

SPECIALIST REPORT



**A STUDY OF THE VEGETATION OF PORTION 78
OF THE FARM ONGEGUNDE VRYHEID NO 746
(ROCKY COAST FARM), CAPE ST FRANCIS.**

By Dr W P D Gertenbach

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1. INTRODUCTION

HilLand Associates Environmental Management Consultants approached Dr W P D Gertenbach of Gertenbach Ecological Consultation to draft a Specialist Report on the Vegetation of Portion 78 of the Farm Ongegunde Vryheid No 746 (Rocky Coast Farm), Cape St Francis.

The owners of this land want to start a limited development, which will entail that the land should be rezoned from the present agricultural land use to Residential Zone I, Resort Zone II and the remainder to Open Space Zone III. The area that is proposed for the Residential development, will be subdivided from the farm, is ± 8 ha in size and is located due west of Cape St Francis. The area that is proposed for the resort development is situated on the far western corner of the farm and two possible options for the development are considered:

Option I: Subdivision of 21 units of ± 5 ha each on which one housing dwelling can be built on a footprint of $\pm 2\,000$ m².

Option II: The identification of 32 footprints of $\pm 1\,000$ m² each, rezoned to Resort Zone II and on which one housing dwelling will be built.

The remainder of the farm will be rezoned to Open Space Zone III and managed as a Private Nature Reserve.

The Terms of Reference for the study includes:

- A baseline study of the ecology of the vegetation of the entire area.
- An assessment of the ecological sensitivity of the two sites where the developments are planned.
- A draft fire management plan for the area.
- Conclusions and Recommendations.

2. LOCATION AND SIZE

The farm is located due west of Cape St Francis on the coast and is situated between 34°11' and 34°13' South and 24°48' and 24°50' East. The entire farm covers an area of 458,5 ha of which ± 65 ha in the east is subdivided from the farm by the Humansdorp/Cape St Francis Road. It has a coast front of ± 3 km (**Fig. 1**).

3. **TOPOGRAPHY AND DRAINAGE**

The farm stretches from sea level in the southern parts to 72 msl on the highest secondary dune near the northeastern corner of the farm. The topography consists of a plateau on the secondary dune in the northern areas of the farm. Towards the sea, the slope is intersected with west/east orientated windblown dunes with lower lying bottomlands or slacks between the dunes.

Except for a small drainage system towards Cape St Francis in the south-eastern corner of the land, drainage is usually subterranean and no well developed drainage lines are recognized. The subterranean drainage follow the main direction of the dunes and usually result in small fresh water fountains or springs close to the edge of the sea where the water emerge on top of the solid rock. The south facing slopes of the dunes towards the sea are usually gentle with a gradient of 1:20. These slopes are a result of the aeolian action of the prevailing winds from the southwest.

The north facing slopes of the dunes are more steep as a result of the same wind action and the gradient can be 1:10.

4. **GEOLOGY AND SOILS**

The farm is situated on a gentle southern slope towards the sea. Geologically it consist of young Cenozoic deposits of the Schelmhoek Formation of the Algoa Group. The fossil dunes were formed by wind action after the dropping of the sea level during the early Palaeocene. The drop in sea level was almost 300 m and it took place over a period of millions of years. Outcrops of silcrete are visible near the coast as yellow coloured rocks (**Fig. 2**).

The soils near the coast are sandy (less than 6 percent clay), deep with a grey-brown colour (10YR 6/4). Inland the colour of the soil becomes more dark grey (10 YR 4/1) as a result of the accumulation of organic material in the A-horizon. The soils on the dunes are deep (> 3 m) and contain less than 6 percent clay in the topsoil. Signs of shell middens were encountered in the soil along the access road (**Fig. 3**).

5. **CLIMATE**

The climate of the area can be described as a temperate coastal climate with rain throughout the year and subjected to high velocity winds. The climate that the farm experience will be discussed under the following headings:

5.1 Temperature

To give an indication of the temperatures at the site, the temperature data for Jeffreys Bay is attached (**Table 1**). According to the temperature data at Jeffreys Bay, the area experience a mild climate with average maximum temperature varying form 19.4°C in August to 25.9°C in February. The average minimum temperature varies from 11.1°C in July to 19.1°C in January. The temperature variation between day and night and winter and summer is very small. It can however be expected that the temperatures at the site will be the same, because of the distance from the sea and the altitude. The absolute maximum temperature for Jeffreys Bay for the period was 40°C on 16 March 2004 and the absolute minimum temperature was 6°C on 22 May 2007.

Table I: Temperature data for Jeffreys Bay in °C
(period 2003 – 2007)

Month	Average Maximum	Average Minimum	Absolute Maximum	Date	Absolute Minimum	Date
January	25.51	18.94	39.0	27/2007	11.0	07/2007
February	25.96	19.12	34.0	08/2005	15.0	12/2007
March	24.52	16.82	40.0	16/2004	13.0	03/2006
April	22.30	14.38	38.0	15/2004	10.0	29/2007
May	21.54	13.41	38.0	07/2007	6.0	22/2007
June	20.79	12.11	31.0	04/2004	7.0	10/2005
July	20.84	11.23	30.0	30/2006	7.0	30/2006
August	19.43	11.08	29.0	05/2005	6.5	19/2005
September	20.76	12.63	37.5	15/2005	7.0	01/2006
October	23.35	14.61	38.0	22/2003	9.0	06/2005
November	23.92	16.35	32.5	03/2005	11.5	09/2005
December	25.42	17.49	36.0	12/2004	12.5	26/2003

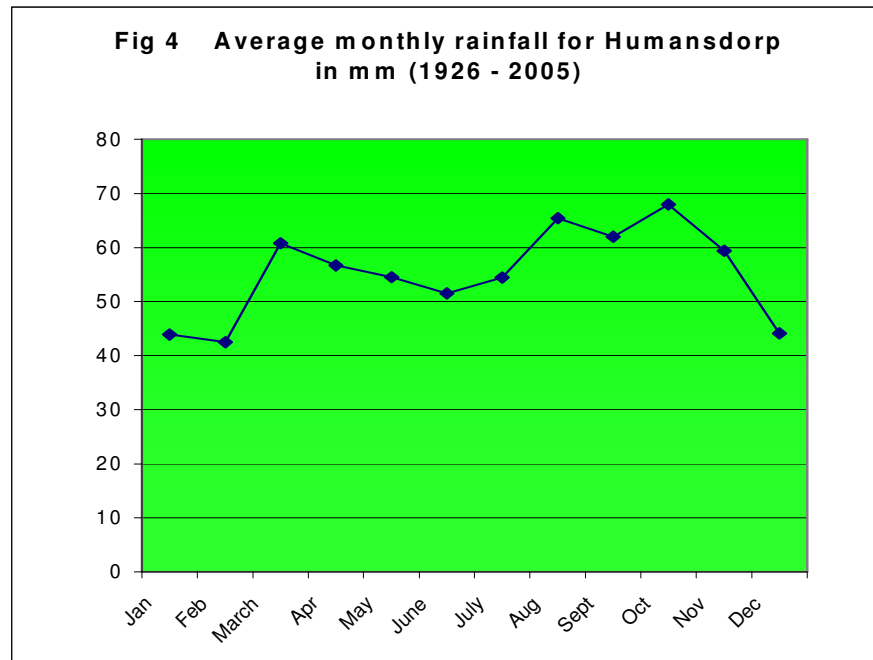
5.2 Rainfall

The average monthly rainfall for Humansdorp for the period 1926 to 2005 is presented in **Fig 4**. Humansdorp is the nearest station where long term rainfall data is available. The area can potentially get more than 40 mm rain in every month of the year. Between March and November the average rainfall is between 50 and 68 mm. The period December to February is the driest part of the year. The average annual precipitation for Humansdorp is 663 mm.

5.3 Wind

The ecology of the biotic and abiotic components of the system are largely regulated by wind action. The prevailing wind is from the southwest and it is also the wind with the highest

velocity. The physical action of the wind resulted in dune formation in the past and at present it dominates the structure of the vegetation to a low shrub, wind pruned and salt sprayed stunted thickets. The wind from the southwest also blow sand from the sea onto the existing dunes and also results in wind



erosion on the sparsely vegetated crests of the dunes, which is clearly visible on the aerial images (**Fig. 5**).

Data from Port Elizabeth indicates that the strongest and also the major wind in the area in summer and winter are from the southwest. The wind can reach a speed of 41 to 60 km per hour. During the summer regular and also strong winds may occur from the east and southeast.

6. VEGETATION

Mucina and Rutherford (2006) describe the vegetation of the farm as Algoa Dune Strandveld. Lubke and De Moor 1998 refer to this vegetation as Dune Fynbos. Acocks 1988 did not specify this vegetation type and included it into the larger veldtype called False Fynbos. Manning 2001 also refers to this vegetation as Dune Fynbos. The reason why the vegetation type is not classified as proper Fynbos is that no representatives of the Proteaceae occur and a strong component of subtropical thickets are present. Another characteristic of the vegetation is that renosterbos (*Elytropappus rhinocerotis*), which is common in adjacent areas, do not occur in this vegetation type.

The vegetation survey was conducted over a two week period starting on 4 February 2008. Some of the plants was not in flower during this time of the year and was difficult to identify. Especially the geophytes were not visible at the time of the survey and some of them could have been missed. To obtain a full list of all the plants that occur on the land, a survey should be undertaken in other times of the year as well. Plants that could not be identified in the field was collected and identified by using field guides on the vegetation of the area. Plants that could not be identified at all, was taken to Me Caryl Logie in St Francis Bay who kindly identified them and also provided some field notes on the status of the plants in the area. A list of the plants collected on the farm with their common names is attached as **Appendix A**.

The vegetation of the two areas that were proposed for development of housing will be discussed in more detail later. The driving force on the vegetation of the entire farm is wind and the resulting dune formation. Taking into consideration the slope direction and steepness, elevation and the distance from the sea, the vegetation can be divided into four different categories (**Fig. 5**):

- 6.1 **Seashore vegetation**
- 6.2 **Coastal Fynbos**
- 6.3 **Dune vegetation**
- 6.4 **Secondary dune plateau vegetation**

6.1 **Seashore vegetation**

Within 50 meters of the high water mark of the ocean, the subterranean water seeps on to the top of the surface with associated springs and marshy conditions (**Fig. 5 & 6**). The plants that occur on the seashore, is mostly succulent and salt resistant. No woody plant species occur and the vegetation is dominated by succulent and other species such as:

Centella asiatica
Chironia melampyrifolia
Carpobrotus deliciosus
Cotula mariae
Crassula orbicularis
Delosperma echlonis
Delosperma litorale
Delosperma patersonea
Gazania rigens var uniflora
Hebenstretia integrifolia
Helichrysum cymosum
Pelargonium capitatum
Syncarpa sordescens (locally dominant)
Tetragonia fruticosa

Thesidium fragile
Triglochin striata
Zygophyllum uitenhagense

Grasses, Cyperids and Restio's that occur along the sea are:

Ammophila arenaria
Cynodon dactylon
Cyperus sp
Ishyrolepis eleocharis
Juncus kraussii
Scirpus nodosus
Sporobolus virginicus
Stenotaphrum secundatum
Thinopyrum distichum

The vegetation is in a sub-climax condition and is subjected to periodic inundation with seawater. No development should be allowed in this landscape.

6.2 Coastal Fynbos

The Coastal Fynbos occurs on the seaward slopes in the south-eastern corner of the farm. It is most probably the most pristine and diverse part of the vegetation on the farm (**Fig. 5 & 7**). It occurs on south-facing, gentle slopes with a gradient of 1:20. The structure and physiognomy of the woody vegetation is subjected to severe south-westerly winds and are therefore wind pruned and restricted to below one meter above the ground. The stunted woody vegetation is however very dense with little chance of wind erosion under normal conditions. Exposure of the soil in cases of fire or other mechanical disturbance may result in wind erosion.

This is the most diverse vegetation unit on the farm. The woody vegetation is dominated by wind pruned species such as *Sideroxylon inerme*, *Metalasia muricata* and *Rhus lucida forma scoparia*. Other woody species that occur are:

Agathosma stenopetala
Anthospermum aethiopicum
Carissa bispinosa
Chrysanthemoides monilifera
Cussonia thyrsiflora
Euclea racemosa
Myrica cordifolia
Oleo exasperata
Osyris compressa
Passerina vulgaris
Phyllica littoralis
Pterocelastrus tricuspidatus

Rapanea gilliana
Rhus glauca
Robsonodendron maritimum

Herbaceous species are common but never with a high density.
Species that do occur are:

Asparagus racemosus
Boophone disticha
Brunsvigia gregaria
Carpobrotus deliciosus
Centella hermaniifolia
Chironia baccifera
Coteledon orbiculata
Felicia echinata
Gladiolus spp
Haemanthus sanguineus
Helichrysum cymosum
Helichrysum terethifolium
Lachenalia algoensis
Limonium scabrum
Muraltia squarrosa
Othonna rufibarbis
Pelargonium capitatum
Polygala ericaefolia
Senecio elegans
Syncarpa sordescens
Tephrosia capensis

Graminoids that occur under and between the dense shrubs are:

Cynodon dactylon
Ischyrolepis eleocharis
Ischyrolepis leptocladus
Panicum deustum
Scirpus nodosus
Setaria sphacelata var torta
Sporobolus virginicus
Stenotaphrum secundatum
Thinopyrum distichum

The aliens *Acacia cyclops* and *Acacia saligna* occurs in dense stands in the northern and eastern parts of this vegetation unit in and around the drainage line and the reservoir.

A few species that are endemic to this veldtype occur mainly in this vegetation unit. They are:

Cotyledon adscendens
Gymnosporia elliptica
Rapanea gilliana

Lobelia zwartkopensis
Brunsvigia litoralis

Other rare species that occur in this vegetation unit are:

Agathosma stenopetala
Phyllica littoralis
Brunsvigia gregaria
Centella hermaniifolia
Othonna rufibarbis
Polygala ericaefolia

The Coastal Fynbos is at present under severe pressure of alien *Acacia cyclops* encroachment especially in the northern and eastern regions close to the access road to Cape St Francis. Pristine Coastal Fynbos should be excluded from any form of development. More detailed discussion of the development site will be done under paragraph 8.1.

6.3 **Dune vegetation**

The dunes form the central part of the farm and are situated parallel to the coast in a west/east orientation. The dunes are higher in the east and then drops down to sea level in the west.

Due to the topography of the dunes, two different plant communities can be identified (**Fig. 5**).

6.3.1 **Seaward slopes and crests**

6.3.2 **Leeward slopes and slacks**

6.3.1 **Seaward slopes and crests**

The seaward slopes face the ocean and are therefore southern slopes. These slopes are gentle, but the vegetation that occurs on these slopes is subjected to heavy south-westerly winds and salt spray. The result is that the plants are wind pruned, stunted and not as dense as the Coastal Fynbos. Although the plant composition is almost the same as the Coastal Fynbos, it is dryer and partially subjected to wind erosion (**Fig. 8**).

The dominant woody plants are *Metalasia muricata*, *Olea exasperata*, *Passerina rigida* and *Sideroxylon inerme*. Other woody species that do occur are:

Acacia cyclops
Aloe africana
Anthospermum aethiopicum
Azima tetraacantha

Brachylaena discolor
Carissa bispinosa
Chrysanthemoides monilifera
Cussonia thyrsiflora
Euclea racemosa
Morella cordifolium
Morella quercifolia
Myrica cordifolia
Mystroxydon aethiopicum
Nylandtia spinosa
Osyris compressa
Passerina vulgaris
Pterocelastrus tricuspidatus
Rhus glauca
Rhus lucida forma scoparia
Salvia africana-lutea
Scutia myrtina
Tarchonanthus littoralis

Due to less dense woody vegetation the herbaceous layer is better developed and is dominated by *Ischyrolepis leptocladus*, *Carpobrotus deliciosus* and *Muraltia squarrosa*.

Other herbaceous plants that occur are:

Asparagus africanus
Asparagus racemosus
Boophone disticha
Brunsvigia gregaria
Brunsvigia littoralis
Centella hermaniifolia
Chironia baccifera
Conyza scabrada
Cotyledon orbiculata
Crassula orbicularis
Felicia echinata
Gasteria ascinascifolia
Haemanthus sanguineus
Helichrysum terethifolium
Helichrysum cymosum
Hermannia flammea
Indigofera tomentosa
Jamesbrittenia microphylla
Lessertia sp
Limonium scabrum
Othonna rufibarbis
Pelargonium capitatum
Polygala ericaefolia
Rhynchosia caribaea

Senecio elegans
Senecio inaequidens
Sida rhombifolia
Solanum linnaeanum
Syncarpa sordescens

The seaward slopes do not carry a dense grass layer but the following species are present:

Brachiaria chusqueoides
Cynodon dactylon
Ehrharta calycina
Ehrharta villosa
Melinis repens
Setaria sphacelata var torta
Sporobolus africanus
Sporobolus virginicus
Stenotaphrum secundatum
Themeda triandra
Cyperus sp
Ischyrolepis eleocharis
Ischyrolepis leptocladus
Juncus kraussii
Scirpus nodosus

The crests of the dunes are sometimes sparsely vegetated and the bare soil is exposed. Signs of wind erosion are visible in these localities. Preferably no development should be allowed in this landscape.

6.3.2 Leeward slopes and slacks

As a result of the dune formation by wind action the northern leeward slopes are steeper, warmer and largely protected from the prevailing and strong south-westerly winds. The result is that the woody vegetation becomes more dense, but also much higher. The woody plants can vary between one and four meters and the grass cover is sparse (**Fig. 9**). Floristic elements of the more temperate areas of South Africa occur in this vegetation type.

The dense woody component is dominated by the indigenous *Grewia occidentalis*, *Passerina rigida* and *Scutia myrtina* and the alien plant *Acacia cyclops*.

The ecotone between the dune crests and the leeward slopes are very sharp and is indicative of the influence of the wind on the vegetation and the hotter northern slopes (**Fig. 10**).

This alien plant usually forms very dense stands of up to 5 meters high and is almost impenetrable.

The following woody plants do occur on the Leeward slopes and slacks. They are indicative of a more temperate climate:

Acacia saligna
Aloe africana
Anthospermum aethiopicum
Azima tetracantha
Brachylaena discolor
Carissa bispinosa
Cassine peragua
Chrysanthemoides monilifera
Cussonia thyrsoiflora
Diospyros dichrophylla
Euclea natalensis
Euclea racemosa
Gymnosporia buxifolia
Gymnosporia elliptica
Lauridia tetragona
Maytenus procumbens
Metalasia muricata
Morella cordifolium
Morella quercifolia
Myrica cordifolia
Mystroxyton aethiopicum
Nylandtia spinosa
Olea exasperata
Osyris compressa
Phyllica littoralis
Psydrax obovatum
Pterocelastrus tricuspidatus
Rhamnus prinoides
Rhus crenata
Rhus glauca
Rhus lucida forma scoparia
Ricinus communis
Salvia africana-lutea
Schotia afra var afra
Sideroxyton inerme
Tarchonanthus littoralis
Zanthoxylum capense

The herbaceous layer is, although less dense, more diverse than that of the seaward slopes. The following species occur:

Asparagus africanus

Asparagus racemosus
Boophone disticha
Carpobrotus deliciosus
Cassytha ciliolate
Chironia baccifera
Chironia melampyrifolia
Conyza scabrada
Cotyledon orbiculata
Cynanchum natalitium
Felicia echinata
Gladiolus spp
Gomphocarpus fruticosus
Haemanthus sanguineus
Hebenstretia integrifolia
Helichysum cymosum
Hermannia flammea
Hibiscus trionum
Indigofera tomentosa
Jamesbrittenia microphylla
Lessertia sp
Muraltia squarrosa
Othonna rufibarbis
Pelargonium capitatum
Polygala ericaefolia
Senecio elegans
Senecio inaequidens
Sida rhombifolia
Solanum linnaeanum
Syncarpa sordescens

Similarly the grass layer is sparse, but a few species were encountered: They are:

Ammophila arenaria
Cynodon dactylon
Ehrharta calycina
Ehrharta villosa
Eragrostis curvula
Eustachys paspaloides
Melica racemosa
Melinis repens
Panicum deustum
Setaria sphacelata var torta
Sporobolus africanus
Sporobolus virginicus
Stenotaphrum secundatum
Themeda triandra
Cyperus sp

Encroachment of alien *Acacia cyclops* is the most severe in the leeward slopes and in some areas form impenetrable thickets. As a result of the alien encroachment in the Leeward slopes and slacks, this area is the most suitable for possible development if the site is carefully selected..

6.4 Secondary dune plateau vegetation

The secondary dune plateau is situated along the northern boundary of the farm from east to west. It is a flat plateau of not more than 250 meters wide and has almost the same vegetation as the leeward slopes and dune slacks. There are however a few floristic elements that differentiate the plateau from the leeward slopes (**Fig. 5**).

The woody plants on the plateau are very dense and usually heavily encroached by *Acacia cyclops* (**Fig. 11**). The occurrence of woody species like *Rhamnus prinoides*, *Diospyros dichrophylla*, *Lauridia tetragona* and *Salvia africana-lutea* and the dominance of *Passerina rigida* is typical for these plateaus if it is not encroached by aliens. Other woody species that occur is largely the same as that of the leeward slopes discussed under paragraph 6.3.2.

The herbaceous layer differs in that a few species like *Gomphocarpus fruticosus*, *Hermannia flammea*, *Hibiscus trionum* and *Sida rhombifolia* are more abundant and the alien plant *Ricinus communis* is also present. Other species that occur are:

Asparagus africanus
Asparagus racemosus
Boophone disticha
Carpobrotus deliciosus
Cassytha ciliolate
Chironia baccifera
Cotyledon orbiculata
Cynanchum natalitium
Haemanthus sanguineus
Helichysum cymosum
Indigofera tomentosa
Jamesbrittenia microphylla
Lessertia sp
Muraltia squarrosa
Othonna rufibarbis
Pelargonium capitatum
Senecio inaequidens
Solanum linnaeanum

It is however the grass layer that differs the most from the leeward slopes. Grasses like *Ammophila arenaria*, *Cymbopogon validus* and *Imperata cylindrical* occurs only on the plateau. Other grass species present are:

Cynodon dactylon
Ehrharta villosa
Eragrostis curvula
Eustachys paspaloides
Lagurus ovatus
Melica racemosa
Melinis repens
Panicum deustum
Setaria sphacelata var torta
Sporobolus africanus
Stenotaphrum secundatum
Themeda triandra

The Restio, *Ischyrolepis leptocladus*, also occur widely in this community.

A firebreak road has recently been constructed along the boundary of the farm. This resulted in an increase of pioneer plants along the road that do not normally occur in the surroundings. Due to the encroachment of alien plants, this area is suitable for development if the sites are carefully selected.

7. **ANIMAL LIFE**

No detailed survey of the fauna were done during the field work phase, but casual observations were done during the visits to the area. No larger mammals were encountered although spoor and dung of antelopes were seen. The general impression is that the occurrence of small antelope is low. Domestic goats were found browsing on the vegetation and several bird species were encountered.

8. **ASSESSMENT OF THE DEVELOPMENT ALTERNATIVES**

It is proposed to protect the majority of the farm as Private Open Space (Open Space Zone III) or a Private Nature Reserve. To be able to manage such a Private Nature Reserve funds are needed and that could only be secured by developing two areas on the farm, to sell the erven and to use these funds to manage the Nature Reserve.

Two different areas are proposed for development:

8.1 **Residential development**

8.2 **Resort development**

8.1 Residential development

The area earmarked for residential development is situated in the south-eastern corner of the farm next to and adjacent to Cape St Francis (**Fig 12 & 13**). It is \pm 8 ha in size. It is proposed to development ordinary residential erven, which will be serviced from Cape St Francis by the Kouga Municipality. From a service delivery point of view, the area seems to be suitable and acceptable for such a development.

In the broad vegetation classification of the area, this portion however falls in the area that was described as Coastal Fynbos (See para. 6.2). In the description of the vegetation it was also stressed that it is the most diverse and pristine vegetation type on the land and that it contains a lot of rare and endangered plant species. A more detailed vegetation survey showed that indeed some of the area is in a pristine state with high biodiversity and a lot of rare and endangered species, but the pure Coastal Fynbos is only restricted to \pm 50 percent of the proposed development footprint (**Fig. 13**). The remainder, although most of the original species still occur, is encroached with alien *Acacia cyclops*. In some areas it occurs to the exclusion of most of the indigenous species.

When considering the area for development the environmental cost of preserving the portion of land, must be weighed up against the potential risk of encroachment by alien biota. Development on this portion of land could therefore be considered on condition that:

- The boundaries of the proposed development area be reconsidered to only include the areas presently encroached by *Acacia cyclops*.
- That the new boundaries be determined with the assistance of a specialist botanist.
- That all rare and endangered plant species that should be encountered on the development footprint be transplanted with the assistance of a vegetation specialist.
- That the detailed layout of erven and provision of bulk services be subjected to environmental authorization.
- That no development be allowed within 100 m from the high water mark of the sea.
- That all alien plants that occur on the property be removed.
- That only indigenous plants be allowed as ornamental plants in gardens and lawns.

8.2 Resort development

The area that is proposed for the Resort development is situated on the far western corner of the farm, is ± 30 ha in size and two possible options for the development are considered:

- Option I: Subdivision of 21 units of ± 5 ha each on which one housing dwelling can be built on a footprint of $\pm 2\,000$ m² (**Fig. 12**).
- Option II: Identification of 32 footprints of $\pm 1\,000$ m² each, rezoned to Resort Zone II and on which one housing dwelling can be built (**Fig. 14**).

In both options the Remainder of the land will be rezoned to Open Space Zone III and managed as a private nature reserve. The proposed site for the development of the resort falls within the area that was described as Dune vegetation (See par 6.3). More specifically, it falls within the section of the Dune vegetation that was described as Leeward slopes and slacks (See par. 6.3.2). The Leeward slopes and slacks is that part of this vegetation type that is most encroached by alien *Acacia cyclops* and *Acacia saligna*.

- Option I: The subdivision of 21 units of ± 5 ha each and the development of a house on a $2\,000$ m² footprint will result in a larger development area that will also involve development on the Seaward slopes and crests (See par. 6.3.1), which are more pristine (**Fig. 15**). Because of the restriction of the footprint to the 5 ha plot, the selection of suitable footprint sites will also be reduced. The proposed size of the footprints will also result in larger areas being cleared.
- Option II The selection of 32 footprints of $\pm 1\,000$ m² will result in a smaller total development area, less impact on the pristine Seaward slopes and crests and better possibilities to select the positions of the footprints on an already disturbed site or encroached environment (**Fig. 15**).

Considering the location of the proposed development in an area that are highly encroached by alien plants, the proposed impact of the resort type development on the vegetation, will be low enough to allow for such a development. Considering the different options for the resort type development, it is clear that the Option II with 32 footprints of $1\,000$ m² each will be the preferred option on condition that:

- The layout plan of the individuals footprints be revised with the assistance of a vegetation specialist.
- The location of access road and provision of internal bulk services be carefully selected to ensure minimum disturbance of pristine vegetation stands.
- That all rare and endangered plants occurring on development sites be identified and transplanted by a specialist botanist.
- That provision be made for a firebreak around the houses within the 1 000 m² footprint.
- That all alien plants that occur on the property be removed.
- That only indigenous plants be allowed as ornamental plants in gardens and lawns.
- That a comprehensive Management Plan be compiled for the management of the Nature Reserve.

9. **FIRE MANAGEMENT PLAN**

One of the terms of reference of this study was to make recommendation for veld fire management on the farm. There are basically two reasons for burning veld. They are:

- To remove moribund and/or unacceptable plant material.
- To eradicate and/or prevent the encroachment of undesirable plant species.

Both these reasons, but especially the second one is applicable to this land.

There are historical evidence that fire played a major role in moulding the vegetation of South Africa. This is also true for the Fynbos vegetation on this farm. It can therefore be concluded that one or other natural fire regime existed for ages in this vegetation in the past and it would be advisable to continue with one or other fire management programme for the area in future.

Recognizing the necessity of a fire management plan for the area and the encroachment by alien plants, it is recommended that one or other fire management plan be implemented. The important considerations for the implementation of such a plan is:

- The frequency of fire (time between successive fires).
- The type of fire (windup, wind-down, crown or basal).
- The intensity of the fire (how high should the temperature be).
- The season of burning (what time of the year to burn).

The floristic composition and growth form of the vegetation indicates that fires did not occur at a frequency of four years or less. It can also

be concluded that it was mainly wind-down fires that burnt at ground level and that the intensity of the fire was very high at ground level. Although the area receives rain almost throughout the year it can be expected that fires would occur more often at the end of the dryer winter period.

In spite of the fact that natural fires occurred in this vegetation type in the past, the encroachment of alien *Acacia cyclops* necessitates the implementation of a fire management plan to assist in getting access to and to successfully eradicate the dense stands of these plants.

To be able to implement a veld burning programme, it is important that scheduled fire treatments should be contained within the boundaries of the farm. To accomplish that, a firebreak system of at least 6 m wide around the perimeter of the farm is required. To allow for refuges for plant seed and small mammals and rodents it is also advisable not to burn the entire farm at one occasion. To accomplish that, the farm needs to be divided into four equal size blocks by means of graded firebreaks. Each of these blocks should then be burnt on rotation over a period of 4 to 8 years. Eradication of alien plants should then be concentrated on the recently burnt block.

Care should be taken to protect housing infrastructure from damage during a rotational fire programme. The entire proposed Residential development should be surrounded by a firebreak and the individual footprints in the proposed Resort development should provide for a firebreak as part of the area of the footprint.

The following fire management plan is recommended:

- a) A firebreak of 6 m wide should be created and maintained on the boundary of the property.
- b) The property should be divided into 4 more or less equal size blocks by means of graded firebreaks of 6 m wide and maintained throughout the year.
- c) The proposed Residential development area should be protected against fires by means of a firebreak.
- d) A firebreak should be included as part of the area of the footprint in the proposed Resort development.
- e) Each block should be burnt in rotation every 4 to 8 years during the late winter (August/September).
- f) Alien plant control programmes should be concentrated on the block that was burnt the most recent.
- g) Time of day and wind velocity and direction should be used to regulate the intensity and type of fire.
- h) According to the Regulations, notice of intension to burn the area should be given to all neighbours.
- i) Use should be made of existing roads as far as possible in creating the firebreak network.
- j) That a comprehensive Management Plan be compiled for the management of the Nature Reserve.

10 **CONCLUSIONS AND RECOMMENDATIONS**

10.1 **Conclusions**

Based on the survey of the vegetation of the Farm Ongegunde Vryheid, it can be concluded that the majority of the vegetation is in a pristine and healthy condition and that the creation of a large portion of the farm as a Nature Reserve, will contribute substantially towards the conservation of biodiversity in the region. Although the Coastal Fynbos is mainly in a good condition, the Dune vegetation and especially the Leeward slopes and slacks are subjected to severe alien plant encroachment sometimes to the exclusion of the indigenous vegetation.

The cost to eradicate the alien plants will be enormous and the environmental cost to develop a portion of the farm to ensure the conservation of the remainder of the area, must be measured against the potential environmental loss due to alien plant encroachment. It can therefore be concluded that limited development of the land is acceptable on condition that it be mainly located in areas where serious alien plant encroachment is already evident.

Fire played an important role in shaping the vegetation of the area and therefore the exclusion of fire from the farm might be unwise and counterproductive. Implementing a rotational burning programme to the land will not only ensure the productivity of the vegetation, but will also facilitate the implementation of alien plant control programmes.

10.2 **Recommendations**

10.2.1 **Residential development**

It is recommended that the proposed Residential development in the south-eastern corner of the farm be allowed on condition:

- 10.2.1.1 That the boundaries of the proposed development area be reconsidered to include only the areas that are encroached with *Acacia cyclops*.
- 10.2.1.2 That the boundaries be determined with the assistance of a specialist botanist.
- 10.2.1.3 That all rare and endangered plant species that should be encountered on the development footprint should be

- transplanted with the assistance of a vegetation specialist.
- 10.2.1.4 That the detailed layout and provision of bulk services be subjected to environmental authorization.
 - 10.2.1.5 That no development be allowed within 100 meters from the high water mark of the sea.
 - 10.2.1.6 That all alien plants should be eradicated.
 - 10.2.1.7 That only indigenous plants should be allowed in gardens.

10.2.2 Resort development

Based on the layout, subdivision, extent and impact of the proposed Resort development, it is recommended that Option II should be the preferred option, where 32 footprints of 1 000 m² will be established in a cluster in the south-western area of the farm. The development should be allowed under the following conditions:

- 10.2.2.1 That the layout plan of the individual footprints be revised with the assistance of a vegetation specialist.
- 10.2.2.2 That the location of access roads and the provision of internal bulk services be carefully selected to ensure minimum disturbance of pristine vegetation stands.
- 10.2.2.3 That all rare and endangered plants occurring on development sites be identified and transplanted by a specialist botanist.
- 10.2.2.4 That provision be made for a firebreak around the houses inside the 1 000 m² footprint.
- 10.2.2.5 That all alien plants that occur on the property be removed.
- 10.2.2.6 That only indigenous plants be allowed as ornamental plants in gardens and lawns.
- 10.2.2.7 That a comprehensive Management Plan be compiled for the management of the Nature Reserve.

10.2.3 Fire Management

It is recommended that a rotational fire management programme be implemented in order to keep the vegetation in a productive state and to facilitate the eradication of alien plants on the entire proposed nature reserve. The following conditions will prevail:

- 10.2.3.1 A firebreak of 6 m wide should be created and maintained on the boundary of the property.
- 10.2.3.2 The property should be divided into 4 blocks of more or less equal size blocks, by means of graded firebreaks of 6 m wide and maintain throughout the year.
- 10.2.3.3 The proposed residential development area should be protected against fires by means of a firebreak.
- 10.2.3.4 A firebreak should be provided as part of the area of the footprint in the proposed resort development.
- 10.2.3.5 Each block should be burnt in rotation every 4 to 8 years during the late winter (August/September).
- 10.2.3.6 Alien plant control programmes should be concentrated on the block that was burnt the most recent.
- 10.2.3.7 Time of day and wind velocity and direction should be used to regulate the intensity and type of fire.
- 10.2.3.8 According to the Regulations, notice of intension to burn the area should be given to all neighbours.
- 10.2.3.9 Use should be made of existing roads as far as possible in creating the firebreak network.
- 10.2.3.10 That a comprehensive Management Plan be compiled for the management of the Nature Reserve.

11. **ACKNOWLEDGEMENTS**

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PLANTS COLLECTED ON ROCKY COAST FARM
KAAP ST FRANCIS

Woody plants

Scientific name	Common name
<i>Acacia cyclops</i>	Red eye/Rooikrans
<i>Acacia saligna</i>	Port Jackson
<i>Agathosma stenopetala</i>	False Buchu/Basterboegoe
<i>Aloe africana</i>	Aloe/Aalwyn
<i>Anthospermum aethiopicum</i>	-
<i>Azima tetracantha</i>	Needle bush/Byeangel
<i>Brachylaena discolor</i>	Coastal silver oak/Kusvaalbos
<i>Carissa bispinosa</i>	Forest num-num/Bosnoemnoem
<i>Cassine peragua</i>	Cape saffron/Bastersaffraan
<i>Chrysanthemoides monilifera</i>	Bush-tick berry/Bietou
<i>Cussonia thyrsoiflora</i>	Cape coast cabbage/Kaapse
<i>kuskiepersol</i>	
<i>Diospyros dichrophylla</i>	Common star-apple/Gewone
sterappel	
<i>Euclea natalensis</i>	Natal quarri/Natalghwarrie
<i>Euclea racemosa</i>	Sea quarri/Seeghwarrie
<i>Grewia occidentalis</i>	Cross-berry/Kruisbessie
<i>Gymnosporia buxifolia</i>	Common spikethorn/Gewone pendoring
<i>Gymnosporia elliptica</i>	-
<i>Lauridia tetragona</i>	Climbing saffron/Ranksaffraan
<i>Maytenus procumbens</i>	Dune koko tree/Duinekokoboom
<i>Metalasia muricata</i>	White bristle bush/Blombos
<i>Morella cordifolia</i>	Candle berry/Glashout
<i>Morella quercifolia</i>	Maagpynbossie
<i>Myrica cordifolia</i>	Waxberry/Basbessie
<i>Mystroxydon aethiopicum</i>	Kooboo-berry/Koeboebessie
<i>Nylandtia spinosa</i>	Tortoise berry/Skilpadbessie
<i>Olea exasperata</i>	Dune olive/Duine-olienhout
<i>Osyris compressa</i>	Cape sumach/Pruimbas
<i>Passerina rigida</i>	Dune gonna/Duingonna
<i>Passerina vulgaris</i>	“ “
<i>Phylica littoralis</i>	Hard leaf/Hardeblaar
<i>Psydrax obovatum</i>	Quar/Kwar
<i>Pterocelastrus tricuspidatus</i>	Candlewood/Kershout
<i>Rapanea gilliana</i>	Cape beech/Kaapse boekenhout
<i>Rhamnus prinoides</i>	Dogwood/Blinkblaar
<i>Rhus crenata</i>	Dune Crow-berry/Duinekraabessie
<i>Rhus glauca</i>	Blue kuni-bush/Bloukoeniebos
<i>Rhus lucida forma scoparia</i>	Glossy currant/Blinktaai-bos
<i>Ricinus communis</i>	Custard oil bush/Kasterolieboom
<i>Robsonodendron maritimum</i>	White silky bark/Witsybas
<i>Salvia africana-lutea</i>	Dune salvia/Geelblomsalie
<i>Schotia afra var afra</i>	Karoo boer-bean/Karoo-boerboom

Scutia myrtina
Sideroxylon inerme
Tarchonanthus littoralis
Zanthoxylum capense

Cat-thorn/Katdoring
White milkwood/Witmelkhout
Camphor bush/Kamferbos
Small knobwood/Kleinperdepram

Herbaceous plants

Asparagus africanus
Asparagus racemosus
Boophone disticha
Brunsvigia gregaria
Brunsvigia littoralis
Carpobrotus deliciosus
Cassytha ciliolate
Centella asiatica
Centella hermaniifolia
Chironia baccifera
Chironia melampyrifolia
Conyza scabrida
Cotula mariae
Cotyledon adscendens
Cotyledon orbiculata
Crassula orbicularis
Cynanchum natalitium
Cynoglossum lanceolatum
Delosperma cf patersonea
Delosperma echlonis
Delosperma litorale
Felicia echinata
Gasteria ascinascifolia
Gazania rigens var uniflora
Gladiolus spp
Gomphocarpus fruticosus
Haemanthus sanguineus
Hebenstretia integrifolia
Helichrysum terethifolium
Helichrysum cymosum
Hermannia flammea
Hibiscus trionum
Indigofera tomentosa
Jamesbrittenia microphylla
Lachenalia algoensis
Lessertia sp
Limonium scabrum
Lobelia zwartkopensis
Muraltia squarrosa
Othonna rufibarbis
Pelargonium capitatum
Polygala ericaefolia

Rhynchosia caribaea
Senecio elegans
Senecio inaequidens
Sida rhombifolia
Solanum linnaeanum
Syncarpa sordescens
Tephrosia capensis
Tetragonia fruticosa
Thesidium fragile
Triglochin cf striata
Zygophyllum uitenhagense

Grasses

Ammophila arenaria
Brachiaria chusqueoides
Cymbopogon validus
Cynodon dactylon
Ehrharta calycina
Ehrharta villosa
Eragrostis curvula
Eustachys paspaloides
Imperata cylindrica
Lagurus ovatus
Melica racemosa
Melinis repens
Panicum deustum
Setaria sphacelata var torta
Sporobolus africanus
Sporobolus virginicus
Stenotaphrum secundatum
Themeda triandra
Thinopyrum distichum

Cyperaceae and Restio's

Cyperus sp
Ischyrolepis eleocharis
Ischyrolepis leptocladus
Juncus kraussii
Scirpus nodosus

Endemic Taxa

Brunsvigia litoralis
Cotyledon adscendens
Gymnosporia elliptica
Lobelia zwartkopensis
Rapanea gilliana



Fig. 1. Locality of the Farm Ongegunde Vryheid.



Fig. 2. Silcrete rock outcrops close to the shore.



Fig. 3 Shell middens are present in the soil close to the sea.



Fig. 5. Classification of the different vegetation units

6.1 Seashore vegetation
6.3 Dune vegetation

6.2 Coastal Fynbos
6.4 Secondary dune plateau vegetation



Fig. 6. Stand of moist Seashore vegetation.



Fig. 7. The Coastal Fynbos in its pristine state.



Fig. 8. The Seaward slopes are less dense and wind pruned.



Fig. 9. The Leeward slope's vegetation is denser and higher.



Fig. 10. The transition of the vegetation on the Crests and the Leeward Slopes are very sharp.



Fig. 11. The Secondary plateau vegetation is seriously encroached with *Acacia cyclops*. *Passarina rigida* occurs in the front.



Fig. 12. Map indicating the proposed Residential development and Option I of the Resort development sites.



Fig. 13 Detailed vegetation of the proposed Residential development.

1. Pure stands of Coastal Fynbos.
2. Coastal Fynbos encroached by *Acacia cyclops*.

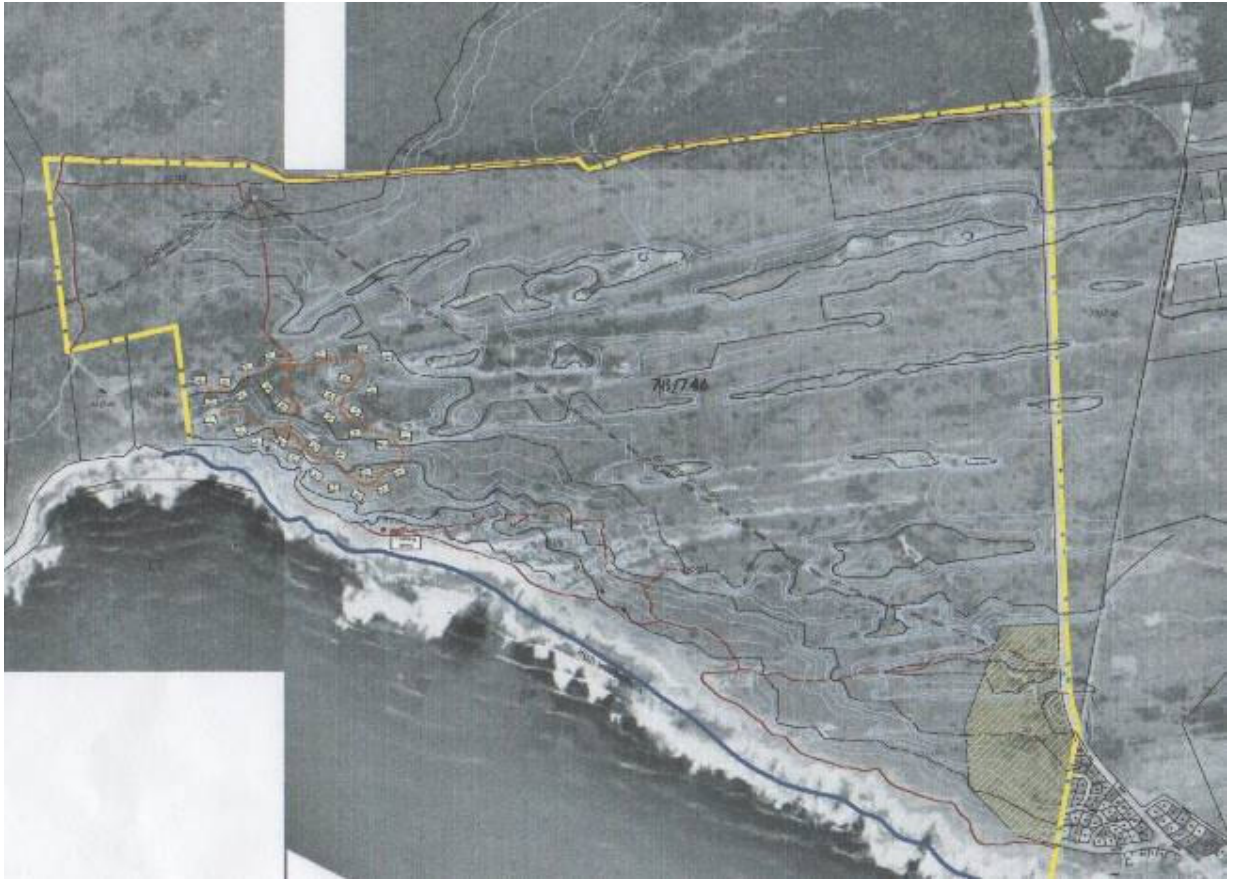


Fig. 14 Map of the proposed Resort Option II and the Residential development sites.



Fig. 15. Detailed vegetation of the proposed area for the Resort development.

- 6.3.1 Seaward slopes and crests
- 6.3.2 Leeward slopes and slacks