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Environmental Surveys and Management Programs

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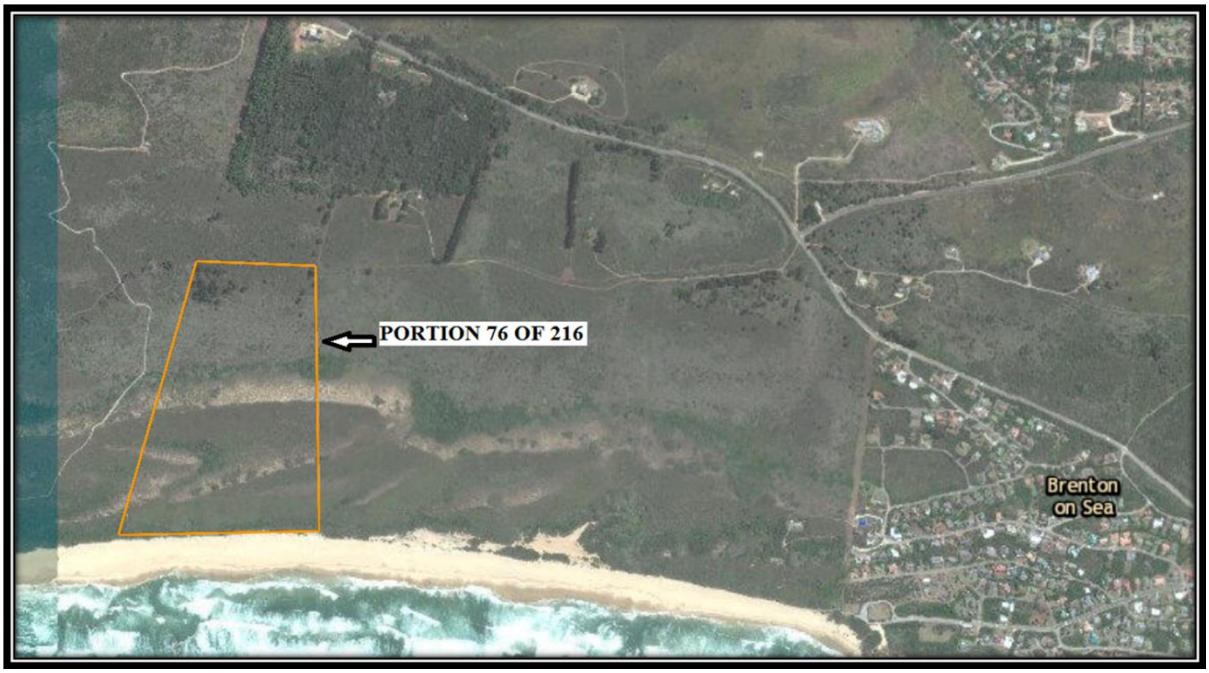
VEGETATION SENSITIVITY ANALYSIS
Portion 76 of the Farm Uitzicht No. 216 , Knysna



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Limitations of the study

Botanical surveys based upon a limited sampling time period, may not reflect the actual species composition of the site due to seasonal variations in flowering times. Additionally Fynbos composition may vary depending on maturity or time since last burn.

Author

The author (Dr. Colleen Ebersohn) has a PhD degree in Botany, specializing in Ecology and Vegetation Science. The author has 25 years of experience related to environmental management practices.

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1. PROJECT DESCRIPTION AND TERMS OF REFERENCE

1.1 Project Description

Portion 76 of the Farm Uitzicht No. 216 is situated within the Knysna Municipal Area and is located on the southern slope between Brenton on Sea and Buffalo Bay.

The property is currently vacant and has an agricultural zoning. The owner intends to construct two single residential dwelling on the property.

The slope analysis indicated two possible positions for the proposed residential dwellings on the property.

1.2 Terms of Reference

Enviro-Prac Environmental Consultancy has been appointed as independent biodiversity specialist by the applicant, Dr. H. Swart, to compile a Vegetation Sensitivity Analysis Report pertaining to the two proposed residential dwelling sites on Portion 76 of the Farm Uitzicht No. 216, Knysna. An onsite meeting was conducted on 19/04/2017.

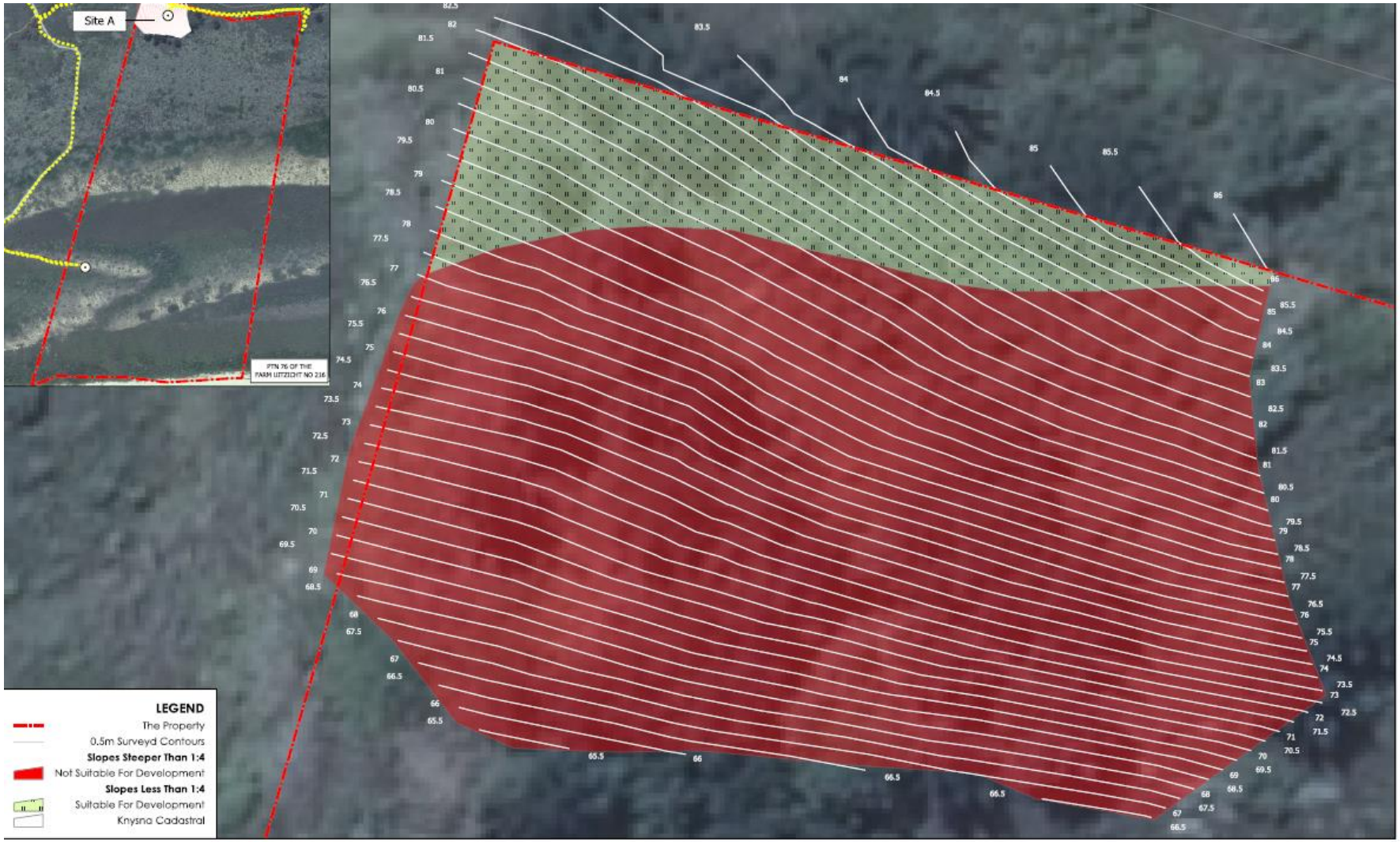
The Terms of Reference guides the scope of work for the specific report. An overview of the current vegetation classification (using VegMap, GRI and Western Heads Vegetation Survey) is given, which describes the dominant vegetation units that would naturally occur on the sites. The Ecological status on the sites and the state of transformation, was determined (using RSA Threatened Ecosystem List according to Section 52 of NEM:BA and the Conservation Planning Report of Critical Biodiversity Areas of the Garden Route).

A list of Species that could in all possibility occur on the site was compiled according to VEGMAP and the conservation status of the plant species was determined according to the Red Data List of South African Plants.

1.3 Cognisance is taken of the following situations

- In terms of the section 52 of the National Environmental Management: Biodiversity Act, (Act No. 10 of 2004) **Knysna Sand Fynbos** a threatened ecosystem occurs on the site, with an ecosystem status of **critically endangered.**
- In terms of the Garden Route Initiative Fine Scale Planning Map *"Critically Biodiversity Areas (CBA)"* occur on the site.
- The size of the property is 21.01 Ha in size.
- The size of the area that has been transformed is 1.13 Ha as a result of old Pine Plantation on the property. Therefore 5.37% of the property has been transformed; the remaining 94.63% of the property consists of intact indigenous vegetation.
- The proposed residential areas (access, dwellings and surrounding areas) will have a combined foot print of approximately 2500 m^2 (0.25 Ha) in size, this constitutes 1.18% of the property..
- After rehabilitation of the transformed area > 99% of the property will be in a pristine condition.

- The presence of an ecotone: transitional zone between the Sea shore and the frontal dune system - this area will not be affected by the proposed development.
- The constraints as identified during the site meeting of 19/04/2017.



PORTION 76 OF THE FARM UITZICHT NO 216

SLOPE ANALYSIS: SITE A

Projection: Transverse Mercator
Centre Lon: 23°00'08" E
Centre Lat: 34°03'57" S
Created: 2017/03/16
Scale: 1:350

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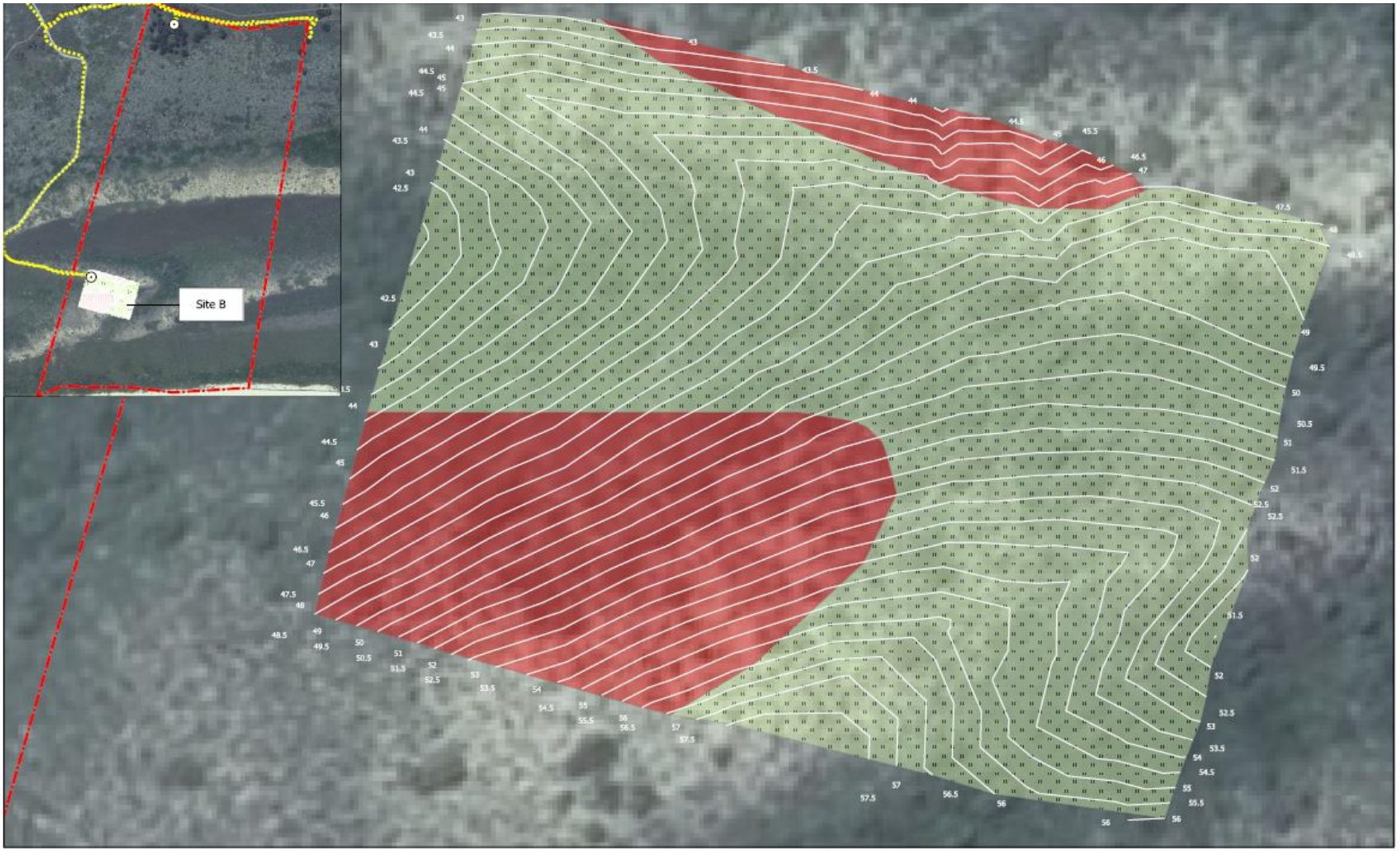

PORTION 76 OF THE FARM
UITZICHT NO 216

SLOPE ANALYSIS: SITE B

Projection: Transverse Mercator
Centre Lon: 23°00'04" E
Centre Lat: 34°04'12" S
Created: 2017/03/16
Scale: 1:370

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1.4 The Garden Route Initiative Fine Scale Conservation Map

"*The vegetation of the ca. 615 000 ha domain of the Garden Route Initiative was classified and mapped at a scale of 1:50 000 in order to develop surrogate biodiversity units to facilitate to development a conservation plan for the domain.*

The vegetation was mapped as untransformed units, as it was perceived to be before European settlement in the region. This proved to be a great challenge as vast areas have been altered to such an extent that only a few remnant patches of vegetation still remain in certain areas.

A classification system that follows a four-tier hierarchy was developed. This facilitates analyses at three different scales, at biome, habitat type and vegetation unit level.

Aquatic and terrestrial systems are recognized, with three aquatic biomes and six terrestrial biomes recognized in the area. Aquatic ecosystems cover more than 13 percent of the surface area, clearly indicating how prominent they are in the domain.

A total of 39 habitat types are recognized; six of these are aquatic habitat types. Descriptions and a photograph are provided for each habitat type.

At the vegetation unit level, 86 units are recognized, 15 in the aquatic ecosystems and 71 in the terrestrial ecosystems. Diagnostic descriptions are provided for each vegetation unit".

1.5 Limitations of the CBA Map

"*Although electronically possible these maps should not be used beyond a scale of 1:50 000. Zooming beyond this level will result in inaccuracies.*

Field mapping was done on hard copy satellite images printed at a scale of approximately 1: 30 000. We believe that field accuracy of the maps is in the order of 100 meter from mapped boundaries, but distortion in the satellite images may result in reduced accuracy in certain areas.

Users should keep the original purpose of this map in mind, to develop a regional conservation plan. This vegetation map is not suitable for small-scale (< 1:50 000) studies or managerial plans.

The vegetation units we recognize and their boundaries are not compatible with those of Mucina and Rutherford (2006), as their map is intended to function at a much larger scale (1: 1 000 000). We do agree conceptually at the higher order level (biome), but differ in many aspects at the lower levels of the classification". (Vlok, et al Unpublished 1:50 00 maps and Report)

The aim of the desktop assessment is to investigate and report on the current ecological status of the site with regard to the terrestrial habitats that occur on the property.

1.6 The following parameters have been assessed:

Ecological Status (Perceived and Present)
Ecological Functionality (Habitat Integrity, Fragmentation, Transformation)
Ecological Rehabilitation Potential

2. METHODOLOGY

A desktop study was done, taking into account all of the available Conservation Planning documents. A literature study was undertaken using the relevant literature as well as other applicable information. A site visit and *in situ* evaluations were carried out.

2.1 Relevant Legislation and Policy Documents

Section 52 the National Environmental Management: Biodiversity Act (Act 10 of 2004), (NEM: BA); National Environmental Management Act (Act No. 107 of 1998);

Please note that a declaration of independence has to be made by the specialist consultant, as determined by the Environmental Conservation Act, (Act 73 of 1989).

2.2 Desktop Studies

- Identification of RSA Vegetation Types
- Identification of RSA Ecosystem Status
- Identification of GRI Vegetation Types
- Identification of GRI Ecosystem Status
- Identification of Critical Biodiversity Areas
- Identification of Western Heads Vegetation Types
- Western Heads Vegetation Map
- Western Heads Ecological Condition
- Western Heads Conservation Status
- Correlation with Red Data Species Lists and the Vegetation Survey
- Geology and Soils
- Soil Erodability
- Slope Analysis
- Transformed Areas

2.3 Ecological Status and Vegetation Sensitivity

- Ecological Status and Vegetation Sensitivity: Present Ecological Status.

- Ecological Status and Vegetation Sensitivity: Perceived Reference State as per Vegetation Descriptions.

2.4 Present Ecological Status of Portion 76 of the Farm Uitzicht No. 216

Aspect	Description
Landscape Description	
Aspect, Slope, Topography	Sloping terrain ranging from relative steep drop from the northern boundary, undulating dune system to the Sea shore between Brenton on Sea and Buffalo Bay. The property has a predominantly southern aspect.
Substrate	Deep, acid Tertiary sand inland of coastal dunes forming regic sands and soils of Lamotte form (*Mucina & Rutherford).* The grey regic soils are of a sandy nature, typical of these podzolized dunes. The Geology is fixed dunes and dune rock.
Community Description	
Vegetation units	<u>RSA Vegetation Classification:</u> Knysna Sand Fynbos (FFd10) Southern Cape Dune Fynbos (FFd11) Cape Sea Shore Vegetation (Azd3) <u>GRI Vegetation Classification:</u> Hoogekraal Sandplain Fynbos Wilderness Forest Thicket Sedgefield Sandplain Fynbos Hartenbos Primary Dune <u>Western Heads Vegetation Classification:</u> Fore Dune Primary Dune and Cliff Fynbos Primary Dune Slack Fynbos Arid Dune Fynbos Brenton Dune Fynbos Goukamma Dune Thicket Moist Dune Fynbos
Vegetation Cover (%)	± 95 % Cover: Indigenous Vegetation. ± 5% Cover: Pine Trees
Transformed Area (%)	± 5 % - as a result of previous Pine Plantation / invasion.
Habitat fragmentation	Very Low
Invasive Alien Plants	Very Low

Aspect	Description
Relative remaining intact habitat:	95 % of the property is in a pristine to near pristine condition.
Grazing (livestock)	None evident
Hunting	None evident
Conservation (flora)	No formalized conservation, the Western Heads Vegetation Sensitivity Analysis Report by Dr. J. Vlok indicated the property to be within the conservation area.
Wetlands	None
Recreational (sport)	None
Sensitivities	
Conservation importance	Very High
Topography	Predominantly a southern aspect
Rehabilitation potential	The invasive Pine trees must be removed and follow on invasive species control carried out. Currently approximately 5 % of the property has been transformed the remainder is in a pristine to near pristine condition.
Community structure	Largely intact
Patterns of Biodiversity	
Flora	Approximately 95% Indigenous Vegetation, with a 5 % transformed area the north eastern corner of the property due to invasive Pine species.
Indigenous Species of Special Concern	*Erica chloroloma (VU);* *Erica glandulosa ssp. fourcadei (VU);* *Erica glumiflora (VU);* *Gladiolus vaginatus (VU);* *Pentaschistis barbata subsp. orientalis barbata ssp. orientalis (CR);* *Satyrium princeps (VU)*
Alien invasion	Low - in the north eastern corner of the property due to invasive Pine species.
Ecological Processes	
Barriers to gene dispersal	None

Aspect	Description
Corridors for gene dispersal	Along the dune slacks, ecotone and across the property as the property is bordered on the western, northern and eastern sides by adjacent properties in largely the same ecological condition.
Community Structure	Largely intact
Coastal dunes	Present on site.
Climatic gradients	Ecotone present on the site
Riparian Vegetation	None
Refugia	No rocky outcrops present on the site
Fire	Important for the maintenance of the Fynbos vegetation types.
Ecotones/Tension zones	Present between the Sea shore and the adjacent terrestrial habitat.
Erosion	High especially on the steep slopes.
Carbon storage	Fynbos vegetation communities have a low carbon storage capacity.
Medicinal plants	Medicinal plant species could occur on site.
Food	The value of the study area as a source of food is expected to be moderate from a wild life perspective.
Fuel wood (availability)	Invasive Pine trees can be harvested.
Building materials	None
Grazing	Important for the wild life in the area.
Conservation importance	
Current Distribution (extent)	Knysna Sand Fynbos is classified as "**Critically Endangered**" according to NEM:BA list of threatened Ecosystems.
Relative Conservation importance (local)	Intact Knysna Sand Fynbos has a High Importance value.
Relative Conservation importance (regional)	Intact Knysna Sand Fynbos has a High Importance value.

3. VEGETATION DESCRIPTIONS AND CLASSIFICATIONS

3.1 General Vegetation Description

The vegetation of the site falls within the Cape Floral Kingdom, one of six such plant kingdoms in the world. This kingdom has over 9 000 plant species, 70% of which grow nowhere else in the world (i.e. they are endemic to the Kingdom) (Cowling and Heijnis, 2001). The Kingdom has the highest known concentration of Red Data Book (threatened) species in the world (Cowling and Hilton-Taylor, 1994) although the occurrence of these species is lower in the eastern part of the Kingdom.

Fynbos is generally characterised by three elements: the tough, wiry restioids (Cape Reeds) form the graminoid (grass-like) layer; the heath component is composed of small, narrow-leafed shrubs (the most famous examples are the Ericas); the proteoid component of proteas, cone-bushes and pin-cushions (Campbell & Sigonyela, 2001). The dominant component of the Mosaic is a Grassy Fynbos community. In Grassy Fynbos, true grasses largely replace the restioids although several species of Restios are still found. The grasses are common, widespread species that are fairly drought-hardy (C^4 grasses).

3.2 Classification of Vegetation Types on the Property

According to the Vegetation of Southern Africa, Lesotho and Swaziland **(VEGMAP)** (*Mucina & Rutherford*) classification, the following vegetation types occur on the property:

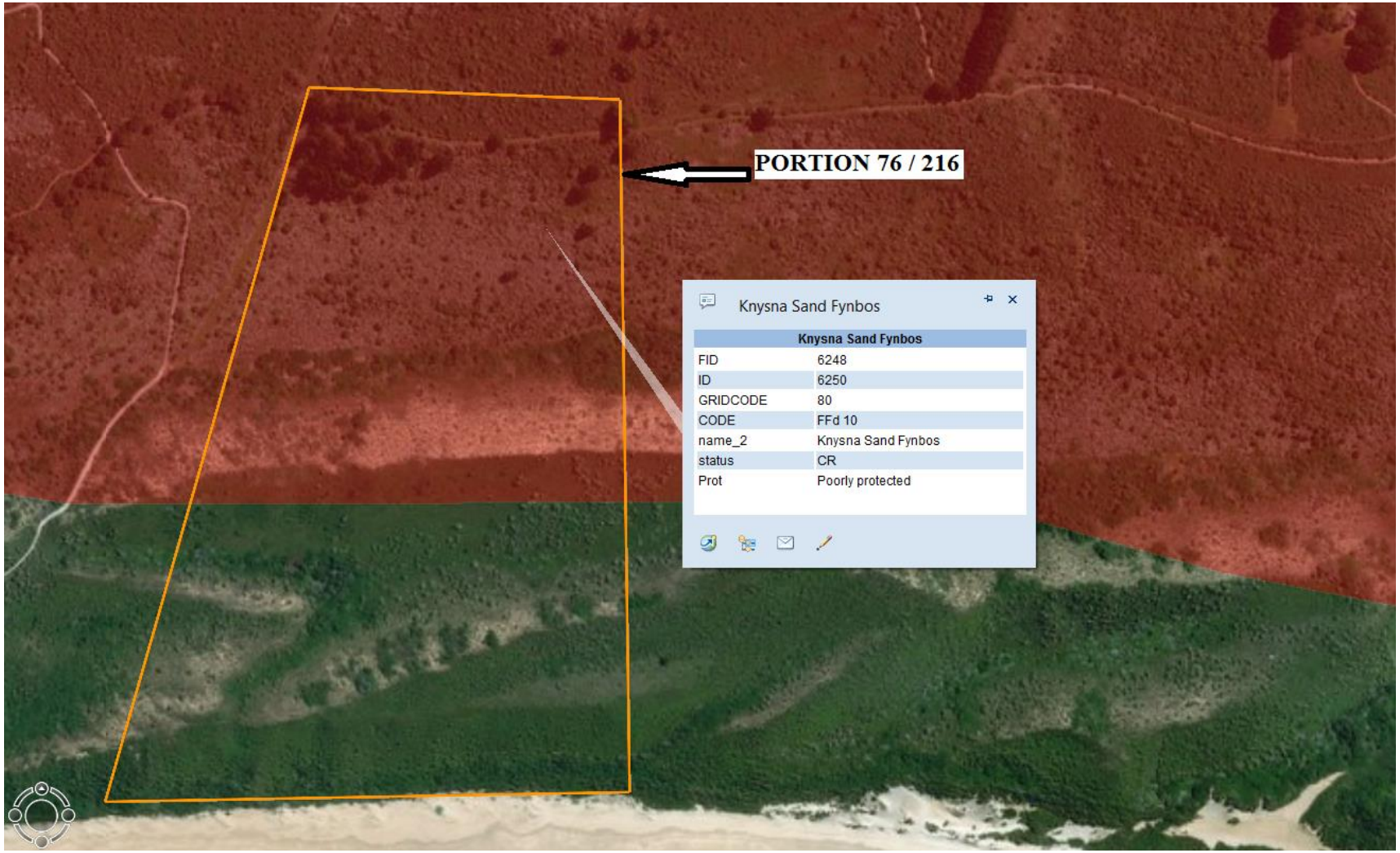
Vegetation Type	Ecological Status
FFd 10 Knysna Sand Fynbos	Critically Endangered
FFd11 Southern Cape Dune Fynbos	Least Threatened
Azd3 Cape Sea Shore Vegetation	Least Threatened

According to the Critical Biodiversity Areas of the Garden Route *Conservation Planning Report 2010 (Holness et al)* **(GRI)** the following vegetation types occur on the property:

Vegetation Type	Ecological Status
Hoogekraal Sandplain Fynbos	Critically Endangered
Wilderness Forest Thicket	Vulnerable
Sedgefield Thicket-Fynbos	Least Threatened
Sedgefield Sandplain Fynbos	Least Threatened
Hartenbos Primary Dune	Least Threatened

According to the Natural Vegetation of the Western Heads (Knysna), Notes on its Ecological Sensitivity and Proposed Future Development. (**Western Heads Vegetation Classification)** *(Regalis Environmental Consultancy – J. Vlok)* the vegetation on the property is identified as:

Vegetation Type	**Ecological Status of Western Heads Area as Surveyed by Dr J. Vlok**			
	Transformation of Western Heads Area			**Total Area**
	Severe	**Moderate**	**Pristine**	**Size (ha)**
Fore Dune	0.0%	31.6%	68.4%	14.8
Primary Dune and Cliff Fynbos	7.2%	60.5%	32.4%	121.7
Primary Dune Slack Fynbos	0.0%	0.0%	100%	49.8
Arid Dune Fynbos	5.7%	5.6%	88.7%	52.8
Brenton Dune Fynbos	0.0%	0.4%	99.6%	37.7
Goukamma Dune Thicket	10.1%	24.2%	65.7%	52.0
Moist Dune Fynbos	2.2%	55.3%	42.6%	225.3



SECTION 52 OF NEM:BA (THREATENED ECOSYSTEMS)

According to Section 52 of the National Environmental Management: Biodiversity Act (NEM:BA) this vegetation type **Knysna Sand Fynbos** is classified as **Critically Endangered**.

Ecosystem Status of Knysna Sand Fynbos according to the NEM:BA.

National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act No. 10 of 2004)
National List of Ecosystems that are threatened and in need of protection, in terms of Section 52 of the NEM:BA.

Vegetation Type: Knysna Sand Fynbos (code: FFd 10 – VEGMAP)

Listed as Critically Endangered Criterion A1

Criterion A1: Irreversible loss of Natural Habitat

"Land cover categories that were considered to represent outright loss of natural habitat were cultivated areas, forestry plantations, mines and quarries, and urban or built-up areas" (*Government Gazette No. 34809, 9 December 2011*).

This criterion identifies ecosystems that have undergone loss of natural habitat, impacting on their structure, function and composition. Loss of natural habitat includes outright loss, for example the removal of natural habitat for cultivation, building of infrastructure, mining etc., as well as severe degradation. For this purpose, habitat is considered severely degraded if it would be unable to recover to a natural or near-natural state following the removal of the cause of the degradation (e.g. invasive aliens, over-grazing), even after very long time periods.

For the current phase of listing, Criterion A 1 has been applied to ecosystems defined as national vegetation types in the South African Vegetation Map 18 or as national forest types recognised by DAFF . The thresholds for this criterion are based on the biodiversity targets developed In the National Spatial Biodiversity Assessment (NSBA) 2004. The biodiversity target for a vegetation type is the proportion of the original extent of the vegetation type required to conserve the majority of species associated with that vegetation type.

It is expressed either as a percentage of the original extent of the vegetation type or in hectares. Biodiversity targets for national vegetation types range from 16% to 36%, with higher targets for more species rich vegetation types. For example, a species rich vegetation type with an original extent of 10 000ha could have a biodiversity target of 30% or 3 000ha.

An ecosystem is categorised as critically endangered if the extent of remaining natural habitat in the ecosystem is less than or equal to its biodiversity target. This threshold indicates a loss of species and change in species composition within the ecosystem. For example, a 1 0 000ha ecosystem with a biodiversity target of 30% would be categorised as critically endangered If 3 000ha or less of the ecosystem remained in a natural state (or conversely if more than 7 000ha of the original extent of the ecosystem had been lost).

An ecosystem is categorised as endangered if the extent of remaining natural habitat in the ecosystem is less or equal to than its biodiversity target plus 15%. This threshold provides a buffer for critically endangered ecosystems. For example, the 1 0 000ha ecosystem with a

biodiversity target of 30% would be categorised as endangered If 4 500ha (45%) or less of the ecosystem remained in a natural state.

An ecosystem is categorised as vulnerable If the extent of remaining natural habitat in the ecosystem is less than or equal to 60% of the original extent of the ecosystem. This threshold indicates a loss of ecosystem functioning. For example, a 10 000ha ecosystem would be categorised as vulnerable if 6 000ha or less of the ecosystem remained in a natural state.

Note that while the Criterion A thresholds for critically endangered and endangered ecosystems varies depending on the biodiversity target for the ecosystem, the threshold for vulnerable ecosystems is independent of the biodiversity target.

For future phases, it may make sense to apply this criterion to recognised vegetation sub-types as well as to national vegetation types. However, an agreed method for Identifying vegetation sub-type and processes for recognising them would be pre-requisites for this.

Biodiversity targets are calculated based on the species-area curve method (Desmet, P. & Cowling, R. 2004. Using the species-area relationship to set baseline targets for conservation. Ecology and Society)

The systematic biodiversity plan for the forest biome Included targets for national forest types. However, these targets were not set using the species-area curve method developed In the NSBA 2004. For the purpose of listing ecosystems, the biodiversity targets for national forest types were revised using the species-area curve method.

The spatial analysis for this criterion used the best available land cover data. For Free State, Limpopo, North West and Northern Cape the best available land cover data was provided by combining the National Land Cover (NLC) 2000 and the NLC 1996. Eastern Cape, Gauteng, KwaZulu-Natal, Mpumalanga and Western Cape had land cover data layers that improved on the NLC 2000 and NLC 1996. These improved data layers were clipped into the combined NLC 2000 and NLC 1996 to make a new "mosaic" national land cover layer that represented the best available land cover data for the country.

Land cover categories that were considered to represent outright loss of natural habitat were cultivated areas, forestry plantations, mines and quarries, and urban or built-up areas. Information on severe degradation was included where available; however, degradation has to date been poorly mapped in South Africa, and distinctions between moderate and severe degradation are usually not made in available spatial information.

National Red List Categories

South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. This scientific system is designed to measure species' risk of extinction. The purpose of this system is to highlight those species that are most urgently in need of conservation action.

Due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. Because the Red List of South African plants is used widely in South African conservation practices such as systematic conservation planning or protected area expansion,

we use an amended system of categories designed to highlight those species that are at low risk of extinction but of conservation concern.

Global and national (regional) assessments

The IUCN Red List categories and criteria are designed to be applied to the entire, or global, range of a species. Such assessments, which take into account the world-wide distribution range of a species, are known as global assessments and are included in the IUCN's international Red List of Threatened Species.

However, the system also allows for assessments of geographical subsections of a species' global range. Such subsections are typically marked by a human-defined boundary, such as a country of provincial border. The assessments of such subsections are known as regional assessments, and use the same set of criteria as global assessments. However, if a species is not endemic to the region, the regional assessment procedures contain an additional step to adjust the regional status to allow for the impact of individuals moving between populations within and outside the region on the extinction risk of the species within the region.

The assessments contained in the Red List of South African plants are regional assessments, also called national assessments. This means that if a plant species is not endemic to South Africa, only that part of the species' distribution range falling within South Africa was evaluated in the assessment. Therefore a species' status on the national Red List may differ from its global status on the IUCN Red List. Where category adjustments were made according to regional assessment procedures, the adjusted status is indicated by the category abbreviation followed by an asterisk (*).

Definitions of the national Red List categories

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

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

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

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

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

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

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

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

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

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

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

The four South African criteria are as follow:

- Restricted range: Extent of Occurrence (EOO) <500 km^2, OR
- Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km^2, OR
- Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR
- Small global population: Less than 10 000 mature individuals.

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

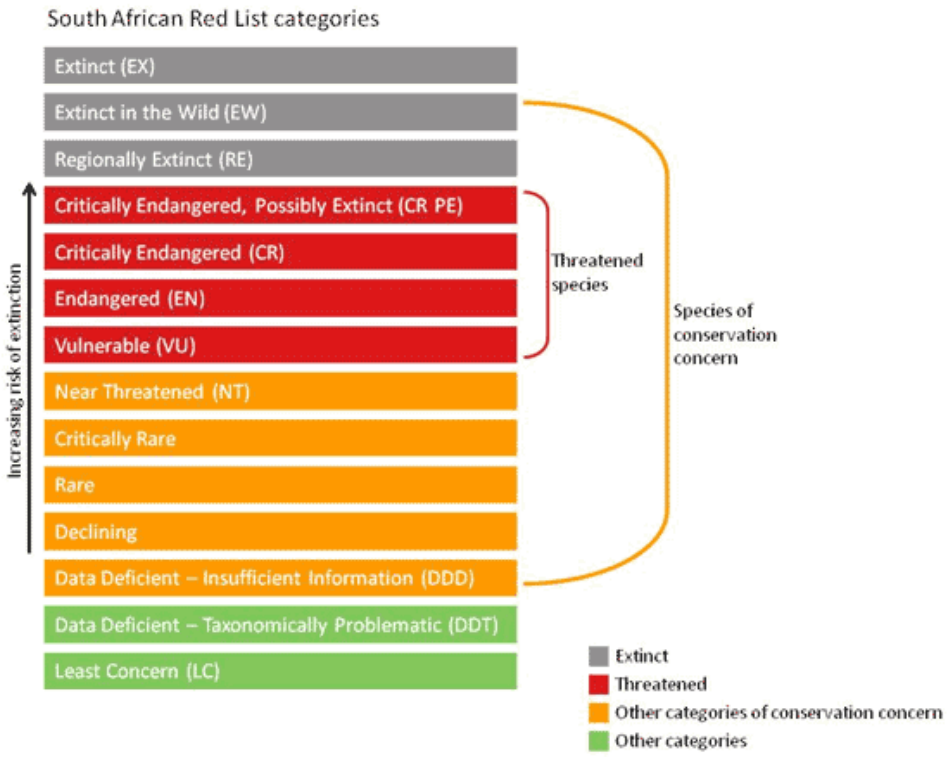
Data Deficient - Insufficient Information (DDD)
A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that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

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

Not Evaluated (NE)
A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status.

However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Threatened Species and Species of Conservation Concern



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

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

3.3 Vegetation Descriptions

3.3.1 VEGMAP Vegetation Descriptions

(Mucina, L., & Rutherford, M. 2006. The Vegetation of South Africa, Lesotho and Swaziland. Pretoria: South African Biodiversity Institute. Strelitzia 19.)

FFd 10 Knysna Sand Fynbos

Distribution

Western Cape Province:

Garden Route coastal flats from Wilderness, generally to the north of the system of lakes, several patches around the Knysna Lagoon, with more isolated patches eastwards to the Robberg peninsula near Plettenberg Bay. Altitude 40-300m.

Vegetation & Landscape Features

Undulating hills and moderately undulating plains covered with a dense, moderately tall, microphyllous shrubland, dominated by species more typical of sandstone Fynbos.

Geology & Soils

Deep, acid Tertiary sand inland of coastal dunes forming regic sands and soils of Lamotte form. Land types mainly Hb and Ga.

Climate

MAP 670-1 090mm (mean: 850mm), with a slight peak in autumn and spring. Mean daily maximum and minimum temperatures 27.3 degrees Celsius and 7.3 degrees Celsius for February and July, respectively. Frost incidence: approximately 2 or 3 days per year.

Conservation

Endangered. Conservation Target 23%. Patches are statutorily conserved in the proposed Garden Route National Park (about 3%) as well as 2% in several private nature reserves. Almost 70% already transformed (pine and gum plantations, cultivation, Knysna urban sprawl, building of roads). Alien *Acacia melanoxylon, A. mearnsii and A. longifolia* occur locally at low densities. Erosion very low to moderate.

Remark: This is a very poorly researched vegetation unit.

Important Taxa

The category of **Important Taxa** includes those species (and lower taxa) that:

- Have a high abundance,
- A frequent occurrence (not being particular abundant) or
- Are prominent in the Landscape of the vegetation unit.

This list forms a basic floristic profile of the vegetation unit.

Endemic Taxa

The concept of endemism is determined by the extent of the vegetation unit. This means that a plant taxon is listed as endemic in the description when it occurs exclusively within the vegetation unit concerned.

The strict interpretation of the "unit based endemism" has been relaxed in the Fynbos Biome, where an endemic plant species may have less than 10% of localities outside the vegetation unit in question.

None listed for the vegetation type.

FLORA				
IMPORTANT TAXA				
Small Tree	**Tall Shrubs**	**Low Shrubs**	**Herbs**	**Graminoids**
Widdringtonia nodiflora LC	*Cliffortia linearifolia* LC, *Leucadendron eucalyptifolium* LC, *Metalasia densa* LC, *Passerina corymbosa* LC	*Anthospermum aethiopicum* LC, *Berzelia intermedia* LC, *Cliffortia drepanoides* LC, *Clutia rubricaulis* LC, *Erica diaphana* LC, *E. glandulosa* subsp. *fourcadei* VU, *E. glumiflora* VU, *E. sessiliflora* LC, *Helichrysum asperum* var. *asperum* LC, *Lachnaea diosmoides* LC, *Leucadendron salignum* LC, *Leucospermum cuneiforme* LC, *Lobelia coronopifolia* LC, *Morella quercifolia* LC, *Muraltia squarrosa* LC, *Oedera imbricata* LC, *Protea cynaroides* LC, *Stoebe plumosa* LC, *Tephrosia capensis* LC	*Geranium incanum* LC, *Helichrysum felinum* LC	*Aristida junciformis* subsp. *galpinii* LC, *Brachiaria serrata* LC, *Cynodon dactylon* LC, *Eragrostis capensis* LC, *Ficinia bulbosa* LC, *Heteropogon contortus* LC, *Ischyrolepsis eleocharis* LC, *Tetraria cuspidata* LC, *Thamnochortus cinereus* LC, *Themeda triandra* LC, *Tristachya leucothrix* LC

(d) Capensis elements also occurring in other than Fynbos units. NT not threatened; LC least concern; VU vulnerable; EN endangered; CR critical endangered; NE not evaluated (exotic); DDD data deficient – insufficiently known DDT data deficient Taxonomically problematic .

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FFd11 Southern Cape Dune Fynbos

Distribution

Western and Eastern Cape Provinces. Two large mapped patches on the Indian Coast span the Wilderness Estuary and Buffels Bay near Knysna (Western Cape), and Tsitsikama River Mouth to Oyster Bay (Eastern Cape).

Smaller cordons occur further east between Oyster and St Francis Bays. A series of smaller unmapped patches occur as far west as Mossel Bay and eastwards to near East London.

Altitude 20–220 m.

Vegetation and Landscape Features

Coastal Dune cordons (those towering above Groenvlei near Sedgefield considered the tallest vegetated Dunes in Southern Africa) often with steep slopes.

The vegetation is Fynbos heath dominated by sclerophyllous shrubs with a rich restiod undergrowth.

The dominant shrubs include *Olea exasperata* and *Phyllica litoralis*, while among restios *Restio eleocharis* is most prominent.

Ecological Drivers

The relative recent (last 100 years) exclusion of fire from a large percentage of this unit enabled many woody species to displace the Fynbos vegetation. The alien *Acacia cyclops* often acted as a precursor for the establishment of thicket vegetation in sites where Fynbos or coastal dunes used to occur.

These thicket clumps occurring within the dune Fynbos are not rich in species and have *Pterocelastrus tricuspidates, Searsia lucida, Sideroxylon inerme* and *Trachonanthus littoralis* as the dominant species.

Dense stands of alien *Acacia cyclops* and *A. saligna* are of conservation concern and are being targeted for removal. *A. mearnsii* and *Leptospermum laevigatum* also occur in places.

Geology & Soils

Stabilised old calcareous or neutral dunes (some as old as 120 000 years) outside the influence of salt spray built of deep sands, moving in places. Soils of Lamotte form, main land types Hb and Ga.

Climate

Mean rainfall: 757 mm, with a slight peak in autumn and spring. Mean daily maximum and minimum temperatures 25.3°C and 8.0°C for February and July, respectively. Frost is a rare phenomenon due to the strong marine influence of the ocean.

Conservation

Least threatened. Target 36%. More than 16% statutorily conserved in the Goukamma (housing the most prominent examples of this vegetation unit) and Huisklip Nature Reserves as well as on the proposed Garden Route National Park. An additional 4% is protected in private conservation areas such as Thyspunt, Rebelsrus and Klasies Rivier Cave. About 17% has been transformed, mainly for cultivation, plantations and urban development.

Dense stands of alien *Acacia cyclops* and *Acacia saligna* are of conservation concern and are being targeted for removal. *Acacia mearnsii* and *Leptospermum laevigatum* occur in places.

Erosion very low and low.

Remarks

Taylor & Morris (1981) made an explicit link between (coastal) 'Grassland' and 'Calcrete Fynbos' and claimed that the balance between these two is a delicate one, being controlled by the depth of soil (hence nutrient status) as well as by degree of grazing and trampling.

Fire

According to local farmers in the Port Elizabeth area, fire is supposed to be of minor importance.

Transition between Dune Fynbos and Grassland

Cowling & Pierce (1985) observed that in areas with pronounced summer rainfall, the dune Fynbos is almost entirely replaced by grasslands dominated by Themeda triandra, *Stenotaphrum secundatum* and species of Cymbopogon. They suggested that the dune Fynbos would extend along the eastern seaboards of South Africa as far north as KwaZulu-Natal.

Indeed the elements of coastal dune Fynbos representing geographically outlying taxa of the genera Metalasia (*M. muricata*), Passerina (*P. corymbosa*, *P. rigida*), Morella (*M. quercifolia*), Phylica (*P. ericifolia*) etc. occur along those coastal stretches on exposed dune slopes and crests. This narrow belt thins out towards the north to become only few metres broad on the KwaZulu-Natal coast.

A report by Vlok & Euston-Brown (2002; see their description of the Kiwane Dune Thicket) supplies further thoughts about the link between coastal grasslands and coastal Fynbos. *Acmadenia kiwanensis* (at present considered as endemic to AT 9 Albany Coastal Belt) may be an indicator of former transformations of this Fynbos-grassland complex.

Shale Fynbos

Shale Fynbos occurs in areas with leached soils derived from shale. It is almost always found at higher altitudes, usually on southern slopes abutting the mountains. Most shale Fynbos units (except those associated with the inland Witteberg Quartzite) abut granite Fynbos and share many of their species.

Important Taxa

The category of **Important Taxa** includes those species (and lower taxa) that:

- Have a high abundance,
- A frequent occurrence (not being particular abundant) or
- Are prominent in the Landscape of the vegetation unit.

This list forms a basic floristic profile of the vegetation unit.

Endemic Taxa

The concept of endemism is determined by the extent of the vegetation unit. This means that a plant taxon is listed as endemic in the description when it occurs exclusively within the vegetation unit concerned.

The strict interpretation of the "unit based endemism" has been relaxed in the Fynbos Biome, where an endemic plant species may have less than 10% of localities outside the vegetation unit in question.

FLORA				
IMPORTANT TAXA				
Tall Shrubs	**Low Shrubs**	**Semi-parasitic Shrub**	**Herbs**	**Graminoids**
Olea exasperata (d) LC *Passerina corymbosa LC* *Searsia crenata LC* *S. glauca LC* *S. laevigata NE* *S. lucida LC*	*Agathosma ovata (d) LC* *Metalasia muricata (d)LC* *Passerina rigida (d)LC* *Phylica litoralis (d)LC* *Agathosma apiculata LC* *A. stenopetala, VU* *Anthospermum aethiopicum LC* *Aspalathus spinosa subsp. spinosa LC* *Chironia baccifera, LC* *Erica glandulosa subsp. fourcadei, VU* *E. glumiflora, VU* *E. zeyheriana, VU* *Felicia echinata, LC* *Lasiosiphon anthylloides LC* *Helichrysum teretifolium LC* *Indigofera sulcata LC* *Jamesbrittenia microphylla LC* *Leucadendron salignum LC* *Morella quercifolia LC* *Muraltia satureioides, LC* *M. squarrosa, LC* *Otholobium bracteolatum, LC* *Pelargonium betulinum, LC* *Phylica ericoides, LC* *Polygala ericaefolia, LC* *Struthiola parviflora.LC*	*Thesium fragile DDT*	*Satyrium princeps (d). VU* *Cyrtanthus loddigesianus LC* *C. obliquus. LC*	*Restio eleocharis (d)LC* *Ehrharta calycina, LC* *Ficinia dunensis, LC* *Restio leptoclados, LC* *Pentaschistis barbata subsp. orientalis heptamera,LC* *Tetraria cuspidata, LC* *Thamnochortus cinereus, LC* *Tribolium obtusifolium. LC*

FLORA		
ENDEMIC TAXA		
Low Shrubs	**Succulent Shrub**	**Graminoids**
Aspalathus cliffortiifolia CR PE *Erica chloroloma. VU*	*Lampranthus algoensis. DDT*	*Pentaschistis barbata subsp. orientalis barbata subsp. orientalis. CR*

(d) Capensis elements also occurring in other than Fynbos units. NT not threatened; LC least concern; VU vulnerable; EN endangered; CR critical endangered; NE not evaluated (exotic); DDD data deficient – insufficiently known DDT data deficient Taxonomically problematic .

AZd3 Cape Sea Shore Vegetation

Distribution

Western Cape and Eastern Cape Provinces: Temperate coastal of the Atlantic Ocean (Olifants River mouth to Cape Agulhas) and Indian Ocean (Cape Agulhas to East London). According to Tinley (1985; see also Lubke et al. 1997), this stretch of coastal comprises the South West and South Coasts.

Vegetation & Landscape Features

Beaches, coastal dunes, dune slacks and coastal cliffs of open grassy, herbaceous and to some extend also dwarf-shrubby (sometimes succulent) vegetation, often dominated by a single pioneer species.

Ecological Drivers

Various plant communities reflect the age of the substrate and natural disturbance regime (moving dunes), distance from the upper tidal mark and the exposure of dune slopes (leeward versus seaward).

Geology & Soils

Young coastal sandy sediments forming beaches and dunes (Strandveld Formation), exposed to reworking by relentless winds and frequent sea storms. Some stretches of the West Coast are covered by extensive shell beds.

Climate

The climate diagram for hits unit shows a largely uniform, all-year precipitation pattern, but this pattern must be interpreted with care since the unit encompasses regions of very diverse precipitation regimes. The West Coast (under influence of the Benguela Current) and the portion of the South Coast bordering on the Atlantic Ocean are characterised by cold seawater and frequent upwelling events.

The local precipitation is low (as low as 100mm in places) and typically seasonal (winter-rainfall peak). From Cape Agulhas westwards the coast is influenced by occasional eddies of the Agulhas Current, but the water stays generally cold. The precipitation becomes transitional, with a considerable increase of summer rainfall eastwards. MAP in Lambert's Bay, Cape Town, Plettenberg Bay and Port Elizabeth is 128mm, 517mm, 661mm and 604mm, respectively.

The temperature varies less than precipitation (17 - 18ºC for both Lambert's Bay and Port Elizabeth).

Important Taxa

The category of **Important Taxa** includes those species (and lower taxa) that:

- Have a high abundance,

- A frequent occurrence (not being particular abundant) or
- Are prominent in the Landscape of the vegetation unit.

This list forms a basic floristic profile of the vegetation unit.

Endemic Taxa

The concept of endemism is determined by the extent of the vegetation unit. This means that a plant taxon is listed as endemic in the description when it occurs exclusively within the vegetation unit concerned.

The strict interpretation of the "unit based endemism" has been relaxed in the Fynbos Biome, where an endemic plant species may have less than 10% of localities outside the vegetation unit in question.

FLORA				
IMPORTANT TAXA **Dunes & beaches**				
Succulent Shrubs:	**Low Shrubs:**	**Herbs**	**Graminoids**	**Succulent Herbs**
*Drosanthemum candens (d)*LC, *Pelargonium capitatum (d)* LC, *Tetragonia decumbens (d)*LC, *Didelta carnosa* var. *tomentosa* LC, *Exomis microphylla* var. *axyrioides* LC, *Lycium tetrandrum* LC, *Scaevola plumieri* LC,	*Hebenstretia cordata (d)*LC, *Frankenia repens* LC, *Oncosiphon sabuosum* LC,	*Gazania rigens (d)*LC, *Senecio littoreus (d)* LC, *Amellus asteroids* LC, *Dasispermum suffruticosum* LC, *Manulea tomentosa* LC, *Polygonum maritimum* NE, *Senecio elegans* LC,	*Cladoraphis cyperoides (d)*LC, *Ehrharta villosa* var. *maxima (d)*LC, *Sporobolus vinginicus (d)*LC, *Stipagrotis zeyheri* subsp. *barbata* LC,	*Arctotheca populifolia (d)* LC, *Carpobrotus acinaciformis* LC, *Carpobrotus edulis* LC,
Semi-parasitic Shrubs		**Herbaceous Climbers**	**Geophytic Herb**	
Thesium fragile DDT		*Cynanchum ellipticum* LC, *Cynanchum obtusifolium* LC,	*Trachyandra divaricate* LC,	
Cliffs				
Succulent Shrubs:	*Disphyma crassifolium (d)* LC, *Sarcocornia littorea (d)* LC,			
Herb:	*Gazania rigens (d)*LC,			

ENDEMIC TAXA **Dunes & beaches**				
Low Shrubs	**Succulent Shrubs**	**Herbs**	**Succulent Herbs**	**Graminoids**
Psoralea repens (d) NT	*Amphibolia laevis (d)LC,*	*Amellus capensis VU,* *Gazania maritime LC,* *Gazania rigens* var. *leucolaena LC,* *Silene crassifolia LC,*	*Senecio litorosus LC,* *Senecio maritimus LC,*	*Thinopyrum distichum (d) NE,* *Eragrostis sabulosa LC,*
Dune Slacks				
Herb	*Vellereophyton vellereum LC,*			
Cliffs				
Succulent Shrubs		**Low Shrubs**		**Herbs**
Drosanthemum marinum (d) NT, *Drosanthemum stokoei LC,* *Erepsia steytlerae EN,* *Prenia vanrensburgii NT,*		*Syncarpha sordescens VU,*		*Limonium* sp. Nov. *(Mucia 6942/1 STEU),* *Lobelia boivinii LC,*

(d) Capensis elements also occurring in other than Fynbos units. NT not threatened; LC least concern; VU vulnerable; EN endangered; CR critical endangered; NE not evaluated (exotic); DDD data deficient – insufficiently known DDT data deficient Taxonomically problematic .

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Conservation

Least threatened.

Target 20%. Almost half of the area statutorily conserved in the West Coastal, Cape Peninsula, Agulhas, proposed Garden Route and Greater Addo Elephant National Parks as well as the Rocher Pan, Cape Columbine, Dassen Island, Wolvengat, Kleinmond, Walker Bay, De Mond (Ramsar site), De Hoop, Kleinjongesfontein, Geelkrans, Robberg, (all Western Cape) and Cape St Francis, Cape Recife, Joan Muir, Gxulu, Cape Henderson , Kwelera and Bosbokstrand Nature Reserves (all Eastern Cape). A number of private conservation arrears such as Donkin Bay, Robben Island, Reins Coastal Reserve and Tharfield Nature Reserve protect other considerable portions of the Cape Seashore Vegetation.

Only about 1.7% has been transformed, mainly by urban development.

Remark

Extensive dune fields are found at De Hoop, Cape St Francis, Gamtoos and Boknes along this coastal stretch (Tinley 1985, Young 1987, Talbot & Bate 1991).

3.3.2 GRI Vegetation Descriptions

(Vlok, J.H.J., Euston-Brown D.I.W. & Wolf, T. 2008. A vegetation map for the Garden Route Initiative. Unpublished 1:50 000 maps and report supported by CAPE FSP task team.)

Fynbos Habitat Types

With the exception of excluding Renosterveld, we do not deviate much from the concepts of Mucina and Rutherford (2006) regarding the Fynbos biome. We do, however, recognize mosaic vegetation units with four of our fourteen Fynbos habitat types being mosaic vegetation types.

Fynbos Ecological Drivers

Fynbos and Herbivory

Apart from fire as an important disturbance regime, we believe that herbivores also played an important role in shaping the vegetation of some of the lowland Fynbos, especially the Dune and Grassy Fynbos habitat types. In the case of the Dune Fynbos mole-rat activity clearly also plays an important soil disturbance role.

Fynbos and Fire

New literature question the general recommendation of late summer to autumn fires as being the most appropriate for much of the Garden Route domain, especially for east of the 24° longitude. Limited evidence indicates that late winter and spring fires may be more appropriate for these more eastern areas.

Much more work is however required before a final answer can be given on this question of ecologically correct fire seasons in the eastern region. Whatever the outcome, we believe that

high intensity fires are vital to retain endemic and rare large-seeded species such as *Leucospermum glabrum, Mimetes pauciflorus* and *Mimetes splendidus*.

Low-intensity fires have been practiced over many years in an attempt to protect the afforested areas. This only resulted in the build up of fuel and devastating fires during extreme conditions.

Dune Sandplain Fynbos Habitat

Habitat

The Sandplain Fynbos habitat is restricted to deep sandy soils with no rock cover.

Species Diversity

It further differs from the Montane Fynbos in not having Ericaceae and Proteaceae abundant, with the Rutaceae often largely replacing the Ericaceae.

Ecological Drivers

The vegetation is clearly also driven by fire as a major disturbance regime, but in the past was much more exposed to herbivory and physical soil disturbance by large mammals.

These disturbance regimes have been severely altered by:

- Fire regimes to protect adjacent afforested areas and residential areas.
- The extirpation of the herbivores (large and small).

Currently the vegetation in most of the remaining habitat is in a rather "messy" condition (due o the altered disturbance regimes and invasion by alien plants) and it is really hard to try to reconstruct its original structure and species composition. Fortunately a few small remaining examples enabled us to develop some idea of its former status.

Hoogekraal Sandplain Fynbos Vegetation Type

Habitat

Hoogekraal Sandplain Fynbos occurs in wetter sites where some Proteaceae, such as *Leucadendron salignum, Leucospermum cuneiforme* and *Protea cynaroides*, are usually present on moist south-facing slopes.

Species Diversity

Both the later species are unusual ecotypes with rather narrow leaves and smaller flowers than their montane counterparts, which deserves specific conservation measures.

Ericaceae are uncommon, but *Erica discolor* is sometimes abundant in wet sites. The unit is not rich in Restionaceae either, but *Restio triticeus* is usually abundant, along with many other graminoid taxa such as *Stenotaphrum secundatum*.

Geophytes such as *Brunsvigia orientalis* are usually abundant and at least one of them, *Disa procera*, is a local endemic.

Other local rarities include Pentaschistis barbata subsp. orientalis *barbata ssp. orientalis* (that may be a distinct taxon when more material becomes available) and *Satyrium princeps.*

Other useful indicator species include: *Aspalathus hispida, Disparago tortilis, Felicia echinata, Heliophila subulata, Lampranthus tegens, Passerina vulgaris, Salvia africana-lutea* and *Roepera flexuosa*.

Sedgefield Sandplain Fynbos Vegetation Type

Habitat

Sedgefield Sandplain Fynbos is an arid unit restricted to north-facing slopes of the secondary dune systems. It is a very arid and vulnerable habitat that is very sensitive to physical disturbance.

Species Diversity

It is poor in species, with the bulk of its dry sands held together by *Agathosma apiculata, Restio eleocharis, Olea exasperata, Searsia crenata* and a few graminoids such as *Stipagrostis zeyheri*.

No rare species are known from this unit, but the local variant of the uncommon *Centella calcarea* may prove to be a distinct endemic taxon.

Dune Sandplain Mosaic Thicket Habitat

Sedgefield Thicket-Fynbos Vegetation Type

Habitat

This habitat type differs from the Sandplain Fynbos habitat only in having some Thicket bush-clumps present. Only one unit is recognised in this habitat, the Sedgefield Thicket-Fynbos.

Ecological Drivers

The bush-clump currently present in this unit are probably more abundant and larger than they used to be as most of this habitat has been protected against fires for many years. In the past browsers probably also contained the extent of these bush-clumps.

These bush-clumps easily overgrow the adjacent matrix Fynbos vegetation in the absence of fire.

This results in the loss of the rich biodiversity of the matrix Sandplain Fynbos.

Geophyte species endemic to the Sandplain Fynbos, such as *Gladiolus vaginatus* and *Satyrium princeps* will first go extinct without the correct fire regimes, but will soon be followed by endemic shrubs such as *Erica glandulosa subsp. fourcadei.*

Species Diversity

Sedgefield Thicket-Fynbos which consists mostly of Dune Thicket species such as *Azima tertracantha, Carissa bispinosa, Cussonia thyrsiflora, Euclea rasemosa, Olea exasperata, Searsia glauca, Sideroxylon inerme* and *Tarchonanthus camphoratus,* which all can grow rapidly in the absence of fire.

Primary Dune Habitat

Hartenbos Primary Dune Vegetation Type

Habitat

The vegetation of this habitat is rather uniform throughout the region and we recognize only two vegetation units in this habitat. The Hartenbos Primary Dune unit is by far the most extensive and it extends westwards to the Breede River. The second unit, Inland Primary Dune, is restricted to a small area in the east of the domain.

Ecological Drivers

The Primary Dune units act as a precursor to the Dune Thicket units. Wherever they are absent, often due to stabilization of the supporting Drift Sands habitat, wave action starts eating into the secondary dunes, undermining the sands of the Dune Thicket. *Gladiolus gueinzii* is the only uncommon plants species present in this unit.

Species Diversity

The Hartenbos Primary Dune vegetation type has few species present, mostly *Ammophila arenaria* (alien), *Arctotheca populifolia, Gazania rigens, Hebenstreitia cordata, Ipomoea pes-caprae, Senecio elegans, Scaevola plumieri, Tetragonia decumbens* and *Thinopyrum distichum* are present.

The plants tend to be sparse, but just inland (secondary dunes) the vegetation becomes rapidly more dense and taller, with shrubs such as *Metalasia muricata, Morella cordifolia, Passerina rigida, Searsia crenata* and often somewhat stunted *Sideroxylon inerme* present.

The latter constitute the transition to Dune Thicket vegetation and the cut-off point between these two units is often difficult to determine. We used the absence species such as *Scaevola plumieri, Tetragonia decumbens* and *Thinopyrum distichum* as indicating the transition from Primary Dune to Dune Thicket units.

Dune Thicket Mosaic Forest Habitat

Wilderness Forest-Thicket Vegetation Type

Habitat

This habitat is restricted to the secondary dune systems, just inland of the mobile dune systems. We recognize only one unit, the Wilderness Forest-Thicket.

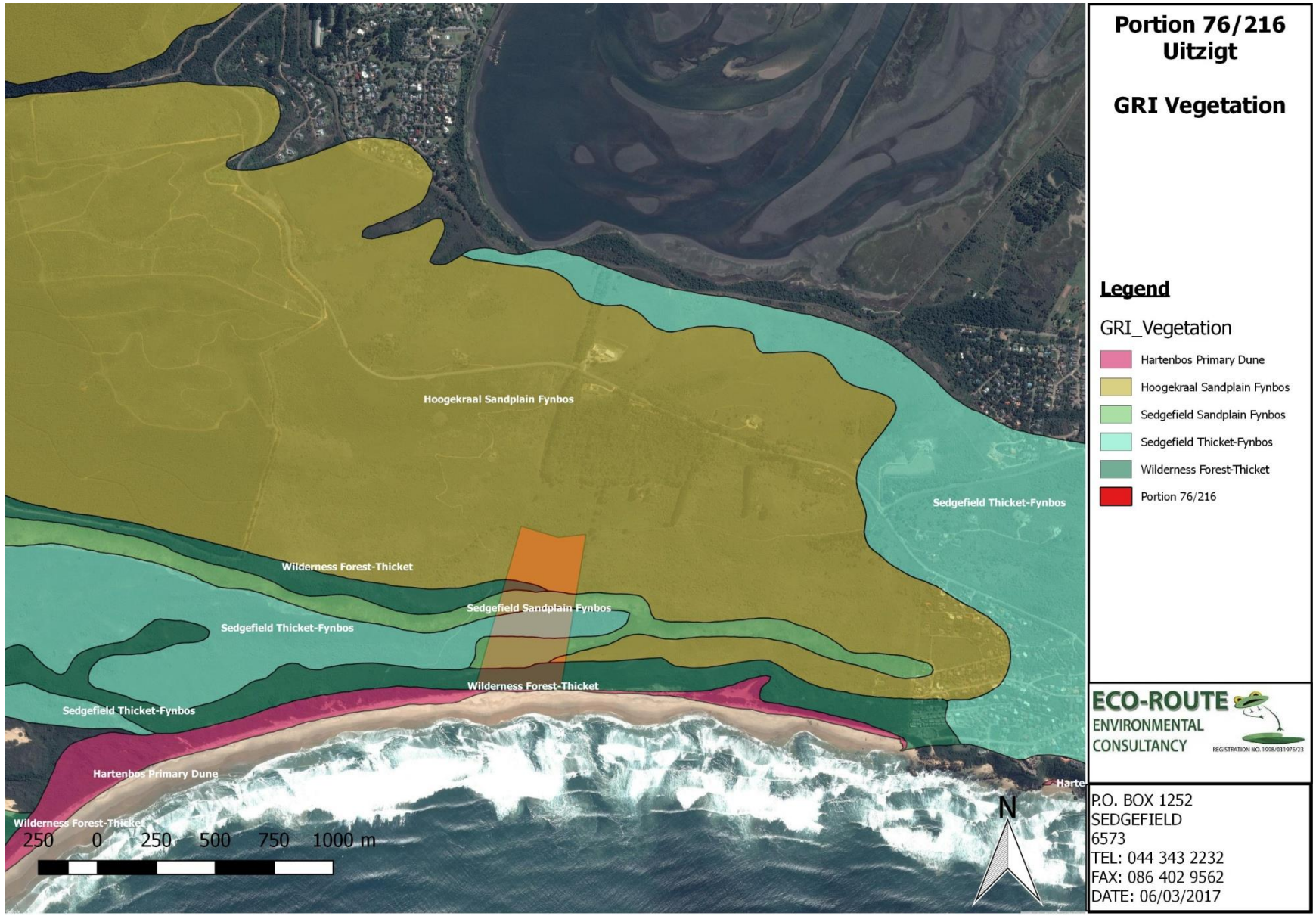
Ecological Drivers

Where these dune slack areas are deep these trees form a dense closed canopy that is well lifted above ground level, thus qualifying to be called a “Milkwood forest”. These forests are never very wide, although they can be quite long, and we thus could not map them as separate entities.

Species Diversity

The matrix vegetation consists of Dune Thicket with typical species such *Azima tetracantha, Carissa bispinosa, Cassine peragua, Euclea racemosa, Lycium cinereum, Searsia crenata, Searsia pterota, Mystroxylon aethiopicum, Nylandtia spinosa, Putterlickia pyracantha* often forming impenetrable stands as these shrubs are usually woven together with creepers such as *Asparagus aethiopicus, Cynanchum ellipticum, Rhoicissus digitata, Sarcostemma viminale* and *Solanum quadrangulare*.

A forest like community of trees such as *Olinia ventosa*, *Pterocelastrus tricuspidatus, Sideroxylon inerme* and *Tarchonanthus camphoratus* occur in the protected dune slack areas.



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GRI Vegetation

Legend

GRI_Vegetation

- Hartenbos Primary Dune
- Hoogekraal Sandplain Fynbos
- Sedgefield Sandplain Fynbos
- Sedgefield Thicket-Fynbos
- Wilderness Forest-Thicket
- Portion 76/216

ECO-ROUTE
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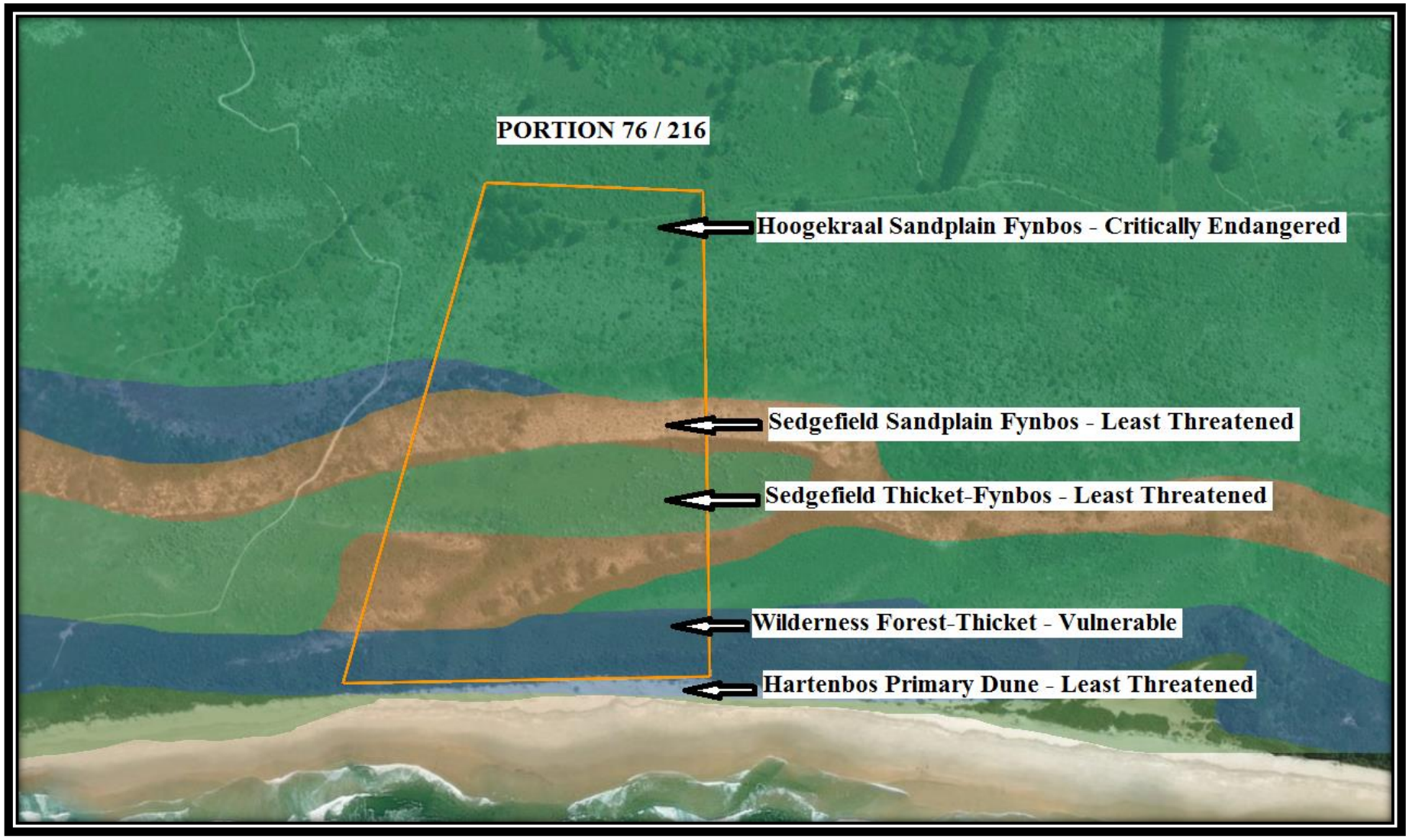
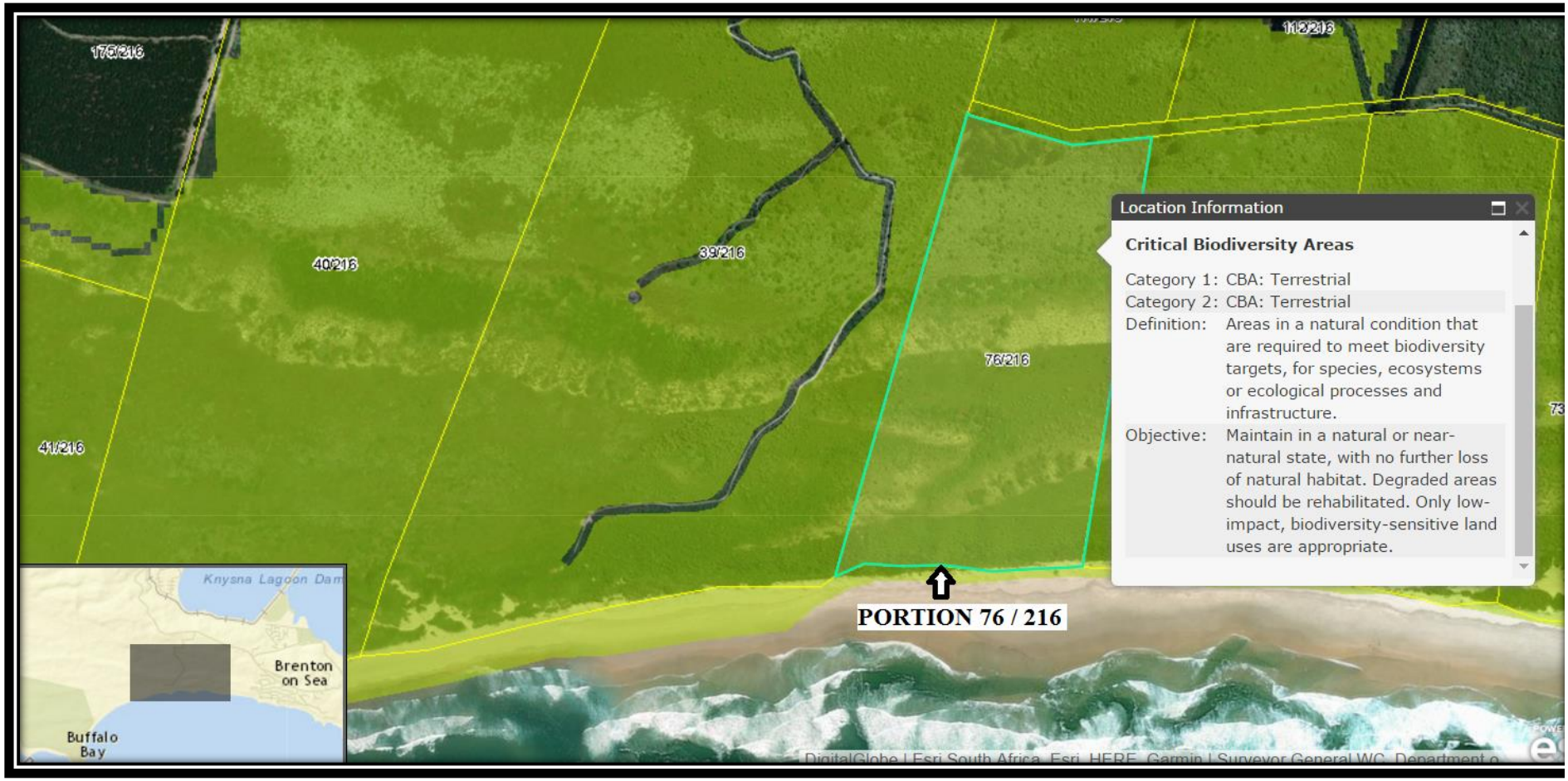


GRI VEGETATION TYPES AND ECOLOGICAL STATUS

CRITICAL BIODIVERSITY AREA



3.3.3 Western Heads Vegetation Descriptions

(Vlok, J.H.J. 2005. The Natural Vegetation of the Western Heads (Knysna), notes on its Ecological Sensitivity and proposed Future Development. Regalis Environmental Services, Oudtshoorn.)

Fore Dune Vegetation Type

Distribution

The Fore dune unit forms a narrow band along the upper edge of the high-water mark along the coastline. Locally it does not form much of a "dune" and is rarely more than one meter high.

Species Diversity

It is easy to recognise and have species such as *Arctotheca populifolia*, *Gazania rigens* and *Tetragonia decumbens* common and dominant. Where better-established shrubs such as *Morella cordifolia* and *Searsia crenata* are also present. *Gladiolus gueinzii* is an interesting species present in this unit, but it is not a rare species, as it is quite widespread. **No rare plant species are known from this vegetation unit.**

In other areas Black Oystercatchers use this habitat for nesting sites, but no such nesting sites are currently known from the local area.

Ecological Drivers

An important ecological driver of this unit is a sustained supply of sand from the sea. The local fore dune system used to receive its sand supply from the Goukamma river mouth via a dune-plume system just north of Buffalo Bay.

This source of sand has largely been arrested through stabilization of the original "drift-sands" in the Goukamma area. This may explain why the local Fore dune community is rather poorly developed, as it no longer receives adequate sand from the sea.

If this is true, much of the current primary dune vegetation may in time also become eroded. Once the Fore dune community disappears, sand will be scoured by wave action from the following dune system, the unit here called the Primary Dune & Cliff Fynbos.

Primary Dune & Cliff Fynbos Vegetation Type

Distribution

This unit occurs on the often-steep south facing slopes of the first dune system. Towards the east it also occurs on rocky cliffs, where the plant community is somewhat different, but not significantly so.

Species Diversity

Common and distinctive species are *Agathosma apiculata, Gazania rigens, Helichrysum dasyanthum, Helichrysum teretifolium, Restio eleocharis, Limonium scabrum, Metalasia muricata, Morella cordifolia, Passerina rigida, Phylica littoralis* and *Silene primuliflora. Cliffortia serpyllifolia* can also be abundant in the rocky sites towards the east.
No rare plant species are known from this vegetation unit.

Ecological Drivers

This vegetation is almost constantly exposed to salt-laden winds blowing from the sea, which renders it quite vulnerable to physical disturbance. Once an area has been disturbed, it takes a long period for plants to re-establish. Most of the steep slopes are also prone to soil erosion, once the vegetation has been disturbed.

Conservation

This unit is also well represented within the Goukamma Nature Reserve.

A typical example of the local Primary Dune & Cliff Fynbos vegetation.

Primary Dune Slack Fynbos Vegetation Type

Distribution

This unit is restricted to the area between the first and second row of dunes.

Species Diversity

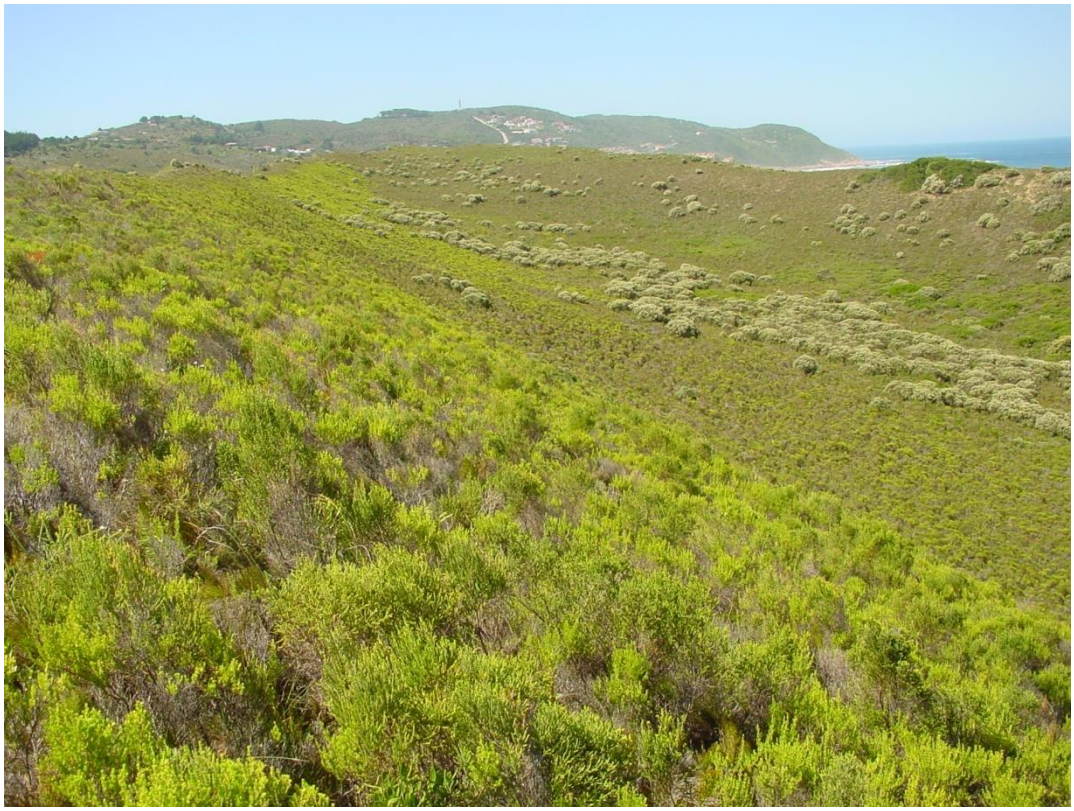
It is dominated by *Agathosma apiculata* and *Metalasia muricata*, but a number of other shrubs and herbs (*e.g. Anthospermum aethiopicum, Felicia echioides, Lotononis pungens, Muraltia squarrosa, Pelargonium betulinum, Sutera campanulata, Wahlenbergia uitenhagensis, etc.)* are also present.
Some geophytes (*e.g. Brunsvigia orientalis, Satyrium membranaceum, etc*.) and graminoids (*e.g. Hellmuthia membranacea, Imperata cylindrica, Restio eleocharis, etc*.) are present, but this unit is not very rich in species.
No rare plant species are known from this unit, but the rare Duthie's golden mole (*Chlorotalpa duthiae*) may be present.

Ecological Drivers

Fires will be required to rejuvenate this vegetation, seemingly at a frequency of 10-12 years.

Conservation

This unit seems to be absent from the Goukamma Nature Reserve and it may be restricted to the study area.



Metalasia muricata in the centre indicates a pristine example of the local Primary Dune Slack Fynbos.

Arid Dune Fynbos Vegetation Type

Distribution

The Arid Dune Fynbos occurs on the north facing slopes of the primary and secondary dune systems.

Species Diversity

The relatively sparse vegetation is dominated by few species, with *Agathosma apiculata, Cymbopogon marginatus, Cyperus brevis, Imperata cylindrica, Restio eleocharis, Metalasia muricata, Muraltia squarrosa, Olea exasperata* and *Stipagrostis zeyheri* the most common species. *Centella tridentata* is a characteristic species, but it is never common.

No rare plant or animal species are known from this unit.

Ecological Drivers

Due to its aridity and the general loose nature of the sand, this unit is very vulnerable to physical disturbance. Soil erosion tends to be rapid and difficult to control once the vegetation has been disturbed.

Conservation

This unit is quite abundant in the Goukamma Nature Reserve.

A typical example of the Arid Dune Fynbos occurs here in the foreground.
Moist Dune Fynbos on the adjacent south facing slope.

Brenton Dune Fynbos Vegetation Type

Distribution

This uncommon unit is restricted to the south facing slopes of the some of the more stable secondary dunes.

Species Diversity

It shares many species with the Primary Dune & Cliff Fynbos, such as *Agathosma apiculata, Helichrysum dasyanthum, Helichrysum teretifolium, Restio eleocharis, Passerina rigida* and *Pelargonium betulinum*, but it is richer in species.

Erica glumaeflora is usually quite abundant and a characteristic species of this unit.

Two rare and threatened plant species, *Pentaschistis barbata subsp. orientalis barbata ssp. orientalis* and *Satyrium princeps* occur in this unit. The former species is perhaps restricted to this unit and is dependent on periodic fires and seemingly also some soil disturbance. The latter may result from mole-rat action and in the past perhaps also from large herbivores that moved through the area.

Conservation

This unit seems to be poorly represented in the Goukamma Nature Reserve.

The Brenton Dune Fynbos occurs here in the foreground, with the band of white-flowered shrubs (*Metalasia muricata*) in the background indicating the boundaries of the Primary Dune Slack Fynbos.

Goukamma Dune Thicket Vegetation Type

Distribution

This unit is largely restricted to a narrow band along the northern foot of secondary dunes.

Species Diversity

It shares most of its common woody species with the Coastal Forest & Thicket unit, but here the tall canopy species (*e.g. Celtis*) are absent. Woody trees and shrubs (*e.g. Pterocelastrus tricuspidatus, Sideroxylon inerme, etc.*) are dominant, but they rarely form a canopy higher than 5 meters above the ground. Many of the species are thorny (*e.g. Azima tetracantha, Capparis sepiaria, Carissa bispinosa, etc*.)

No rare plant species are known from this unit, but it seems to be an important habitat for some rare birds, such as the Knysna Warbler (*Bradypterus sylvaticus*).

Ecological Drivers

Fires burning from a north-westerly direction clearly defined the boundaries of this unit. An increase in alien vegetation along its boundaries threatens this unit, as they increase the fire intensity.

Conservation

This unit is well developed in the Goukamma Nature Reserve and further westwards. It seems to act as an important migration corridor for certain fauna along the coast. Maximum connectivity should be retained between the remaining examples of the Goukamma Dune Thicket and other Coastal Forest and Thicket vegetation units.

A classic example of the Goukamma Dune Thicket vegetation

Moist Dune Fynbos Vegetation Type

Distribution

This unit occurs on the south facing slopes of the more inland well-stabilised dunes.

Species Diversity

It is quite rich in species and cannot easily be confused with any of the other local Fynbos units. Species such as *Artemisia afra, Athanasia trifurcata, Erica discolor, Erica hispidula, Leucadendron salignum, Metalasia densa, Passerina filiformis, Pentaschistis barbata subsp. orientalis pallida, Phylica stipularis, Restio triticeus, Selago villicaulis, Tetraria cuspidata, Thamnochortus cinereus* and *Thamnochortus erectus* are abundant and distinctive species.

***Erica glandulosa subsp. fourcadei* is the only rare plant species are known from this unit**, but the uncommon *Gladiolus vaginatus* was also seen here. It is expected that this unit would be rich in geophytes after a fire, of which some may be rare species.

Ecological Drivers

This unit will also have to burn at intervals of 10-12 years to rejuvenate the vegetation.

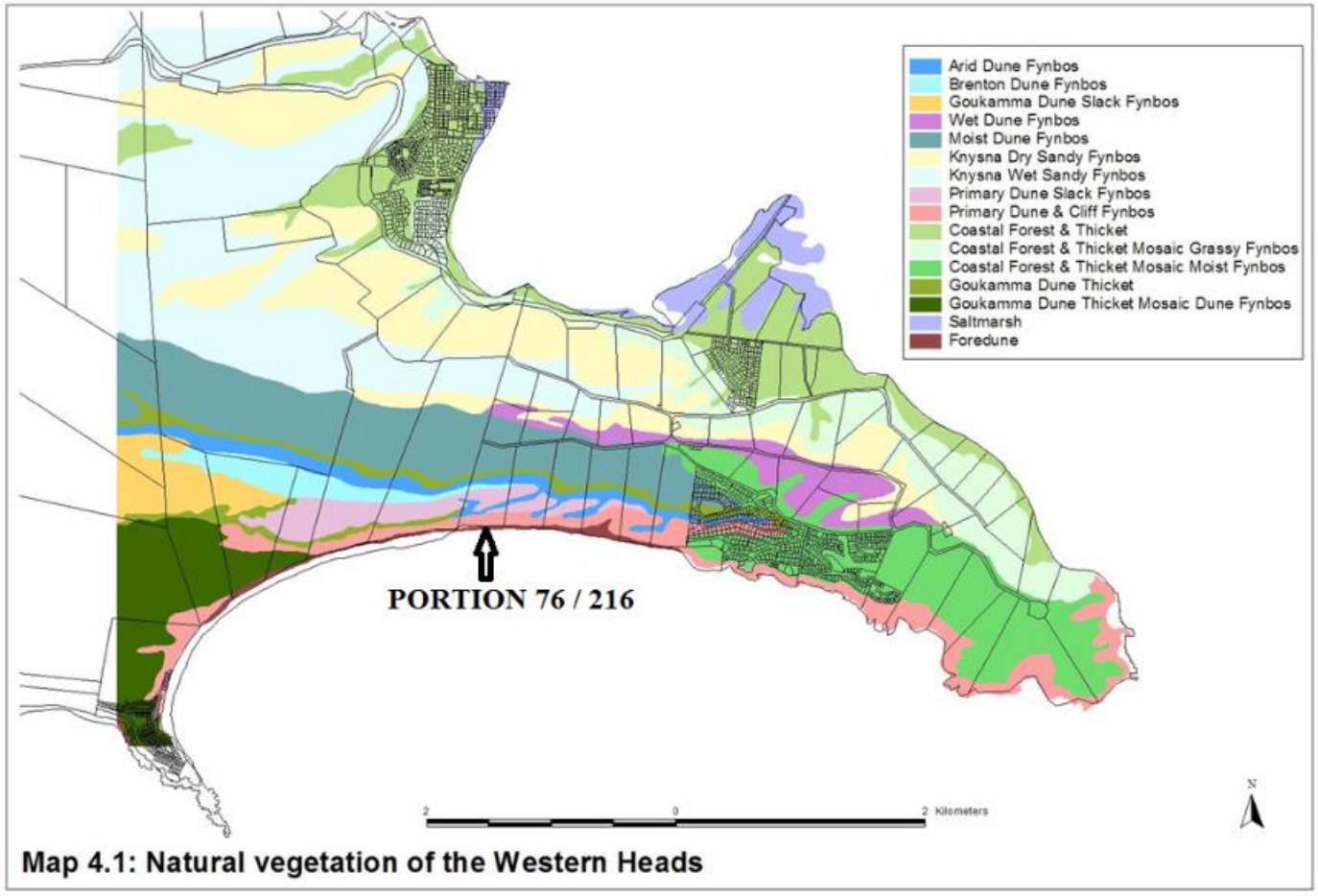
Conservation

It is well represented on the Goukamma Nature Reserve.

SPECIES OF SPECIAL CONCERN	STATUS	DISTRIBUTION
Erica chloroloma	Vulnerable	Eastern and Western Cape. **Wilderness to the Fish River Mouth.** **A large subpopulation still survives in the Goukamma Nature Reserve** **Southern Cape Dune Fynbos; Cape Seashore Vegetation Types**
Erica glandulosa ssp. fourcadei	Vulnerable	Eastern and Western Cape. **Many recent records indicate that this species is more common than previously estimated (occurring at between 10 and 20 locations), however, except for the area between Sedgefield and Knysna, where this species is still quite common, particularly in the Goukamma Nature Reserve.** **Southern Cape Dune Fynbos; Knysna Sand Fynbos Vegetation Types**
Erica glumiflora	Vulnerable	Eastern and Western Cape. **Wilderness to East London, and extending inland around Grahamstown.** **Southern Cape Dune Fynbos, Knysna Sand Fynbos Vegetation Types**
Gladiolus vaginatus	Vulnerable	Western Cape **Cape Peninsula to Knysna Southern Cape Dune Fynbos; Knysna Sand Fynbos**

Pentaschistis barbata subsp. orientalis barbata ssp. orientalis (that may be a distinct taxon when more material becomes available)	Critically Endangered	Western Cape **A highly range-restricted subspecies (EOO<6 km², AOO<1 km²), known from two subpopulations in the Knysna area. The subpopulation inside the Goukamma Reserve disappeared over the past 10 years, most likely as a result of incorrect fire management. The second subpopulation (outside the reserve) is severely threatened by invasive alien plants and urban development. There are fewer than 50 mature individuals of this subspecies extant.** **Southern Cape Dune Fynbos and indicated by Dr. J. Vlok to be present in the Brenton Dune Fynbos Vegetation Types.**
Satyrium princeps	Vulnerable	Eastern and Western Cape. **Wilderness to Port Alfred.** **Southern Cape Dune Fynbos, Knysna Sand Fynbos; Cape Seashore Vegetation Types**

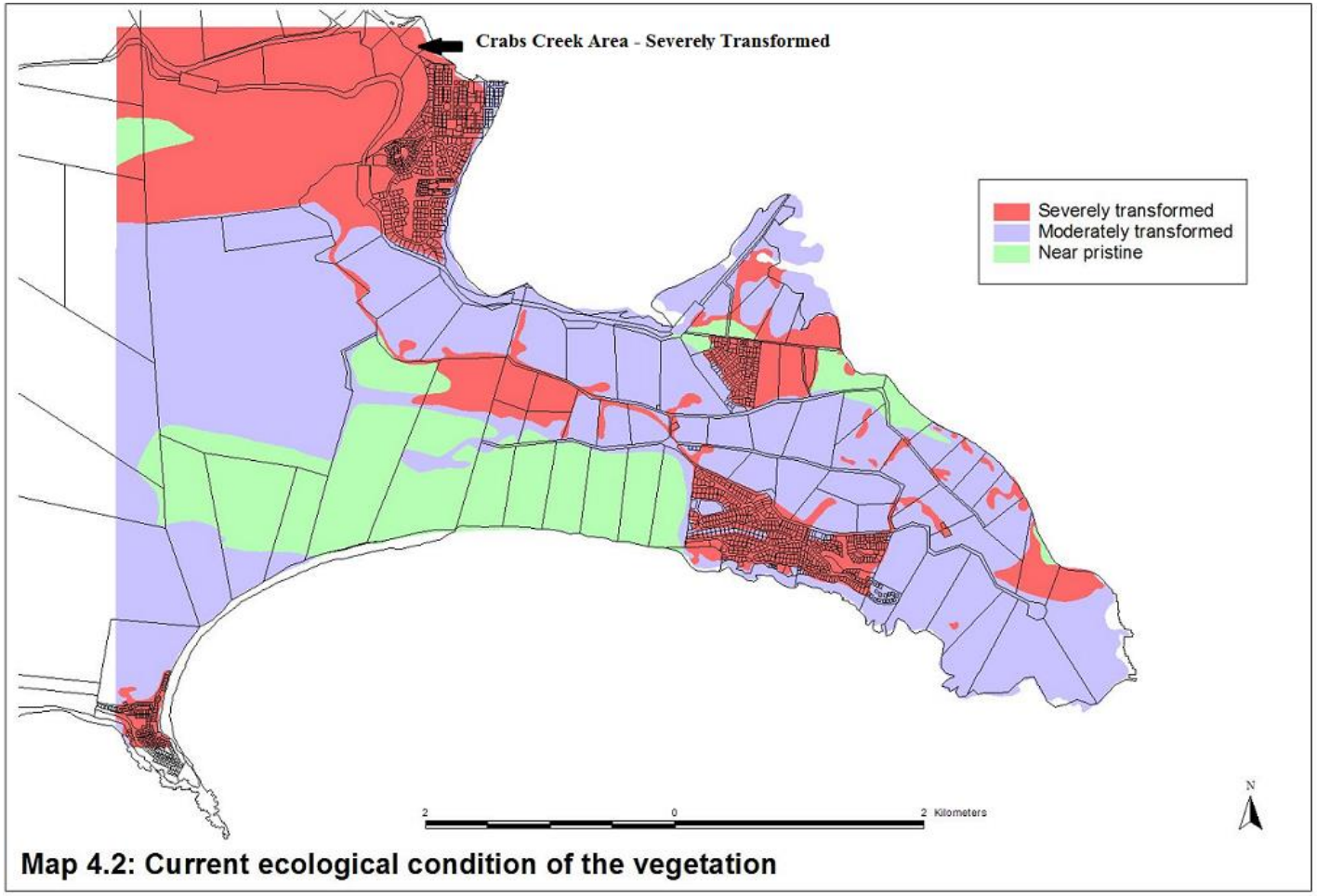
Western Heads Vegetation Types present on the Property



Map 4.1: Natural vegetation of the Western Heads

Current Condition of the Vegetation (Regalis Environmental Services (2005)

Most of the local vegetation types have been affected by urban development, infestation by alien vegetation and/or altered ecological processes.



Map 4.2: Current ecological condition of the vegetation

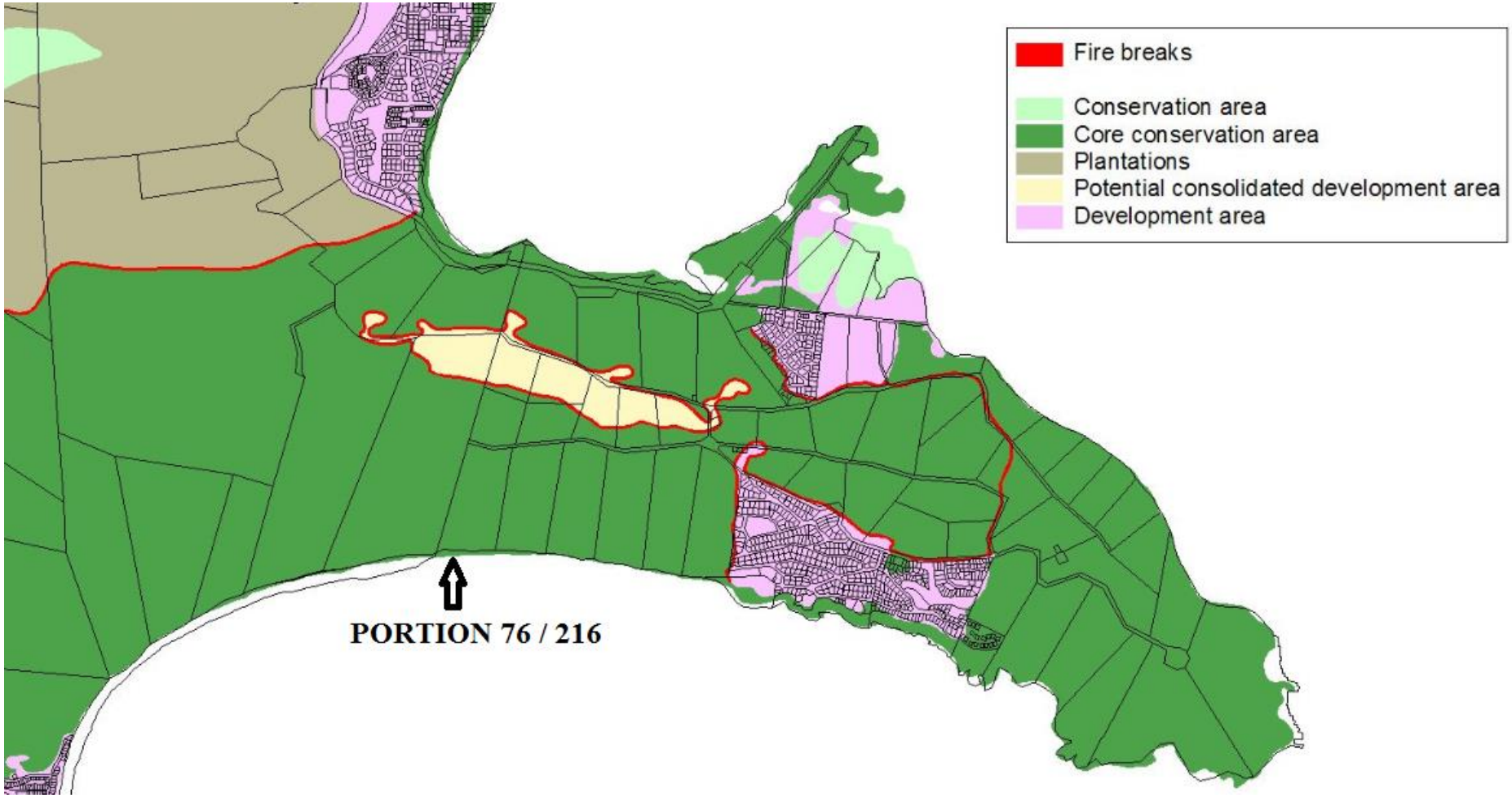
Spatial extent of the sixteen vegetation units of the Western Heads area and degree to which they have been transformed (percentage of total area).

VEGETATION TYPE	TRANSFORMATION			TOTAL
	SEVERE	MODERATE	PRISTINE	AREA (ha)
Foredune	0.0%	31.6%	68.4%	14.8
Brenton Dune Fynbos	0.0%	0.4%	99.6%	37.7
Primary Dune Slack Fynbos	0.0%	0	100.0%	49.8
Goukamma Dune Slack Fynbos	0.0%	32.8%	67.2%	51.9
Goukamma Dune Thicket	10.1%	24.2%	65.7%	52.0
Arid Dune Fynbos	5.7%	5.6%	88.7%	52.8
Wet Dune Fynbos	9.5%	90.5%	0	61.8
Saltmarsh	6.8%	93.1%	0.1%	62.4
Goukamma Dune Thicket Mosaic Dune Fynbos	11.1%	87.3%	1.5%	111.5
Primary Dune & Cliff Fynbos	7.2%	60.5%	32.4%	121.7
Coastal Forest & Thicket Mosaic Grassy Fynbos	19.3%	76.7%	4.0%	184.1
Coastal Forest & Thicket Mosaic Moist Fynbos	29.4%	70.5%	0	213.8
Moist Dune Fynbos	2.2%	55.3%	42.6%	225.3
Coastal Forest & Thicket	64.9%	20.2%	14.9%	257.9
Knysna Dry Sandy Fynbos	34.5%	65.3%	0.2%	354.6
Knysna Wet Sandy Fynbos	54.8%	39.8%	5.4%	446.1

Spatial extent of the Western Heads vegetation units that are still in a pristine to moderate ecological condition.

VEGETATION TYPE	AREA (hectare)	
	PRISTINE	PRIST+MOD
Foredune	10.1	14.8
Brenton Dune Fynbos	37.5	37.7
Goukamma Dune Thicket	34.2	46.8
Arid Dune Fynbos	46.8	49.8
Primary Dune Slack Fynbos	49.8	49.8
Goukamma Dune Slack Fynbos	34.9	51.9
Wet Dune Fynbos	0.0	56.0
Saltmarsh	0.1	58.1
Coastal Forest & Thicket	38.4	90.5
Goukamma Dune Thicket Mosaic Dune Fynbos	1.7	99.1
Primary Dune & Cliff Fynbos	39.4	113.0
Coastal Forest & Thicket Mosaic Grassy Fynbos	7.4	148.5
Coastal Forest & Thicket Mosaic Moist Fynbos	0.0	150.9
Knysna Wet Sandy Fynbos	24.2	201.7
Moist Dune Fynbos	95.9	220.4
Knysna Dry Sandy Fynbos	0.8	232.2

Proposed Core Conservation Area for the Western Heads



4. Impacts, Mitigation Measures and Significance Rating

Two negative and two positive impacts of significance were identified using the following methodology:
Four factors need to be considered when assessing the significance of impacts, namely:

A. the relationship of the impact to temporal scales
B. the relationship of the impact to spatial scales
C. the actual significance of the impact, and
D. the degree of confidence place in the assessment

A. The **temporal scale** defines the significance of the impact at various time scales, as an indication of the duration of the impact.

1. **Short term:** less than 5 years. Many construction phase impacts will be of a short duration.
2. **Medium term:** between 5-20 years, the approximate duration of the mining operation.
3. **Long term:** between 20-40 years, and from a human perspective essentially permanent.
4. **Permanent:** over 40 years, and resulting in a permanent and lasting change that will always be there.

B. The **spatial scale** defines physical extent of the impact.

1. **Localized:** having an impact only within the confined of the development.
2. **Municipal:** having an impact within the municipal area (i.e. the Bitou municipality)
3. **Regional:** having an impact within the regional context (Western Cape)
4. **National:** having an impact at the National Level (South Africa)

C. The **Environmental Significance** scale is an attempt to evaluate the importance of a particular impact. This evaluation needs to be undertaken in the relevant context, as an impact can either be ecological or social, or both. The evaluation of the significance of an impact relies heavily on the values of the person making the judgment. For this reason, impacts of especially a social nature need to reflect the values of the affected society. Significance will need to be evaluated with and without mitigation. In many cases, mitigation will take place, as it will have been incorporated into project design. A six-point significance scale has been applied.

1. **Very High:** These impacts are considered by the specialist as constituting a major and usually permanent change to the environment, and usually result in severe or very severe effects, or beneficial or very beneficial effects.

2. **High:** These impacts will usually result in long-term effects on the natural environment. Impacts rated as high are considered by the specialist as constituting an important and usually long-term change to the environment.

3. **Moderate:** These impacts will usually result in medium- to long-term effects on the natural environment. Impacts rated as moderate are considered by the specialist as constituting a fairly important and usually medium term change to the environment. These impacts are real but not substantial.

4. **Low:** These impacts will usually result in medium- to short-term effects on the natural environment. Impacts rated as low are considered by the specialist as constituting a fairly unimportant and usually short-term change to the environment. These impacts are not substantial and are likely to have little real effect.

5. **No Significance:** There are no primary or secondary effects that are important to the specialist.

6. **Don't Know:** In certain cases it may not be possible to determine the significance of an impact.

D. It is also necessary to state the **degree of confidence** with which one has predicted the significance of an impact.

1. **Definite:** More than 90% sure of a particular fact. To use this one will need to have substantial supportive data.
2. **Probable:** Over 70% sure of a particular fact, or of the likelihood of that impact occurring.
3. **Possible:** Only over 40% sure of a particular factor of the likelihood of an impact occurring.
4. **Unsure:** Less than 40% sure of a particular fact or the likelihood of an impact occurring**.**

Vegetation related impacts identified:

Two negative and two positive vegetation related impacts have been identified:

1. Removal of Alien Invasive Species during construction phase (+VE);
2. Re-instatement of Knysna Sand Fynbos vegetation in areas currently invaded by alien plant species.
3. Re-invasion of Alien Invasive Plant species during operational phases.
4. Impact on near pristine indigenous vegetation to construction activities.

Environmental Impact	Relevant Phase	Mitigation Measures	Temporal Scale	Spatial Scale	Significance of impact		Degree of Certainty
					Before mitigation	After mitigation	
1. Removal of Alien Invasive Species during construction phase (+VE)	Construction	All Invasive plant species should be removed from the site and follow up actions implemented.	Short Term	Localised	Low (+VE)	High (+VE)	Probable
2. Re-instatement of Knysna Sand Fynbos Vegetation in areas currently invaded by alien plant species.	Construction and Operation	Invasive Kikuyu grass should be removed, Salt marsh area must be cordoned off and re-establishment of Salt marsh vegetation monitored.	Long Term	Localized	Low (+VE)	High (+VE)	Probable
3. Re-invasion of Alien Invasive Plant species during operational phases	Post-construction & Operational	Continuous clearing during rehabilitation and landscaping of emerging invasives is required particularly surrounding the site	Medium Term	Localised	Moderate	Low	Possible
4. Impact on near pristine indigenous vegetation to construction activities.	Construction	Appropriate soil erosion control measures should be taken in order to avoid any impact on the indigenous vegetation area. This area should be demarcated as a **"No Go" Area.**	Short Term	Localised	Low	Very Low	Possible

5. Conclusions & Recommendations:

- **Knysna Sand Fynbos** is a **Critically Endangered** Ecosystem according to the National Environmental Management: Biodiversity Act (NEM:BA), 2011.
- The property fall within a **Critical Biodiversity Area** according to the GRI Documents, 2010.
- All Invasive plant species should be removed from the site and follow up actions implemented.
- Continuous clearing during rehabilitation and landscaping of emerging invasives is required particularly surrounding the site.
- Appropriate soil erosion control measures should be taken in order to avoid and contain erosion.
- The re-establishment of Knysna Sand Fynbos vegetation should be encouraged and monitored.
- It is clear from the detailed studies carried out by Dr. Jan Vlok of Regalis Environmental Services on the Western Heads Area that portion 76 of the Farm Uitzicht No. 216 fall within the area delineated as "core conservation area".
- The size of the property is 21.01 Ha in size.
- The size of the area that has been transformed is 1.13 Ha as a result of old Pine Plantation on the property.
- Therefore 5.37% of the property has been transformed; the remaining 94.63% of the property consists of intact indigenous vegetation.
- The proposed residential areas (access, dwellings and surrounding areas) will have a combined foot print of approximately 2500 m^2 (0.25 Ha) in size, this constitutes 1.18% of the property.
- After rehabilitation of the transformed area > 99% of the property will be in a pristine condition.
- Indigenous Species of Special Concern (Refer to Appendix A for detail information)
- Disturbance of the **Brenton Dune Fynbos** should be avoided due to the possible presence of the **critically endangered** grass species ***Pentaschistis barbata subsp. orientalis barbata ssp. orientalis***. The species were not identified during the site visit, however the area is currently under severe drought conditions which seriously restrict the identification of grass species.

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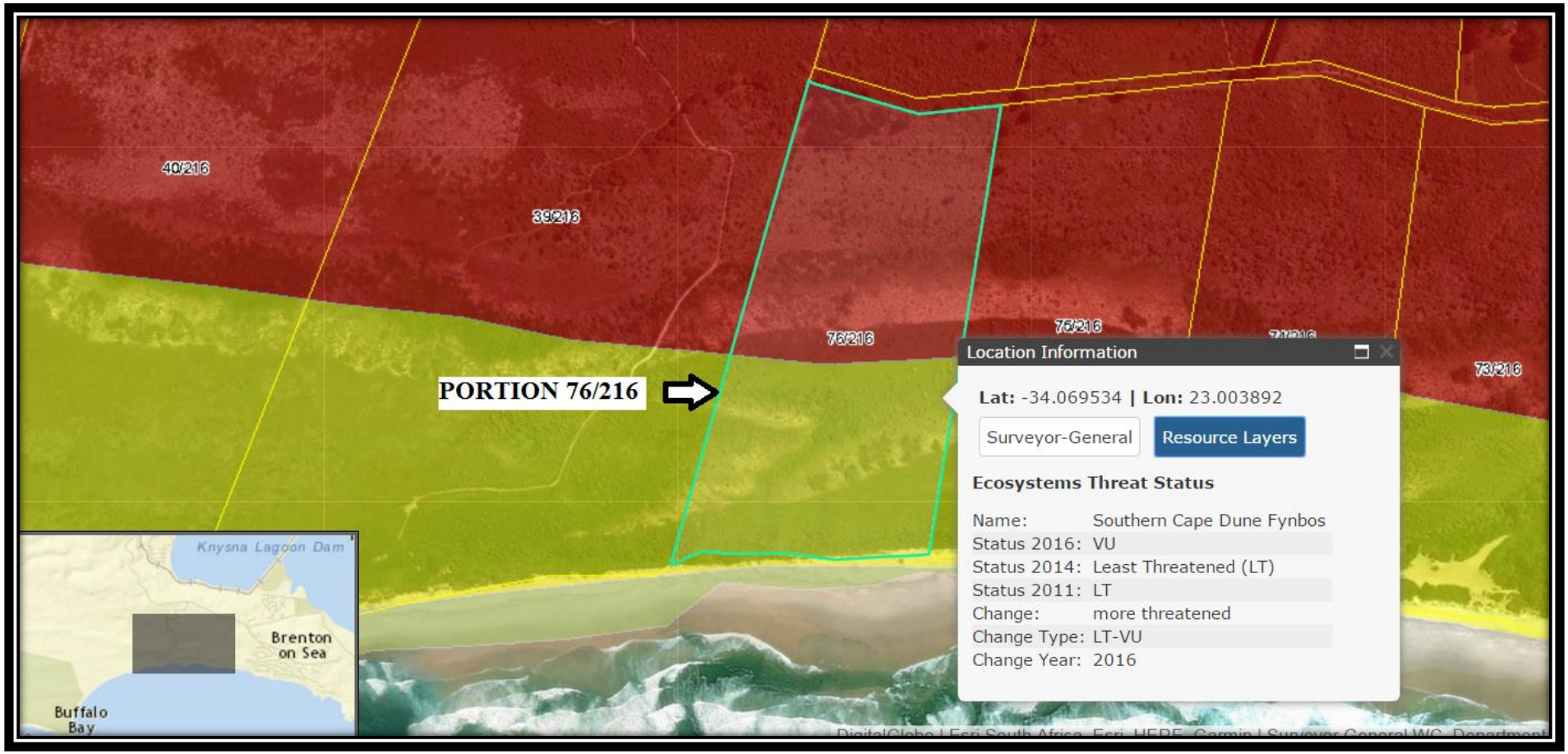
SOIL ERODIBILITY

GEOLOGY AND SOILS

RSA ECOSYSTEM THREAT STATUS
Southern Cape Dune Fynbos - Vulnerable



RSA ECOSYSTEM THREAT STATUS
Knysna Sand Fynbos - Critically Endangered