

PROPOSED LAGUNA BAY RESORT DEVELOPMENT, JEFFREYS BAY

DEDEA REF NO.: EC08/387/10-32

VEGETATION OF THE LAGUNA BAY SITE IN A REGIONAL CONTEXT

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1. GENERAL SITE DESCRIPTION AND CONTEXT

1.1. Site Description

The proposed Laguna Bay Resort and Visitor Centre is to be constructed on remainder of Portion 6 of the Farm Kabeljous River No. 328 in Jeffrey's Bay, Eastern Cape Province of South Africa (Figure 1-1).

The site lies to the north of the existing residential area of Kabeljous-on-Sea and is approximately 18.08ha in extent. This assumes that the main road on the western side of the site, Da Gama Road, is contained within its own erf portion, and is thus excluded from the site area.



Figure 1-1: The proposed location for the Laguna Bay Resort and Visitor Centre.

1.2. Vegetation description

1.2.1. Mucina and Rutherford

Mucina and Rutherford (2006), describe the vegetation occurring within the Laguna Bay site as Gamtoos Thicket, and occurring close to the eastern edge of the site: Cape Estuarine Salt Marsh (Figure 1-2). The closest occurrence of Humansdorp Shale Renosterveld is approximately 1.5kms away from the Laguna Bay site. It should be noted that the Mucina and Rutherford vegetation map maps the extent of vegetation that would occur in the region without anthropogenic influence.

The National Vegetation map was developed by Mucina and Rutherford (2006) as part of a South African National Biodiversity Institute (SANBI) funded project: "It was compiled in order to provide floristically based vegetation units of South Africa, Lesotho and Swaziland at a greater level of detail than had been available before." The map was developed using a wealth of data from several contributors and has allowed for the best national vegetation map to date, the last being that of Acocks developed over 50 years ago. This map forms the base of finer scale bioregional plans such as STEP. This SANBI Vegmap project has two main aims:

- “to determine the variation in and units of southern African vegetation based on the analysis and synthesis of data from vegetation studies throughout the region, and
- to compile a vegetation map. The map was to accurately reflect the distribution and variation on the vegetation and indicate the relationship of the vegetation with the environment. For this reason the collective expertise of vegetation scientists from universities and state departments were harnessed to make this project as comprehensive as possible.”

The map and accompanying book describe each vegetation type in detail, along with the most important species including endemic species and those that are biogeographically important. This is the most comprehensive data for vegetation types in South Africa.

Gamtoos thicket occurs in the Eastern Cape Province on low mountain slopes and low ridges. It is a tall dense thicket comprising both succulent flora and trees. It is listed as Least Threatened, with a conservation target of 19% and 6% statutorily conserved.

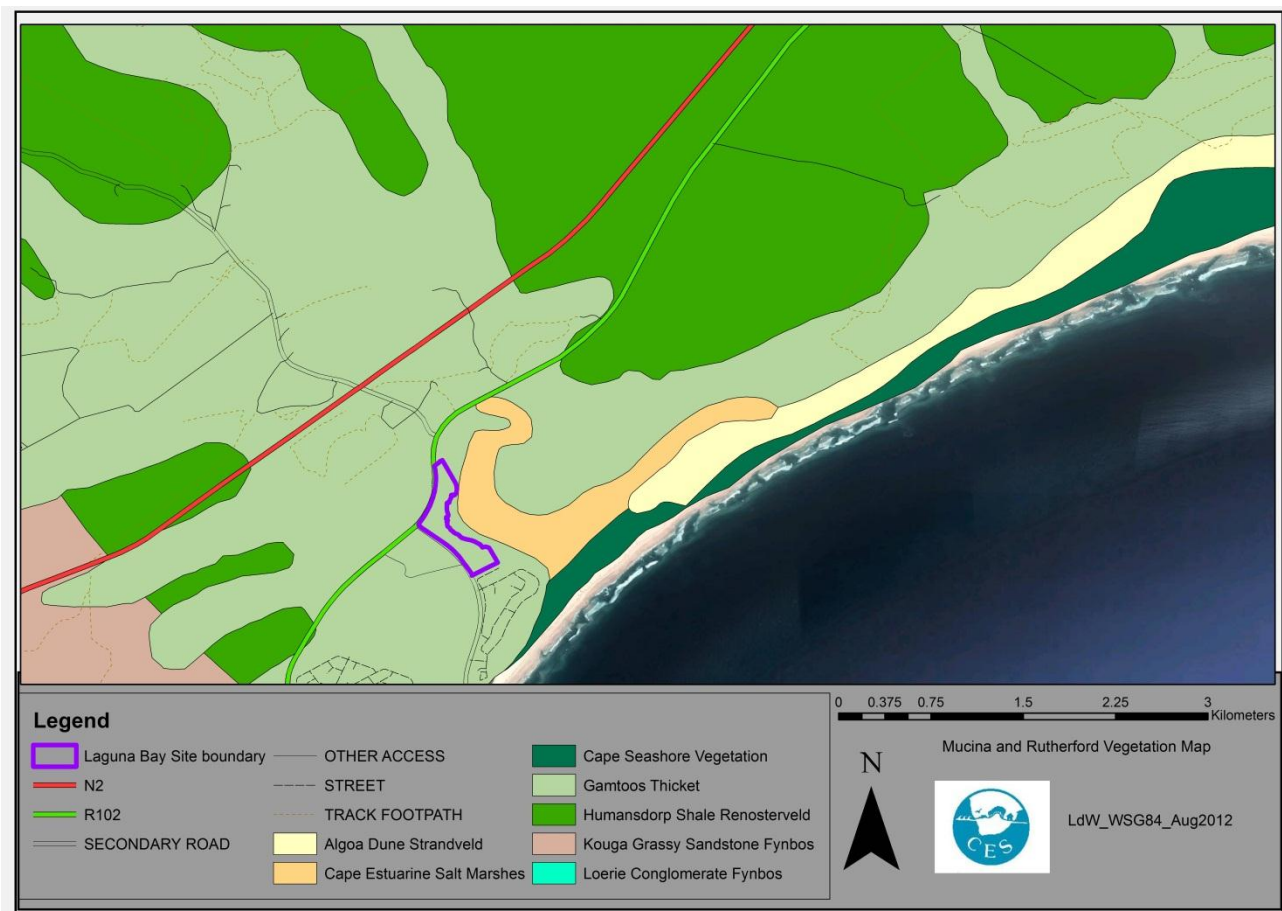


Figure 1-2: Mucina and Rutherford vegetation map of the Laguna Bay site and surrounding areas.

1.2.2. STEP

STEP was developed originally in 2003 in order to provide conservation and planning tools for the STEP region (Pierce and Mader 2006). The STEP region is the region containing the Subtropical Thicket Biome and its constituents, as well as those biomes closely related to it. STEP is a complex system for conservation priorities which is further described in Chapter 6. STEP, as part of the conservation planning tool, has mapped the vegetation types within the Thicket Biome that would occur in the area in the absence of anthropogenic influences.

The vegetation type described by STEP for this site is Gamtoos Thicket (Figure 1-3). The Gamtoos Thicket is easily recognised by the canopy emergence of *Cussonia spicata* and *Euphorbia*

triangularis and the general absence of *Cussonia gamtoosensis*, *Euphorbia grandidens* and other succulent species. Woody trees and shrubs, such as *Hippobromus pauciflorus*, *Olea europaea*, *Phyllanthus verrucosus*, *Plumbago auriculata*, *Rhus lucida*, *Schotia latifolia* and *Scutia myrtina* are dominant in this unit. This vegetation type is classified as **vulnerable** according to STEP (Pierce & Mader 2006). The unit is floristically and structurally very similar to the Sundays Thicket, but differs in lacking some of the species typical of the Sundays Thicket, such as *Aloe ciliaris*. This unit is largely restricted to fairly shallow clayey soils derived from the Gamtoos group of formations (Kaan and Klein River Formations), but the main determining factor is probably the more predictable and higher rainfall zone in which this unit occurs. Here woody species (*e.g.* *Olea europaea*) may gain dominance over the woody species typical of the Valley Thicket unit, mostly due to the lack of regular water stress, (Vlok and Euston-Brown 2004). When this thicket unit forms a mosaic with renosterveld it is known as Kabeljous Renoster Thicket (Pierce & Mader 2006).

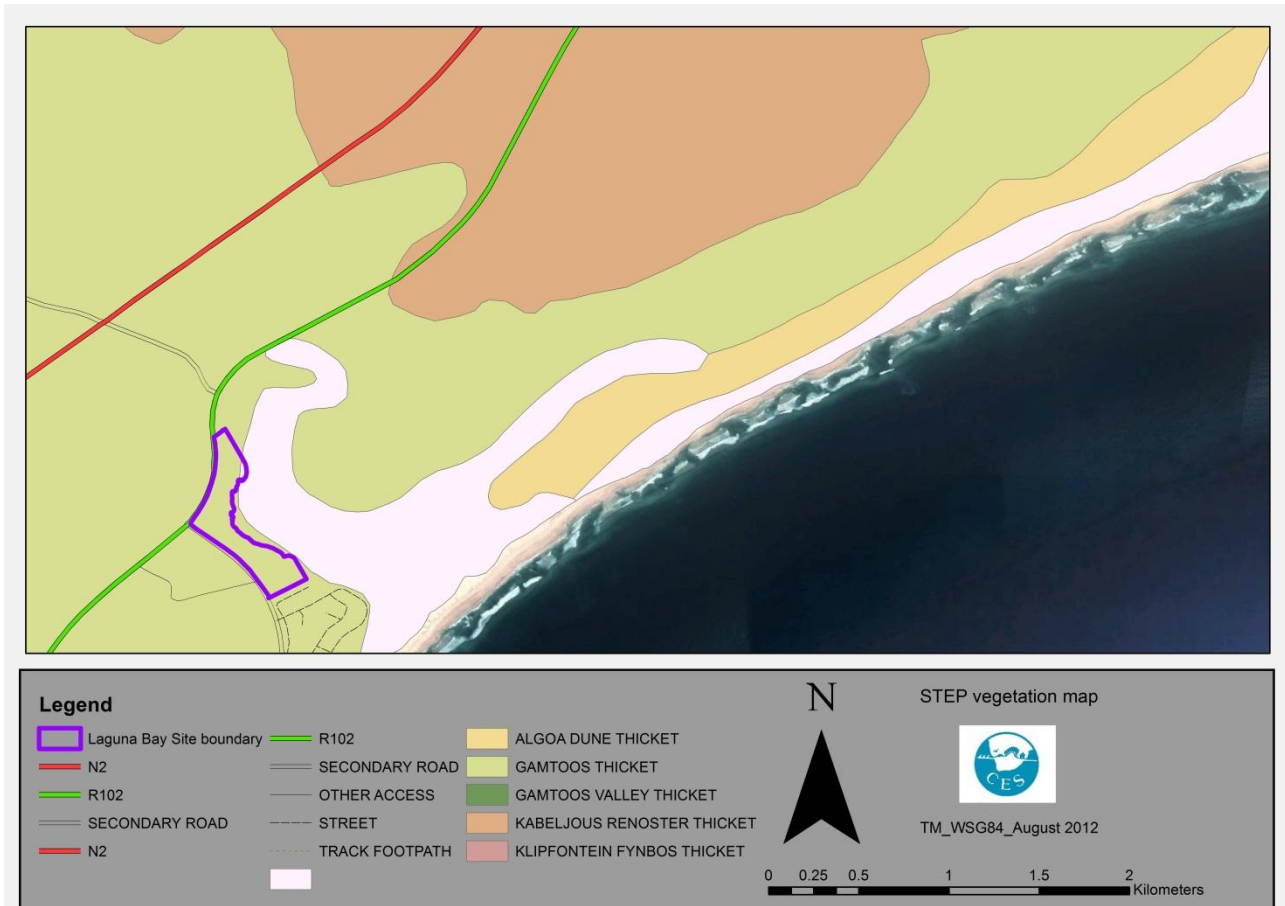


Figure 1-3: STEP vegetation for the Laguna Bay site and surrounds.

1.2.3. Vegetation on site: Previous descriptions

There were six vegetation types previously identified on site (CES, 2010). These included: Bushclumps, Grassland, Open Ground, Renosterveld, Saltmarsh and Thicket (Figure 1-4). The vegetation type of interest here is the Renosterveld, and to a lesser extent, the Bushclumps and Thicket. The original description of the Renosterveld is provided below. It is clear that these areas described as Renosterveld are interspersed within the thicket and is most likely grassland being invaded by thicket species. These areas are interspersed with thicket patches.



Figure 1-4: Map of the study site, showing the spatial distribution of the vegetation types

Renosterveld

This Renosterveld was described in our previous report (CES,2010) as Kabeljous Renoster Thicket mosaic (Pierce & Mader 2006) but it was pointed out that it has none of the characteristics of this type of Renosterveld (Plate 3-1 A and 3-1 B). *Aloe africana* is abundant in this Renosterveld where it may act as a precursor for Thicket clumps (Vlok and Euston-Brown 2004). The thicket woody species are dispersed by fructivorous birds and the Aloes act as perch sites, and thicket shrubs and trees will grow up from the seeds that the birds deposit around the aloes. It was further pointed out that this type of Renosterveld is invaded by many species and the dominant species which appears to be increasing is a 1-2m tall yellow flowering shrub (*Oedera genistifolia*). With the large number of shrub species there are few small herbs or succulents in this Renosterveld (CES, 2010).



Plate 1-1: A. Renosterveld with bushclumps and invasive rooikrans (*Acacia cyclops*) in the background. B. Grassveld invaded by thicket forming the Bushclump vegetation type (from CES,2010).

1.3. Sensitivity

The sensitivities of the different vegetation types were described in the original specialist report (CES, 2010) as follows (Figure 1-5, which also indicates the area to be developed at the south of the site and the area to be actively conserved to the north of the site, separated by a green line.):

- **Salt Marsh** should not be developed or interfered with in anyway as it has a HIGH sensitivity. It is not rich in plant species but the site is extensively used by a variety of water birds and other animals. It is a major feature of the site that should be conserved and used as an educational area with hides and trails.
- **Thicket** is also rated as a HIGH sensitivity; it is confined to a narrow strip above the estuary but is fairly widespread along the coast. Development must occur in the terrestrial environment maintaining the thicket vegetation in its present form.
- **Renosterveld** occurs in patches and is very variable in its sensitivity rating. The diversity and species of special concern in this vegetation type is lower than it probably is in other sites in this region. On average it only scores as a MODERATE sensitivity. It is quite abundant in this region and in other sites, where it is conserved in some areas. It is recommended that removal of alien species and rehabilitation of disturbed areas be conducted within the Renosterveld. With better management and the removal of some species that occur in over abundance, such as the shrub, *Oedera genistifolia*, the Renosterveld of the site could be improved to achieve a more acceptable condition.
- **Grasslands with Bushclumps** are rated as LOW and development could proceed in this region adjacent to the Grasslands and along above the Coastal Thicket at the edge of the estuary. Bushclumps are a mixture of grassland where woody plant species have invaded into the grassland. Although their plant species richness is high this is because they are a mixture of Grassland and Thicket vegetation types. Their dispersion between grasslands and thicket is clearly shown in the scatter diagram of the dispersal of the vegetation types.
- **Grasslands** are generally rated as LOW, as much of the grassland area is disturbed with the invasion of introduced grasses such as kikuyu. A singular exception of a natural grassland patch surrounded by Thicket and Renosterveld. The sensitivity of this grassland was recorded as 58% and 73% in two separate surveys, because of the isolation of this small grassland habitat, presence of many species of plants and there was also evidence of the site being used by a variety of small mammals, including otters, as an otter midden was recorded on this site.

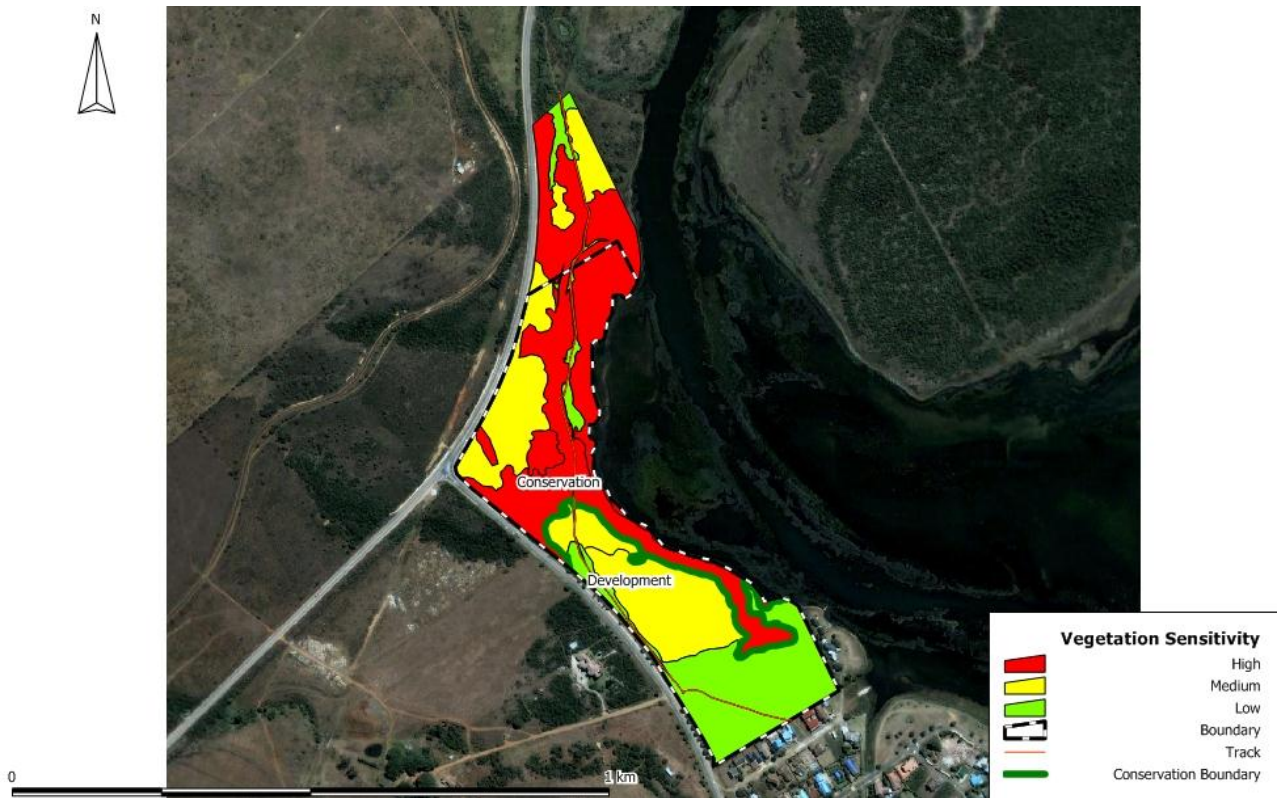


Figure 1-5: Ecological Sensitivity map of the study site, showing original conservation boundary, which has since been increased (from CES, 2010).

2. ENVIRONMENTAL AUTHORISATION

2.1. Key factors considered in making the decision

Section 5 – *Key factors considered in making the decision* - of the environmental authorisation for the development (DEDEAT, May 2012) included the following criteria (reproduced here):

- 5.3. The subject site consists of a number of sensitive ecosystems. A large area of saltmarsh occurs on the site, and there are areas of Gamtoos Thicket, classified as “Vulnerable” according to the Subtropical Thicket Ecosystems Project (STEP). Both these vegetation types are very sensitive and no development should occur here. Furthermore, Renosterveld and Thicket-shrub land mosaic vegetation occurs on site and this is considered sensitive. The Renosterveld has been degraded by previous overgrazing practices, and the Gamtoos Thicket has formed a mosaic with it, thus it is classified as Kabeljous Renoster Thicket in terms of STEP and is also vulnerable. The Ecological Impact Assessment (Section A of Volume 2 of the EIR) indicates that the site is highly sensitive and an ‘Endangered Area’ which dictates a high conservation status. The vegetation is further identified as:
- a. Saltmarsh – which has a High sensitivity and should not be developed or interfered with in any way;
 - b. Coastal Thicket – also with a High sensitivity and must be maintained in its present form;
 - c. Renosterveld – rated as moderate sensitivity, due to lower diversity and occurrence of species of special concern than surrounding areas with Renosterveld.
 - d. Grasslands and bush clumps – rated as low sensitivity even though the species richness is high in the bush clumps, and the protected white milkwood, *Sideroxylon inerme*, occurs within these bush clumps.

The conditions of this authorisation have been designed to reduce and minimise the negative impacts on this highly sensitive site, by reducing the size of the development and limiting development to the most degraded area of the site (DEDEAT 2012 pg 21).

- 5.4. However, the Renosterveld on this site has been described as Humansdorp Shale Renosterveld by Mucina and Rutherford (2006). This vegetation is now listed as an “Endangered Ecosystem” in terms of Section 52 of the National Environmental Management: Biodiversity Act, Act 10 of 2004, and “loss of habitat in a critically endangered or endangered ecosystem should be ranked as highly significant” (ph. 46 of GN R. 1002 of 09 December 2011), thus DEDEAT cannot accept the description of the Renosterveld as having a moderate sensitivity based on its degraded nature, as this is one of the criterion utilised to list this ecosystem as Endangered. Furthermore, the bush clumps cannot be considered to be of low to medium sensitivity as they contain high species richness as well as protected species such as the white milkwood. The general degraded state of this vegetation is largely due to the lack of management of the vegetation on the site, and it is DEDEAT’s view that this vegetation, rated as Medium sensitivity, can be rehabilitated and thus no areas rated as Medium sensitivity should be lost to development on this site (DEDEAT 2012 pg 21).

2.2. Issues

Issues brought up by this environmental authorisation include the following:

1. The Gamtoos Thicket and Saltmarsh. It is indicated that no development should occur here;
2. Renosterveld being described as “Humansdorp Shale Renosterveld”;
3. the presence of the protected tree, White Milkwood (*Sideroxylon inerme*), and;
4. the assertion that development should only take place in areas described as having a LOW ecological sensitivity.

Each of these concerns is addressed in Chapter 3 below.

3. CONCERNS REGARDING THE ISSUES RAISED AND DECISIONS MADE IN THE ENVIRONMENTAL AUTHORISATION

In order to examine the issues raised in the Environmental Authorisation we have carried out a detailed study of the earlier reports on the vegetation, and also carried out further studies in the field. Earlier reports consulted included the Ecological Impact Assessment conducted by CES in 2010 (CES, 2010), as well as the one conducted by Nelson Mandela Metropolitan University in 2005 (Klages, 2005). The issues raised by the Environmental Authorisation are serious, and in need of clarification. These are elaborated upon here under the four issues as set out in section 2 above.

3.1. Issue 1: Gamtoos Thicket and Saltmarsh

As can be seen from the vegetation map (Figure 3-1) of the site, there are no plans to develop any areas containing thicket or saltmarsh. These areas are earmarked for active conservation. This is important, as the current land use for the site is resulting in its continued degradation (Plate 3-1) and, if left as is will continue to degrade. The facility will thus have an overall positive impact on the site.

In addition, although the renosterveld thicket mosaic would be expected to be Kabeljous Renoster Thicket mosaic as described by STEP and mentioned in the authorisation (see chapter 2, above) (Pierce & Mader 2006); it has none of the characteristics of this type of Renosterveld, and thus cannot be classified as such. It is important to note this was explicitly stated in the specialist report (CES, 2010).



Plate 3-1: The site is used for grazing of horses, as a thoroughfare, as well as a general dump site.

3.2. Issue 2: Renosterveld being described as “Humansdorp Shale Renosterveld”

3.2.1. Current mapping

Humansdorp Shale Renosterveld, as described by Mucina and Rutherford (2006) does occur in the area (Figure 1-2). In addition, the recently legislated National List of Ecosystems that are Threatened and in need of Protection (Government Notice no. 34809, 09 December 2011) also

lists Humandorp Shale Renosterveld as number 80, Endangered due to criteria A1¹. The vegetation type has 6 endemic plant species, with only 35% of the original 87 000-hectare extent remaining. It tends to occur on plains and hills and forms a low graminoid shrubland, dominated by renosterbos (*Dicerotheramnus rhinocerotis*), and in some stages by *Aspalathus nivea*.

The distribution of this ecosystem has been mapped by SANBI in order to provide spatial reference to the data provided by the Government Notice.

It is very important to note, as can be seen by Figures 3-2 and 3-3, that neither the original, nor remaining extent of this ecosystem occurs within 1.5km of the Laguna Bay site.

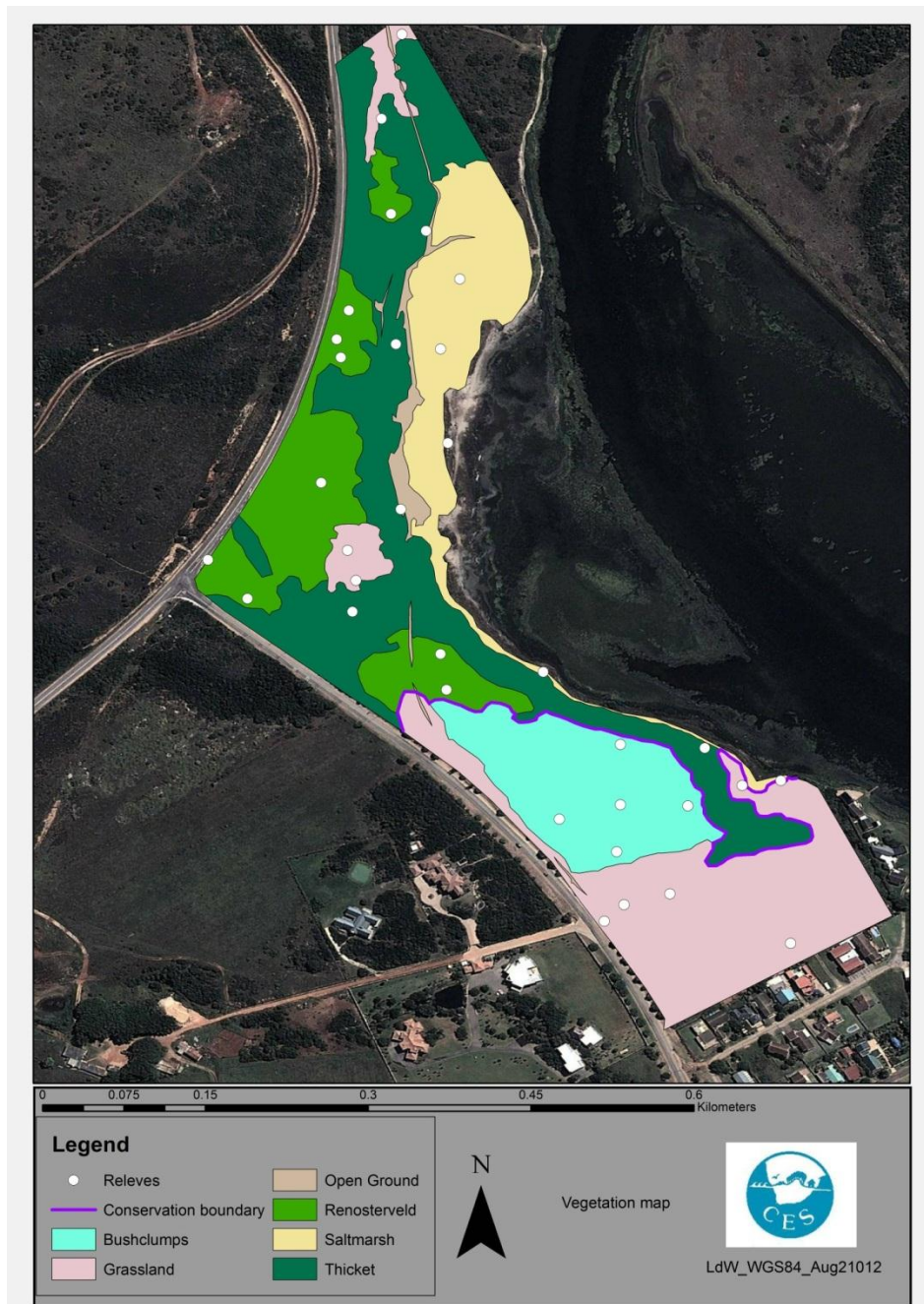


Figure 3-1: Vegetation map of the study area indicating the areas to be developed and conserved, as well as all sample plots (modified from CES, 2010).

¹ Criterion A1: Irreversible loss of natural habitat, for Endangered ecosystems this is when the remaining natural habitat is less than the biodiversity target (+ 15%).

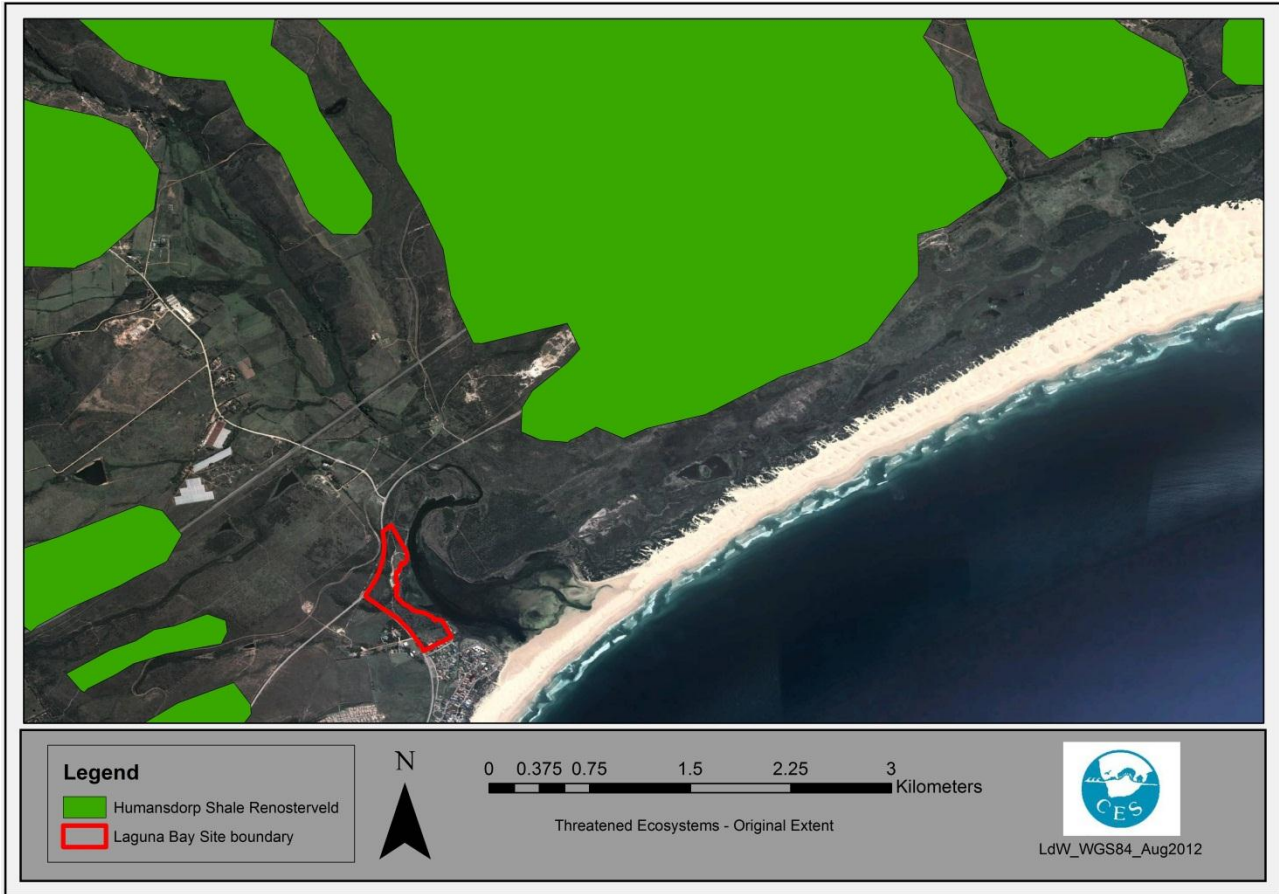


Figure 3-2: Original Extent of Humansdorp Shale Renosterveld as mapped by SANBI (2011).

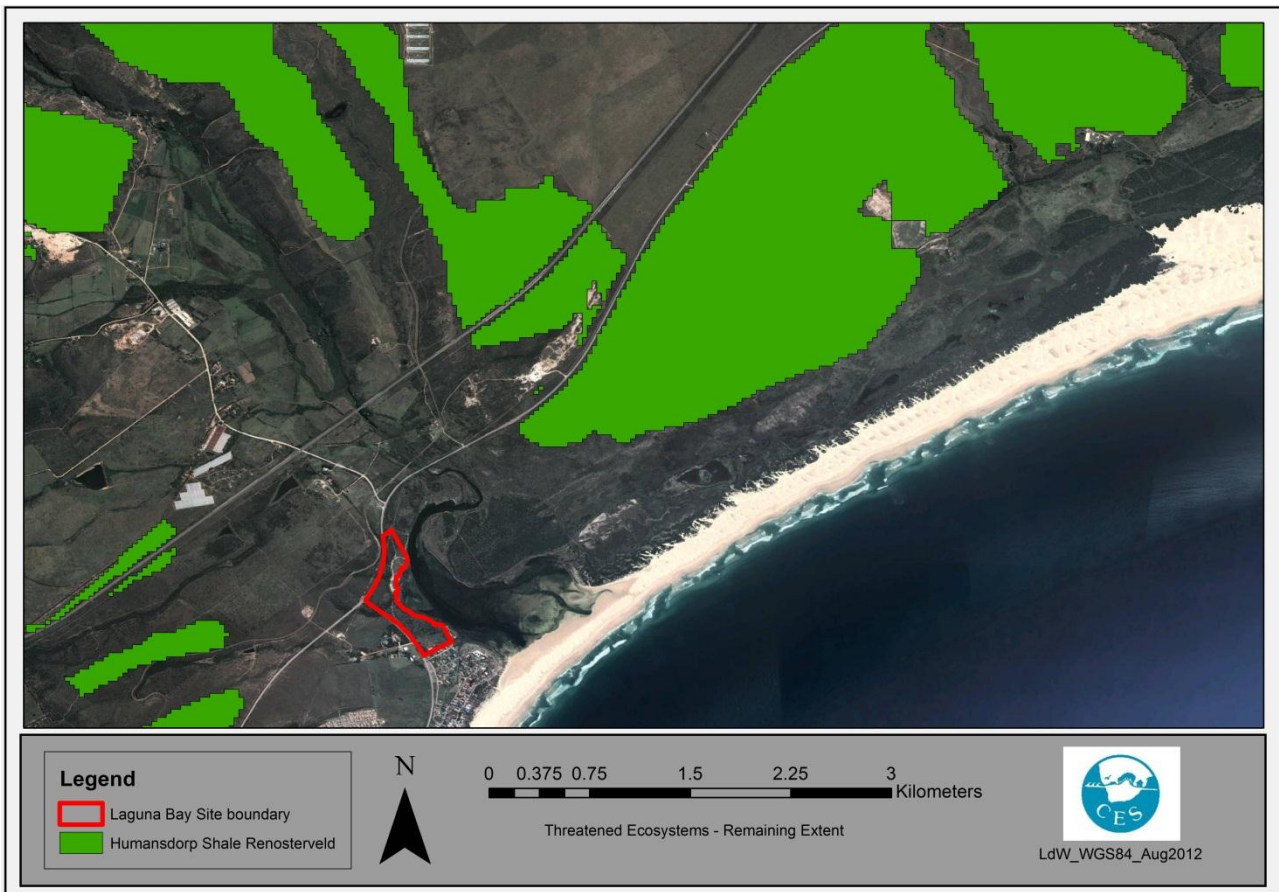


Figure 3-3: Remaining Extent of Humansdorp Shale Renosterveld as mapped by SANBI (2011).

3.2.2. Field data

In order to determine if Mucina and Rutherford (2006), as well as the compilers of the list of Threatened Ecosystems (2011), were correct in their mapping of the distribution of the Humansdorp Shale Renosterveld, field surveys were conducted in August 2012. Original relevé data were used (CES, 2010), as well as data from an additional site visit on the 15th of August 2012. The sample plots used can be seen in Figure 3-4 below. Several sample plots were taken on the Laguna Bay site (inset in Figure 3-4) and three in mapped Humansdorp Shale Renosterveld to the east of the site to provide a benchmark.

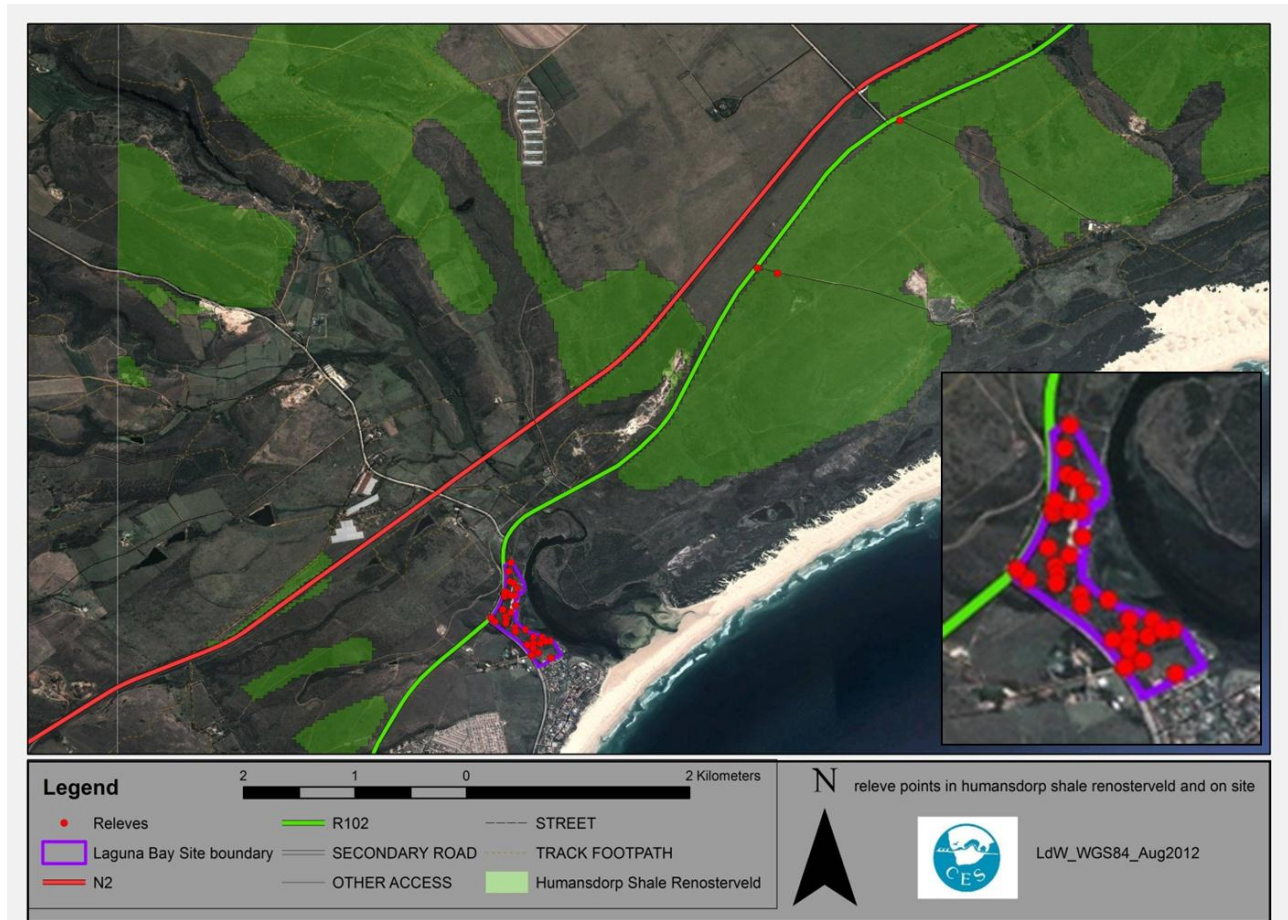


Figure 3-4: Relevé sites at the Laguna Bay study site as well as in Humansdorp Shale Renosterveld (red dots).

The study sites show a marked difference in vegetation structure, and a complete difference in dominant species. The Laguna bay site comprises mostly thicket species (*Euclea undulata*, *Azima tetracantha*) ranging in height from 0.5m to 3m, with some invasive species (*Opuntia ficus-indica*, *Acacia cyclops*) and species indicated degraded veld (*Pteronia incana*). More detail on species composition is given below. The vegetation structure is that of large thicket clumps surrounded by areas dominated by grasses and smaller shrubs (the Renosterveld) (Plate 3-2). In comparison, the Humansdorp Shale Renosterveld (HSR) site comprises short (maximum 0.3m) karroid shrubs and various small herbaceous species. Areas close to the road have an abundance of *Aspalathus nivea*, indicative of disturbance in HSR (Mucina and Rutherford 2006). Invasive species include *Acacia cyclops* (Plate 3-3).



Plate 3-2: General vegetation of the Laguna Bay site, in the area defined as Renosterveld and Bushclumps. A: The soil is sandy and deep, B: There are swathes of grassland in-between bushclumps and C: Most of the vegetation is comprised of thicket species.

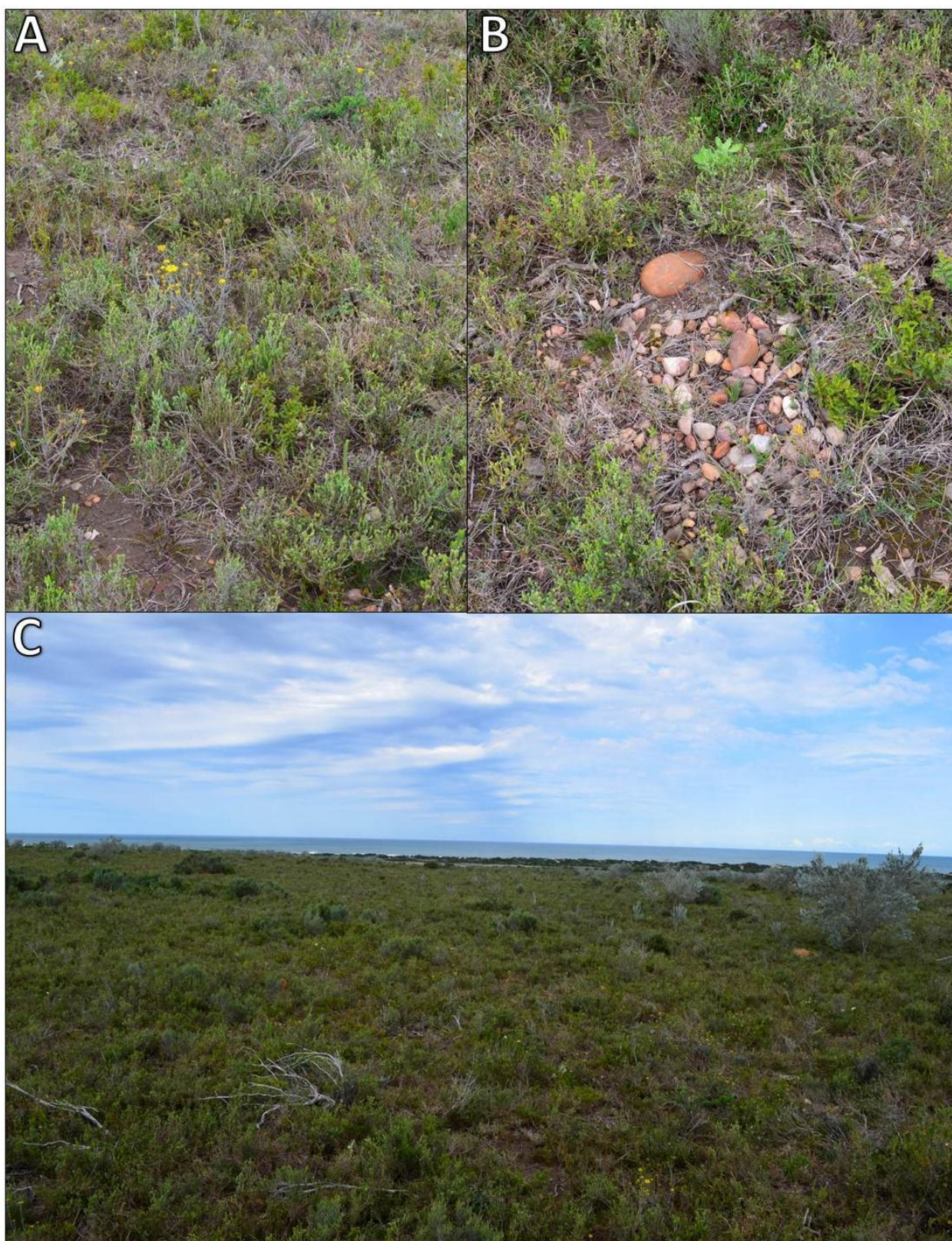


Plate 3-3: General vegetation of the Humansdorp Shale Renosterveld site. A: The vegetation comprises primarily small karroid shrubs with numerous herbaceous shrubs, B: the soils are very stony and C: Vegetation tends to be very low, with a maximum height of 0.3m, except for isolated larger shrubs in disturbed areas.

Species lists have been compiled from the studies of both of the sites, and these are provided in Appendix 1. Comparison of the species lists shows a total number (from both Laguna Bay and the HSR sites) of 158 species. Of these, 55 species (35%) are common to both sites, 93 species (59%) occur only in Laguna Bay and 10 species (6%) occur only in HSR. Plates 3-5 and 3-6 indicate some of the common species at the Laguna Bay site and the HSR sites respectively.

It is important to note the two dominant species of the HSR include *Dicrothamnus rhinocerotis* and *Aspalathus nivea*, only *D. rhinocerotis* occurs on the Laguna Bay site, and in small numbers. From a botanical perspective, it can clearly be said that the Renosterveld occurring on the Laguna Bay site is not Humansdorp Shale Renosterveld. Moreover; development on the site will not occur in an areas mapped as Renosterveld, these areas will be conserved (Figure 3-1). In a previous study conducted on the area (Klages, 2005), it was determined that the areas of renosterveld on site were not sensitive, and it was recommended that development could go ahead in these areas.

Should development and land use pose a threat to areas of Humansdorp Shale Renosterveld, such land use practices or developments should not be allowed to go ahead. In the HSR sites sampled in the interests of this study, it was observed that the sites sampled were under grazing by cattle and horses, and evidence of degradation caused by grazing was clear. In addition, invasion of alien species and degradation of the vegetation type was found to occur on the road sides, and was encroaching on the HSR. It was also noted that this area is earmarked for development (Plate 3-4). The presence of the container indicates that commencement of work on site is imminent. This is extremely concerning, as any remaining areas of HSR should be conserved.



Plate 3-4: Sign on the edge of the Humansdorp Shale Renosterveld site, indicating development due to take place.

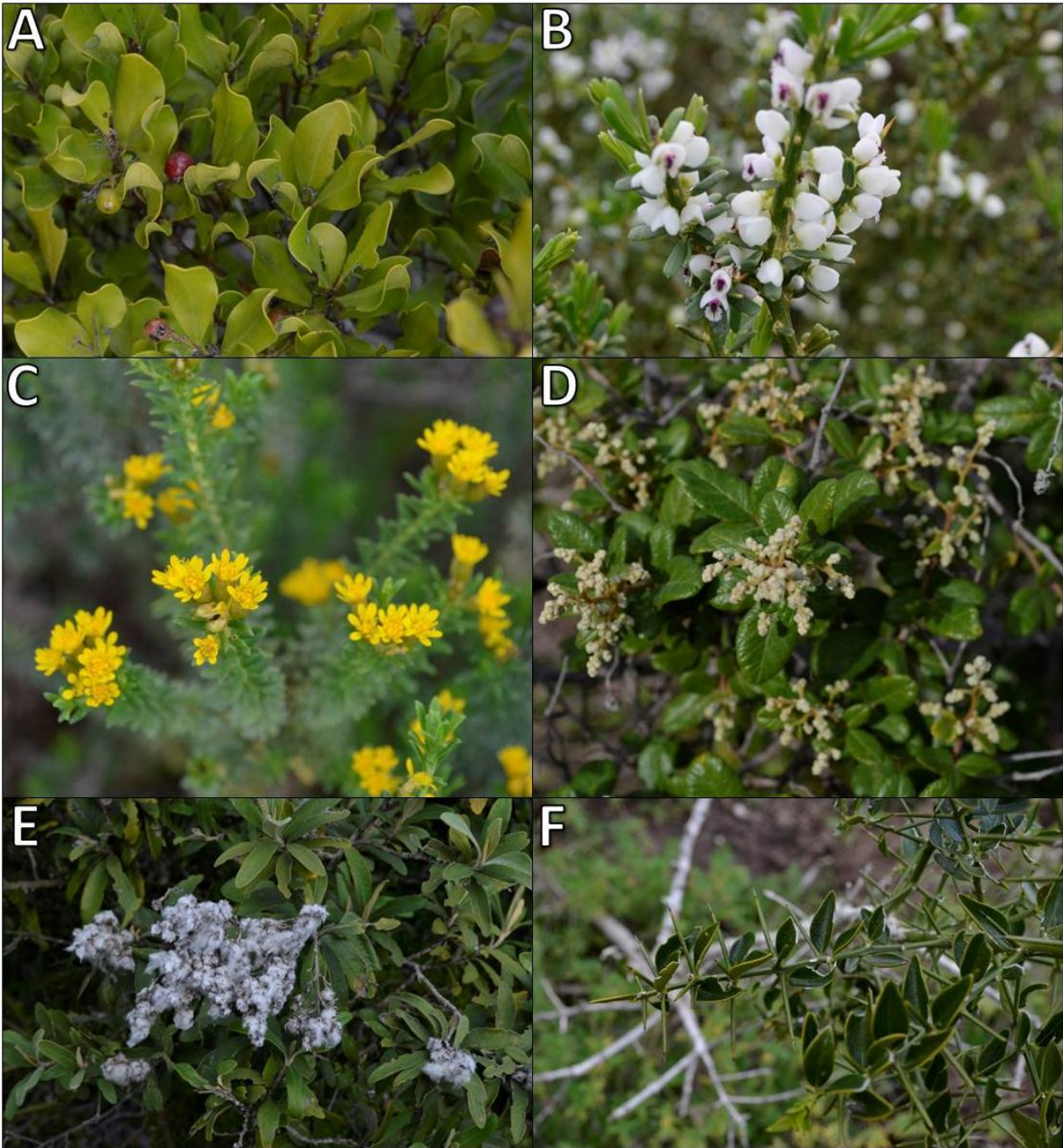


Plate 3-5: Species occurring at the Laguna Bay site. A: *Euclea undulata*, B: *Nylandtia spinosa*, C: *Oedera genisifolia*, D: *Rhus incisa*, E: *Tarchonanthus camphoratus* and F: *Azima tetraacantha*.

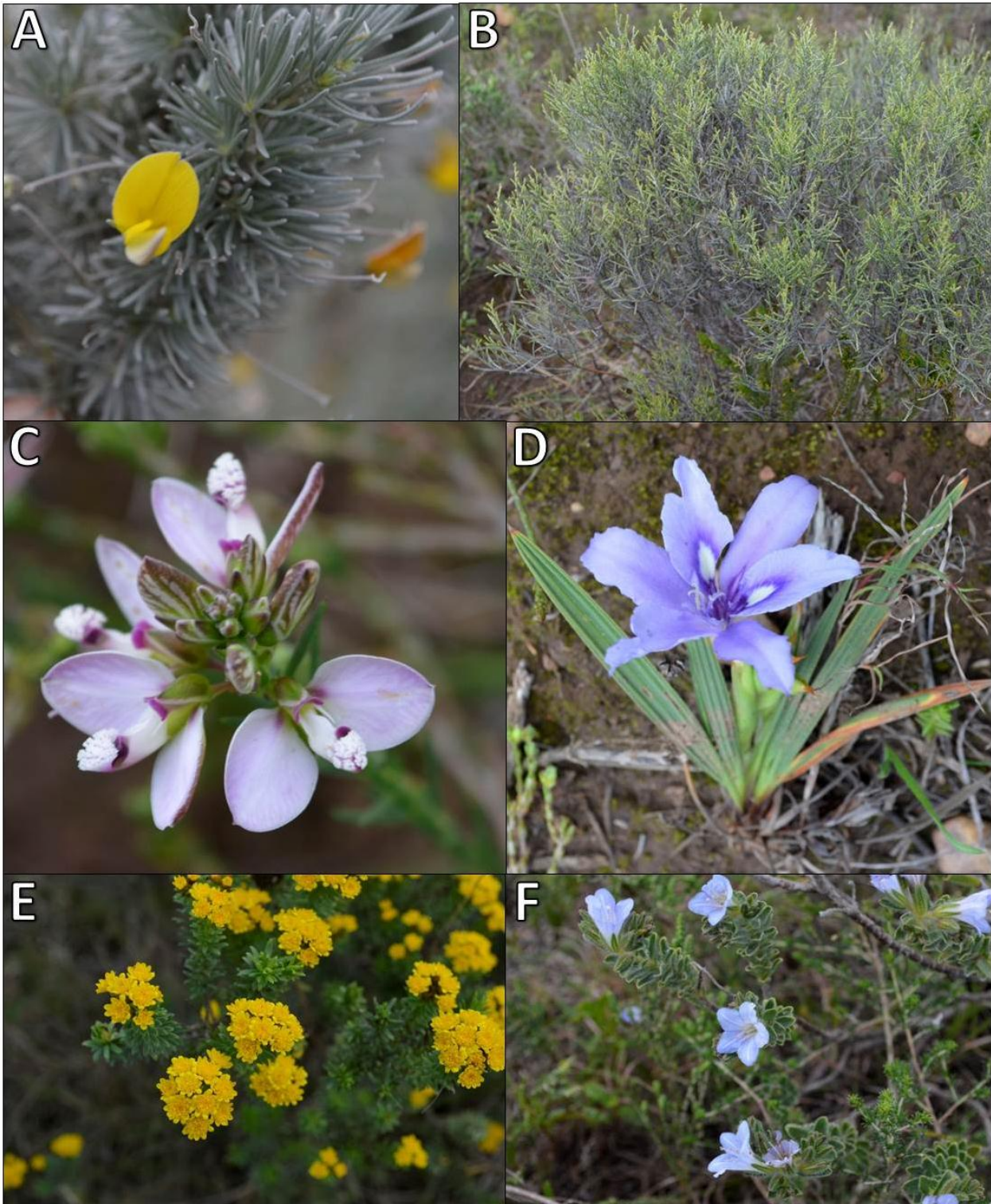


Plate 3-6: Species occurring in Humansdorp Shale Renosterveld. A: *Aspalathus nivea*, B: *Dicerthamnus rhinocerotis*, C: *Polygala sp.*, D: *Babiana patersoniae*, E: *Oedera genitifolia* and F: *Lobostemon sp.*

3.3. Issue 3: The presence of the protected White Milkwood (*Sideroxylon inerme*).

Sideroxylon inerme (Plate 4-7) is on the National List of Protected Trees. It is, however, not listed on the South African Red Data List (as developed by SANBI), nor is it listed on the international IUCN red data List. It is also not listed on the Provincial Nature Conservation Ordinance for the Eastern Cape. It is widespread (Palgrave, 2005) and common. The species is easy to grow as an ornamental plant and is widely available in nurseries. Some of the examples of the species that are found on the Laguna Bay development site will have to be removed to make way for the

development, but many more can be planted in order to make up for those removed. In addition, other trees within the conservation areas will be actively conserved.

As for other Species of Special Concern, those that can be replanted after being removed will be used in the gardens of the development. Others occurring in the conservation area will be actively conserved. It should be noted that other protected species (most on the PNCO, Schedule 4) are widespread within the thicket biome.



Plate 3-7: White Milkwood (*Sideroxylon inerme*). A: Fruit and B: Flowers.

3.4. **Issue 4: The assertion that development should only take place in areas described as having a LOW ecological sensitivity.**

The area of MEDIUM sensitivity that will be lost due to the development comprises Bushclumps, a mosaic of grassland and thicket. All species present in this area are represented in the thicket, which forms a large proportion of the area to be conserved. Species of Special Concern in this area of medium sensitivity will be rescued before development commences and planted in the development gardens. This area is also very small, and will not represent a major loss of biodiversity at the national or even provincial level. In fact, building the development in this area ensures that the rest of the area is actively conserved, thus resulting in net positive impact of the development.

4. SUMMARY AND CONCLUSIONS

There are four issues that arise from the Environmental Authorisation. Each of these has been discussed in detail in section 3, above. A brief summary is provided below:

1. *The Gamtoos Thicket and Saltmarsh: it is indicated that no development should occur here*

The areas of Gamtoos Thicket and Saltmarsh are earmarked for active conservation on the site. They will not be developed. Moreover, it has been determined that Kabeljous Renoster Thicket, mentioned in the Environmental Authorisation, does not occur on the site.

2. *Renosterveld being described as “Humansdorp Shale Renosterveld”*

The mapping data for this vegetation type in terms of Mucina and Rutherford (2006), as well as the National List of Ecosystems which are Threatened and in need of Protection show that Humansdorp Shale Renosterveld does not occur within 1.5km of the site. Site visits and vegetation surveys at the Laguna Bay site as well as at a site of Humansdorp Shale Renosterveld have determined that the Renosterveld described as occurring at the Laguna Bay site in no way resembles Humansdorp Shale Renosterveld.

3. *the presence of the protected tree, White Milkwood (Sideroxylon inerme)*

Although some of these trees will have to be removed for the development, they are numerous on site and easy to grow. The developer will remove as few as possible to facilitate the development, and will plant this species in the development gardens.

4. *the assertion that development should only take place in areas described as having a LOW ecological sensitivity*

Areas marked as medium sensitivity include species represented in other parts of the site where development will not occur. Search and rescue for species of special concern will take place before development commences. Development of these areas allows for a net positive impact on the area, as the development will create capacity to actively conserve the rest of the site.

In conclusion: the authorities appear to have made some inappropriate and poorly-informed decisions about the nature of the vegetation on site. It is therefore suggested that an independent review be conducted of these findings, as well as previous reporting on the proposed development, by an appropriately qualified and experienced botanist.

5. REFERENCES

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6. APPENDIX 1: SPECIES LIST

7mm	Species	Presence	
		Renosterveld on Site	Humansdorp Shale Renosterveld
1	<i>Acacia cyclops</i>	x	
2	<i>Agathosma gonaquensis</i>		x (Site visit)
3	<i>Agathosma ovata</i>	x	
4	<i>Agathosma puberula</i>	x	
5	<i>Aloe africana</i>	x	x (Mucina & Rutherford list)
6	<i>Anthospermum galioides</i>	x	x (Mucina & Rutherford list)
7	<i>Arctotus acaulis</i>	x	x (Mucina & Rutherford list)
8	<i>Argyrobium incanum</i>	x	
9	<i>Aristida junciformis</i>	x	x (Mucina & Rutherford list)
10	<i>Aristida junciformis subsp. galpinii</i>		x (Mucina & Rutherford list)
11	<i>Aspalathus nivea</i>		x (Site visit)
12	<i>Aspalathus sp.</i>	x	
13	<i>Asparagus densiflorusvh</i>	x	
14	<i>Asparagus sp</i>	x	
15	<i>Azima tetracantha</i>	x	
16	<i>Azoon glinoides</i>	x	
17	<i>Babiana patersoniae</i>		x (Site visit)
18	<i>Barleria pungens</i>	x	
19	<i>Berkheya heterophylla</i>	x	x (Mucina & Rutherford list)
20	<i>Bobartia orientalis</i>	x	x (Mucina & Rutherford list)
21	<i>Bracharia serrata</i>	x	x (Mucina & Rutherford list)
22	<i>Brachylaena ilicifolia</i>	x	
23	<i>Brunsvigia sp</i>	x	
24	<i>Bulbine asphodeloides</i>	x	
25	<i>Bulbostylis hispidula</i>	x	
26	<i>Carissa bispinosa</i>	x	
27	<i>Carpobrotus sp.</i>	x	x (Site visit)
28	<i>Cassine aethiopica</i>	x	
29	<i>Cassine tetragona</i>	x	
30	<i>Centella asiatica</i>	x	x (Mucina & Rutherford list)
31	<i>Chaetachanthus setiger</i>	x	x (Mucina & Rutherford list)
32	<i>Chrysanthemoides monilifer subsp. indet</i>	x	
33	<i>Chrysocoma ciliata</i>	x	x (Site visit)
34	<i>Cliffortia strobilifera</i>	x	x (Mucina & Rutherford list)
35	<i>Clutia rubricaulis</i>	x	x (Mucina & Rutherford list)
36	<i>Cotula sericea</i>	x	
37	<i>Cotyledon orbiculata var. Indet</i>	x	
38	<i>Crassula arborescens subsp. undulatifolia</i>	x	
39	<i>Crassula sp.</i>	x	
40	<i>Cymbopogon marginatus</i>	x	x (Mucina & Rutherford list)
41	<i>Cynodon dactylon</i>	x	x (Mucina & Rutherford list)
42	<i>Delospema ecklonis</i>	x	
43	<i>Delosperma ecklonis</i>	x	
44	<i>Delosperma patersonia</i>	x	x (Mucina & Rutherford list)
45	<i>Dicerotheramnus rhinocerotis</i>	x	x (Mucina & Rutherford list and Site visit)
46	<i>Digitaria eriantha</i>	x	

7mmm	Species	Presence	
		Renosterveld on Site	Humansdorp Shale Renosterveld
47	<i>Diospyros dichrophylla</i>	x	
48	<i>Dovyalis rhamnoides</i>	x	
50	<i>Eragrostis capensis</i>	x	x (Mucina & Rutherford list)
51	<i>Eragrostis curvula</i>	x	x (Mucina & Rutherford list)
52	<i>Erica sp</i>	x	
53	<i>Euclea undulata</i>	x	
54	<i>Euphorbia mauritanica</i>	x	
55	<i>Euryops algoensis</i>	x	
56	<i>Euryops munitus</i>	x	x (Mucina & Rutherford list)
57	<i>Eustachyus paspaloides</i>	x	x (Mucina & Rutherford list)
58	<i>Felicia echinata</i>	x	
59	<i>Felicia filifolia</i>	x	x (Mucina & Rutherford list)
60	<i>Felicia ovata</i>	x	
61	<i>Ficinia bracteata</i>	x	
62	<i>Ficinia bulbosa</i>	x	
63	<i>Ficinia lateralis</i>	x	
64	<i>Ficinia nigrescens</i>	x	x (Mucina & Rutherford list)
65	<i>Ficinia tristachya</i>	x	x (Mucina & Rutherford list)
66	<i>Gazania linearis</i>	x	x (Mucina & Rutherford list)
67	<i>Geissorhiza heterostyla</i>		x (Mucina & Rutherford list)
68	<i>Gerbera piloselloides</i>		x (Mucina & Rutherford list)
69	<i>Gerbera piloselloides</i>	x	x (Mucina & Rutherford list)
70	<i>Glottiphyllum longum</i>	x	
71	<i>Grewia occidentalis var. occidentalis</i>	x	
72	<i>Grewia robusta</i>	x	
73	<i>Gymnosporia buxifolia</i>	x	
74	<i>Haemanthus albiflos</i>	x	
75	<i>Haplocarpha sp.</i>	x	
76	<i>Helichrysum anomalum</i>	x	x (Mucina & Rutherford list)
77	<i>Helichrysum nudifolium</i>	x	x (Mucina & Rutherford list)
78	<i>Helichrysum roseum</i>	x	
79	<i>Helictotrichon hirtulum</i>	x	
80	<i>Hermania flamea</i>	x	x (Mucina & Rutherford list and site visit)
81	<i>Heteropogon contortis</i>	x	
82	<i>Hibiscus pusillus</i>	x	x (Mucina & Rutherford list)
83	<i>Hyparrhenia hirta</i>	x	
84	<i>Hypoestes aristata var. aristata</i>	x	
85	<i>Hypoxis sp.</i>	x	
86	<i>Indigofera denudata</i>	x	x (Mucina & Rutherford list)
87	<i>Indigofera heterophylla</i>	x	x (Mucina & Rutherford list)
88	<i>Lampranthus sp.</i>	x	
89	<i>Lauridia tetragona</i>	x	
90	<i>Ledebouria cooperi</i>	x	x (Mucina & Rutherford list)
91	<i>Lobostemon sp.</i>		x (Site visit)
92	<i>Lotononis acuminata</i>	x	x (Mucina & Rutherford list)
93	<i>Maytenus procumbens</i>	x	
94	<i>Merxmuellera disticha</i>	x	x (Mucina & Rutherford list)
95	<i>Merxmuellera stricta</i>	x	x (Mucina & Rutherford list)

7mm	Species	Presence	
		Renosterveld on Site	Humansdorp Shale Renosterveld
96	<i>Metalasia aurea</i>	x	x (Mucina & Rutherford list)
97	<i>Metalasia densa</i>	x	x (Mucina & Rutherford list)
98	<i>Metalasia muricata</i>	x	
99	<i>Montinia caryophyllacea</i>	x	
100	<i>Morella serata</i>	x	x (Mucina & Rutherford list)
101	<i>Muraltia alopecuroides</i>		x (Mucina & Rutherford list)
102	<i>Muraltia sidoides</i>	x	x (Mucina & Rutherford list)
103	<i>Mystroxydon aethiopicum subsp. aethioides</i>	x	
104	<i>Nylandtia spinosa</i>	x	
105	<i>Oedera genistifolia</i>	x	x (Mucina & Rutherford list and Site visit)
106	<i>Olea exasperata</i>	x	
107	<i>Opuntia ficus-indica</i>	x	
108	<i>Orchid sp.</i>	x	
109	<i>Oxalis algrensis</i>	x	
110	<i>Oxalis punctata</i>	x	x (Mucina & Rutherford list)
111	<i>Oxalis smithiana</i>	x	x (Mucina & Rutherford list)
112	<i>Panicum maximum</i>	x	
113	<i>Paspalum dilatatum</i>	x	x (Mucina & Rutherford list)
114	<i>Passerina rubra</i>	x	x (Mucina & Rutherford list)
115	<i>Pelargonium peltatum</i>	x	
116	<i>Pelargonium reniforme subsp. velutinum</i>	x	
117	<i>Pelargonium ribifolium</i>	x	
118	<i>Pelargonium sidoides</i>	x	x (Mucina & Rutherford list)
119	<i>Pelargonium sp. 1</i>	x	
120	<i>Pelargonium sp. 2</i>	x	
121	<i>Pennisetum setaceum</i>	x	
122	<i>Pentaschistis palida</i>	x	x (Mucina & Rutherford list)
123	<i>Pharnacium incanum</i>	x	
124	<i>Phyllanthus axillaris</i>	x	
125	<i>Phyllanthus</i>	x	
126	<i>Plectranthus sp.</i>	x	
127	<i>Polygala sp.</i>		x (Site visit)
128	<i>Pterocelastrus tricuspidatus</i>	x	
129	<i>Pteronia incana</i>	x	
130	<i>Putterlickia pyracantha</i>	x	
131	<i>Restio tetragona</i>	x	x (Mucina & Rutherford list)
132	<i>Rhoiacarpos capensis</i>	x	
133	<i>Rhoicissus digitata</i>	x	
134	<i>Rhus incisa var. incisa</i>	x	
135	<i>Rhus pallens</i>	x	
136	<i>Rhus refracta</i>	x	
137	<i>Salvia Africana-lutea</i>	x	
138	<i>Sarcostemma viminalis subsp. indet</i>	x	
139	<i>Satyrium membranaceum</i>	x	
140	<i>Schotia afra var indet</i>	x	
141	<i>Scutia myrtina</i>	x	
142	<i>Selago corymbosa</i>	x	
143	<i>Senecio aizoides</i>	x	

7mmm	Species	Presence	
		Renosterveld on Site	Humansdorp Shale Renosterveld
144	<i>Senecio glutinosus</i>	x	
145	<i>Senecio linifolius</i>	x	
146	<i>Senecio othoniflorus</i>	x	
147	<i>Setaria sphacelata</i> var. <i>sphacelata</i>	x	
148	<i>Sideroxylon inerme</i> subsp. <i>inerme</i>	x	
149	<i>Sporobolus africanus</i>	x	
150	<i>Stachys</i> sp.	x	
151	<i>Sutera campanulata</i>	x	x (Site visit)
152	<i>Tarconanthus camphoratus</i>	x	
153	<i>Tephrosia capensis</i> var. <i>indet.</i>	x	x (Mucina & Rutherford list)
154	<i>Themeda triandra</i>	x	x (Mucina & Rutherford list)
155	<i>Thunbergia capensis</i>	x	x (Mucina & Rutherford list)
156	<i>Tribolium hispidum</i>	x	x (Mucina & Rutherford list)
157	<i>Trichodiadema fourcadei</i>	x	x (Mucina & Rutherford list)
158	<i>Tristachya leucothrix</i>	x	x (Mucina & Rutherford list)