

# GALAGO ENVIRONMENTAL



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## *Flora Assessment*

*of*

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**Portion 277 of the farm Wonderboom 302-JR  
(Annlin Extension 97)**

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**January 2014**

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**Report verified/reviewed by:** Dr. J.V. van Greuning (D.Sc.,Pr.Sci.Nat)

## DECLARATION OF INDEPENDENCE

I, Petro Lemmer (440129 0025 085) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
- abide by the Code of Ethics of the S.A. Council for Natural Scientific Professions
- act as an independent specialist consultant in the field of botany
- am subcontracted as specialist consultant by Galago Environmental CC for the proposed development of portion 277 of the farm Wonderboom 302 JR.
- have no financial interest in the proposed development other than remuneration for work performed
- have or will not have any vested or conflicting interests in the proposed development
- undertake to disclose to Galago Environmental CC and its client as well as the competent authority any material information that have or may have the potential to influence the decision of the competent authority required in terms of the Environmental Impact Assessment Regulations, 2006.

A handwritten signature in black ink, appearing to read 'Petro Lemmer', with a long horizontal flourish extending to the right.

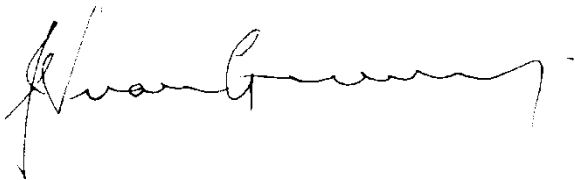
Petro Lemmer

### VERIFICATION STATEMENT

Petro Lemmer is a Certified Natural Scientist with the S.A. Council for Natural Scientific Professions. This communication serves to verify that the flora report compiled by Petro Lemmer has been prepared under my supervision, and I have verified the contents thereof.

**Declaration of Independence:** I, Dr. J.V. van Greuning (400168/08) declare that I:

- am committed to biodiversity conservation but concomitantly recognize the need for economic development. Whereas I appreciate the opportunity to also learn through the processes of constructive criticism and debate, I reserve the right to form and hold my own opinions and therefore will not willingly submit to the interests of other parties or change my statements to appease them
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Dr. J.V. van Greuning

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# 1. INTRODUCTION

Galago Environmental was appointed to conduct a vegetation survey on Portion 277 of the farm Wonderboom 302 JR (also known as Annlin Extension 97), scheduled for residential development. The objective was to determine which species occur on the site. Special attention had to be given to the habitat requirements of all the Red List species that may occur in the area. This survey focuses on the current status of threatened plant species occurring, or which are likely to occur on the study site, and a description of the available and sensitive habitats on the site and within 200 meters of the boundary of the site.

## 2. OBJECTIVES OF THE STUDY

- To assess the current status of the habitat component and current general conservation status of the area;
- To list the perceptible flora of the site and to recommend steps to be taken should threatened plant species, plant species of conservation concern and protected plant species be found;
- To highlight potential impacts of the development on the flora of the proposed site; and
- To provide management recommendations to mitigate negative and enhance positive impacts should the proposed development be approved.

## 3. SCOPE OF STUDY

This report:

- Pertains to the study site as described in subsection 4.2 and is not meant as a report of the general vegetation of the area (subsection 4.1).
- Lists the more noticeable trees, shrubs, herbs, geophytes and grasses observed during the study and offers recommendations about the protection of the sensitive areas on the study site;
- Indicates medicinal plants recorded and lists alien species;
- Comments on connectivity with natural vegetation on adjacent sites;
- Comments on ecological sensitive areas;
- Evaluates the conservation importance and significance of the site with special emphasis on the current status of resident threatened species; and
- Offers recommendations to reduce or minimise impacts, should the proposed development be approved

## 4. STUDY AREA

### 4.1 Regional vegetation

The study site lies in the quarter degree square 2528CA (Pretoria). Mucina & Rutherford (2006) classified the area as Marikana Thornveld, with open *Acacia karroo* woodland occurring in valleys and slightly undulating plains and lowland hills. Shrubs are denser along drainage lines, on termitaria and rocky outcrops or in other fire-protected habitat. Most of the area is underlain by mafic intrusive rocks such as gabbro, norite, pyroxenite and anorthosite. The shales and quartzites of the Pretoria group also contribute. The soil is mainly vertic, dark clays with leached layers of compressed particles and some freely-drained, deep soils.

This unit falls within a summer-rainfall region with very dry winters and frequent winter frosts. This vegetation unit is considered endangered. Its conservation target is 19%. Less than 1% is conserved in statutory reserves such as Magaliesberg Nature Area and De Onderstepoort Nature Reserve. The unit is considerably impacted, with 48% transformed, mainly by urbanization and cultivation. Towards the west this unit is transformed by agriculture while in the east industrial development is the greater threat.

## 4.2 The study site

The 37,7977 ha study site lies south of, and abuts, the entire southern boundary line of Wonderboom Aerodrome. The Wonderboom Spruit enters the site near the southeastern corner and runs the length of the study site to exit the site at its western boundary line. An old excavation occurs near the southwestern corner of the site.

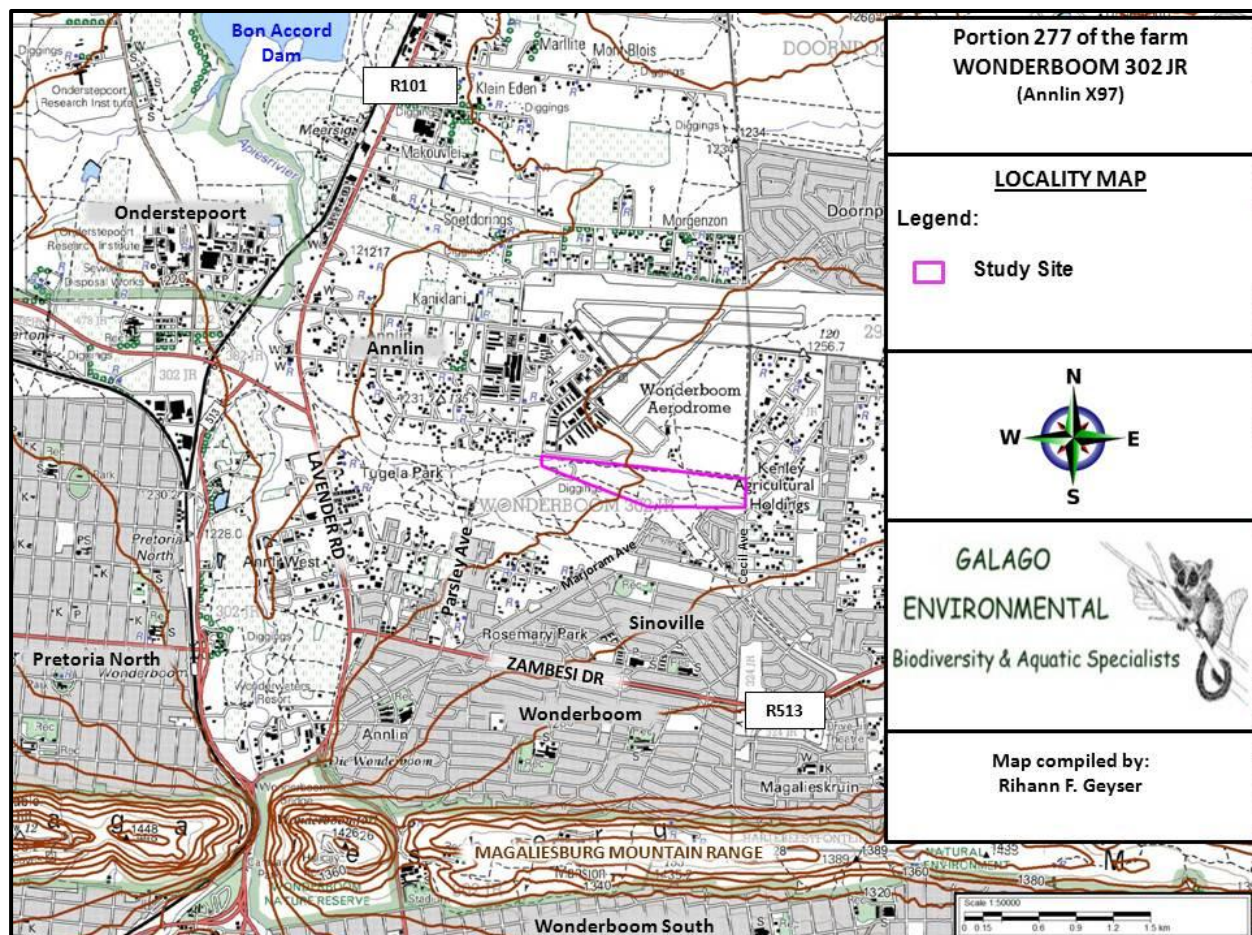


Figure 1: Locality map of the study area

## 5. METHOD

A desktop study of the habitats of the Red List and Orange List species known to occur in the area was done before the site visit. Information about the Red List and Orange List plant species that occur in the area was obtained from GDARD. Various Acts and Ordinances were consulted about the protected plant species and species of special concern that might occur on the site (Section 11). The Guidelines issued by GDARD to plant specialists as well as various publications (Section 11) were consulted about the habitat preferences of the Red- and Orange List species concerned.

The list of plants recorded in the 2528CA quarter degree square was obtained from SANBI and consulted to verify the record of occurrence of the plant species seen on the site. The vegetation map published in Mucina and Rutherford (2006) was consulted about the composition of Tsakane Clay Grassland.

The study site was first visited on 28 November 2013 to determine whether suitable habitat for the Red List species known to occur in the quarter degree square, and for those for which biodiversity studies were required by GDARD, existed and to survey the flora present on the site.

Different study units were identified (Figure 2) and one or more plots, depending on the size and composition of the study unit, were selected at random from each study unit for detailed study. Each plot, which measured about 10m x 10m, was surveyed in a random crisscross fashion and the plants recorded. Areas where the habitat was suitable for the Red List species known to occur in the quarter degree square were examined in detail. The entire site was examined for the presence of protected tree species and their positions recorded.

Suitable habitat for Red List species on the neighbouring properties, where accessible, was examined to a distance of 200 m from the boundaries of the site for the presence of Red List plant species.

The suitability of habitat for Red List species on the site and on an extended area within 200 meters of the boundaries of the site was evaluated.

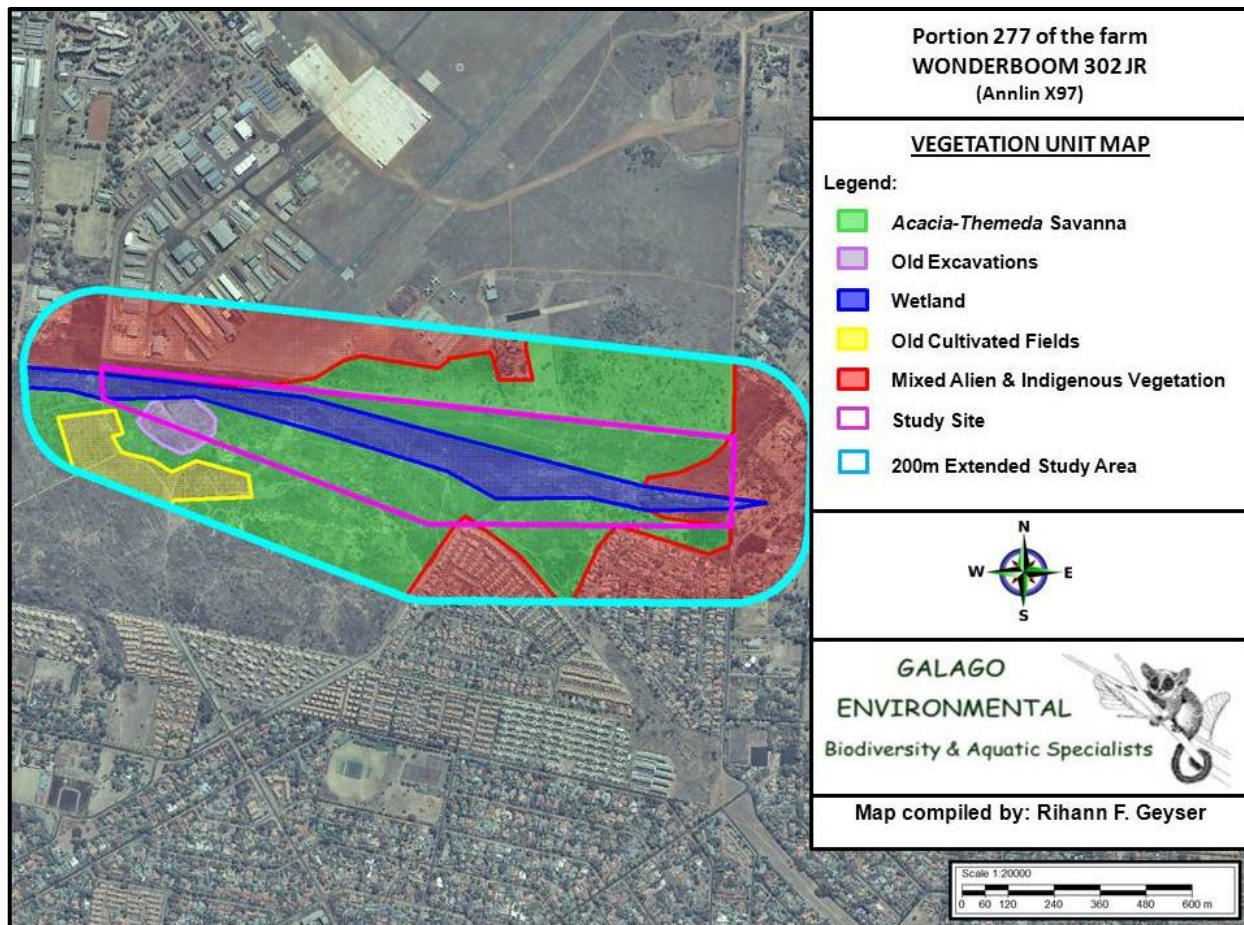


Figure 2: Vegetation study units identified on the study site

## 6. RESULTS

### 6.1 Vegetation study units

Three vegetation study units were identified on the study site:

- *Acacia – Themeda* savanna;
- Wetland; and
- Mixed alien and indigenous vegetation.

Tables 3 to 5 list the trees, shrubs, geophytes, herbs and grasses found on each of the surveyed areas of the site.

## 6.2 Medicinal plants

The names of known medicinal plants are marked with numbers Tables 3 to 5 and the numbers appear as footnotes at the end of the last table. Of the 98 plant species recorded on the site, 16 species with medicinal properties were found. Their distribution in the various study units is as follows:

**Table 1: Number of medicinal species in the various study units**

| STUDY UNIT                            | TOTAL NO OF SPECIES IN STUDY UNIT | NO OF MEDICINAL SPECIES IN STUDY UNIT |
|---------------------------------------|-----------------------------------|---------------------------------------|
| <i>Acacia – Themeda savanna</i>       | 61                                | 14                                    |
| Wetland                               | 29                                | 2                                     |
| Mixed alien and indigenous vegetation | 30                                | 1                                     |

## 6.3 Alien plants

Alien plants are not listed separately, but are included in the lists as they form part of each particular study unit. Their names are marked with an asterisk in Tables 3 to 5. Twenty-eight alien plant species, of which two species were Category 1 Declared weeds, one was a Category 2 Declared invader and four were Category 3 Declared invaders, were recorded on the site. The number of alien species in each study unit is reflected in table 2.

**Table 2: Number of Alien species in each study unit**

| STUDY UNIT                            | NO. OF ALIEN SPECIES | CAT 1 | CAT 2 | CAT 3 | NOT DECLARED |
|---------------------------------------|----------------------|-------|-------|-------|--------------|
| <i>Acacia – Themeda savanna</i>       | 11                   | 2     | 0     | 1     | 8            |
| Wetland                               | 9                    | 0     | 1     | 0     | 8            |
| Mixed alien and indigenous vegetation | 17                   | 1     | 0     | 4     | 12           |

The removal of Category 1 Declared Weeds is **compulsory** in terms of the regulations formulated under “The Conservation of Agricultural Resources Act” (Act No. 43 of 1983), as amended. In terms of these regulations, Category 2 Declared invaders may not occur on any land other than a demarcated area and should likewise be removed.

Although the regulations under the above Act require that Category 3 Declared invader plants may not occur on any land or inland water surface other than in a biological control reserve, these provisions shall not apply in respect of category 3 plants already in existence at the time of the commencement of said regulations. If this is the case, a land user must take all reasonable steps to curtail the spreading of propagating material of Category 3 plants.

## 6.4 Orange List species on the study site

The site has suitable habitats for three of the eight Orange List plant species known to occur in the 2528CA quarter degree square. Only one of these species occurs in two of the study units. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree square.)

## 6.5 Red List species on the study site

Twenty-one Red List plant species are known to occur in the 2528CA quarter degree square, ten of these within 5 km of the site. The study site has suitable habitat for five of the Red List species known to occur in the quarter degree square, one of which occurs in the *Acacia – Themeda savanna* study unit.



In addition to the milkweed species *Stenostelma umbelluliferum* that occurs on the study site, GDARD required biodiversity studies for *Argyrobium megarrhizum* and *Cucumis humifructus*. However, no suitable habitats occur for these last two species.

## 6.6 *Acacia – Themeda savanna*

### 6.6.1 Compositional aspects and Connectivity

This study unit comprises *Acacia* savanna on black turf soil. An old excavated area occurred near the western boundary line of the site.

With the exception of a higher percentage of the alien species that also occur in the rest of the *Acacia – Themeda* savanna study unit, the species composition of this area is the same. Connectivity with natural savanna was limited by township development to the south and west and by disturbed agricultural holdings to the east. Connectivity with grassland cleared of large trees, existed to the north on the property of the Wonderboom Aerodrome. The species diversity of this study unit was high, with 62% of all species recorded on the site found in this unit. Of the 98 plant species recorded on the site 61 were recorded in the *Acacia – Themeda* savanna study unit. Of these, 50 were indigenous species. The following number of species in each life form was noted:

| LIFE FORM                             | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 40                |
| Tree species                          | 6                 |
| Shrubs and dwarf shrubs               | 5                 |
| Grasses                               | 4                 |
| Geophytes                             | 5                 |
| Sedges                                | 1                 |
| Total No of species                   | 61                |

### 6.6.2 Red- and Orange List species on the study unit

The *Acacia – Themeda* savanna study unit has suitable habitats for three of the Red List species known to occur in the quarter degree square. These three species are also known to occur within 5 km of the study site. One of these species, *Stenostelma umbelluliferum*, occurs in this study unit. In addition to *S. umbelluliferum* that occurs in the *Acacia – Themeda* savanna study unit, GDARD required biodiversity studies for *Argyrobium megarrhizum* and *Cucumis humifructus*. However, no suitable habitat occurs for these last two species. This study unit has suitable habitat for three of the Orange List plant species, but only *Crinum macowanii* occurs on the site. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree square.)

### 6.6.3 Medicinal and alien species

Fourteen of the 16 medicinal species and 11 of the 28 alien species recorded on the site occur in the *Acacia – Themeda* savanna study unit. Of the alien species, two are Category 1 Declared weeds and one is a Category 3 Declared invader.

### 6.6.4 Sensitivity

Owing to the presence of the Red List and Orange List species, this study unit is considered sensitive and should be excluded from development. A 200 meter buffer should be maintained around the Red List and Orange list species.



Figure 3: *Acacia – Themeda* savanna

Table 3: Plants recorded in the *Acacia – Themeda* savanna

| SCIENTIFIC NAME   | INV CAT | COMMON NAMES                                    |
|---|---------|---|
| <i>Abildgaardia ovata</i>   |         |   |
| <i>Acacia caffra</i>  |         | Common hook thorn / Gewone haakdoring           |
| <i>Acacia karroo</i> <sup>1,2</sup>                                   |         | Sweet thorn / Soetdoring                        |
| <i>Acacia nilotica</i> subsp. <i>kraussiana</i>                       |         | Scented pod / Lekkerruikpeul                    |
| <i>Acacia tortilis</i> subsp. <i>heteracantha</i>                     |         | Umbrella thorn / Haak-en-steek                  |
| <i>Alysicarpus rugosus</i> subsp. <i>perennirufus</i>                 |         | Pioneer fodder plant                            |
| <i>Asparagus laricinus</i>  |         | Wild asparagus / Katbos                         |
| <i>Campuloclinium macrocephalum</i> *                                 | 1       | Pom pom weed / Pompombossie                     |
| <i>Chamaecrista</i> sp.   |         |   |
| <i>Convolvulus sagittatus</i>   |         |   |
| <i>Conyza podocephala</i>   |         |   |
| <i>Corchorus asplenifolius</i>  |         |   |
| <i>Crabbea angustifolia</i> <sup>2</sup>                              |         |   |
| <i>Cynodon dactylon</i>   |         | Couch grass / Kweek                             |
| <i>Dipcadi marlothii</i>  |         |   |
| <i>Dombeya rotundifolia</i> var. <i>rotundifolia</i> <sup>1,2,4</sup> |         | Wild pear / Drolpeer                            |
| <i>Elephantorrhiza elephantina</i> <sup>1,2,3</sup>                   |         | Elephant's root / Olifantswortel                |
| <i>Eragrostis chloromelas</i>   |         | Curly leaf / Krulblaar                          |
| <i>Eulophia hians</i> var. <i>hians</i>                               |         |   |
| <i>Euphorbia prostrata</i> *  |         | Hairy creeping milkweed / Harige kruipmelkkruid |
| <i>Flaveria bidentis</i> *  |         | Smelter's bush / Smelterbossie                  |
| <i>Gaura lindheimeri</i> *  |         |   |
| <i>Gazania krebsiana</i> subsp. <i>serrulata</i> <sup>3</sup>         |         | Common gazania / Botterblom                     |
| <i>Gladiolus permeabilis</i> subsp. <i>edulis</i>                     |         | Kleinaandblom                                   |
| <i>Gomphrena celosioides</i> *  |         | Bachelor's button / Mierbossie                  |
| <i>Gymnosporia buxifolia</i> <sup>2</sup>                             |         | Spike-thorn / Pendoring                         |
| <i>Habenaria epipactidea</i>  |         |   |
| <i>Hermannia coccocarpa</i>   |         |   |
| <i>Hibiscus trionum</i> *   |         | Bladder hibiscus / Terblansbossie               |
| <i>Hilliardiella oligocephala</i> <sup>1,2</sup>                      |         | Cape vernonia / Blounaaldetee bossie            |
| <i>Indigofera</i> sp.   |         |   |
| <i>Ipomoea bathycolpos</i>  |         | Veldsambreeltjies                               |
| <i>Ipomoea crassipes</i> <sup>2,3</sup>                               |         | Leafy-flowered Ipomoea / Wildewinde             |
| <i>Ipomoea oblongata</i> <sup>2</sup>                                 |         |   |
| <i>Jamesbrittenia</i> sp.   |         |   |
| <i>Ledebouria revoluta</i> <sup>3</sup>                               |         | Common ledebouria                               |
| <i>Lippia javanica</i> <sup>1,2,3</sup>                               |         | Fever tea / Koorsbossie                         |

| SCIENTIFIC NAME   | INV CAT | COMMON NAMES                            |
|---|---------|---|
| <i>Melilotus alba</i> *   |         | White sweet clover / Witstinkklawer     |
| <i>Monsonia angustifolia</i>                                      |         | Crane's bill / Angelbossie              |
| <i>Morus alba</i> *   | 3       | Common mulberry / Gewone moerbeï        |
| <i>Nidorella resedifolia</i> subsp. <i>resedifolia</i>            |         |   |
| <i>Polygala hottentotta</i> <sup>2,3</sup>                        |         | Small purple broom                      |
| <i>Pseudognaphalium oligandrum</i>                                |         |   |
| <i>Rhynchosia albissima</i>                                       |         |   |
| <i>Rhynchosia minima</i> var. <i>prostrata</i>                    |         |   |
| <i>Scabiosa columbaria</i> <sup>1,2,3</sup>                       |         | Wild scabiosa / Bitterbos               |
| <i>Schkuhria pinnata</i> *  |         | Dwarf marigold / Klein kakiebos         |
| <i>Senecio affinis</i>  |         |   |
| <i>Senecio erubescens</i> var. <i>crepidifolius</i>               |         |   |
| <i>Setaria sphacelata</i> var. <i>torta</i>                       |         | Creeping bristle grass / Kruipmannagras |
| <i>Sida alba</i>  |         | Spiny sida / Stekeltaaiman              |
| <i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>                 |         | Arrow leaf Sida / Taaiman               |
| <i>Solanum delagoense</i>   |         | Poison apple / Gifappel                 |
| <i>Sphenostylis angustifolius</i>                                 |         | Wild swetpea bush / Wilde ertjie        |
| <i>Stenostelma umbelluliferum</i>                                 |         |   |
| <i>Syncolostemon</i> sp   |         |   |
| <i>Tephrosia capensis</i> var. <i>capensis</i>                    |         |   |
| <i>Themeda triandra</i>   |         | Red grass / Rooigras                    |
| <i>Verbena brasiliensis</i> *                                     |         |   |
| <i>Xanthium strumarium</i> *                                      | 1       | Large cocklebur / Boetebos              |
| <i>Xysmalobium undulatum</i> var. <i>undulatum</i> <sup>1,2</sup> |         | Uzara / Bitterwortel                    |

## 6.7 Wetland

### 6.7.1 Compositional aspects and Connectivity

This study unit comprises wetland dominated by *Leersia hexandra* and *Typha capensis* along the Wonderboom Spruit. Large patches of juvenile *Cosmos bipinnata* also occur in the wetland. A leaking sewer drains raw sewage from the buildings of the Wonderboom Aerodrome into the wetland near the western boundary line of the site. Connectivity with natural wetland existed downstream to the west. Of the 98 plant species recorded on the site 29 were recorded in the Wetland. Of these, 20 are indigenous species. The following number of species in each life form was noted:

| LIFE FORM                             | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 11                |
| Shrubs and dwarf shrubs               | 2                 |
| Grasses                               | 6                 |
| Geophytes                             | 3                 |
| Sedges                                | 7                 |
| Total No of species                   | 29                |

### 6.7.2 Red- and Orange List species on the study unit

The Wetland study unit has suitable habitat for two Red List species, *Gnaphalium nelsonii* and *Trachyandra erythrorrhiza*, known to occur in the quarter degree square. None of these species were found during the survey.

GDARD required biodiversity studies for *Argyrolobium megarrhizum*, *Cucumis humifructus* and *Stenostelma umbelluliferum*. The habitat of the Wetland study unit is, however, not suitable for these three species.

This study unit has suitable habitat for the Orange List species *Crinum macowanii* which occurs just outside the wetland. (See Annexure A for a list of the Orange- and Red List species known to occur in the quarter degree square.)

### 6.7.3 Medicinal and alien species

Two medicinal species and nine alien species are recorded in the Wetland study unit. Of the alien species, one is a Category 2 Declared invader.

### 6.7.4 Sensitivity

As wetlands form biological filters and drainage lines form corridors for the movement of species, which include pollinators of plant species, this study unit is considered sensitive and should be excluded from development. A wetland specialist should determine the extent of the wetland. The buffer prescribed by GDARD should be maintained around the wetland.



**Figure 4: Wetland with *Typha capensis*.**



**Figure 5: Wetland dominated by *Leersia hexandra*.**

**Table 4: Plants recorded in the Wetland**

| SCIENTIFIC NAME                                   | INV CAT | COMMON NAMES                                  |
|---|---------|---|
| <i>Abildgaardia ovata</i>                         |         |   |
| <i>Agrostis lachnantha</i> var. <i>lachnantha</i> |         | Bent grass / Vink-agrostis                    |
| <i>Asparagus laricinus</i>                        |         | Wild asparagus / Katbos                       |
| <i>Berkheya radula</i>                            |         | Boesmanrietjie                                |
| <i>Cosmos bipinnatus</i> *                        |         | Cosmos  |
| <i>Crinum macowanii</i>                           |         |   |
| <i>Cynodon dactylon</i>                           |         | Couch grass / Kweek                           |
| <i>Cyperus congestus</i>                          |         |   |
| <i>Cyperus eragrostis</i> *                       |         |   |
| <i>Dipcadi viride</i>                             |         | Slymuintjie                                   |
| <i>Fimbristylis dichotoma</i>                     |         |   |
| <i>Kyllinga erecta</i> var. <i>erecta</i>         |         |   |
| <i>Leersia hexandra</i>                           |         | Wild rice grass / Wilderysgras                |
| <i>Mimulus gracilis</i>                           |         | Wild monkey flower                            |
| <i>Nasturtium officinale</i> *                    | 2       | Water cress / Bronkhors                       |
| <i>Paspalum dilatatum</i> *                       |         | Common paspalum / Gewone paspalum             |
| <i>Paspalum urvillei</i> *                        |         | Giant paspalum / Langbeen-paspalum            |
| <i>Persicaria decipiens</i>                       |         | Snakeroot / duisendknoop                      |
| <i>Persicaria lapathifolia</i> *                  |         |   |
| <i>Ranunculus multifidus</i> *                    |         | Common buttercup / Geelbotterblom             |
| <i>Raphanus raphanistrum</i> *                    |         | Wild radish / Wilderadys                      |
| <i>Rorippa nudiuscula</i>                         |         |   |
| <i>Rumex crispus</i> <sup>1*</sup>                |         | Curley dock / Krultongblaar                   |
| <i>Schoenoplectus brachyceras</i>                 |         |   |
| <i>Schoenoplectus corymbosis</i>                  |         |   |
| <i>Sesbania transvaalensis</i>                    |         |   |
| <i>Setaria nigrirostris</i>                       |         | Black seed bristle grass / Swartsaadmannagras |
| <i>Typha capensis</i> <sup>1,2</sup>              |         | Bulrush / Papkuil                             |
| <i>Veronica anagallis-aquatica</i>                |         | Water speedwell / Water ereprys               |

INV: Invader CAT: Category

## 6.8 Mixed alien and indigenous vegetation

### 6.8.1 Compositional aspects and Connectivity

This study unit comprises vegetation such as that in the *Acacia* – *Themeda* savannah. Builder's rubble and garden refuse introduced various alien species which invaded this vegetation. Builders' rubble and also household refuse, litter the study unit. The vegetation along the Spruit at the eastern boundary was severely infested with aliens that formed the dominant vegetation under the canopy of trees. The species diversity of this study unit was low. Of the 98 plant species recorded on the study site, 30 were recorded in the Mixed alien and indigenous vegetation study unit. Of these, 13 are indigenous species. The following number of species in each life form was noted:

| LIFE FORM                             | NUMBER OF SPECIES |
|---------------------------------------|-------------------|
| Annual & perennial herbaceous species | 18                |
| Tree species                          | 4                 |
| Shrubs and dwarf shrubs               | 3                 |
| Grasses                               | 2                 |
| Geophytes                             | 2                 |
| Sedges                                | 1                 |
| Total No of species                   | 30                |

## 6.8.2 Red- and Orange List species in the study unit

This study unit does not have suitable habitats for any of the Red List species or Orange List species known to occur in the quarter degree square or for those species for which GDARD required biodiversity studies.

## 6.8.3 Medicinal and alien species

One medicinal species was recorded in this study unit. Seventeen of the 28 alien species recorded on the site are found in this study unit. Of these, one is a Category 1 Declared weed and four are Category 3 Declared invaders.

## 6.8.4 Sensitivity

This study unit is not considered sensitive.



Figure 6: Alien vegetation dominated along the Spruit near the eastern boundary.

Table 5: Plants recorded in the Mixed alien and indigenous vegetation

| SCIENTIFIC NAME                                     | INV CAT | COMMON NAMES                            |
|---|---------|---|
| <i>Acacia karroo</i> <sup>1,2</sup>                 |         | Sweet thorn / Soetdoring                |
| <i>Acacia tortilis</i> subsp. <i>heteracantha</i>   |         | Umbrella thorn / Haak-en-steek          |
| <i>Amaranthus hybridus</i> subsp. <i>hybridus</i> * |         | Common pigweed / Kaapse misbredie       |
| <i>Asparagus laricinus</i>                          |         | Wild asparagus / Katbos                 |
| <i>Bidens bipinnata</i> *                           |         | Spanish blackjack / Spaanse knapsekêrel |
| <i>Bidens pilosa</i> *                              |         | Blackjack / Knapsekêrel                 |
| <i>Convolvulus sagittatus</i>                       |         |   |
| <i>Crinum macowanii</i>                             |         |   |
| <i>Cynodon dactylon</i>                             |         | Couch grass / Kweek                     |
| <i>Cyperus esculentus</i> var. <i>esculentus</i>    |         | Yellow nutsedge / Geeluintjie           |
| <i>Euphorbia heterophylla</i> *                     |         | Wild poinsettia / Wilde poinsettia      |
| <i>Flaveria bidentis</i> *                          |         | Smelter's bush / Smelterbossie          |
| <i>Gladiolus crassifolius</i>                       |         |   |
| <i>Gomphrena celosioides</i> *                      |         | Bachelor's button / Mierbossie          |
| <i>Hibiscus trionum</i> *                           |         | Bladder hibiscus / Terblansbossie       |
| <i>Ipomoea purpurea</i> *                           | 3       | Morning glory / Purperwinde             |
| <i>Melia azedarach</i> *                            | 3       | Syringa / Sering                        |
| <i>Morus alba</i> *                                 | 3       | Common mulberry / Gewone moerbeï        |

| SCIENTIFIC NAME  | INV CAT | COMMON NAMES                                |
|--|---------|---|
| <i>Nidorella resedifolia</i> subsp. <i>resedifolia</i> |         |   |
| <i>Paspalum urvillei</i> *                             |         | Giant paspalum / Langbeen-paspalum          |
| <i>Schkuhria pinnata</i> *                             |         | Dwarf marigold / Klein kakiebos             |
| <i>Senna didymobotrya</i> *                            | 3       | Peanut butter cassia / Grondboontjie cassia |
| <i>Sesbania transvaalensis</i>                         |         |   |
| <i>Sida rhombifolia</i> subsp. <i>rhombifolia</i>      |         | Arrow leaf Sida / Taaiman                   |
| <i>Solanum delagoense</i>                              |         | Poison apple / Gifappel                     |
| <i>Stenostelma umbelluliferum</i>                      |         |   |
| <i>Tagetes minuta</i> *                                |         | Tall khaki weed / Lang kakiebos             |
| <i>Verbena aristigera</i> *                            |         | Fine-leaved verbena / Fynblaar verbena      |
| <i>Verbena brasiliensis</i> *                          |         |   |
| <i>Xanthium strumarium</i> *                           | 1       | Large cocklebur / Boetebos                  |

INV: Invader CAT: Category

<sup>1)</sup> Van Wyk, B-E., Van Oudtshoorn, B. & Gericke, N. 2002.

<sup>2)</sup> Watt, J.M. & Breyer-Brandwijk, M.G. 1962.

<sup>3)</sup> Pooley, E. 1998.

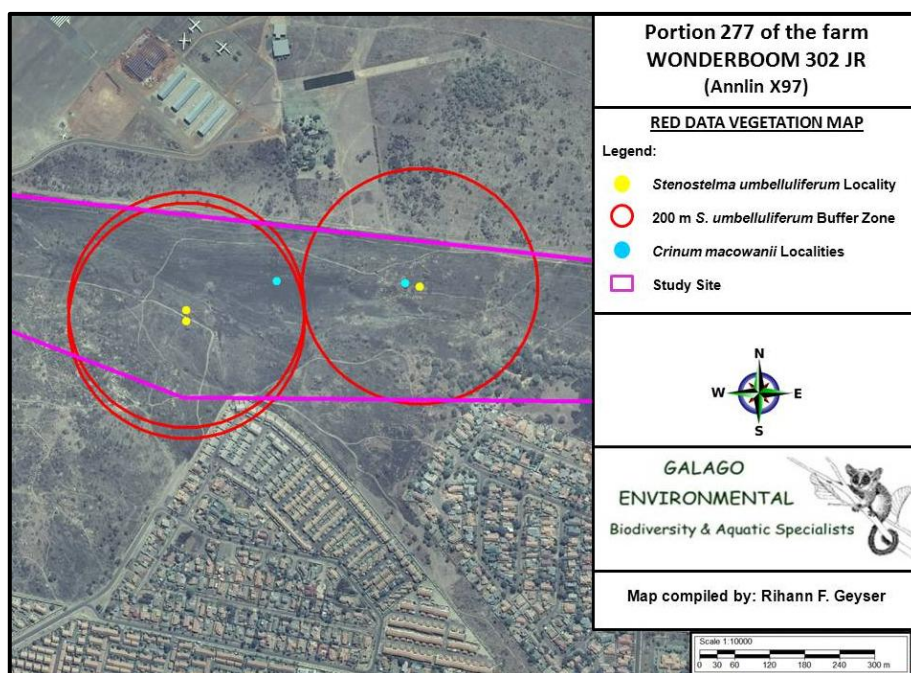
<sup>4)</sup> Van Wyk, B. & Van Wyk P. 1997.

## 7. LIMITATIONS, ASSUMPTIONS AND GAPS IN KNOWLEDGE

The site was visited in the late spring after it was burned during winter. Many grass and sedge species could therefore not be identified, but it is assumed that more species of such life forms occur on the site if the POSA list of species for the quarter degree square and the list given in Mucina and Rutherford (2006) are taken as guidelines.

## 8. FINDINGS AND POTENTIAL IMPLICATIONS

Most of the site comprised natural savanna with an extensive wetland running from east to west along the entire length of the site. One Red List species and one Orange List species were recorded on the study site. Development within the recommended buffer zones might destroy the populations of these two species. Habitat for Red List plants existed in the *Acacia* – *Themeda* savanna on the surrounding properties to a distance of 200 m from the boundary of the site.



**Figure 7: Map of the red listed plants found on site her with the buffers**

## **9. RECOMMENDED MITIGATION MEASURES**

The following mitigation measures are proposed by the specialist:

- Where possible, trees naturally growing on the site should be retained as part of the landscaping. Measures to ensure that these trees survive the physical disturbance from the development should be implemented. A tree surgeon should be consulted in this regard.
- Dumping of builders' rubble and other waste in the areas earmarked for exclusion must be prevented, through fencing or other management measures. These areas must be properly managed throughout the lifespan of the project in terms of fire, eradication of exotics etc. to ensure continuous biodiversity.
- All Declared Weeds and invaders and other alien species must be removed from the site.

The following mitigation measures were developed by GDARD, 2012 (Department of Agriculture and Rural Development, Directorate of Nature Conservation) and are applicable to the study site:

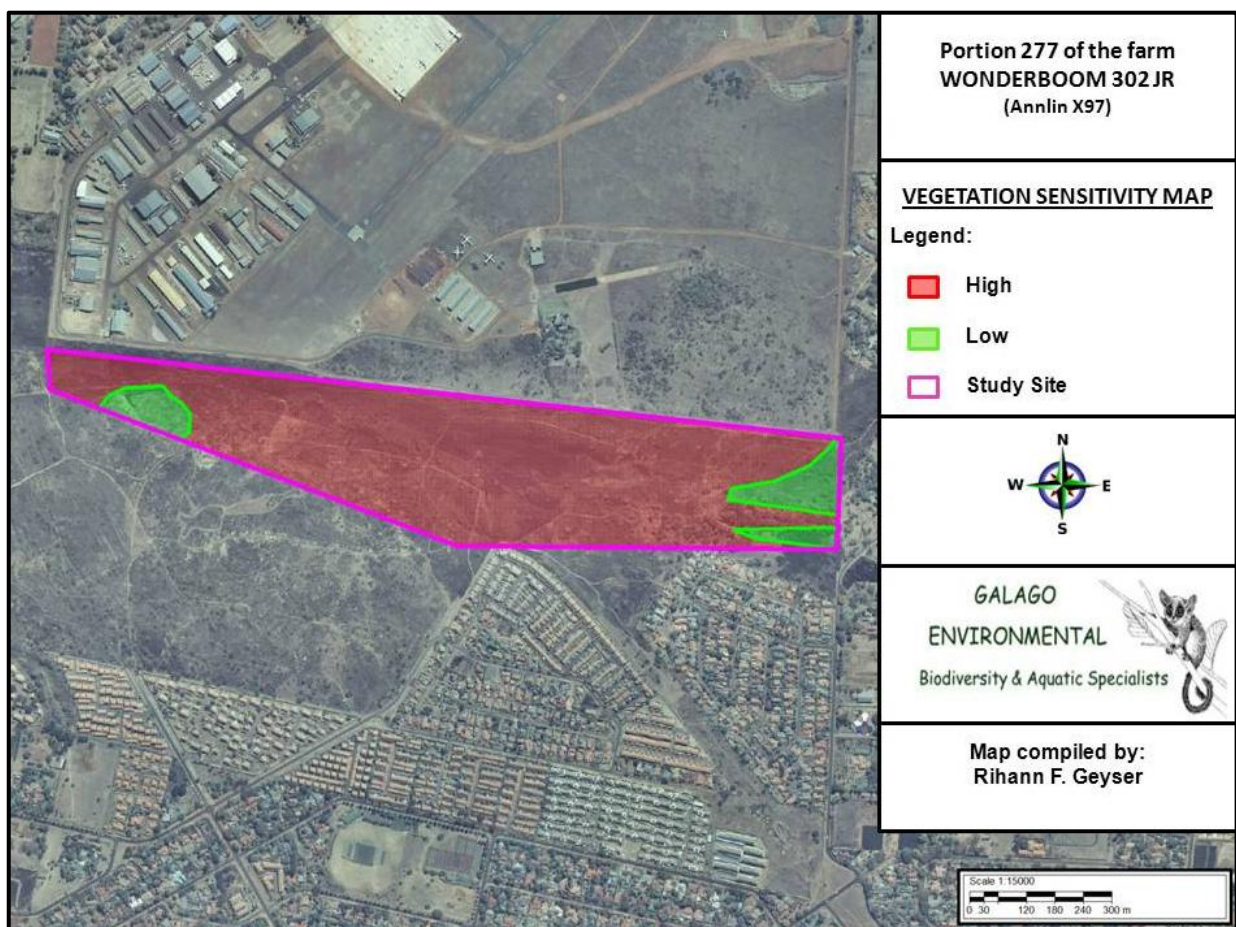
- An appropriate management authority (e.g. the body corporate) that must be contractually bound to implement the Environmental Management Plan (EMP) and Record of Decision (ROD) during the operational phase of the development should be identified and informed of their responsibilities in terms of the EMP and ROD.
- All areas designated as sensitive in a sensitivity mapping exercise should be incorporated into an open space system. Development should be located on the areas of lowest sensitivity.
- The open space system should be managed in accordance with an Ecological Management Plan that complies with the *Minimum Requirements for Ecological Management Plans* and forms part of the EMP.
- The Ecological Management Plan should:
  - o include a fire management programme to ensure persistence of grassland
  - o include an ongoing monitoring and eradication programme for all non-indigenous species, with specific emphasis on invasive and weedy species
  - o include a comprehensive surface runoff and storm water management plan, indicating how all surface runoff generated as a result of the development (during both the construction and operational phases) will be managed (e.g. artificial wetlands / storm water and flood retention ponds) prior to entering any natural drainage system or wetland and how surface runoff will be retained outside of any demarcated buffer/flood zones and subsequently released to simulate natural hydrological conditions
  - o ensure the persistence of all Red and Orange List species
  - o include a monitoring programme for all Red and Orange List species
  - o facilitate/augment natural ecological processes
  - o provide for the habitat and life history needs of important pollinators
  - o minimize artificial edge effects (e.g. water runoff from developed areas & application of chemicals)
  - o include a comprehensive plan for limited recreational development (trails, bird hides etc.) within the open space system
  - o result in a report back to the Directorate of Nature Conservation on an annual basis
- The open space system should be fenced off prior to construction commencing (including site clearing and pegging). All construction-related impacts (including service roads, temporary housing, temporary ablution, disturbance of natural habitat, storing of equipment/building materials/vehicles or any other activity) should be excluded from the open space system. Access of vehicles to the open space system should be prevented and access of people should be controlled, both during the construction and operational phases. Movement of indigenous fauna should however be allowed (i.e. no solid walls, e.g. through the erection of palisade fencing).



- Information boards should be erected within the development to inform residents of the presence of Red / Orange List species, their identification, conservation status and importance, biology, habitat requirements and management requirements.
- Only indigenous plant species, preferably species that are indigenous to the natural vegetation of the area, should be used for landscaping in communal areas. As far as possible, plants naturally growing on the development site, but would otherwise be destroyed during clearing for development purposes, should be incorporated into landscaped areas. Forage and host plants required by pollinators should also be planted in landscaped areas.
- In order to minimize artificially generated surface stormwater runoff, total sealing of paved areas such as parking lots, driveways, pavements and walkways should be avoided. Permeable material should rather be utilized for these purposes.
- The crossing of natural drainage systems should be minimized and only constructed at the shortest possible route, perpendicular to the natural drainage system. Where possible, bridge crossings should span the entire stretch of the buffer zone.

## 10. CONCLUSION

One Red List species and one Orange List species were found on the study site. A buffer of 200 meters should be maintained around the populations of these species. The *Acacia – Themeda* savanna and the Wetland are considered sensitive and should be excluded from development and where possible, **these areas must be connected to other natural vegetation** areas on the neighbouring properties to facilitate connectivity.



**Figure 8: Vegetation sensitivity map**

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## ANNEXURE A: Red- and Orange List\* plants of the 2528CC q.d.s.

| Species  | Flower season | Suitable habitat  | Priority group | Conserv status               | PRESENT ON SITE         |
|--|---------------|---|----------------|------------------------------|-------------------------|
| ▲ <i>Adromischus umbraticola</i> subsp. <i>umbraticola</i> | Sep-Jan       | Rock crevices on rocky ridges, often in shade of other vegetation.  | A2             | Near threatened <sup>1</sup> | Habitat not suitable    |
| <i>Aloe peglerae</i>                                       | July-Aug      | Grassland, in shallow gravelly quartzitic soils on rocky north-facing slopes or summits of ridges.                        | A2             | Endangered <sup>1</sup>      | Habitat not suitable    |
| ▲ <i>Argyrobium campicola</i>                              | Nov-Feb       | Highveld grassland  | A3             | Near threatened <sup>1</sup> | <b>Habitat suitable</b> |
| <i>Argyrobium megarrhizum</i>                              | Sep-Jan       | Mixed bushveld  | A3             | Near threatened <sup>1</sup> | Habitat not suitable    |
| <i>Boophane disticha</i>                                   | Oct-Jan       | Dry grassland and rocky areas.  | N/A            | Declining <sup>2</sup>       | Habitat not suitable    |
| ▲ <i>Bowiea volubilis</i> subsp. <i>volubilis</i>          | Sep-Apr       | Shady places, steep rocky slopes and in open woodland, under large boulders in bush or low forest.                        | B              | Vulnerable <sup>2</sup>      | Habitat not suitable    |
| <i>Brachycorythis conica</i> subsp. <i>transvaalensis</i>  | Jan-Mrt       | Short grassland, hillsides, on sandy gravel overlying dolomite, sometimes also on quartzites, occasionally open woodland. | A3             | Vulnerable <sup>1</sup>      | Habitat not suitable    |
| <i>Callilepis leptophylla</i>                              | Aug-Jan & May | Grassland or open woodland, often on rocky outcrops or rocky hillslopes.  | N/A            | Declining <sup>2</sup>       | Habitat not suitable    |
| ▲ <i>Ceropegia decidua</i> subsp. <i>pretoriensis</i>      | Nov-Apr       | Direct sunshine or shaded situations, rocky outcrops of the quartzitic Magaliesberg mountain series.                      | A1             | Vulnerable <sup>1</sup>      | Habitat not suitable    |
| <i>Crinum macowanii</i>                                    | Oct-Jan       | Grassland along rivers in gravelly soil or on sandy flats   | N/A            | Declining <sup>2</sup>       | <b>FOUND</b>            |
| <i>Cucumis humifructus</i>                                 | Jan & Apr     | Woodland and grassland, on deep sand.   | B              | Vulnerable <sup>2</sup>      | Habitat not suitable    |
| ▲ <i>Delosperma gautengense</i>                            | Nov-Apr       | Among rocks on hillslopes of Magaliesberg and associated ridge systems on south-facing slopes.                            | A1             | Vulnerable <sup>1</sup>      | Habitat not suitable    |
| ▲ <i>Delosperma leendertziae</i>                           | Oct-Apr       | Rocky ridges; on rather steep south facing slopes of quartzite in mountain grassveld.                                     | A2             | Near Threatened <sup>1</sup> | Habitat not suitable    |
| <i>Dicliptera magaliesbergensis</i>                        | Feb-Apr       | Forest, savanna (Riverine forest and bush).   | A1             | Vulnerable <sup>1</sup>      | Habitat not suitable    |
| <i>Dioscorea sylvatica</i>                                 | Oct-Jan       | Wooded places with fair to reasonably good rainfall, such as the moister bushveld areas, wooded mountain kloofs.          | B              | Vulnerable <sup>2</sup>      | Habitat not suitable    |
| <i>Drimia altissima</i>                                    | Sep-Feb       | Hot dry bushveld and thicket  | N/A            | Declining <sup>2</sup>       | Habitat not suitable    |
| ▲ <i>Drimia sanguinea</i>                                  | Aug-Dec       | Open veld and scrubby woodland in a variety of soil types   | B              | Near threatened <sup>2</sup> | <b>Habitat suitable</b> |
| <i>Eucomis autumnalis</i>                                  | Nov-Apr       | Damp open grassland and sheltered places.   | N/A            | Declining <sup>2</sup>       | <b>Habitat suitable</b> |
| <i>Gnaphalium nelsonii</i>                                 | Oct-Dec       | Seasonally wet grasslands   | A2             | Rare-sparse <sup>1</sup>     | <b>Habitat suitable</b> |
| <i>Gunnera perpensa</i>                                    | Oct-Mar       | In cold or cool continually moist localities, mainly along upland streambanks.  | N/A            | Declining <sup>2</sup>       | Habitat not suitable    |
| <i>Habenaria bicolor</i>                                   | Jan-Apr       | Well-drained grassland, at about 1600m.   | B              | Near Threatened <sup>2</sup> | Habitat not suitable    |
| ▲ <i>Habenaria kraenzliniana</i>                           | Feb-Apr       | Terrestrial in stony, grassy hillsides, recorded from 1000 to 1400m.  | A3             | Near Threatened <sup>1</sup> | Habitat not suitable    |
| ▲ <i>Holothrix randii</i>                                  | Sep-Jan       | Grassy slopes & rock ledges, usually southern aspects.  | B              | Near Threatened <sup>2</sup> | Habitat not suitable    |
| <i>Hypoxis hemerocallidea</i>                              | Sep-Mar       | Occurs in a wide range of habitats. Grassland and mixed woodland.   | N/A            | Declining <sup>2</sup>       | <b>Habitat suitable</b> |

| Species                                  | Flower season | Suitable habitat   | Priority group | Conserv status               | PRESENT ON SITE         |
|--|---------------|--|----------------|------------------------------|-------------------------|
| <i>Ilex mitis var.mitis</i>              | Oct-Dec       | River banks, stream beds, evergreen forests.                               | N/A            | Declining <sup>2</sup>       | Habitat not suitable    |
| <i>Macleodium pretoriense</i>            | Apr           | Hillsides.   | A1             | Extinct <sup>1</sup>         | Habitat not suitable    |
| <i>Searsia gracillima var.gracillima</i> | Jan-Apr       | Rocky quartzitic outcrops in bushveld.                                     | A1             | Near threatened <sup>1</sup> | Habitat not suitable    |
| ▲ <i>Stenostelma umbelluliferum</i>      | Sep-Mar       | Deep black turf in open woodland mainly in the vicinity of drainage lines. | A3             | Near threatened <sup>1</sup> | <b>FOUND</b>            |
| <i>Trachyandra erythrorrhiza</i>         | Sep-Nov       | Marshy areas, grassland, usually in black turf marshes.                    | A3             | Near Threatened <sup>1</sup> | <b>Habitat suitable</b> |

<sup>1)</sup> global status

<sup>2)</sup> national status

\* Orange listed plants have no priority grouping and are designated 'N/A'

▲ Has been recorded from the farm on which the study site is situated / within 5km of the study site. Should suitable habitat be present, it is highly likely that this species occur on the study site.

### ANNEXURE B: Red List plants for which biodiversity studies were required by GDARD

| Species                           | Flower season | Suitable habitat   | Priority group | Conserv status               | PRESENT ON SITE      |
|-----------------------------------|---------------|--|----------------|------------------------------|----------------------|
| <i>Argyrobium megarrhizum</i>     | Sep-Jan       | Mixed bushveld   | A3             | Near threatened <sup>1</sup> | Habitat not suitable |
| <i>Cucumis humifructus</i>        | Jan & Apr     | Woodland and grassland, on deep sand.                                      | B              | Vulnerable <sup>2</sup>      | Habitat not suitable |
| <i>Stenostelma umbelluliferum</i> | Sep-Mar       | Deep black turf in open woodland mainly in the vicinity of drainage lines. | A3             | Near threatened <sup>1</sup> | <b>FOUND</b>         |