# Botanical Assessment: La Motte, Drakenstein Municipality, Western Cape Province


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***Report prepared for EnviroAfrica CC***

***May 2013***

## National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2010.

## Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by EnviroAfrica CC to provide specialist botanical consulting services for the proposed housing development at La Motte, Drakenstein Municipality, Western Cape Province. The consulting services comprise an assessment of potential impacts on the flora and vegetation in the designated study area by the proposed project.

### Details of Specialist

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## Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 30 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 300 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

## Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the survey was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

## Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

Note: Aerial photo images based on Google Earth ™ in this report are used under a valid Google Earth Pro licence.

Curriculum Vitae – See Appendix 2.

## THE INDEPENDENT PERSON WHO COMPILED A SPECIALIST REPORT OR UNDERTOOK A SPECIALIST PROCESS

I David Jury McDonald, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 71 of GN No. R. 543.

**Note:** The terms of reference must be attached.

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

29 May 2013

Date:

# CONTENTS

# 1. Introduction

Towns in the Western Cape Province are requiring more housing for an every-increasing population, particularly in the lower-income sector. Franschhoek is no exception and a new housing development is planned for the nearby hamlet of La Motte.

Proposals have been tabled to develop erven to the north, south and east of the present residential are of La Motte. To comply with the National Environmental Management Act (No. 107 of 1998) a Basic Assessment it is necessary to provide environmental information to inform the application for authorization to proceed with the development. EnviroAfrica CC was appointed to conduct the Basic Assessment and in turn appointed Bergwind Botanical Surveys & Tours CC to conduct a baseline botanical assessment.

When assessing the vegetation of the study area the recommended guidelines for specialist biodiversity studies (Brownlie 2005, De Villiers *et al.* 2005) were followed. The requirements and recommendations of CapeNature and the Botanical Society of South Africa for proactive assessment of biodiversity of proposed development sites were also taken into account.

# 2. Terms of Reference

- Describe the vegetation of the designated study area for the proposed new housing development on the properties, Farm 1333 Portion 1, Farm 1158 Portion 1 and Farm 1653, Franschhoek, Drakenstein Municipality, placing it in a regional context.

- Describe the conservation value/sensitivity of the area and identify any sections of specific concern (e.g. high sensitivity and/or conservation status).

- Provide specific information relating to any species of special concern and their conservation status, which can be used as baseline information for the assessment of potential impacts of the proposed development.

- Investigate ecological/biodiversity processes that could be affected by the proposed project (following Fynbos Forum Ecosystem Guidelines for Environmental Assessment).

# 3. Project Area

## 3.1 Locality and access

The study area is in the vicinity of the small residential area of La Motte near the main town of Franschhoek in the Stellenbosch Municipality, Western Cape Province. Access is from the R45 along the Roberts' Valley road.

Three land parcels are the focus of this study (Figures 2, 3 & 4). They are Keysersdrift 1158/1; Farm 1339/R and Farm 1653, with an additional small parcel (Farm 1339/3) alongside Farm 1653 (see Figure 3).

Farm Keysersdrift 1558/1 has previously supported an exotic pine plantation but it has been clear-felled and allowed to revert to a semi-natural condition (referred to as Area 1 for ease of reference in this report). Farm 1653 and Farm 1339/3 are currently under active use for agriculture (referred to together as Area 2). Farm 1339/R (referred to as Area 3) was also used for plantation forestry in the past as well as for extraction of sand. Forestry is no longer practised on this property but sand extraction still occurs on a limited scale. The vegetation on Farm 1339/R (Area 3) has also reverted to a semi-natural condition.

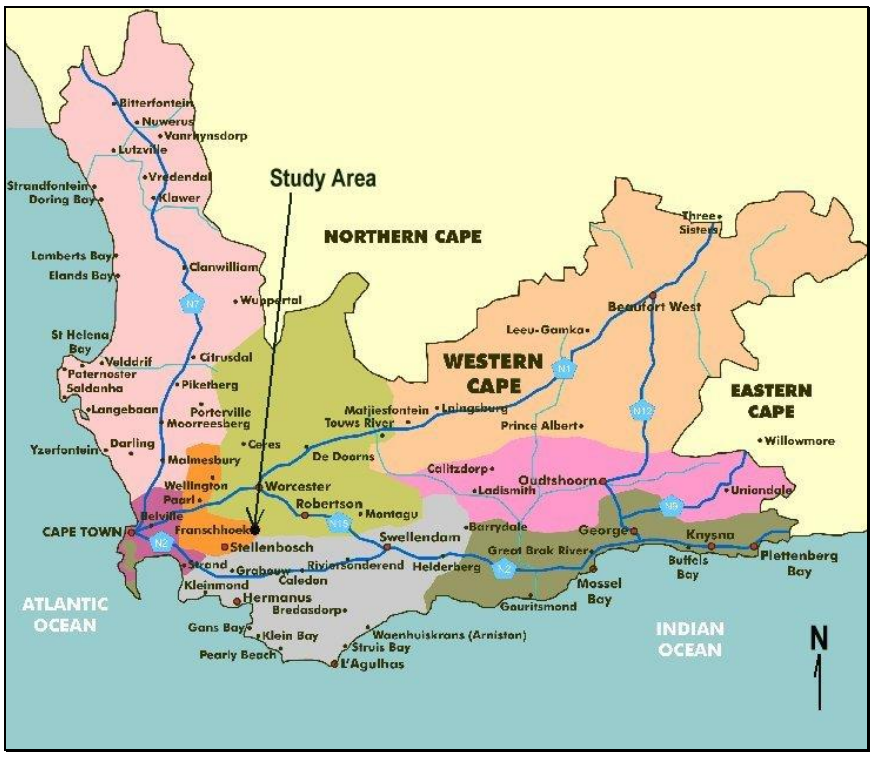


**Figure 1.** The study area is at La Motte near Franschhoek (arrow and black dot) in the south-west of the Western Cape Province.

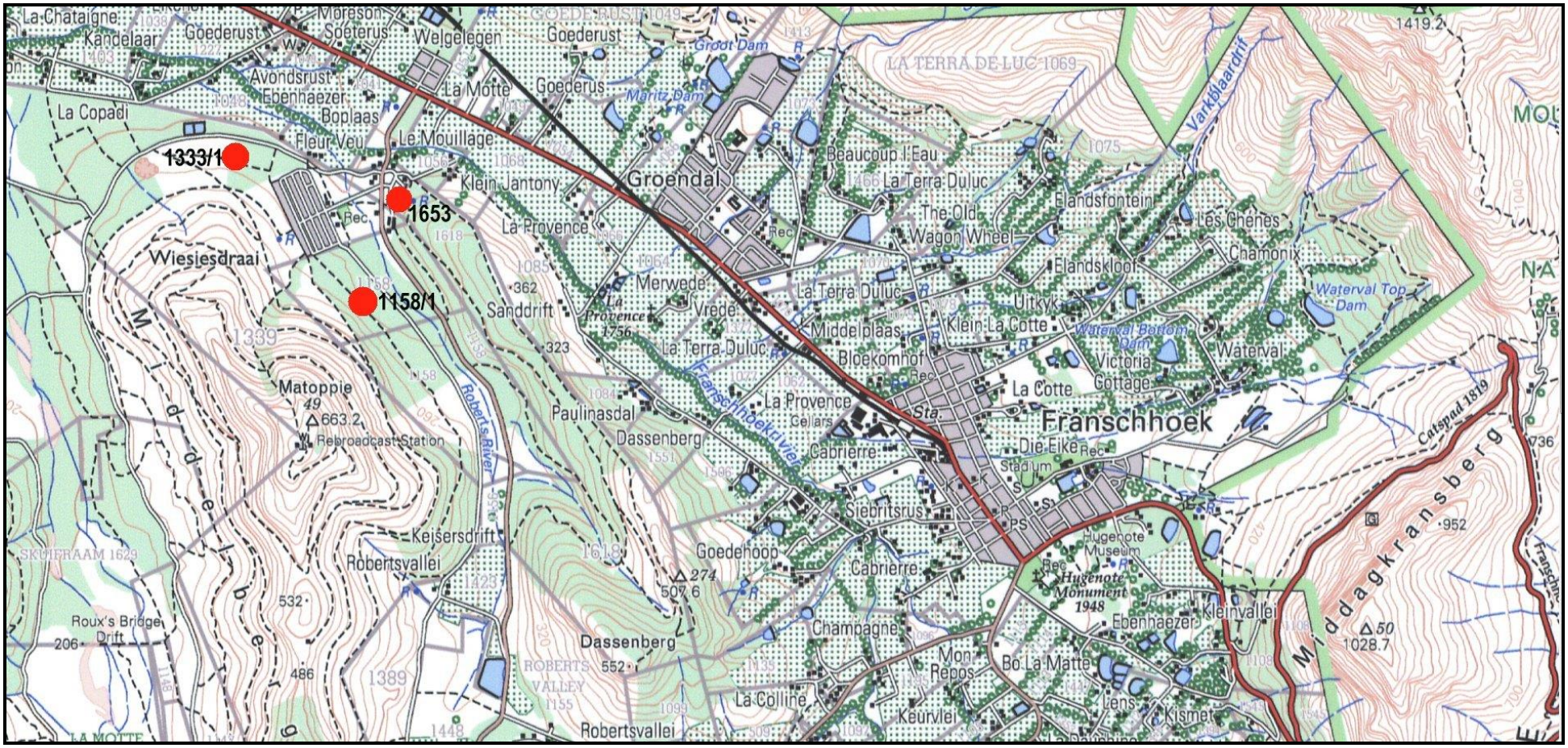


**Figure 2.** Topographical map indicating the three land parcels (red dots) surveyed at La Motte (near Franschhoek), Drakenstein Municipality, Western Cape Province (Portion of 1:50 000 topographical map 3319 CC Franschhoek, Chief Directorate: National Geo-spatial Information)


**Figure 3.** Google Earth ™ aerial image of La Motte showing the three separate development areas (red). Note that the shape of Area 3 reflects an early proposal; it should be compared with Figure 4 which is the final layout of areas proposed for development.

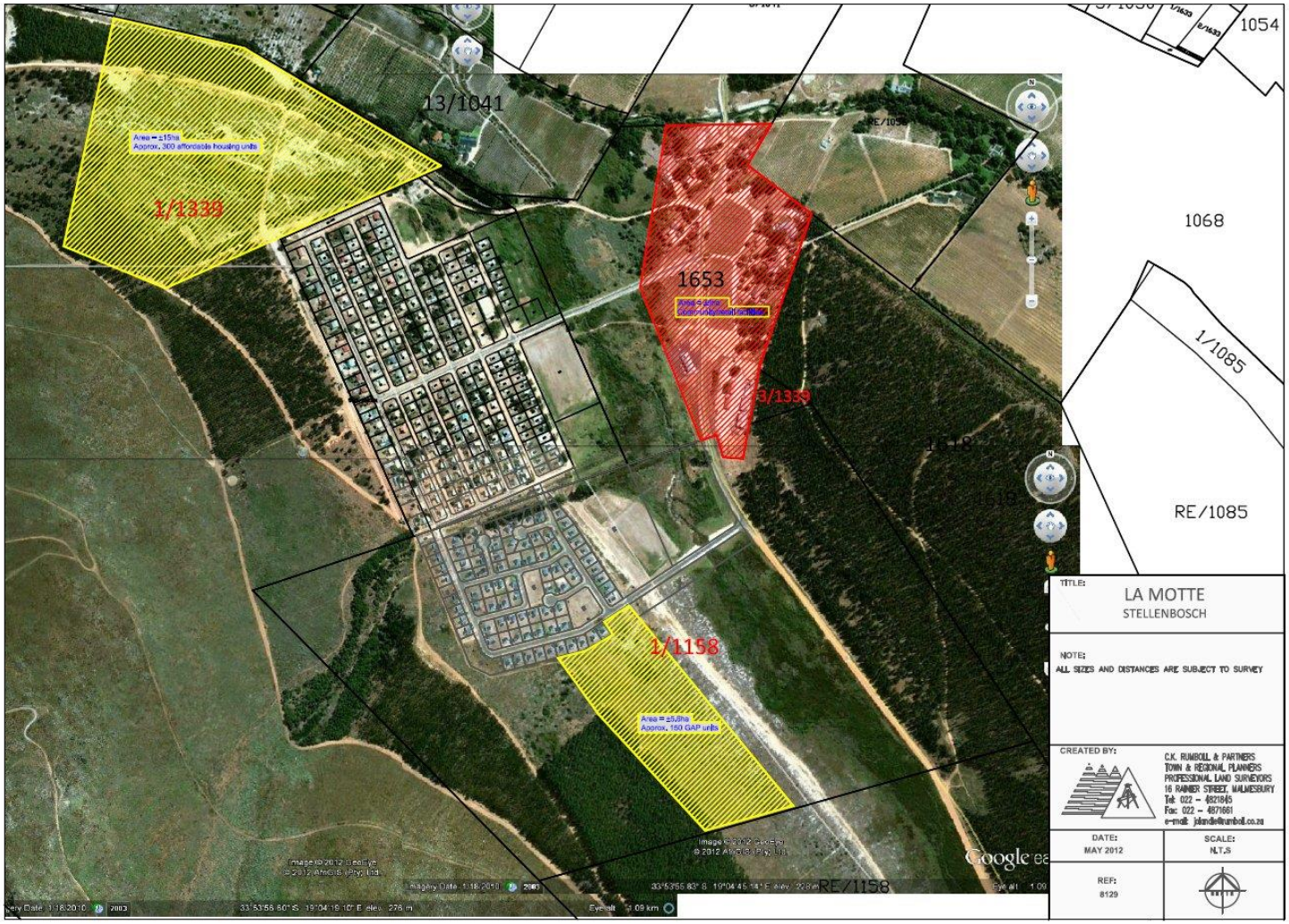


**Figure 4.** Final layout of areas proposed for development at La Motte. The yellow areas are proposed for residential use and the red area for commercial use (see Figure 21). (Figure courtesy of CK Rumboll & Partners).

## 3.2 Topography, Geology and Soils

The project area is in the low-lying areas of the Roberts' Valley on gently sloping or relatively flat terrain. The geology is quartzitic sandstone of the Peninsula Formation, Table Mountain Group and granite of the Stellenbosch Pluton, Cape Granite Suite (Land Type Survey Staff, 1972—2006). The basement rock is overlain by colluvial and alluvial sand and gravel and so is not visible at the surface. The soils are therefore colluvial types or deep, white acid sands (particularly Fernwood Form) which directly influence the vegetation found on them (see below). The land type found at Areas 1 – 3 is Fa657 (Figure 5).

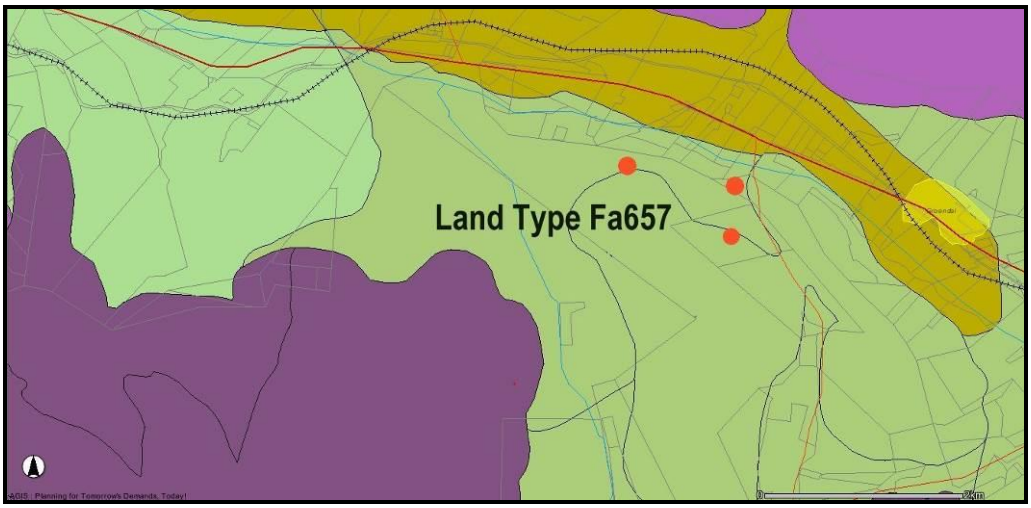


**Figure 5.** The land types map of the general area around La Motte (Source: http://www.agis.agric.za/agisweb/viewer.htm?pn=2015).

## 3.3 Climate

The climate at La Motte is typical of the South-western Cape with hot, dry summers and cool wet winters (Mediterranean type). The mean daily maximum temperature for February at the height of summer is 29 °C whereas the average winter low temperature is 7 °C in July, the coldest month. Rain occurs mainly from autumn to spring with rainfall peaking from June to August (Figure 6 & 7). Mean annual precipitation is around 650 mm (Figure 6). The climate for Swartland Alluvium Fynbos as shown in the climate diagram in Figure 7 most closely represents that of the study area.

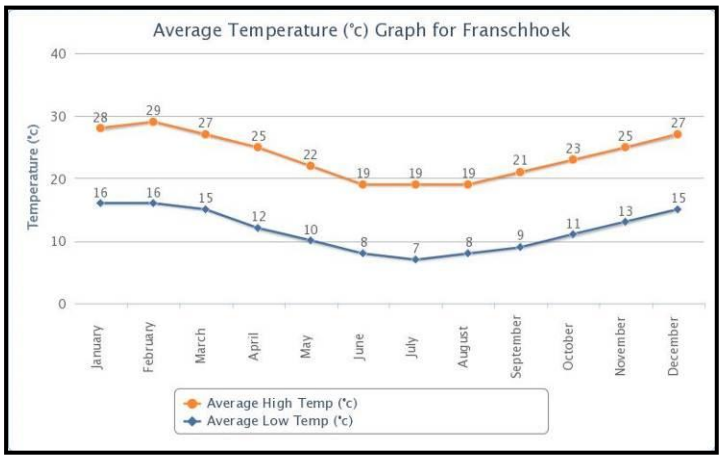


**Figure 6a.** Average monthly temperatures for Franschhoek near La Motte.

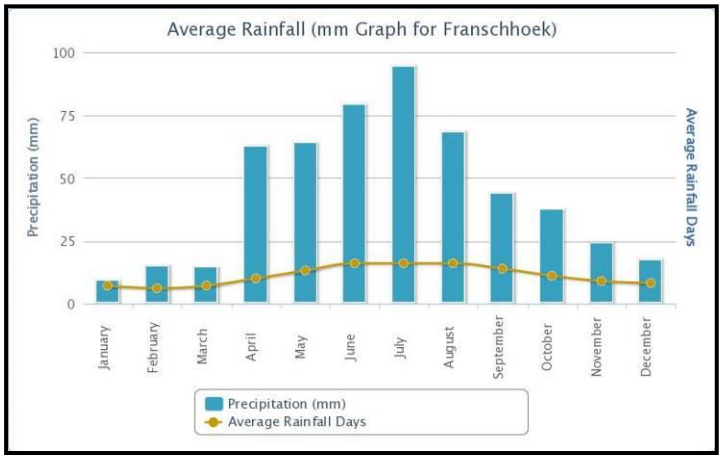


**Figure 6b.** Average monthly rainfall for Franschhoek near La Motte.

(Source: www.worldweatheronline.com)

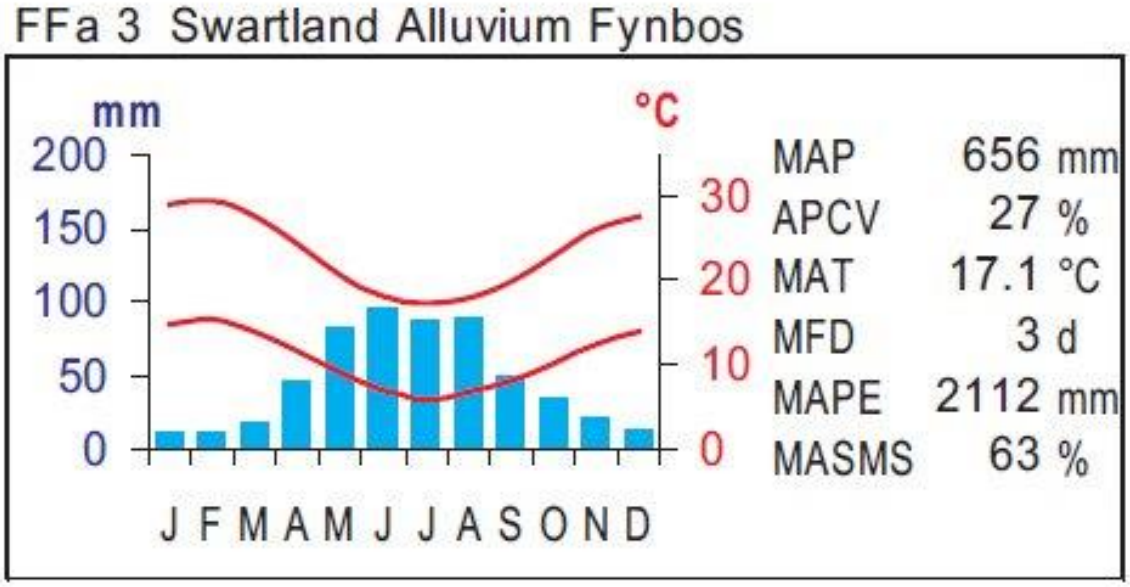


**Figure 7.** Climate diagram for Swartland Alluvium Fynbos (from Mucina & Rutherford, 2006) showing MAP – Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

# 4. Evaluation Method

The La Motte study area was surveyed on 21 August 2012. Only Area 1 and Area 3 were visited with Area 2 interpreted from aerial photographs. The study area had experienced normal winter rainfall in the few months prior to the site visit and the weather at the time of survey was overcast and cool. The vegetation was in a spring growth phase with numerous plant species in flower including geophytes. Owing to this being a once-off 'snapshot' visit the assessment presented here is largely an evaluation of the overall condition of the land parcels concerned. A Garmin ® GPS 62s was used to record selected waypoints (Table 1) and notes and photographs of the terrain and vegetation were compiled. It should be noted that no attempt was made to cover the whole of each land parcel in the sampling exercise but that a representative area was examined in each case from which conclusion were drawn with the additional aid of aerial photographs.

# 5. Disturbance Regime

Areas 1 and 3 were historically used for timber production. The pine trees were planted in the shrubby fynbos vegetation which was not cleared first and the sites were not ploughed. After reaching maturity the pine trees in the two areas were cleared and the fynbos vegetation allowed to revert to near-natural condition. Part of Area 3 was also used for mining of sand. A number of large sand quarries or borrow pits are found in the eastern sector of Area 3. These have either filled partially or completely with water, forming seasonal to permanent ponds (Figures 8 & 9).

**Figure 8.** Highly disturbed part of Area 3 with invasive exotics and inundation due to high water table in winter.

**Figure 9.** Sand mine borrow pit filled with water after winter rain.

**Table 1. Co-ordinates of recorded waypoints**

| Waypoint | Latitude (S) | Longitude (E) |
|---|---|---|
| LM1 | 33° 54’ 03.7” | 19° 04’ 51.3” |
| LM2 | 33° 54’ 04.7” | 19° 04’ 50.0” |
| LM3 | 33° 54’ 05.8” | 19° 04’ 47.5” |
| LM4 | 33° 54’ 06.0” | 19° 04’ 46.2” |
| LM5 | 33° 54’ 01.8” | 19° 04’ 44.4” |
| LM6 | 33° 53’ 59.3” | 19° 04’ 41.7” |
| LM7 | 33° 53’ 55.1” | 19° 04’ 40.7” |
| LM8 | 33° 53’ 54.6” | 19° 04’ 39.0” |
| LM9 | 33° 53’ 55.2” | 19° 04’ 35.9” |
| LM10 | 33° 53’ 56.6” | 19° 04’ 32.8” |
| LM11 | 33° 53’ 59.3” | 19° 04’ 33.7” |
| LM12 | 33° 53’ 59.0” | 19° 04’ 38.1” |
| LM13 | 33° 54’ 01.1” | 19° 04’ 49.5” |
| LM14 | 33° 53’ 24.3” | 19° 04’ 04.2” |
| LM15 | 33° 53’ 26.1” | 19° 04’ 01.1” |
| LM16 | 33° 53’ 28.8” | 19° 04’ 01.8” |
| LM17 | 33° 53’ 30.3” | 19° 04’ 03.9” |
| LM18 | 33° 53’ 31.4” | 19° 04’ 08.0” |
| LM19 | 33° 53’ 32.4” | 19° 04’ 10.0” |
| LM20 | 33° 53’ 31.6” | 19° 04’ 12.8” |
| LM21 | 33° 53’ 30.2” | 19° 04’ 13.7” |
| LM22 | 33° 53’ 26.3” | 19° 04’ 10.3” |
| LM23 | 33° 53’ 29.3” | 19° 04’ 24.1” |
| LM24 | 33° 53’ 35.2” | 19° 04’ 39.5” |

# 6. The Vegetation

## 6.1 General description

According to the broad-scale map of the national vegetation classification (Mucina *et al.* 2005; Rebelo *et al.* (2006) in Mucina & Rutherford 2006) three vegetation types occur in the La Motte area namely, Boland Granite Fynbos, Kogelberg Sandstone Fynbos and Swartland Alluvium Fynbos (Figure 10). Superimposition of the three land parcels surveyed indicates

that they fall in areas mapped as Boland Granite Fynbos (Areas 1 & 2) and Swartland Alluvium Fynbos (Area 3). The south-east end of Area 2 is shown in Figure 10 to have all of the above types but this was not observed in the field during the survey (see below).

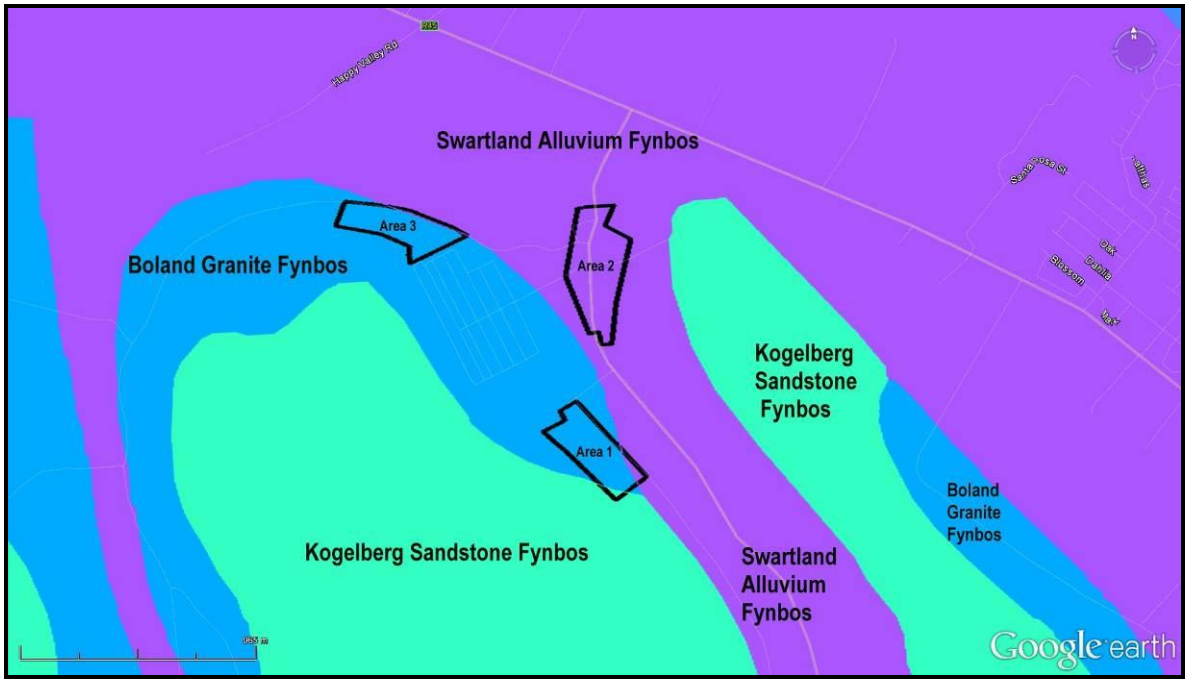


**Figure 10.** Portion of the Vegetation Map of South Africa, Lesotho & Swaziland (Mucina *et al*. 2005), showing the study area units at La Motte, located in Boland Granite Fynbos, Kogelberg Sandstone Fynbos and Swartland Alluvium Fynbos according to the classification of Rebelo *et al.* (2006).

## 6.2. Conservation Status

The three original vegetation types found are all listed in the National List of Threatened Ecosystems (Government Gazette, 2011). Boland Granite Fynbos is **Vulnerable D1** where the D1 criterion in this case means that there are threatened plant species associations present with ≥ 40 Red List plant species. Kogelberg Sandstone Fynbos is **Critically Endangered D1** and Swartland Alluvium Fynbos is **Critically Endangered A1**. For the Critically Endangered Category the A1 criterion means that there is irreversible loss of natural habitat with the remaining habitat ≤ the biodiversity target; the D1 criterion means that there are threatened plant species associations with ≥ 80 Red List plant species.

The main questions to consider pertaining to the sites were, (1) Was there any natural vegetation present and if so, what was the condition of the vegetation on the sites? and (2) Would the vegetation on the sites make a contribution to achieving conservation targets for any of the threatened vegetation types encountered?

## 6.3. Site investigation

### 6.3.1 Area 1

Area 1 is a relatively flat bottomland over most of its extent with white sandy soil which has accumulated due to colluvial and alluvial processes. Owing to a slight change in the extent of Area 1, a greater area was surveyed than was necessary (Figure 11). However, this gave a somewhat wider perspective on the site which showed that the site characteristics are uniform from the site itself to beyond the south-east and north-west boundaries.

Although it has been documented that pines alter nutrient-poor 'fynbos' soils less than invasive trees such as leguminous, nitrogen-fixing *Acacia* sp. (Stock & Allsopp, 1992) there is still a strongly suppressive effect of pine plantations on the growth of fynbos. Once the pine plantations are removed, regeneration of fynbos can and does occur but with lowered species richness. This was indeed the situation in Area 1.


**Figure 11.** Portion of the Vegetation Map of South Africa, Lesotho & Swaziland (Mucina *et al*. 2005), showing the study area units at La Motte, located in Boland Granite Fynbos, Kogelberg Sandstone Fynbos and Swartland Alluvium Fynbos according to the classification of Rebelo *et al.* (2006).

This site has been heavily negatively impacted by disturbance caused by (1) the pine plantation itself and (2) the clear-felling operation (vehicle movement, soil compaction etc.) Cut branches were left in piles or randomly distributed over the site. This has had a

secondary suppressive effect but the fynbos has regenerated to a certain extent. The present plant community does not have a well-defined structure and consists of clusters of plants interspersed with open areas with debris from the cleared pine plantation. There is also a vigorous re-growth of *Pinus radiata** saplings (opslag) and numerous clusters of invasive alien *Acacia longifolia** (long-leaved wattle) (Figures 12 & 13).

Area 1 was sampled at waypoints LM1 – LM13, with the most representative waypoints being LM5 – LM9 and LM12 –LM13 (see Table 1). There is little variation in the fynbos plant community on the site. It is mostly a low to mid-high open shrubland with occasional dense stands of tall leguminous shrubs (*Wiborgia obcordata*) (Figure 14). Significant areas are dominated by *Seriphium plumosum* (slangbos), a species indicating past intense disturbance. *Ursinia paleacea* is also common as a pioneer species. Other species recorded in the area include, *Acacia mearnsii** (black wattle), *Agathosma serpyllacea, Aspalathus* sp., *Avena fatua*, Briza maxima*, Carpobrotus edulis, Dischisma ciliatum, Diospyros glabra, Eragrostis curvula, Erepsia* sp., *Ficinia* sp., *Gladiolus tristis, Helichrysum sp., Hermannia alnifolia, Ischyrolepis* sp., *Lachenalia orchioides, Lachenalia unifolia, Lachnaea capitata* (Vulnerable), *Leptospermum laevigatum*, Lobostemon* cf. *trichotomus, Maytenus oleoides, Metalasia fastigiata, Moraea* sp., *Muraltia heisteria, Oftia africana, Osteospermum clandestinum, Othonna bulbosa, Othonna bulbosa, Othonna parviflora, Oxalis pes-caprae, Passerina corymbosa, Pelargonium capitatum, Pentaschistis* sp., *Pennisetum clandestinum* (Kikuyu grass) (Figure 15), *Raphanus raphanistrum, Rumex acetosella, Selago corymbosa, Taraxacum officinale* and *Willdenowia sulcata.*

**Figure 12.** Low-lying part of Area 1 with of debris from felled pines and invasion by long-leaved wattle (green & yellow shrubs)

**Figure 13.** Pioneer fynbos species (*Ursinia paleacea*) growing amongst debris in Area 1. Note the young pine trees 'opslag'.

**Figure 14.** Dense stand of *Wiborgia obcordata*

**Figure 15.** Invasive exotic grasses, particularly Kikuyu grass, at the western end of Area 1.

### 6.3.2 Area 2

Area 2 has mostly been disturbed by buildings, gardens, orchards and other human habitation. It was sampled at waypoint LM 24 along the road leading to La Motte village. The only parts of Area 2 with some semi-natural to natural vegetation are the areas north and south of the fire station and east of the river, indicated by white arrows in Figure 16, but even these areas are disturbed. They have been ploughed and mowed. The area north of the fire station was covered with exotic lupins (used for fodder), Thesium sp., various grasses with *Eragrostis curvula* prominent and the annual daisy *Dimorphotheca pluvialis*. These areas have been transformed and are not botanically sensitive (Figures 17 & 18).

Closer to the river, *Pennisetum macrourum* (riverbed grass) and *Cliffortia strobilifera*, Senecio sp. and *Zantedeschia aethiopica* (arum) present with abundant invasive alien *Paraserianthes lophantha* (stinkbean). Kikuyu grass (*Pennisetum clandestinum*) is also invading from the road verge (Figures 19 & 20). Some old exotic *Quercus robur* (English oak) trees are found along the river.

Generally Area 2 can be considered for development of a commercial node due to the low botanical sensitivity but a mandatory buffer zone to accommodate the river and the 1:100 year flood-line should be observed.

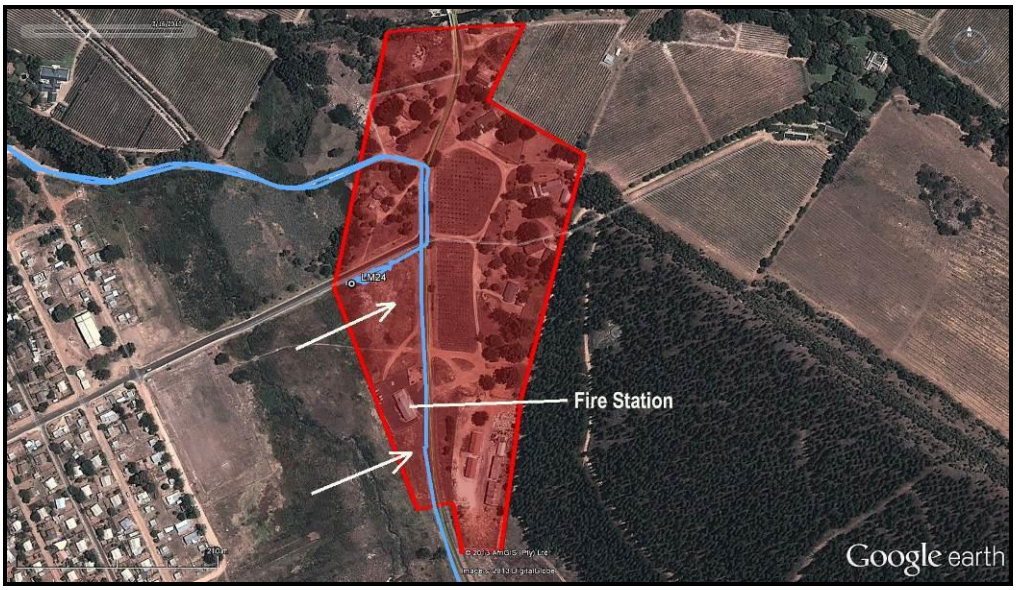


**Figure 16.** Area 2 was sampled at waypoint LM24. The greater part if the area is completely disturbed. Semi-natural but disturbed areas are shown by the white arrows, north and south of the fire station.

**Figure 17.** The area north of the fire station that has previously been ploughed and planted with lupins. It is now in a semi-natural state.

**Figure 18.** Verge of the road leading into La Motte village. This are is planted with Kikuyu grass and mowed.

**Figure 19.** Mowed road verge with dense riparian vegetation away from the road.

**Figure 20.** Stinkbean (*P. lophantha*) is strongly invading the riparian vegetation near the bridge on the road into la Motte village.


**Figure 21.** Proposed layout for the commercial precinct at La Motte on Area 2. (Figure courtesy of CK Rumboll & Partners).

### 6.3.3 Area 3

The configuration of Area 3 has changed with different layout proposals (compare Figure 3 with Figure 4 and Figure 22). Originally the extent of Area 3 included the yellow area in Figure 22 but it has now been reduced to the area shown in green. However, the botanical survey included samples in both areas with samples at waypoints LM14 – LM23. North of waypoint LM14 and north of the access road the site has previously been planted with pine and has now been clear-felled (Figure 23). It is completely disturbed with no natural vegetation apparent.

The area around waypoint LM14 was also previously planted with pine trees which have been removed, with piles of wood debris scattered throughout the site (Figure 24). The soil is white sand and the fynbos and the fynbos has recovered well, with cover estimated at 80%.

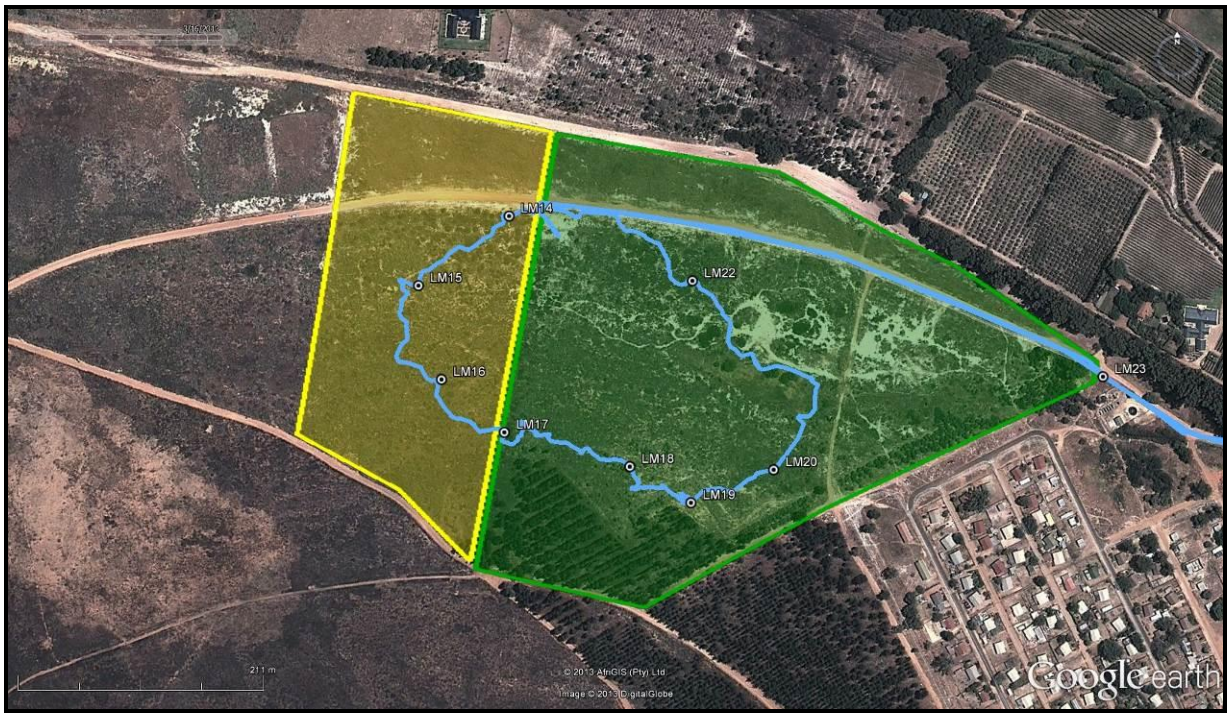


**Figure 22**. Area 3. The original proposed extent of development would have included both the green and yellow areas. The final layout excludes the yellow area which was surveyed in the botanical survey (blue line is the sample track with waypoints LM#).

Species recorded at waypoint LM14 include *Briza maxima, Cineraria geifolia, Diospyros glabra, Eragrostis curvula, Maytenus oleoides, Oftia africana, Pelargonium triste, Rumex* sp., *Senecio* sp. (succulent leaves), *Thamnochortus fruticosus,* Scrophulariaceae (white) *Ursinia* sp. and *Willdenowia sulcata.*

**Figure 23.**The access road between the northern part of Area 3 and the southern part.

**Figure 24.** View over the southern part of Area 3 where the fynbos has restored but there is still evidence of disturbance from plantation forestry.

The vicinity of waypoint LM15 is characterised by an undulating sand slope with deep white sand. The previous disturbance from plantation forestry (Figure 25) is reflected in the

dominance of *Seriphium plumosum* (slangbos) over large areas (Figure 26) together with an abundance of grass.

Other species noted around this waypoint include *Cliffortia* cf*. juniperifolia, Ehrharta villosa,* (dominant grass species), *Ficinia filiformis, Hermannia* cf. *alnifolia* (yellow), *Ischyrolepis* sp., *Muraltia spinosa, Oftia africana, Osteospermum clandestinum, Passerina corymbosa,* Scrophulariaceae (white), *Senecio* sp. (succulent leaves), *Seriphium* sp., *Trichocephalus stipularis, Eragrostis curvula, Wiborgia obcordata* and *Willdenowia sulcata.*

**Figure 25.** Piles of dead branches from the former plantation are found irregularly located over Area 3. The fynbos vegetation has restored over most of the area.

**Figure 26.** Slangbos (*Seriphium plumosum*) [grey shrub in foreground] is a common species on the site its abundance signifies past intense disturbance of the site.

Waypoint LM16 is mid-way up the slope to the existing plantation (Figure 27). The soil is reddish and sandy and supports a mid-dense cover of fynbos with moderate species diversity. Scattered individuals of *Leucadendron rubrum* (Figure 28) occur here together with *Agathosma* sp., *Anthospermum aethiopicum, Asparagus rubicundus, Diospyros glabra, Ehrharta villosa, Lobostemon* sp., *Metalasia fastigiata, Oftia africana, Othonna* sp., *Passerina corymbosa, Seriphium plumosum* and *Tricocephalus stipularis.*

**Figure 27.** The mid-slopes of Area 3 have restored to a mid-dense cover of fynbos with moderate diversity of species.

**Figure 28.** Mid-high, mid-dense fynbos at waypoints LM16 with tall shrubs of *Leucadendron rubrum*.

Waypoint LM17 is near the pine plantation (Figure 29). A few young *Eucalyptus* sp. trees were noted here amongst the rocks and further along the slope (Figure 30). The vegetation at this waypoint is very grassy, dominated by *Ehrharta villosa*. Other species include *Babiana* sp., *Cliffortia ruscifolia, Eragrostis curvula, Heeria argentea, Hermannia* cf. *alnifolia, Ischyrolepis sieberi, Ischyrolepis* sp., *Lachenalia orchioides, Moraea* sp. (yellow), *Muraltia heisteria, Muraltia spinosa, Othonna parviflora, Passerina corymbosa, Pseudoselago spuria, Rafnia perfoliata, Seriphium plumosum, Tetraria involucrata, Thesium virgatum* and *Ursinia paleacea.*

**Figure 29.** The vicinity of waypoint LM17 shows signs of past disturbance but the fynbos is regenerating well. Piles of debris present for past forestry activities

**Figure 30.** LM17 is near an existing pine plantation. Eucalyptus sp. trees are regenerating near a sandstone outcrop.

At waypoint LM18 the surrounds are much more disturbed than elsewhere on the site. The soil has been scraped (Figure31). There were formerly large *Eucalyptus* sp. trees here that were felled and now there are many young saplings regenerating (Figures 31 & 32).

**Figure 31.** At waypoint LM18 the soil has been disturbed by scraping and numerous young gum trees are taking hold.

**Figure 32.** The vicinity of waypoint LM18 shows intense disturbance with young gum trees invading the slope.

Waypoint LM19 is at the site of an old graveyard (Figure 33). Botanically this area has very low sensitivity, being highly disturbed. However, it has cultural and heritage value.

**Figure 33.** A historical graveyard is found at waypoint LM19. This area has low botanical value.

The eastern end of Area 3 is highly disturbed. It is dominated by grass, *Seriphium plumosum* (slangbos) and young 'opslag' *Eucalyptus* sp. There was evidence of a fire since most of the old pine logs were burnt. The composite shrub Othonna parviflora was prominent in this area (Figure 34).

**Figure 34.** The eastern end of Area 3 is highly disturbed although the vegetative cover is moderate to high. The species diversity is low with the area dominated by grass and strongly invaded by young *Eucalyptus* sp. trees.

Waypoint LM21 is located in a highly disturbed area with white sand. It appears that this area has been used for sand-mining (Figure 35). It has numerous exotic plant species such as *Quercus robur* (English oak), *Pennisetum clandestinum* (Kikuyu grass) (Figure 36), *Pinus radiata* (Monterey pine), *Avena fatua* (wild oats) and *Sesbania punicea*. The sand borrow-pits have filled with water (winter condition) and refuse has been dumped in the pits as well (see Figures 8 & 9). Some indigenous shrubs are found namely *Searsia angustifolia*, *Passerina corymbosa* and *Seriphium plumosum* but generally the area is highly degraded.

**Figure 35.** The environs of waypoint LM21 are highly disturbed by sand-mining. The holes fill with water in the winter and are also sites for dumping refuse.

**Figure 36.** Invasive alien plants such as Kikuyu grass dominate the area around waypoint LM21, with *Chasmanthe* cf. *floribunda* (indigenous but not local and likely to have come from garden refuse) seen in this photo.

Waypoint LM22 is located on a sandy flat area northwest of the borrow pits It is dominated by *Thamnochortus* cf. *fruticosus* and shows high levels of disturbance from the former plantation (Figure 37). Plant species recorded here include, *Carpobrotus edulis, Diospyros glabra, Hermannia* sp.*, Maytenus oleoides* (Figure 38)*, Oftia africana, Oxalis* sp., *Passerina corymbosa, Seriphium plumosum, Trichocephalus stipularis* and *Willdenowia sulcata.*

**Figure 37.** Parts of Area 3 such as at waypoints LM22 have regenerated well following removal of the pine plantation. Here *Thamnochortus* sp. is dominant.

**Figure 38.** Very few indigenous trees are found in Area 3. In this case a small tree of *Maytenus oleoides* was found near waypoint LM22.

Waypoint LM23 is on the road near the La Motte settlement and in the small area adjacent to the former waste water treatment plant (Figures 39 & 40). This area is highly degraded and invaded by *Acacia longifolia*, *Eucalyptus* spp. and *Paraserianthes lophantha* (stinkbean). Invasive Kikuyu grass is the main ground cover and a few plants of *Zantedeschia aethiopica* were noted.

**Figure 39.** The area adjacent to the defunct waste water treatment works at La Motte is highly disturbed and invaded by both herbaceous (Kikuyu grass) and woody (*Acacia longifolia*) alien species.

**Figure 40.** The main access to Area 3 with large Eucalyptus sp. trees near waypoint LM3. This area is highly degraded.

# 7. Impact Assessment

Impacts on the vegetation of the three areas proposed for development at La Motte are assessed for two alternatives i.e. the development alternative (residential [Areas 1 & 3] and commercial [Area 2] and the 'No Go' alternative i.e. no development and allowance for the vegetation to revert to fynbos.

Three types of impacts are assessed:

- **Direct impacts:** Impacts occurring directly on the vegetation of the site as a result of the proposed agricultural development.
- **Indirect impacts:** Impacts that are not a direct result of the proposed activity (in this case the development), but occur away from the original source of impact.
- **Cumulative impacts**: impacts caused by several projects, strategic actions and existing trends.

## 7.1 Assessment of Area 1

### 7.1.1 Direct impact of cultivation on Area 1.

Using the measuring tool in Google Earth ™ Areal 1 was measured as 6.48 ha in extent. The effects of the former plantation will be apparent for a long time but there is no doubt that fynbos of fair to good condition with a good diversity of species would eventually recolonize Area 1 if it is properly managed. Alien invasive wattles (*Acacia longifolia*) and pine 'opslag' would have to be controlled. The question therefore is whether Area 1 would make a significant contribution to conservation of Boland Granite Fynbos / Swartland Alluvium Fynbos in the medium to long term? The area is small and only one threatened species (*Lachnaea capitata*, Vulnerable) was found [but there could be more]. The area could therefore make a meaningful contribution to conservation of the above fynbos types i.e. the 'No Go' scenario which would be **Medium Positive**. Given the history and projected future of the site is the impact of developing Area 1 for housing would therefore be **Medium Negative** (Table 2).

No realistic mitigation measures are recommended apart from recommending that the area southeast of the proposed Area 1 development area, which was previously also under plantation, should be set aside for conservation and appropriately managed. This mitigation measure will, however, not lessen the impact on the development area (Table 2).

**Table 2.** Loss of fynbos and associated ecological processes in Area 1 at La Motte.

| Action | Alternative | Impact | Extent | Duration | Intensity | Significance | Status | Probability of occurrence | Confidence |
|---|---|---|---|---|---|---|---|---|---|
| | No Go | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | +ve | Improbable | High |
| Without mitigation | Develop Area 1 for housing | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | -ve | Highly probable | High |
| With mitigation | Develop Area 1 for housing | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | -ve | Highly probable | High |

### 7.1.2 Indirect Impacts

No indirect impacts were identified for the development of Area 1.

### 7.1.3 Cumulative Impacts

The loss of Area 1 to housing would mean a loss of area that can potentially be rehabilitated to fynbos in the Roberts River valley. The cumulative loss of fynbos in this area therefore has negative significance but not on a large scale.

## 7.2 Assessment of Area 2

### 7.2.1 Direct impact of development on Area 2.

Most of Area 2 is transformed or at least disturbed by small holdings, plantations and houses. Only the area north and south of the fire-station and riparian zone have any merit from a conservation perspective and even they show significant levels of disturbance. The area is generally suitable for development but the riparian zone should be well-buffered and any 'wetland' areas avoided. Overall the direct impact of the proposed commercial node develop would be **Low Negative** (Table 3). The 'No Go' scenario for Area 2 would result in the status quo persisting for the foreseeable future, except that alien vegetation invasion could get worse if not controlled.

The two important mitigation measures that should be observed would be (1) to buffer the riparian zone i.e. no development within 30 m (at least) of the watercourse (1:100 year flood lines should be investigated and observed) and (2) alien vegetation, particularly stinkbean (*Paraserianthes lophantha*) must be removed from the riverine vegetation.

**Table 3.** Loss of fynbos and associated ecological processes in Area 2 at La Motte.

| Action | Alternative | Impact | Extent | Duration | Intensity | Significance | Status | Probability of occurrence | Confidence |
|---|---|---|---|---|---|---|---|---|---|
| | No Go | Loss of fynbos with associated ecological processes | Local | Long-term | Low | Low | +ve | Improbable | High |
| Without mitigation | Develop Area 2 –La Motte for commercial node | Loss of fynbos with associated ecological processes | Local | Low | Low | Low | -ve | Highly probable | High |
| With mitigation | Develop Area 2 –La Motte for commercial node | Loss of fynbos with associated ecological processes | Local | Low | Low | Low | -ve | Highly probable | High |

### 7.2.2 Indirect Impacts

Development of Area 2 could have low negative indirect impacts on the nearby riparian environment if any effluent or other waste from the proposed commercial development is allowed to impinge on this area.

### 7.2.3 Cumulative Impacts

Development of Area 2 for a commercial node will not have any significant cumulative contributory effect to loss of any important fynbos habitat.

## 7.3 Assessment of Area 3

### 7.3.1 Direct impact of development on Area 3.

The areal extent of Area 3 (green shaded area in Figure 22) is 13 ha. Some parts are extremely degraded whereas the some parts are returning to good fynbos since the clear-felling of the pine plantation. It is therefore difficult to generalise as to the impacts of the proposed residential development on Area 3. However, given the historical disturbance of the pine plantation but reasonable restoration of fynbos in approximately 3 – 4 ha and the extreme disturbance from sand mining and other factors in the remaining 9 – 10 ha, the proposed development would have a **Medium to Low Negative** impact. It would be **Medium Negative** in areas where the fynbos is restoring well and **Low Negative** in the highly disturbed areas (Table 4).

In the 'No Go' situation the degraded areas are likely to degrade even further due to illegal dumping etc. In contrast, the areas regenerating to fynbos are likely to improve over time and result once again in viable fynbos plant communities. No development in Area 3 would therefore have a mixed result – positive in the areas where fynbos is re-establishing and negative in the highly degraded sand-mining area.

**Table 4.** Loss of fynbos and associated ecological processes in Area 3 at La Motte.

| Action | Alternative | Impact | Extent | Duration | Intensity | Significance | Status | Probability of occurrence | Confidence |
|---|---|---|---|---|---|---|---|---|---|
| | No Go | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | +ve | Improbable | High |
| Without mitigation | Develop Area 3 La Motte for housing: Less disturbed area | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | -ve | Highly probable | High |
| With mitigation | Develop Area 3 La Motte for housing: Less disturbed area | Loss of fynbos with associated ecological processes | Local | Long-term | Medium | Medium | -ve | Highly probable | High |
| Without mitigation | Develop Area 3 La Motte for housing: Highly degraded area | Loss of fynbos with associated ecological processes | Local | Long-term | Low | Low | -ve | Highly probable | High |
| With mitigation | Develop Area 3 La Motte for housing: Highly degraded area | Loss of fynbos with associated ecological processes | Local | Long-term | Low | Low | -ve | Highly probable | High |

### 7.3.2 Indirect Impacts

The major indirect impact of development of Area 3 would be that it could no longer be used for illegal dumping.

### 7.3.3 Cumulative Impacts

The cumulative impacts would be similar to those for Area 1. The loss of Area 3 to housing would mean a loss of area that can potentially, at least in part, be rehabilitated to fynbos as is already happening. The cumulative loss of fynbos in this area therefore has negative significance but not on a large scale. It would be important to secure areas around the proposed Area 3 development site for conservation of the fynbos vegetation.

# 8. Conclusions and Recommendations

- The vegetation found in the three areas that make up the La Motte study site is mapped mainly as Boland Granite Fynbos (Areas 1 & 3) and Swartland Alluvium Fynbos (Area 2).

- Areas 1 and 3 have fynbos vegetation which is regenerating after the effects of suppression by pine plantations. This vegetation could return to viable fynbos communities in the long term. Area 2, however, is largely transformed and only the riparian zone has any significant conservation value.

- Only one Red List plant species (Raimondo *et al.* 2009) *Lachnaea capitata* (Vulnerable) was encountered (in Area 1). A more intensive study over a number of season could possibly reveal more threatened species (particularly in Areas 1 & 3) so loss of fynbos habitat in Areas 1 & 3 would have negative implications for such species in the La Motte district.

- Given the past disturbance on Areas 1 and 3 but regenerating fynbos the impacts of the proposed residential development are rated as **Medium Negative** overall. On-site mitigation would be difficult but it is recommended that in the broader planning for the La Motte area, areas of fynbos should be earmarked for conservation purposes, even if those areas previously had pine plantations.

- The loss of fynbos habitat to residential development in Areas 1 & 3 is only indicated only supported by the previous disturbance of these areas. Had the fynbos not been previously disturbed, the impact would be High Negative and these areas (in the case of Area 3, the least degraded part) would be considered 'No Go' areas for development. In the current situation, however, they can be promoted for development.

- The high level of transformation of Area 2 indicates that there should be no constraints on development of that area apart from adequately buffering the riparian zone.

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# Appendix 1: Convention for assigning significance ratings to impacts.

Specialists will consider seven rating scales when assessing potential impacts. These include:

- extent;
- duration;
- intensity;
- status of impact;
- probability;
- degree of confidence; and
- significance.

In assigning significance ratings to potential impacts before and after mitigation specialists are instructed to follow the approach presented below:

1. The core criteria for determining significance ratings are “extent” (Section 6.3.1), “duration” (Section 6.3.2) and “intensity” (Section 6.3.3). The preliminary significance ratings for combinations of these three criteria are given in Section 6.3.7.

2. The status of an impact is used to describe whether the impact will have a negative, positive or neutral effect on the surrounding environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

3. Describe the impact in terms of the probability of the impact occurring (Section 6.3.5) and the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge (Section 6.3.6).

4. Additional criteria to be considered, which could “increase” the significance rating if deemed justified by the specialist, with motivation, are the following:

- Permanent / irreversible impacts (as distinct from long-term, reversible impacts);
- Potentially substantial cumulative effects (see Item 7 below); and
- High level of risk or uncertainty, with potentially substantial negative consequences.

5. Additional criteria to be considered, which could “decrease” the significance rating if deemed justified by the specialist, with motivation, is the following:
    - Improbable impact, where confidence level in prediction is high.

6. When assigning significance ratings to impacts *after mitigation*, the specialist needs to:
    - First, consider probable changes in intensity, extent and duration of the impact after mitigation, assuming effective implementation of mitigation measures, leading to a revised significance rating; and
    - Then moderate the significance rating after taking into account the likelihood of proposed mitigation measures being effectively implemented. Consider:
        - Any potentially significant risks or uncertainties associated with the effectiveness of mitigation measures;
        - The technical and financial ability of the proponent to implement the measure; and
        - The commitment of the proponent to implementing the measure, or guarantee over time that the measures would be implemented.

7. The cumulative impacts of a project should also be considered. “Cumulative impacts” refer to the impact of an activity that may become significant when added to the existing activities currently taking place within the surrounding environment.

8. Where applicable, assess the degree to which an impact may cause irreplaceable loss of a resource. A resource assists in the functioning of human or natural systems, i.e. specific vegetation, minerals, water, agricultural land, etc.

9. The significance ratings are based on largely objective criteria and inform decision-making at a project level as opposed to a local community level. In some instances, therefore, whilst the significance rating of potential impacts might be "low" or "very low", the importance of these impacts to local communities or individuals might be extremely high. The importance which I&APs attach to impacts must be taken into consideration, and recommendations should be made as to ways of avoiding or minimising these negative impacts through project design, selection of appropriate alternatives and / or management.

The relationship between the significance ratings after mitigation and decision-making can be broadly defined as follows (see overleaf): substance

| Significance rating | Effect on decision-making |
|---|---|
| VERY LOW;<br>LOW | Will not have an influence on the decision to proceed with the proposed project, provided that recommended measures to mitigate negative impacts are implemented. |
| MEDIUM | Should influence the decision to proceed with the proposed project, provided that recommended measures to mitigate negative impacts are implemented. |
| HIGH;<br>VERY HIGH | Would strongly influence the decision to proceed with the proposed project. |

## 1. Extent

"Extent" defines the physical extent or spatial scale of the impact.

| Rating | Description |
|---|---|
| LOCAL | Extending only as far as the activity, limited to the site and its immediate surroundings. Specialist studies to specify extent. |
| REGIONAL | Western Cape. Specialist studies to specify extent. |
| NATIONAL | South Africa |
| INTERNATIONAL | |

## 2. Duration

"Duration" gives an indication of how long the impact would occur.

| Rating | Description |
|---|---|
| SHORT TERM | 0 - 5 years |
| MEDIUM TERM | 5 - 15 years |
| LONG TERM | Where the impact will cease after the operational life of the activity, either because of natural processes or by human intervention. |
| PERMANENT | Where mitigation either by natural processes or by human intervention will not occur in such a way or in such time span that the impact can be considered transient. |

## 3. Intensity

"Intensity" establishes whether the impact would be destructive or benign.

| Rating | Description |
|---|---|
| ZERO TO VERY LOW | Where the impact affects the environment in such a way that natural, cultural and social functions and processes are not affected. |
| LOW | Where the impact affects the environment in such a way that natural, cultural and social functions and processes continue, albeit in a slightly modified way. |

| | |
|---|---|
| MEDIUM | Where the affected environment is altered, but natural, cultural and social functions and processes continue, albeit in a modified way. |
| HIGH | Where natural, cultural and social functions or processes are altered to the extent that it will temporarily or permanently cease. |

## 4. Loss of resources

"Loss of resource" refers to the degree to which a resource is permanently affected by the activity, i.e. the degree to which a resource is irreplaceable.

| Rating | Description |
|---|---|
| LOW | Where the activity results in a loss of a particular resource but where the natural, cultural and social functions and processes are not affected. |
| MEDIUM | Where the loss of a resource occurs, but natural, cultural and social functions and processes continue, albeit in a modified way. |
| HIGH | Where the activity results in an irreplaceable loss of a resource. |

## 5. Status of impact

The status of an impact is used to describe whether the impact would have a negative, positive or zero effect on the affected environment. An impact may therefore be negative, positive (or referred to as a benefit) or neutral.

## 6. Probability

"Probability" describes the likelihood of the impact occurring.

| Rating | Description |
|---|---|
| IMPROBABLE | Where the possibility of the impact to materialise is very low either because of design or historic experience. |
| PROBABLE | Where there is a distinct possibility that the impact will occur. |
| HIGHLY PROBABLE | Where it is most likely that the impact will occur. |
| DEFINITE | Where the impact will occur regardless of any prevention measures. |

## 7. Degree of confidence

This indicates the degree of confidence in the impact predictions, based on the availability of information and specialist knowledge.

| Rating | Description |
|---|---|
| HIGH | Greater than 70% sure of impact prediction. |
| MEDIUM | Between 35% and 70% sure of impact prediction. |
| LOW | Less than 35% sure of impact prediction. |

## 8. Significance

"Significance" attempts to evaluate the importance of a particular impact, and in doing so incorporates the above three scales (i.e. extent, duration and intensity).

| Rating | Description |
|---|---|
| VERY HIGH | Impacts could be EITHER:<br>of ***high intensity*** at a ***regional level*** and endure in the ***long term***;<br>OR of ***high intensity*** at a ***national level*** in the ***medium term***;<br>OR of ***medium intensity*** at a ***national level*** in the ***long term.*** |
| HIGH | Impacts could be EITHER: |

| Rating | Description |
|---|---|
| | of ***high intensity*** at a ***regional level*** and endure in the ***medium term***;<br>OR of ***high intensity*** at a ***national level*** in the ***short term***;<br>OR of ***medium intensity*** at a ***national level*** in the ***medium term;***<br>OR of ***low intensity*** at a ***national level*** in the ***long term***;<br>OR of ***high intensity*** at a ***local level*** in the ***long term***;<br>OR of ***medium intensity*** at a ***regional level*** in the ***long term.*** |
| MEDIUM | Impacts could be EITHER:<br>of ***high intensity*** at a ***local level*** and endure in the ***medium term***;<br>OR of ***medium intensity*** at a ***regional level*** in the ***medium term***;<br>OR of ***high intensity*** at a ***regional level*** in the ***short term***;<br>OR of ***medium intensity*** at a ***national level*** in the ***short term***;<br>OR of ***medium intensity*** at a ***local level*** in the ***long term***;<br>OR of ***low intensity*** at a ***national level*** in the ***medium term;***<br>OR of ***low intensity*** at a ***regional level*** in the ***long term.*** |
| LOW | Impacts could be EITHER<br>of ***low intensity*** at a ***regional level*** and endure in the ***medium term***;<br>OR of ***low intensity*** at a ***national level*** in the ***short term***;<br>OR of ***high intensity*** at a ***local level*** and endure in the ***short term***;<br>OR of ***medium intensity*** at a ***regional level*** in the ***short term***;<br>OR of ***low intensity*** at a ***local level*** in the ***long term***;<br>OR of ***medium intensity*** at a ***local level*** and endure in the ***medium term.*** |
| VERY LOW | Impacts could be EITHER<br>of ***low intensity*** at a ***local level*** and endure in the ***medium term***;<br>OR of ***low intensity*** at a ***regional level*** and endure in the ***short term***;<br>OR of ***low to medium intensity*** at a ***local level*** and endure in the ***short term.*** |
| INSIGNIFICANT | Impacts with:<br>Zero to very low intensity with any combination of extent and duration. |
| UNKNOWN | In certain cases it may not be possible to determine the significance of an impact. |

### 9. Degree to which impact can be mitigated

This indicates the degree to which an impact can be reduced / enhanced.

| Rating | Description |
|---|---|
| NONE | No change in impact after mitigation. |
| VERY LOW | Where the significance rating stays the same, but where mitigation will reduce the intensity of the impact. |
| LOW | Where the significance rating drops by one level, after mitigation. |
| MEDIUM | Where the significance rating drops by two to three levels, after mitigation. |
| HIGH | Where the significance rating drops by more than three levels, after mitigation. |

### 10 Reversibility of an impact

This refers to the degree to which an impact can be reversed.

| Rating | Description |
|---|---|
| IRREVERSIBLE | Where the impact is permanent. |
| PARTIALLY REVERSIBLE | Where the impact can be partially reversed. |
| FULLY REVERSIBLE | Where the impact can be completely reversed. |

# Appendix 2: Curriculum Vitae

**Dr David Jury McDonald Pr.Sci.Nat.**

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**E-mail:** dave@bergwind.co.za

**Website:** www.bergwind.co.za

**Profession:** Botanist / Vegetation Ecologist / Consultant / Tour Guide

**Date of Birth:** 7 August 1956

**Employment history:**

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.
- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa
- Six years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

**Nationality:** South African (ID No. 560807 5018 080)

**Languages:** English (home language) – speak, read and write
Afrikaans – speak, read and write

**Membership in Professional Societies:**

- South Africa Association of Botanists
- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

**Key Qualifications :**

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute)

- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.
- Further tasks involved the day-to-day management of a large non-profit environmental organisation.
- **Independent botanical consultant** (2005 – to present) over 300 projects have been completed related to environmental impact assessments in the Western, Southern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

**Higher Education**

Degrees obtained
and major subjects passed:

B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level : 4 Code: TGC7 (Registered Tour Guide: WC 2969).

**Employment Record :**

January 2006 – present: Independent specialist botanical consultant and tour guide in own company:
**Bergwind Botanical Surveys & Tours CC**

August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa

January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute

January 1979—Dec 1980 : National Military Service

*Further information is available on my company website: www.bergwind.co.za*