becomes overwhelmingly dominant and can form pure stands. This intermontane valley thicket vegetation is called Spekboomveld by Acocks (1953) and Lubke *et al.* (1986), and Spekboom succulent thicket by Low and Rebelo (1996). Endemic succulents include *Delosperma echinata, Delosperma ecklonis, Lampranthus productus, Euphorbia fimriata, Euphorbia*

gorgonis, Gasteria armstrongii, Aloe africana, Senecio pyramidatus and *Haworthia fasciata* (Cowling 1983).
The Albany Thicket area is also a center of endemism for certain geophytes including *Albuca, Cyrtanthus* and *Ornithogallum* (Cowling 1983). Important Taxa of this floral zone can include: *Cussonia gamtooensis, Cassine reticulate, Rapanea gilliana and Smellophyllum capense, Euphorbia grandidens, E. triangularis, Aloe arborescens, Portulacaria afra , Crassula muscoides, C. perforata, Gasteria bicolor, Kalanchoe rotundifolia, Sarcostemma viminale, Senecio radicans, Euclea undulata, Pappea capensis, Schotia afra, Acacia natalitia, Sansevieria aethiopica, Aloe africana, A. speciosa, Cotyledon orbiculata, Commiphora harveyi, Stellarioides media, Panicum deustum, Ehrharta erecta, Cussonia spicata, Ptaeroxylon obliquum, Sideroxylon inerme, Brachylaenba ilicifolia, Encephalartos altensteinii, E. trispinosus, Gymnosporia polyacantha, Plumbago auriculata, Carissa haematocarpa, Azima tetracantha, Hippobromus pauciflorus, Putterlickia pyracantha, Pelargonium peltatum, Capparis sepiaria var. citrina, Secamone filiformis, Aloe ciliaris, Dalechampia capensis, Asparagus racemosus, Viscum rotundifolium, Dracaena alectroformis, Strelitzia reginae* and *Plectranthus madagascariensis.*
Several additional species other than the above were identified in the field study such as *Ehretia rigida, Helichrysum splendidum, Eucomis sp, Kiggelaria africana, Burchellia bubaline, Podocarpus falcatus, Aloe ferox, Buddleja saligna, Dietes grandiflora, Hypoestes aristata, polygala myrtifolia and Halleria lucida*.
Land-use pressures by means of agriculture and development have in turn negatively affected this thicket vegetation type, The Thicket vegetation is under severe threat and is suffering major habitat fragmentation. This threat to the conservation of taxa in the Albany Thicket is of concern. Future Development and land use infringement must be carefully considered from a botanical perspective so as to limit further fragmentation. It is imperative to retain unbroken corridors of this biome for the successful succession of its biodiversity.
Scattered and localized alien and invasive species were also observed in the study area. As the site lies downstream from Grahamstown, the Blaaukranz river's catchment area, it is understandable to find such species that have established themselves within the floodplain and riparian zone. Such species have travelled downstream in and out of times of flood by natural biomechanical means, and where deposited have germinated to continue species succession. The Kowie thicket is by nature slow growing and moderately competitive and thus can be overrun by certain invasives. Studies on the production of thicket have shown that the life-strategy of most species appears to be one of slow growth (Aucamp *et al*. 1982), possibly due to the high investment of resources into surviving the climate. The incidence of invasives and exotics is particularly evident in the floodplain areas where the natural endemic flora has been removed and assumed by floods, but remains relatively intact as one moves away from the river into the upland zones. Exotics and invasives tend to take advantage of the soil conditions being sandy alluvial deposits lacking in organic material, and generally unsuitable for the long term sustainability of typical Kowie river thicket taxa. Species such as *Acacia mearnsii, Solanum mauritanicum, Quercus robur, Lantana camara, Populous canescens, Acacia saligna* and *Cestrum laevigatum* can be found in the study area, but predominantly closer to the river and often seen as emergent trees through the gallery forest.
Symbiosis between diverse species in the study area is the interaction between *Quercus robur* and *Podocarpus falcatus*, with *Quercus robur* being exotic and *Podocarpus falcatus* being indigenous. These two species can be found predominantly in the floodplain and denuded riverbanks, with at least one sapling or young *Podocarpus* observed growing under each larger established *Quercus*.
In summary, this vegetation is generally classified as least threatened but sensitive in the context of the location of the study area. The retention of this vegetation is important as it is end of a thicket corridor and vital for species succession, as well as habitat formation for endemic species, both faunal and floral.
b) **Grassy Fynbos** – Fallow lands and slopes of surrounding hills

As the primary function of the property was agriculture in the past, approximately 25 to 30% of the land has laid fallow for several years. This has also led to resultant fragmentation. In turn the land has provided the opportunity for pioneer and opportunistic species to start and establish botanical succession which include alien species. Due to the very unique nature of Fynbos vegetation many Fynbos species are extremely localized in their distribution, with sets of such localized species organized into centres of endemism. This general ecozone can be found in the Eastern Cape from the Kouga Mountains to Port Elizabeth, and on the Grootrivierberge from Steytlerville to Grahamstown, to the Bushmans River Mouth, and mainly on mountain slopes and tops. These grasses tend to be of the widely distributed C, grasses and is dominated by typical Eastern Cape grassland species such as *Themeda triandra*, *Heteropogon contortus* and *Tristachya leucothrix.*

Fallow lands have developed into secondary grassland-type vegetation cover that within a season or two become spectrally indistinguishable from adjacent natural grasslands and contains species such as *Alloteropsis semialata*, *Themeda triandra* and *Helichrysum cymosum*. Exotic species in some areas contribute a large proportion of the aerial cover of the vegetation of these grasslands of which the most predominant species is *Pennisetum clandestinum*.

This grassy vegetation type is considered as least threatened and the impact of the proposed development is largely minimal.

3. FIELD ASSESSMENT

3.1 Plant Species

Typical species of the both vegetation types were identified on site.
Of the species found in the Kowie River Thicket, these included *Podocarpus falcatus, Carissa bispinosa, Ehretia rigida, Helichrysum splendidum, Ehretia rigida, Ekebergia capensis, Cussonia spicata, Kiggilaria africana, Hypoestes aristata, Eucomis spp* and *Dietes grandiflora.*

Some of the species identified in the Grassy Fynbos ecozone include: *Sideroxylon inerme, Rhus undulata, Halleria lucida, Buddleja saligna, Polygala myrtifolia, Podocarpus falcatus, Eucomis sp.* and *Ehretia rigida* as can be seen in plate 1.

3.2 Alien Species

Several alien species were identified in the study area. Despite some of these species being category 1 species, the study area is dominated by endemic vegetation which is indicative of the sites importance as a corridor of succession. It can also function as a corridor for alien and invasive succession so future environmental management plans are required for long term endemic sustainability and eradication programs. The Blaaukranz river serves as a transport method for alien species with eroded river banks serving as prime germination zones for transported seed.
Alien species identified in both the Kowie thicket and Grassy fynbos ecozones include *Quercus robur, Acacia mearnsii, Solanum, Solanum tampicense and Solanum mauritianum.*
The NEMBA act of 2004 lists the following categories of invasive plant species:
Category 1a: Invasive species requiring compulsory control. Remove and destroy. Any specimens of Category 1a listed species need, by law, to be eradicated from the environment. No permits will be issued.
Category 1b: Invasive species requiring compulsory control as part of an invasive species control programme. Remove and destroy. These plants are deemed to have such a high invasive potential that infestations can qualify to be placed under a government sponsored invasive species management programme. No permits will be issued.
Category 2: Invasive species regulated by area. A demarcation permit is required to import, possess, grow, breed, move, sell, buy or accept as a gift any plants listed as Category 2 plants. No permits will be issued for Cat 2 plants to exist in riparian zones.
Category 3: Invasive species regulated by activity. An individual plant permit is required to undertake any of the following restricted activities (import, possess, grow, breed, move, sell, buy or accept as a gift) involving a Category 3 species. No permits will be issued for Cat 3 plants to exist in riparian zones.

3.3 Species of concern

Victor and Dold (2003) report that six plant species had become extinct during the last 100 years in the Eastern Cape. These are *Alepidea multisecta, Aspalathus cliffortiifolia, Brachystelma tabularium, Brachystelma schoenlandianum, Ceropegia bokeri* and *Holothrix longicornu*. Apart from the 6 extinct species, 6 are critically endangered, 5 are endangered, 26 are near threatened, 28 are rare, 17 vulnerable, 6 data deficient and 49 of least concern in the Makana district. (IUCN version 3.1, 2001)
Apart from the above botanical species, the Eastern Cape State of the Environment Report (CSIR, 2004) gives estimates of threatened species of fish (4 endemic freshwater species), herpetiles (amphibians (6) and reptiles (19)), mammals (15) and birds (62).
The riparian areas are ultimately the most bio-diverse of all the ecological zones of the study area. Here, the most important Species of concern is *Sideroxylon inerme.*
Although this species is classified as one of least concern it as well as *Podocarpus falcatus* appear on the National Forestry Act of 1998 as protected. It is therefore essential that none of these species be disturbed by any future development of the site.

Plate 3. Plant species identified in the Kowie Thicket include the above (top row from left) *Sideroxylon inerme, Rhus undulata,* (middle row from left) *Halleria lucida, Buddleja saligna, Polygala myrtifolia* (bottom row from left) *Podocarpus falcatus, Eucomis sp., Ehretia rigida*

Belmont Valley Golf Course

Vegetation types of the study area

Legend

- Study Area
- Kowie thicket
- Grassy fynbos
- Fallow lands

N

Meters

0 100 200 400 600 800

Plate 2. Plant species identified in the Grassy fynbos include the above (top row from left) *Acacia karroo, Chrysanthemoides monilifera,* (middle row from left) *Diospyros wheyteana, Helichrysum splendidum, geranium sanguineum* (bottom row from left) *Watsonia sp. Olea europea subsp. Africana, Dovyalis caffra*

Plate 1. Aliens species identified on site included: (top row from left) *Salix babylonica, Acacia mearnsii* (middle row from left) *Vinca major, Quercus robur* (bottom row from left) *Solanum mauritianum, Passiflora incarnate*

4. SENSITIVITY

Vegetation types in South Africa are categorized according to their conservation status. This is determined by means of its intactness and remaining habitat when measured against a baseline of that specific ecosystem. This information is achieved from two sources namely the Draft National List of threatened Ecosystems (GN1477 of 2009), published under the National Environmental Management Biodiversity Act (Act no.10 of 2004) and information provided by the best available scientific literature. Thresholds listed in the NEMBA literature are often high and therefore can differ from scientific information which can often result in skewed and bias conclusions.
In the case of this study, both the vegetation types identified in the study area are not listed the Draft National List of threatened Ecosystems or any scientific literature (Driver et al. 2005; Mucina et al. 2006).

Table 1: Conservation status according to Driver et al. 2005; Mucina et al. 2006 and NEMBA

VEGETATION TYPE	**CONSERVATION STATUS**	
	Scientific data	**NEMBA**
Kowie Thicket	Least threatened	Not Listed
Grassy Fynbos	Least threatened	Not Listed

Despite Vegetation types being classified as those of least threatened, and few species present that are listed as protected under the National Forestry Act of 1998, or of Special concern, certain areas of the site can be considered as sensitive. Riparian zones are also known as process areas. This area is species rich, offers increased habitat creation, is an area towards the end of its distribution zone and includes a watercourse and wetland zones. The likelihood of additional species of concern that were not recorded in the field study is high, especially due to this zones richness in bio-diversity.
The upland areas, although lower in species richness but still part of the Kowie Thicket vegetation, forms an integral aspect of the riparian ecosystem and is the interface between the adjacent vegetation types. In lieu of this, The Kowie thicket is classified as a highly sensitive area where any development is concerned.
Previously cultivated lands can be considered as those with low sensitivity. Though these areas appear spectrally indistinguishable from adjacent natural grasslands with similar speciation, the natural return to pristine veld condition is a long-term process. The ubiquitous incidence of this type of vegetation is further considered as an area of least concern. The presence of Species of Concern was not recorded in the field study and the likelihood of such species being present is low due to the past agricultural usage.

Belmont Valley Golf Course

Sensitivity areas of the site

Legend

- Study Area
- Ecologically sensitive
- Suitable for development

N

Meters

0 100 200 400 600 800

5. THE ECOLOGICAL ENVIROMENT: IMPACTS AND MITIGATION

With any form of ecological interruption, impacts are expected. Such impacts may be directly on individual organisms or through impacts on habitat structure and functioning. The following issues with regards to development impact are raised.

1. IMPACTS ON ECOSYSTEMS AND PROCESS FUNCTIONS:
This relates to the possible disruption of ecological processes such as river flow rates, water quality, erosion due to increased runoff speed, soil nutrient levels, increase in alien vegetation, endemic succession and habitat fragmentation. These impacts can lead to the impedance of ecosystem functionality and ultimately degradation of ecosystems.

2. IMPACTS ON SENSITIVE SPECIES AND HABITATS:
This relates to impacts on both fauna and flora, individual species, communities, habitats and bio-diversity.

3. IMPACTS ON THE BROADER ENVIROMENT:
This relates to possible impacts on the greater environment and can include cumulative impacts especially where processes are concerned such as rivers.

Table 2: DEAT Listing 1 of activities relating to the study area

ITEM	ACTIVITY	POSSIBLE IMPACTS
1	The construction of facilities or infrastructure, including associated structures or infrastructure, for –	Depending on the size, all infrastructure development could result in: • physical impacts on ecosystems; • visual impact; • disturbance of cultural heritage (archaeological and historical remains) • habitat loss; • habitat fragmentation; • species movements and disturbance of populations; • introduction of invasive alien species; and • increased run-off from surface areas (contamination by petro-chemicals). Initial construction often leads to ribbon development or additional construction with increasing cumulative effects
1(e)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose where lawns, playing fields or sports tracks covering an area of more than three hectares, but less than 10 hectares, will be established;	Impacts may include: • disturbance/destruction of cultural resources; • harm to species and ecosystems from pre, during and post construction phases. Ongoing degradation from human impacts may occur especially if spectators behave irresponsibly or if facilities are built inappropriately (including inadequate waste/sewage management facilities, catering for too many visitors, building in pristine areas which destroys the natural value of the area, and an increased demand for services/infrastructure e.g. electricity). Additional impacts on ecosystem may result

ITEM	ACTIVITY	POSSIBLE IMPACTS
		from the construction of roads and other infrastructure to transport people and goods. Loss of habitats, especially as such facilities are often located in pristine areas. As above but additional impacts of water pollution may result from the use of pesticides and fertilizers on the facilities.
1(f)	The construction of facilities or infrastructure, including associated structures or infrastructure, for sport spectator facilities with the capacity to hold 8 000 spectators or more;	The construction of sports fields reduces biodiversity by replacing the natural vegetation with grass. An increase in water usage and water pollution from herbicides and fertilizers may occur. Additional impacts may include a reduction in public open space, light pollution if facilities are used at night, and increased impacts to plant and animal habitat from increased human activity in the area. Construction of roads and infrastructure to transport people and goods to and from the facility, water provision, waste management and sewerage during use of facility may also result in impacts.
1(m)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose in the one in ten year flood line of a river or stream, or within 32 meters from the bank of a river or stream where the flood line is unknown, excluding purposes associated with existing residential use, but including - i. canals; ii. channels; iii. bridges; iv. dams; and v. weirs;	Physical impacts on ecosystems may occur. The channelisation of streams (creating a hard surface over which the water flows by constructing a concrete channel) destroys the integrity of the ecosystem and has vast effects on the organisms and vegetation (i.e. decreases oxygen, reduces plants and micro-organisms therefore decreasing birdlife which feeds on them.) Bird breeding may be affected due to the reduction of safe areas for fledglings and increased danger to organisms due to flooding (water also flows faster over hard surfaces.) Large-scale impacts from dams on downstream environments include: • Interruption of the natural flow of rivers leads to drying out of wetlands and the sedimentation of downstream ponds, rivers, and lakes thereby reducing essential ecosystem services. • Increased danger to downstream inhabitants both in terms of drought and flooding if the dam wall breaks. Dams/weirs also present physical barriers to organisms (especially juvenile water birds). Increased water pooling can provide habitat for insects carrying disease and could increase malaria/bilharzia.

Table 3: DEAT Listing 2 of activities relating to the study area

ITEM	ACTIVITY	POSSIBLE IMPACTS
1(t)	The construction of facilities or infrastructure, including associated structures or infrastructure, for any purpose where lawns, playing fields or sports tracks covering an area of 10 hectares or more, will be established.	The construction of sports fields reduces biodiversity by replacing the natural vegetation with a grass. Impacts may include: • increase in water usage and water pollution caused by herbicides and fertilizers; • reduction in public open space; • light pollution if facilities are used at night, • increased impacts to plant and animal habitat from increased human entry into the area; and • introduction of invasive alien species.

The above impacts are expanded on below with particular reference to expected direct impacts of each of the issues raised.

1. IMPACTS ON ECOSYSTEMS AND PROCESS FUNCTIONS

a) Impacts on soil structures: The construction of any golf course requires the shifting around of vast quantities of soil in order to reshape and build the course. A cut to fill method is mostly employed where some areas are excavated and others filled up in order to achieve final levels. The excavation of areas requires the removal stripping of topsoil layers and in many cases, also the sub topsoil layers. The removal of topsoil or the invasive impacts of bulk earthworks can lead to process failure.

Mitigation measures to reduce impact:

- All vegetation stripped from construction areas should be stockpiled with the intention of converting it into mulch to return the areas it was stripped from.
- All topsoil should be stockpiled and replaced as a final graded layer over the subsoil contouring at a minimum depth of 300mm.
- The new course contouring should assist in dispersing water runoff instead of concentrating it and increasing the risk of erosion.
- The new course vertical profile should be gentler towards peripheral rough areas so as to reduce water runoff speed.

	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	short-term	local	moderate	probable	low
Without mitigation	short-term	local	severe	definite	Moderate
Operational					
With mitigation	long-term	local	slight	may occur	low
Without mitigation	long-term	local	severe	probable	high

b) Impacts on water-courses: The effects of large-scale bulk earthworks have overall effects on water penetration rates, surface runoff speeds and rates of larger areas. The presence of grasses with developed and knitted thatch reduces the rate of water penetration into the soil as well as increases the speed of surface runoff. This in turn raises surface water volume discharge rates into watercourses resulting in potentially increased erosion. Higher water speeds further increase the potential to

wash away shallow rooted species and undermine ecosystems. The fact that the proposed course lies on both sides of the river increases this risk. The need for the construction of water crossings and bridges can affect the flow and processes of a watercourse.

Mitigation measure to reduce impact:

- Fairways and driving ranges should be kept as comfortably narrow as possible so as to reduce the scale of knitted thatch.
- Rough areas should be wider especially on the downward side of the slope so as to assist in reducing surface runoff speeds.
- Rough areas should attempt to retain and attenuate surface runoff where possible.
- Irrigation application rates should be carefully controlled and managed.
- Water crossings and bridges should not impede the natural flow of the river and be legally approved by all relevant departments.
- Parking areas should make use of attenuation areas and erosion control methods at discharge points.
- Operational management programs to keep the river clean and clear of rubbish should be implemented.

	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	long-term	local	slight	unlikely	low
Without mitigation	long-term	regional	severe	probable	Moderate
Operational					
With mitigation	long-term	local	slight	unlikely	low
Without mitigation	long-term	regional	severe	probable	Moderate

c) Impacts on ecological processes: Ecological systems may be disrupted through fragmentation, isolation and vegetation clearing. This leads to reduced or the cessation of succession and the reduction of ecological zones and habitats and in turn lead to the increase in alien vegetation. When view Independently on the site only this may be limited but when cumulatively viewed, it may be detrimental to individual species or communities.

Mitigation measures to reduce impact:

- Vegetation type corridors should be retained.
- Cognizance of animal pathways must be made and retained where possible.
- Greens, tee boxes, fairways and landscaping to the clubhouse (an existing structure to be converted) should be planted only with indigenous species and particularly those characteristics of the existing veld types. Grasses should also be indigenous for use on greens, tee boxes and fairways with avoidance of invasive species.

	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	medium-term	study area	moderate	probable	moderate
Without mitigation	long-term	regional	severe	definite	high
Operational					
With mitigation	medium-term	study area	moderate	probable	moderate
Without mitigation	long-term	regional	severe	probable	high

2. IMPACTS ON SENSITIVE SPECIES AND HABITATS:

a) Impacts on Sensitive species: It is not intended to directly disrupt sensitive and species of special concern. Construction as well as operational phases will provide for the potential of impact and require attention so as to ensure the minimal disruption of both species and habitats.

Mitigation measures to reduce impact:

- The appointment of a botanist/zoologist to check for sensitive species and habitats (both fauna and flora) within the development footprints.
- Access to areas outside the footprints should be limited and controlled.
- The use of chemicals in nutrient enrichment should be controlled and organic products should be used instead.
- The use of chemicals for herbicide and pesticide control should not be allowed.
- The use of fire for vegetation clearing should not be allowed.
- Construction phases should allow for education of staff as to the significance of species of concern.

	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	short-term	local	Very beneficial	definite	low
Without mitigation	long-term	regional	severe	definite	high
Operational					
With mitigation	medium-term	local	Very beneficial	definite	low
Without mitigation	long-term	regional	moderate	probable	moderate

b) Impacts of Alien species: The occurrence of pioneer and opportunistic plant species is inevitable. Although this is a natural process, many pioneer species are invasive aliens, which often taint the area with a chemical or mechanical method so as to ensure species succession and reduce competition. Such methods ensure that other species, and often those endemic to the area cannot continue and can result in cessation of the species with a localized region. The impact of alien species is both a construction and an operational issue that requires attention.

Mitigation measures to reduce impact:

- Construction phases should employ eradication programmes to remove existing invasive's as well as the removal of new invasive's, especially those categorized as 1, 2 and 3 on the NEMBA list.
- Long-term operational eradication programs to eradicate invasive's should be implemented.
- Access to areas outside the course and facilities should be limited.
- The removal of any indigenous flora from the site should not be allowed.

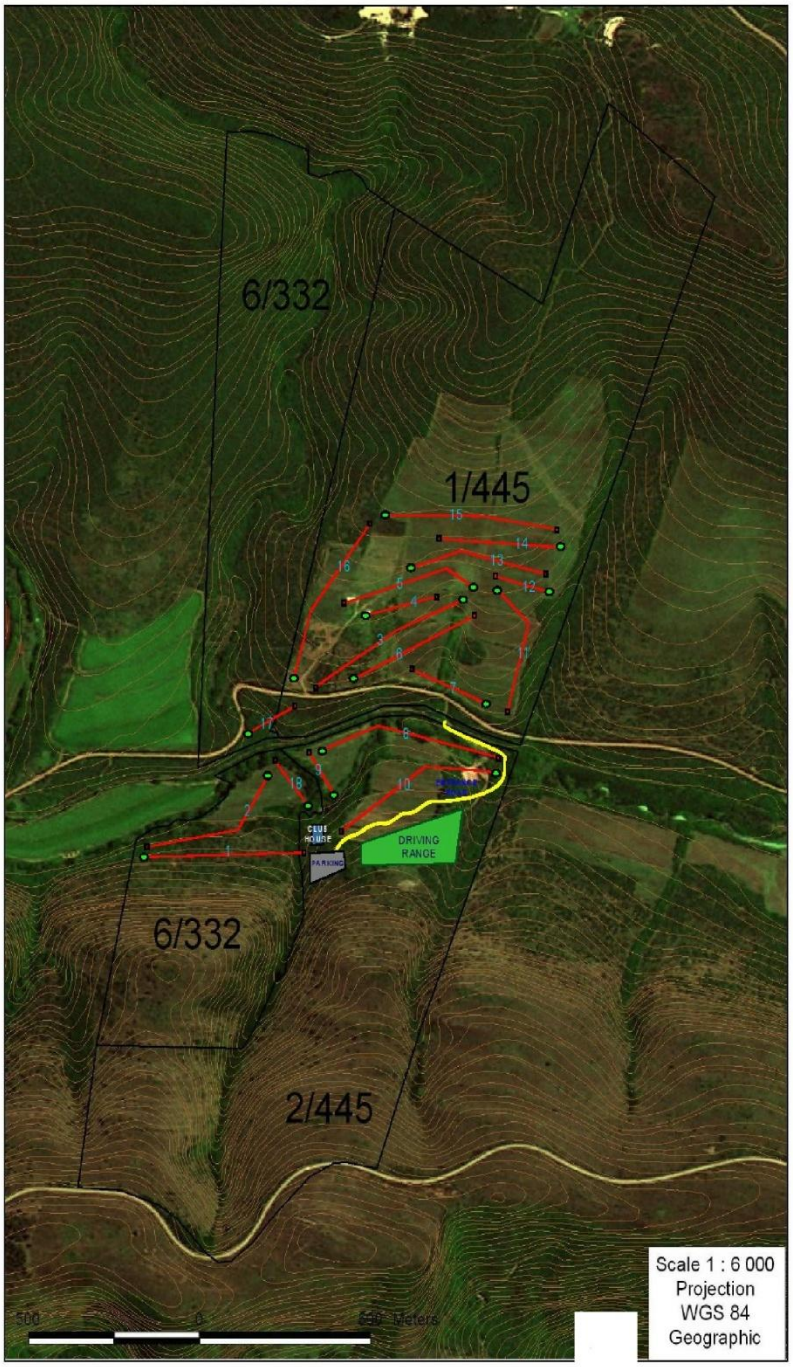
	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	short-term	local	very beneficial	probable	low
Without mitigation	long-term	study area	severe	definite	high
Operational					
With mitigation	short-term	local	very beneficial	probable	low
Without mitigation	long-term	regional	severe	definite	high

3. IMPACTS ON THE BROADER ENVIROMENT:

a) Impacts on the Broader Environment: The study area lies downstream from the town of Grahamstown and the sewerage treatment works for the town. Both of these factors already negatively affect the quality of water in the river. The cumulative effect of upstream activities combined with the proposed development, as well as downstream agricultural activities can lead to irreparable damage to other ecosystems. It should be the responsibility of a development to not only mitigate its own impacts, but also of those above it in both linear and non linear processes. Mitigation measures` to reduce impact:

- The trustees of the proposed development should interact with adjacent developments with the aim of working together to improve individual and cumulative impacts.
- Environmental educational programs designed for the users of the proposed development should be implemented as long term operational considerations.
- The storage of hazardous materials, both during construction and operational phases, should be correctly managed and be situated away from sensitive areas.

	Effect	Extent	Intensity	Probability of occurrence	Significance
Construction					
With mitigation	long-term	regional	moderate	may occur	moderate
Without mitigation	long-term	regional	severe	definite	high
Operational					
With mitigation	long-term	regional	slight	may occur	moderate
Without mitigation	long-term	regional	moderate	definite	high



Belmont Valley Golf Course

Proposed new golf course routing

Legend

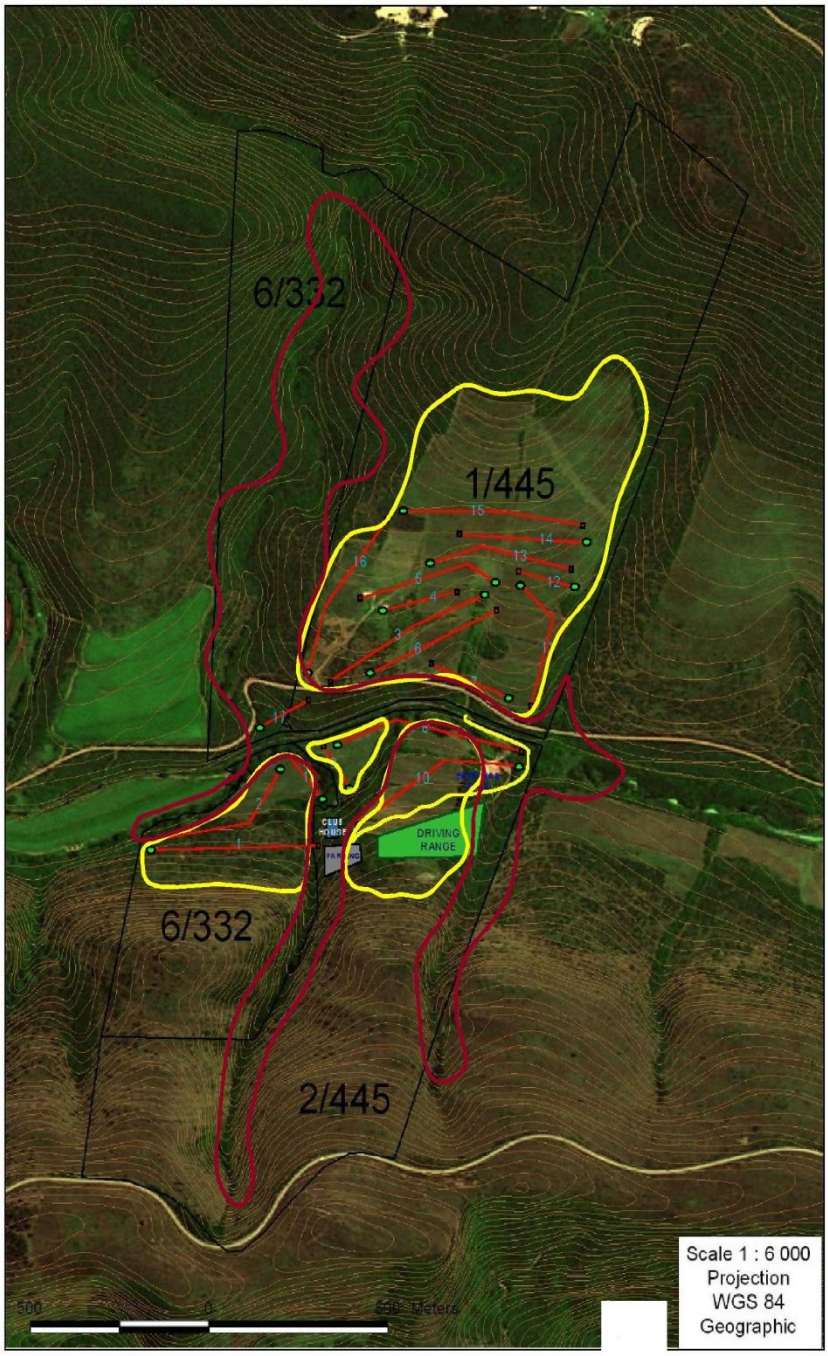
Proposed course routing

Tees and greens

N

Meters

0 100 200 400 600 800



Belmont Valley Golf Course

Proposed new golf course routing laid over the sensitive areas

Legend

- Proposed course routing
- Tees and greens
- Ecologically sensitive
- Suitable for development

Meters

0 100 200 400 600 800

6. CONCLUSIONS

The Blaaukranz river forms an important feature of the study area as well as a central aspect of the riparian zone. All river and water-courses, regardless of their condition, have conservation status as promulgated in legislation. The river is a functional entity and therefore must be protected and managed. Additionally the riparian zone and river course provide habitat for a diverse species range which extends further out into the grassy fynbos.

Any anthropogenic influence on the site should be sited primarily in those areas which have seen previous human activity as intervention within these areas will mitigate the need to disturb some of the pristine areas. The presence of aliens in the study area is limited with some areas resisting invasives and thus retaining their centres of endemism. Any proposed development must adhere to environmental and good conservation practices by means of sound environmental management plans, which if followed, will ensure sustained succession of the existing vegetation types, not just for the study area but for the regional floristic zones.

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8. APPENDIX A

LEGISLATION GOVERNING THE CONSERVATION AND MANAGEMENT OF WETLANDS (EWART-SMITH 2005)

The following are the main portions of the legislation that pertain to the management of wetlands:

a) NATIONAL ENVIRONMENTAL MANAGEMENT ACT (ACT NO 107, 1998)

The National Environmental Management Act of 1998 (NEMA), outlines measures that…."prevent pollution and ecological degradation; promote conservation; and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."

Of particular relevance to this assessment is Chapter 1(4r), which states that sensitive, vulnerable, highly dynamic or stressed ecosystems, such as coastal shores, estuaries, wetlands, and similar systems require specific attention in management and planning procedures, especially where they are subject to significant human resource usage and development pressure.

b) RAMSAR CONVENTION OF 1995

Signatories of the convention (which include South Africa) are obliged to promote the conservation of listed wetlands and the "wise management" of all others.

c) CONSERVATION OF AGRICULTURAL RESOURCES ACT (Act 43 of 1983)

Key aspects include legislation that allows for:

Section 6: Prescription of control measures relating to the utilisation and protection of vleis, marshes, water sponges and water courses. These measures are described in regulations promulgated in terms of the Act, as follows;

Regulation 7(1): Subject to the Water Act of 1956 (since amended to the Water Act 36 of 1998), no land user shall utilise the vegetation of a vlei, marsh or water sponge or within the flood area of a water course or within 10 m horizontally outside such flood area in a manner that causes or may cause the deterioration or damage to the natural agricultural resources.

Regulation 7(3) and (4): Unless written permission is obtained, no land user may drain or cultivate any vlei, marsh or water sponge or cultivate any land within the flood area or 10 m outside this area (unless already under cultivation).

Regulation 15B - Combating of category 2 plants (1): Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.

(8): A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.

d) CAPE NATURE CONSERVATION ORDINANCE (Ordinance 19 of 1974; amended in 2000)

This ordinance provides measures to protect the natural flora and fauna, as well as listing nature reserves in the Western Cape that are managed by the Western Cape Nature Conservation Board (WCNCB or known colloquially as Cape Nature). This ordinance, with the Western Cape Nature Conservation Board Act of 1998 was amended in 2000 to become the Nature Conservation Laws Amendment Act. Lists of endangered flora and fauna can be found in this act.

9. APPENDIX B

EXTRACT FROM REGULATIONS GOVERNING THE CONTROL OF INVADER PLANTS.

a) COMBATING OF CATEGORY 1 PLANTS

(1) Category 1 plants may not occur on any land or inland water surface other than in biological control reserves.
(2) A land user shall control any category 1 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
(3) No person shall, except in or for purposes of a biological control reserve –
(a) establish, plant, maintain, multiply or propagate category 1 plants;
(b) import or sell propagating material of category 1 plants or any category 1 plants;
(c) acquire propagating material of category 1 plants or any category 1 plants.
(4) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with the requirements of sub-regulation (1) on such conditions as the executive officer may determine in each case.

b) COMBATING OF CATEGORY 2 PLANTS

(1) Category 2 plants may not occur on any land or inland water surface other than a demarcated area or a biological control reserve.
(2) (a) The executive officer may on application in writing demarcate an area as an area where category 2 plants may occur, be established and be maintained.
(b) An area in respect of which a water use license for stream flow reduction activities has been issued in terms of section 36 of the National Water Act, 1998 (Act No. 36 of 1998) shall be deemed to be a demarcated area.
(3) The executive officer shall demarcate an area for the occurrence, establishment and maintenance of category 2 plants only if –
(a) the category 2 plants in the area are cultivated under controlled circumstances; and (b) the land user concerned has been authorised to use water in terms of the National Water Act, 1998 (Act No. 36 of 1998); and
(c) the category 2 plants or products of category 2 plants in the area are demonstrated to primarily serve a commercial purpose, use as a woodlot, shelter belt, building material, animal fodder, soil stabilisation, medicinal or other beneficial function that the executive officer may approve; and all reasonable steps are taken to curtail the spreading of propagating material of the category 2 plants outside the demarcated areas.
(4) When an area is demarcated for the occurrence, establishment and maintenance of category 2 plants the executive officer may impose such additional conditions as may reasonably be deemed necessary to keep the category 2 plants in the area in check.
(5) No person shall sell propagating material of category 2 plants or any category 2 Makana LEAP: Comprehensive Environmental Audit: Vegetation of Makana 38 plants to another person unless such other person is a land user of a demarcated area or of a biological control reserve.
(6) No person shall acquire propagating material of category 2 plants or any category 2 plants unless such material or such plants are intended for use in a demarcated area or in a biological control reserve.
(7) Propagating material of category 2 plants or category 2 plants shall only be imported or sold in accordance with the provisions of the Plant Improvement Act, 1976 (Act No. 53 of 1976), the Agricultural Pests Act, 1983 (Act No. 36 of 1983) and the environment conservation regulations.
(8) A land user shall control any category 2 plants that occur on any land or inland water surface in contravention of the provisions of sub-regulation (1) by means of the methods prescribed in regulation 15E.
(9) Unless authorised thereto in terms of the National Water Act, 1998 (Act No. 36 of 1998), no land user shall allow category 2 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or

intermittently, lake, dam or wetland.
(10) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub regulations (1), (3), (5), (6), (8) and (9) on such conditions as the executive officer may determine in each case.

c) COMBATING OF CATEGORY 3 PLANTS

(1) Category 3 plants shall not occur on any land or inland water surface other than in a biological control reserve.
(2) Subject to the provisions of sub-regulation (3), the provisions of sub-regulation (1) shall not apply in respect of category 3 plants already in existence at the time of the commencement of these regulations.
(3) (a) No land user shall allow category 3 plants to occur within 30 meters of the 1:50 year flood line of a river, stream, spring, natural channel in which water flows regularly or intermittently, lake, dam or wetland.
(b) The executive officer may impose such additional conditions as may reasonably be deemed necessary with regard to category 3 plants already in existence at the time of the commencement of these regulations.
(c) A land user must take all reasonable steps to curtail the spreading of propagating material of category 3 plants.
The executive officer may, after consultation with the land user, issue a direction in terms of section 7 of the Act that category 3 plants in existence at the time of the commencement of these regulations must be controlled by means of the measures prescribed in regulation 15F.
(4) No person shall, except in or for purposes of a biological control reserve –
(a) plant, establish, maintain, multiply or propagate category 3 plants;
(b) import or sell propagating material of category 3 plants or any category 3 plants;
(c) acquire propagating material of category 3 plants or any category 3 plants.
(5) The executive officer may, on good cause shown in writing by the land user, grant written exemption from compliance with one or more of the requirements of sub regulations
(1), (3) and (4) on such conditions as the executive officer may determine in each case.

10. APPENDIX C

1.1 Methodology for Assessing the Significance of Impacts

The following methodology was used to assess the potential impact significance of the proposed development. The significance of any impacts are considered against 5 main parameters so that a standardized result can be achieved. This result is in the form of a ranking system that makes use of quantitative results to identify the impact significance. The following are the parameters against which the impacts are considered:

- Temporal effects or time scales which is seen as the significance of the impact at various times. It can also be seen as the expected duration of the overall impact.
- Spatial scale or the extent is the total physical extent of the impact which can extend past the physical boundaries of the study area.
- The intensity is the possible severity scale of the impacts and is seen as those with negative effects.
- The intensity is the possible beneficial scale of the impacts and is seen as those with positive effects.
- The probability or likelihood of an impact occurring is important. Certain probabilities are expected but it is often difficult to foresee knock on effects or those resultant from others. The specific issue being considered is however considered as in depth as possible.

The impacts are further considered with and without mitigation so as to scale their impact significance with and without measure to reduce such impacts. The employment of mitigatory techniques may well change significance outcomes.
Impacts are also considered within the construction and operational phases of the project. As much as there may be definite and unavoidable impacts during construction phases, such impacts may be mitigated and remedied in operational phases so as to reverse such possible impacts.

Table 4: Ranking of Evaluation Criteria

Effect/Time Scale			**Score**
Short term	Less than 5 years		1
Medium term	Between 5-20 years		2
Long term	Between 20 and 40 years and almost permanent		3
Permanent	Over 40 years and thus permanent		4
Extent/Spatial Scale			
Local	At localised scale and a few hectares in extent		1
Study Area	The proposed site and its immediate environs		2
Regional	District and Provincial level		3
National	Country		3
International	Internationally		4
Intensity Scale	**Severity**	**Benefit**	
Slight	Slight impacts on the affected system	Slightly beneficial to the affected system	1
Moderate	Moderate impacts on the affected system	Moderately beneficial to the affected system	2
Severe/ Beneficial	Severe impacts on the affected system	A substantial benefit to the affected system	4
Very Severe/ Beneficial	Very severe change to the affected system	A very substantial benefit to the affected system	8
Probability Scale			
Unlikely	The likelihood of these impacts occurring is slight		1
May Occur	The likelihood of these impacts occurring is possible		2
Probable	The likelihood of these impacts occurring is probable		3
Definite	The likelihood is that this impact will definitely occur		4

Table 5: Environmental Significance ratings, descriptions and scores

Significance Rate	Description	Score
Low	Low impact magnitude with a site specific extent and short term duration, or a very low magnitude with any combination of extent and duration except regional and long term. Therefore this can be considered as an acceptable impact but may require management plans for implementation. No additional investigation should be required.	4-8
Moderate	High magnitude with a site specific extent and short term duration. Medium magnitude with a site specific extent and short term duration. Low magnitude with any combination of extent and duration except site specific and short term. Very low magnitude with a regional extent and long term duration. Such impacts most probably require mitigation and possible alternative investigations.	9-12
High	High magnitude with a local extent and medium term duration. High magnitude with a regional extent and short term duration or a site specific extent and long term duration. High magnitude with either a local extent and short term duration or a site specific extent and medium term duration. Medium magnitude with any combination of extent and duration except site specific and short term or regional and long term. Low magnitude with a regional extent and long term duration. High impacts require definite mitigation measures and or alternative investigations.	13-16
Very High	High magnitude with a regional extent and long term duration. High magnitude with either a regional extent and medium term duration or a local extent and long term duration. Medium magnitude with a regional extent and long term duration. Very high impacts require alternative investigations with mitigation measures not adequate enough to affect significance scales.	17-20