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Plant Rescue and Protection Plan

De Aar 2 South Wind Energy Facility near De Aar in Northern
Cape Province





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Plant Rescue and Protection Plan for the De Aar 2 South Wind Energy Facility near De Aar in Northern Cape Province

Location:

Emthanjeni Local Municipality and Renosterberg Local Municipality
within the Pixley Ka Seme District Municipality

Prepared for

Mulilo De Aar 2 South (Pty) Ltd

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10 November 2022

Report version: Final

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1. INTRODUCTION

1.1 Background

This document provides a management plan for the rescue of any listed plants for which rescue is considered appropriate in the project area of the De Aar 2 South Wind Energy Facility in De Aar in the Northern Cape Province. The general location is shown in Figure 1 and a layout plan is shown in Figure 2. This site-specific plant rescue and protection management plan was developed as part of the Environmental Management Programme (EMPr) update process, to address the requirement to rescue any plants that could reasonably be expected to survive transplanting from the path of proposed construction, as required in terms of Condition 16.2 of the Environmental Authorisation issued for the De Aar 2 South Wind Energy Facility in March 2013, and will form part of the final EMPr to be submitted to the Department of Forestry, Fisheries and the Environment (DFFE) for written approval. Currently, the site is in a mostly natural state, but this will be altered during the course of the development of the project, at which time various locations will be cleared of natural habitat in preparation for construction of components of the authorised project. Where possible, it is desirable to undertake rescue of suitable plant material.

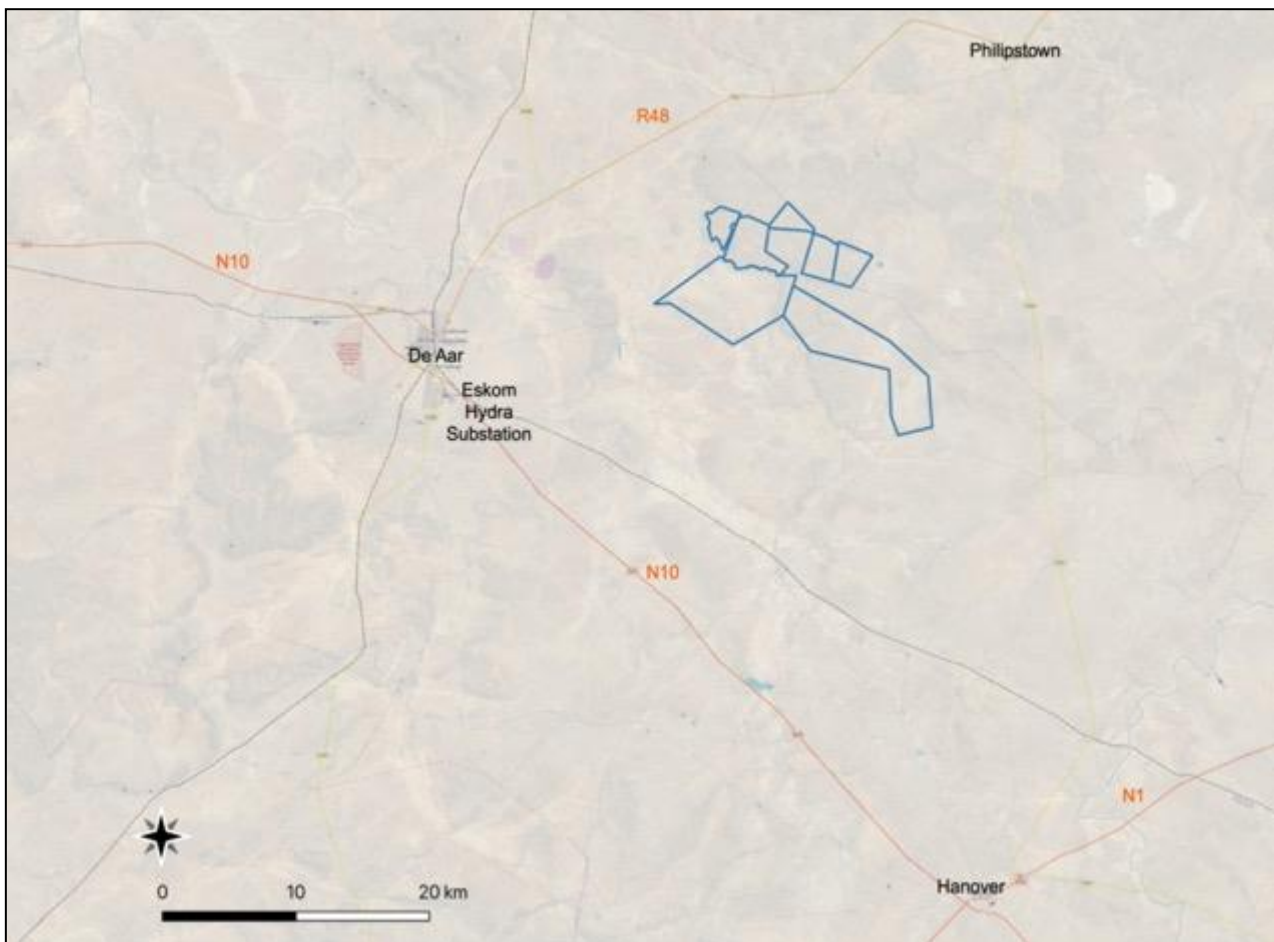


Figure 1: Location and extent of the study area.

1.2 Purpose of the Plant Rescue Plan

The purpose of the Plant Rescue Plan is:

- to provide practical guidance on search and rescue of threatened or protected plant species (TOPS) that could reasonably be expected to survive transplanting, as well as any other plants that can be used in the rehabilitation process.

The objective is to identify, remove and, where possible, rescue or relocate species of concern and other species, as discussed that could reasonably be expected to survive rescue and transplanting. It should be noted however, that permit applications have/will be made for the removal and/or destruction of protected plants, the numbers of which have been estimated. Therefore, it is not required that all protected plants be rescued and relocated, as the permit applications will allow for a certain number of plants to be destroyed during construction. The area to which this Plan refers is the footprint of the project infrastructure within the study area (Figure 1).



Figure 2: Location and extent of the study area.

1.3 Responsible persons

Rescue of sensitive plant species during the construction phase of the project will be dependent on a number of project personnel. These are listed below:

The Developer

This refers to the project proponent, Mulilo De Aar 2 South (Pty) Ltd. The Developer will be responsible for the following:

1. Ensure that the requirements set out in this Plan are adhered to and implemented;
2. Allocate the responsibilities assigned to the Environmental Control Officer (ECO) to an independent suitably qualified individual prior to the start of construction activities on site; and
3. Provide all principal contractors working on the project with a copy of this rescue and protection plan (which is to form part of the updated Environmental Management Plan (EMP) as part of tender contract documentation to allow the contractors to cost for its requirements within their respective construction contracts or alternatively, commission a suitable service provider to undertake the required Search and Rescue independent from any contract documentation with individual contractors.

The Project Environmental Manager

The Project Environmental Manager of the proposed development will be responsible for the overall implementation of the Plan during the construction phase of the project. To effectively implement the plant rescue plan, the Project Environmental Manager must be aware of the findings, mitigation measures and conclusions of the Final EIA report, the requirements of the EA, the EMPr, and this Plan.

The Environmental Control Officer (ECO)

The ECO is responsible for monitoring and verifying the implementation of the Plan during the construction phase of the project. To effectively implement the Plan, the ECO must be aware of the findings, mitigation measures and conclusions of the Final EIA Report, the EA, and this Plan.

The Contractor

The contractor, being any directly appointed company or individual undertaking the implementation of works, may be responsible for complying with the Plan at all times during the construction phase. Alternatively, an independent Nursery Contractor/Horticulturalist may be appointed to undertake the Search and Rescue. If such a contractor is appointed, they require competency in horticulture, and possibly landscaping.

1.4 Legal Requirements

- National Environmental Management: Biodiversity Act (Act 10 of 2004), including Threatened or Protected Species Regulations;
- National Environmental Management Act (Act 107 of 1998);
- Northern Cape Nature Conservation Act No. 9 of 2009

2. ECOLOGICAL PRINCIPLES FOR PLANT RESCUE

Plant rescue is considered to be a last resort to conserve individual plants, when authorization for development has been obtained and construction is imminent. The ecosystem within the footprint of the development, with all its species diversity, genetic variation and ecological interrelationships will be lost and the objective is to salvage anything of potential value that may be reasonably expected to survive prior to the destruction. Some considerations are as follows:

1. Plant rescue can usually only salvage a small proportion of the plants on site. This is due to two main factors, firstly, the fact that different species appear at different times and some species will almost certainly be dormant at the time that the Search and Rescue is undertaken, and secondly, there may be practical limitations in terms of how much plant material can be salvaged.
2. Globally, it has been recognised that the selection of plants to rescue is based on criteria that may have little to do with conservation, for example, ease of access, horticultural value and probability of survival.
3. Plants chosen for rescue may not thrive or even survive. It is highly unlikely that all rescued plants will survive. This is based on the fact that it is virtually impossible to predict without experimentation and research exactly what artificial conditions will be required for the management of each species in order to ensure survival.
4. Various agencies globally (e.g. IUCN) and nationally (e.g. SANBI) have expressed concern regarding the concept of plant rescue. The concern is that the implementation of a plant Search and Rescue can weaken support for habitat conservation by fostering the perception that rescuing selected plants can compensate for destruction of an entire habitat, or that landscape plantings can substitute for natural areas.
5. Plant rescue can divert time, energy, resources and leadership from tasks that may be more effective in protecting natural habitats.
6. Plants can be used for rehabilitation of affected areas, thereby restoring something resembling the natural vegetation.
7. It can make a long-term contribution to public education by providing native plants for public gardens and nature centres.

2.1 Principles

- *In situ* conservation is preferable to *ex situ* conservation. Removing a population from its natural habitat and placing it under artificial conditions results in the erosion of the inherent genetic diversity and characteristics of that species. This principle is very strongly emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:

"In situ conservation is vital and should be recommended as the only option for conserving species of conservation concern. Ex situ conservation, i.e. the removal of a subpopulation from its natural habitat to an artificial environment, a practice often termed 'search and rescue', will result in the erosion of the inherent genetic diversity and characteristics of that species and increase its extinction risk in the wild. Similarly, translocation of subpopulations is an unacceptable conservation measure."

- In order to ensure the persistence of a population, it is imperative that the ecological processes maintaining that population persist. This requires that natural habitats are maintained in an ecologically functional condition.

- Translocation of Red List species is an unacceptable conservation measure since the translocated species may have undesirable ecological effects, as follows:
 - Alterations to habitat by translocated species may be harmful to other species,
 - Translocations may lead to transmission of pathogens or parasites (Hodder & Bullock, 1997).
 - Translocation may result in rapid changes in the species itself (Conant, 1988).
 - Translocations are expensive and rarely successful (Griffith et al., 1989).
 - Success entails not only survival of the translocated individuals but also establishment of a self-sustaining, viable population able to reproduce and adapt to changing environmental conditions (Milton et al., 1999).
 - Relocation of rescued plants to undisturbed habitats falsifies the local history of natural dispersal and alters the natural species composition of the target site.

Once again, this has been emphasized on the SANBI websites "Guidelines for Environmental Impact Assessments" (www.redlist.sanbi.org/eiaguidelines.php) where the following is stated:

"Translocations are expensive and rarely successful. Even if they are successful, translocated individuals may harm other species within the receiving environment, the translocated individuals may transmit pathogens and/or parasites, and translocation may result in rapid changes in the species itself."

"Search and Rescue" as a conservation ideal therefore contradicts ecological principles espoused by the South African National Biodiversity Institute (SANBI) and IUCN.

The implications of these principles are as follows:

- It is highly preferable not to replant rescued plants into other natural habitats. Based on scientific evidence and concerns expressed by SANBI, translocation to an existing conservation area cannot be supported as a management measure.
- Rescued plants, if re-planted back in the wild, should be placed as close as possible to where they were originally removed. However, as stated in the previous paragraph, re-planting into natural areas is not supported as a conservation management measure.
- Re-planting into the wild must cause as little disturbance and harm as possible to existing natural ecosystems. As stated in the previous paragraph, re-planting into natural areas is not supported as a conservation management measure.
- Rescue must be limited to only those areas where plants will be destroyed by the development. No plants should be removed from areas that will otherwise not be disturbed.
- Rescue should not be undertaken from any site where there is a significant risk that well-established invasive alien plants or other pests will be spread by the relocation of native plants.
- The solution would be for rescued plants to only be replanted into disturbed areas after construction for rehabilitation purposes.

2.2 Planning considerations

The following factors affect planning of plant rescue:

- Adequate time must be allowed to obtain the necessary information about the site and its flora. This is usually achieved during the EIA stage and follow-up surveys. A detailed walk-through survey has already been undertaken for the current project. A reliable inventory of the plants found on a site is a key factor in determining whether a rescue is appropriate and, if it is, how the plants will be used. In general, a rescue should not be undertaken if an appropriate use of the rescued plants is not ready at hand or easily found. Where invasive alien species are present, which is not the case here, the numbers and concentrations must be known. If there are large concentrations of alien invasive species, this may rule out any rescue and limits the choice of relocation sites or eventual use of the rescued plants.
- There must be adequately qualified and equipped personnel to undertake a plant rescue. Personnel undertaking the rescue should have the knowledge and skills to ensure that the rescue operation is a success. A trained and qualified botanist is required to identify the species to be rescued, but horticultural skills are required for nursery establishment and for the actual planning and management of a nursery.
- In principle, rescued plants should be utilized for public benefit, not private gain. Acceptable uses are therefore replanting in rehabilitated areas, providing stock for propagation and providing plant material for a scientific project. Problematic uses are selling rescued plants to the public and providing plants for private gardens. This is because additional permits would be required for transport and trade of protected species. An incentive is also created to remove plants from the wild, which is not supported.
- Rescuing plants that are listed as protected under National or Provincial legislation is subject to requirements that cover the collection and use of whole plants, their progeny and plant parts, including seeds. A permit is required to possess, transport or propagate such species. The general permit for removal of TOPS will cover these components. Any trader would be required to get their own permits.
- A priority for replanting is to maintain the ecological integrity of the target habitat. Appropriate target sites include a managed wildflower garden, such as a botanical garden, and an interpretative nature trail, or an area that needs to be rehabilitated. Botanical gardens offer programs to help visitors identify and learn about native plants and can make it clear that plants have been rescued, not wild collected, especially for those species that are not commercially available. Unfortunately, botanical garden in South Africa are not generally receptive to receiving rescued plants from development projects. Inappropriate target sites are natural habitats in which ecological integrity is currently uncompromised.

3. SPECIES OF CONSERVATION CONCERN THAT OCCUR ON SITE

This section provides an outline of the existing status of the study area with respect to the occurrence of any species of conservation concern or any other plant species that are deemed worthy of rescue prior to construction. The purpose is to provide an indication of the identity of such species.

3.1 Protected plants (National Environmental Management: Biodiversity Act)

No plant species were found on site that are protected according to the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004). The only one likely to occur on site is *Hoodia gordonii*, a relatively conspicuous plant that would have been easily seen if it occurred there. There are no other plant species protected according to this legislation (see Appendix 3) that have a geographical distribution that includes the study area. The walk-down survey did not encounter any individuals of this species. There are therefore no species for which permits will be required under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004).

3.2 Protected plants (Northern Cape Nature Conservation Act No. 9 of 2009)

Plant species protected under the Cape Nature and Environmental Conservation Ordinance 19 of 1974 are listed in Appendix 2. There are two Schedules under this Ordinance, the first (Schedule 1) being Endangered species and the second (Schedule 2) Protected species.

Several species protected according to Schedules 1 and 2 were found on site. From the field surveys of the site, this includes the following species:

1. *Adromischus trigynus* (CRASSULACEAE), Schedule 2 - 20 plants.
2. *Babiana hypogaea* (IRIDACEAE), Schedule 2 - 50 plants.
3. *Boophone disticha* (IRIDACEAE), Schedule 2 - 10 plants.
4. *Brunsvigia radulosa* (IRIDACEAE), Schedule 2 - 30 plants.
5. *Crassula dependens* (CRASSULACEAE), Schedule 2 - 10 plants.
6. *Crassula setulosa* (CRASSULACEAE), Schedule 2 - 20 plants.
7. *Dianthus micropetalus* (CARYOPHYLLACEAE), Schedule 2 - 20 plants.
8. *Diascia alonsooides* (SCROPHULARIACEAE), Schedule 2 - 7 plants.
9. *Eucomis autumnalis* (ASPARAGACEAE), Schedule 2 - 2 plants.
10. *Euphorbia rhombifolia* (EUPHORBIACEAE), Schedule 2 - 40 plants.
11. *Freesia andersoniae* (IRIDACEAE), Schedule 2 - 250 plants.
12. *Hereroa* sp (AIZOACEAE), Schedule 2 - 20 plants.

13. *Lachenalia karoovica* (HYACINTHACEAE), Schedule 2 - 5 plants.
14. *Lapeirousia plicata* ssp. *foliosa* (IRIDACEAE), Schedule 2 - 4 plants.
15. *Moraea pallida* (IRIDACEAE), Schedule 2 - 90 plants.
16. *Oxalis pocockiae* (OXALIDACEAE), Schedule 2 - 900 plants.
17. *Pachypodium succulentum* (APOCYNACEAE), Schedule 2 - Appendix II of CITES, 1 plant.
18. *Pelargonium abrotanifolium* (GERANIACEAE), Schedule 1 - 150 plants.
19. *Ruschia intricata* (AIZOACEAE), Schedule 2 - 5000 plants.
20. *Stomatium* sp. cf. *mustelinum* (AIZOACEAE), Schedule 2 - 100 plants.
21. *Trichodiadema* sp. prob *T. setuliferum* (AIZOACEAE), Schedule 2 - 20 plants.

3.3 Protected species not seen that may occur on site

Protected species are according to both NEMBA and the Northern Cape Nature Conservation Act.

The site is within an arid area with seasonal (summer) rainfall. There are several species, especially geophytes, that are only visible under favourable environmental conditions and at particular times of the year. This is especially true of geophytes that often only emerge for a short period of time and are dormant for the remainder of the season, or even for extended periods of time. There are also small herbaceous plants, as well as small succulents, that are locally rare, as well as being small and inconspicuous, that may occur at a site but are relatively invisible even to detailed searching in suitable habitats.

A risk assessment was undertaken to identify protected plant species not seen on site, but which could occur there. This includes species that may be too inconspicuous to see, as well as those that may potentially be dormant at the time of the survey. A list of species is provided in Appendix 3 that fits this profile. This list (Appendix 3) includes any plant species previously recorded within 50 km of De Aar (according to SANBI collection records as well as the iNaturalist online database) that are either geophytes or are inconspicuous herbaceous or succulent plants. For each species, a desktop assessment was undertaken that considers the overall distribution of each species, as well as the habitat requirements of the species. From this assessment, the following species were considered to have a possibility of occurring in the type of habitats seen on site, even though they were not recorded during the walk-down survey:

1. *Ammocharis coranica* (AMARYLLIDACEAE) - geophyte - moderate possibility.
2. *Daubenya comata* (HYACINTHACEAE) - geophyte - low possibility.
3. *Disa pulchra* (ORCHIDACEAE) - geophyte - low possibility.
4. *Gethyllis longistyla* (IRIDACEAE) - geophyte - low possibility.
5. *Gethyllis villosa* (IRIDACEAE) - geophyte - low possibility.
6. *Gladiolus dalenii* subsp. *dalenii* (IRIDACEAE) - geophyte - low possibility.
7. *Gladiolus ecklonii* (IRIDACEAE) - geophyte low possibility.
8. *Gladiolus permeabilis* subsp. *edulis* (IRIDACEAE) - geophyte - moderate possibility.
9. *Moraea falcifolia* (IRIDACEAE) - geophyte - high probability.
10. *Moraea polystachya* (IRIDACEAE) - geophyte - high probability.
11. *Syringodea bifucata* (IRIDACEAE) - geophyte - low probability.
12. *Syringodea concolor* (IRIDACEAE) - geophyte - moderate possibility.

13. *Euphorbia arida* (EUPHORBIACEAE) - Succulent - high probability.
14. *Euphorbia juttae* (EUPHORBIACEAE) - succulent - moderate possibility.
15. *Haworthia bolusii* (ASPHODOLACEAE) - succulent - high probability.
16. *Haworthiopsis tessellata* (ASPHODOLACEAE) - succulent - high probability.
17. *Jamesbrittenia filicaulis* - (SCROPHULARIACEAE) - herb - high probability.
18. *Jamesbrittenia tysonii* (SCROPHULARIACEAE) - herb - high probability.
19. *Manulea fragrans* (SCROPHULARIACEAE) - herb - moderate probability.
20. *Microlooma armatum* (APOCYNACEAE) - succulent - moderate possibility.
21. *Nemesia linearis* (SCROPHULARIACEAE) - herb - moderate possibility.
22. *Pelargonium aestivale* (GERANIACEAE) - semi-succulent - moderate possibility.
23. *Pelargonium minimum* (GERANIACEAE) - herb - moderate possibility.
24. *Pelargonium tragacanthoides* (GERANIACEAE) - herb - moderate probability.
25. *Stapelia grandiflora* (APOCYNACEAE) - succulent - moderate probability.
26. *Tridentea virescens* (APOCYNACEAE) - succulent - moderate possibility. Flagged in DEA Online Screening Tool for site.

Note that these species were NOT seen on site but the possibility of them occurring there cannot be dismissed. The walk-down survey was conducted in detail with special emphasis placed on searching for inconspicuous plants.

4. PLANT RESCUE PLAN

This section provides details on the actions that are required to rescue any TOPS and/or listed plant species from the path of development that could reasonably be expected to survive transplanting and what steps are to be taken to house them temporarily and then to place them back into suitable habitats.

According to the detailed walk-through survey, several protected plant species were encountered on site. Some of these are relatively common species for which rescue is not warranted or justified. Also, they are unlikely to transplant easily and therefore rescue efforts are unlikely to be successful. It is therefore recommended that a permit be obtained for their destruction and no further steps taken to rescue any of these. A general guideline is as follows:

- Geophytes: can be rescued, although not warranted for common species.
- Succulents, can be rescued, although sometimes grow in difficult-to-reach places.
- Dwarf shrubs: seldom transplant easily, destroy, unless specifically flagged for rescue.

A list is provided of species found on site, and for which there is a possibility of them being observed on site. For those species for which rescue is considered to be required (depends on outcome of flora permit process), the following rescue activities for rescue should be followed.

4.1 Plant rescue activities required

Before construction commences at the site, the following actions must be taken:

<i>Action</i>	<i>Responsible person</i>
<p><u>Collate information on potential species of concern</u></p> <p><i>Initial identification of all listed species that may occur within the project area. This is covered in this report and other survey reports related to this project. The action is therefore complete.</i></p>	Botanist
<p><u>Mark footprint of proposed construction area</u></p> <p><i>The footprint of proposed development must be marked out prior to breaking ground. (It is assumed that this will follow a phased approach and that not all areas will be marked simultaneously. An example would be pegging out the route of a section of road to be constructed prior to earth-moving equipment beginning work on construction but could also include provision of a GPS track or GIS polygon file that depicts the affected areas.)</i></p>	Contractor / Engineer / Developer
<p><u>Species search and rescue</u></p>	Botanist / horticulturalist

<p><i>Location and rescue of all plants to be rescued that may occur within marked out areas (within the footprint of proposed infrastructure). The marked-out area must be walked and required species rescued.</i></p>	
<p><u>Plant marking and information requirements</u></p> <p><i>For all plants that are rescued, relevant information should be collected, as is determined by the horticulturalist as being adequate for reporting and monitoring. This information could include the number of individuals/clumps and date collected, as well as where they came from.</i></p>	<p>Qualified botanist / horticulturalist</p>
<p><u>Plant rescue</u></p> <ul style="list-style-type: none"> • <i>Appoint an experienced horticulturalist or landscaping contractor to undertake the rescue operation, manage the rescued plant material and operate any nursery that may be established.</i> • <i>From information gathered during the process of marking plants, establish the resource requirements for the plant rescue team workforce and the methodology to be employed to maximize the likelihood of success.</i> • <i>A multipronged approach to plant rescue should be followed to maximize the likelihood of success. This should take into account overall genetic variability and alternatives to preserving genetic variability. In addition to transplanting of whole plants, seed can be collected to sow in situ in suitable habitats. For plants that can be successfully grown in a nursery environment, seed and other propagules (cuttings, wildlings) must be propagated to supplement the plant rescue effort.</i> • <i>Habitats that are currently disturbed/transformed and that are outside the development footprint are possible sites for rehabilitation where a positive biodiversity outcome can be locally achieved.</i> • <i>Rescued plants must be planted into a container to be housed within a temporary nursery on site, or immediately planted into the target habitat. If planted into natural habitat, it must be protected from construction activities and monitored to ensure survival.</i> • <i>Where appropriate, it may be possible to directly transplant individuals from areas about to be cleared backwards to areas that are already undergoing rehabilitation.</i> 	<p>Project ECO</p>
<p><u>Control of impacts on adjacent areas</u></p> <ul style="list-style-type: none"> • <i>Any listed plants close to the development servitude that will remain in place may not be defaced, disturbed, destroyed or removed. They should be cordoned off with construction tape or similar barrier and marked as no-go areas.</i> • <i>The collecting of plants by unauthorized persons should be prevented.</i> • <i>ECO to monitor that vegetation clearing only happens once all search and rescue operations have been completed.</i> 	<p>ECO / qualified botanist</p>

- | | |
|--|--|
| <ul style="list-style-type: none">• <i>The ECO should monitor construction activities in sensitive habitats to ensure that impacts within these areas are kept to a minimum.</i> | |
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5. MONITORING REQUIREMENTS

The following monitoring activities are recommended as part of the plant rescue plan for those plants that could reasonably be expected to survive transplanting:

- Post-relocation monitoring of plants relocated during search and rescue to evaluate whether the intervention was successful or not. This should be undertaken on an annual basis over a period of three years in order to evaluate the success thereof. The initial survey to mark the location and identity of each rescued plant can be undertaken by the ECO during the construction phase, but the monitoring surveys should be undertaken by a botanical specialist.
- Provision of a detailed record, including photographs, that indicates the success of the plant rescue operation.

5.1 Indicators and Targets

Indicator	Target
Written and photographic records from all search and rescue operations.	All species of conservation concern identified or removed prior to clearing.
Survival rate of translocated plants	50-80% (based on probable survival rate of grassland species)

6. CONCLUSIONS

Currently, a flora permit is required for destruction of individuals of several plant species for which rescue is not considered appropriate. For remaining plants for which plant rescue is considered desirable, detailed measures are provided here. The requirement for plant rescue is dependent on conditions associated with the flora permit.

A detailed photographic guide to protected species found on site is provided in Appendix 6.

10. REFERENCES:

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10. APPENDICES:

Appendix 1: Checklist of plant species found on site.

Adromischus trigynus (1 observation)
Albuca setosa (1 observation)
Aloe broomii (1 observation)
Aptosimum indivisum (1 observation)
Aptosimum procumbens (4 observations)
Aristida adscensionis (1 observation)
Aristida diffusa (3 observations)
Asparagus lignosus (1 observation)
Asparagus striatus (11 observations)
Asparagus suaveolens (5 observations)
Babiana hypogaea (5 observations)
Berkheya sp (1 observation)
Blepharis mitrata (1 observation)
Boophone disticha (3 observations)
Brunsvigia radulosa (5 observations)
Caroxylon aphyllum (1 observation)
Cheilanthes eckloniana (13 observations)
Chloris virgata (1 observation)
Chrysocoma ciliata (12 observations)
Cineraria sp (1 observation)
Cissampelos capensis (1 observation)
Cotula sp (1 observation)
Crassula sp (2 observations)
Cyperus usitatus (1 observation)
Dianthus micropetalus (1 observation)
Diascia alonsooides (1 observation)
Dimorphotheca cuneata (2 observations)
Diospyros austro-africana (5 observations)
Diospyros lycioides (1 observation)
Dodonaea viscosa (15 observations)
Drimia sp (10 observations)
Eragrostis bergiana (2 observations)
Eragrostis lehmanniana (1 observation)
Eragrostis obtusa (3 observations)
Eriocephalus ericoides (21 observations)
Euclea crispa (10 observations)
Eucomis autumnalis (1 observation)
Euphorbia rhombifolia (5 observations)
Euryops lateriflorus (5 observations)
Felicia filifolia (6 observations)
Felicia muricata (3 observations)
Freesia andersoniae (6 observations)
Gazania krebsiana (2 observations)
Gnaphalium confine (1 observation)
Gnaphalium simii (1 observation)
Grimmia sp (1 observation)
Helichrysum asperum (1 observation)
Hereroa sp (1 observation)
Hermannia coccocarpa (1 observation)
Hermannia vestita (1 observation)

Heteropogon contortus (5 observations)
Hyparrhenia hirta (1 observation)
Isolepis sp (2 observations)
Lachenalia karooica (1 observation)
Lasiopogon (1 observation)
Lasiosiphon polycephalus (3 observations)
Leobordea (2 observations)
Lessertia frutescens (1 observation)
Lycium cinereum (7 observations)
Lycium horridum (1 observation)
Melianthus comosus (1 observation)
Melolobium microphyllum (9 observations)
Miscanthus junceus (1 observation)
Moraea pallida (9 observations)
Nemesia fruticans (2 observations)
Oedera humilis (4 observations)
Osteospermum calendulaceum (1 observation)
Osiris lanceolata (1 observation)
Oxalis pocockiae (1 observation)
Pachypodium succulentum (1 observation)
Pegoletia retrofracta (1 observation)
Pelargonium abrotanifolium (7 observations)
Pelargonium tragacanthoides (1 observation)
Pentzia incana (12 observations)
Potamogeton (1 observation)
Pteronia glauca (3 observations)
Rhigozum obovatum (1 observation)
Ruschia indurata (1 observation)
Ruschia intricata (17 observations)
Salvia verbenaca (1 observation)
Schoenoplectus (1 observation)
Searsia burchellii (20 observations)
Searsia erosa (1 observation)
Setaria verticillata (2 observations)
Solanum giftbergense (1 observation)
Solanum tomentosum (5 observations)
Stachys rugosa (5 observations)
Stomatium (2 observations)
Tarchonanthus minor (2 observations)
Themeda triandra (8 observations)
Trichodiadema (1 observation)
Ursinia nana (1 observation)
Zaluzianskya villosa (1 observation)

Appendix 2: Protected plant species previously recorded within 30 km of De Aar.

Taxon	Family	Description and habitat	Probability of occurrence*
GEOPHYTES			
<i>Ammocharis coranica</i>	AMARYLLIDACEAE	Summer-growing, deciduous bulb with 9-15 strap-shaped leaves that lie flat on the surface of the soil. It prefers sandy soils, open flat areas and full sun. Often occurs in local colonies. Previously recorded near to De Aar.	Could occur on site, but leaves should be clearly visible even when not flowering.
Boophone disticha	AMARYLLIDACEAE	Deciduous bulb with bulb visible above ground. Leaves form a conspicuous fan. Flowers in spring even if it does not rain. Recorded a number of times in the area around De Aar but all within the low mountains.	FOUND. Usually clearly visible as bulbs, dry seedheads, or leaves.
<i>Daubinya comata</i>	HYACINTHACEAE	Flat-growing bulbous geophyte that produces two spreading leaves. Grows in seasonally waterlogged loam or clay soils. Recorded a number of times near to De Aar.	Could occur on site and may be inconspicuous.
<i>Disa pulchra</i>	ORCHIDACEAE	Robust to slender terrestrial orchid. Main distribution is in mesic grasslands of the eastern part of South Africa, but 1 iNaturalist record from near to De Aar. Occurs in stony grassland in hilly or mountainous country.	Unlikely to occur on site.
<i>Gethyllis longistyla</i>	IRIDACEAE	Small, flat-growing geophyte with small, linear leaves from corm. Summits of rocky dolerite hills.	Highly unlikely to occur on site.
<i>Gethyllis villosa</i>	IRIDACEAE	Small, flat-growing geophyte with small, twirled, linear leaves from corm. Mostly winter rainfall areas, but extends along escarpment eastwards and on summits of rocky dolerite hills.	Highly unlikely to occur on site.
<i>Gladiolus dalenii</i> subsp. <i>dalenii</i>	IRIDACEAE	Fairly robust geophyte occurring in the mesic eastern parts of South Africa, extending westwards only in mountainous areas.	Highly unlikely to occur on site.
<i>Gladiolus ecklonii</i>	IRIDACEAE	Fairly robust geophyte occurring in the mesic eastern parts of South Africa, extending westwards only in mountainous areas.	Highly unlikely to occur on site.
<i>Gladiolus permeabilis</i> subsp. <i>edulis</i>	IRIDACEAE	Relatively slender, inconspicuous geophyte, occurring singly. Widespread in SA in stony grassland and open, grassy shrubland. Recorded in hills near De Aar.	Could occur in area but likely to only be in hills around De Aar, not on flats - if on flats then only in rocky areas.
<i>Moraea falcifolia</i>	IRIDACEAE	Small plants forming a dense, sessile rosette. Occurs on dry, open, stony or clay flats. Has been recorded a number of times near to De Aar in a variety of habitats.	Could occur on site and may be relatively inconspicuous.

Moraea pallida	IRIDACEAE	Perennial upright plant. Occurs in the central parts of SA, including the dryer parts of the Grassland Biome and is responsible for stock poisoning. Widespread and common, including around De Aar. Occurs in open veld and disturbed veld.	FOUND.
Moraea polystachya	IRIDACEAE	Perennial upright plant. Occurs in the central parts of SA. Regularly recorded around De Aar. Occurs in open well-drained flats and slight slopes.	High probability to occur on site although not seen.
Syringodea bifucata	IRIDACEAE	Relatively small plant with tussock of fine leaves growing from corm. Recorded from near De Aar but this is edge of known distribution. Occurs in washes or seasonal drainage lines on clay flats in karroid scrub and open grassland.	Low likelihood but could occur. May be relatively inconspicuous.
Syringodea concolor	IRIDACEAE	Relatively small plant with tussock of fine leaves growing from corm. Core of distribution includes De Aar and SE of there. Occurs in washes or seasonal drainage lines on clay flats in karroid scrub and open grassland.	Low likelihood but could occur.
HERBACEOUS PLANTS AND SUCCULENTS			
Euphorbia arida	EUPHORBIACEAE	Succulent. Site is within known distribution. Probably only occurs in rocky areas.	Could occur on site and may be relatively inconspicuous
Euphorbia flanagani	EUPHORBIACEAE	Low succulent, perennial, relatively conspicuous in flat areas.	Low likelihood but could occur.
Euphorbia juttae	EUPHORBIACEAE	Small succulent, widespread but uncommon. Restricted to rocky or stony areas.	Could occur on site and may be inconspicuous.
Euphorbia rhombifolia	EUPHORBIACEAE	Succulent that forms compact, rounded dwarf shrubs that are relatively conspicuous. Mostly found on mountain slopes and in rocky areas.	FOUND
Haworthia bolusii	ASPHODOLACEAE	Small succulent. Found in rocky areas within the Karro escarpment mountains and on other ridges.	Could occur on site and may be inconspicuous.
Haworthiopsis tessellata	ASPHODOLACEAE	Small succulent found deeply wedged between rocks.	Could occur on site and may be inconspicuous.
Jamesbrittenia filicaulis	SCROPHULARIACEAE	Small herb. Mostly on hillslopes, shallow soils, within rocks and on dolerite outcrops.	Could occur on site and may be inconspicuous.
Jamesbrittenia tysonii	SCROPHULARIACEAE	Small herb. Mostly on hillslopes, shallow soils, within rocks and on dolerite outcrops.	Could occur on site and may be inconspicuous.
Kniphofia ensifolia	ASPHODOLACEAE	Bottomlands, moist locations in landscape, valley bottoms. Relatively robust and conspicuous plant	Unlikely
Manulea fragrans	SCROPHULARIACEAE	Small herb. Karroid flats and hills between other plants.	Could occur on site and may be relatively inconspicuous
Microloma armatum	APOCYNACEAE	Herbaceous succulent forming stiff branches from ground level. Moderately conspicuous.	Could occur on site.

Nemesia linearis	SCROPHULARIACEAE	Herbaceous plant. Found in escarpment areas, low mountains, hills and rocky areas, as well as in areas of shallow soil on flatter areas.	Could occur on site and may be inconspicuous.
Pachypodium succulentum	APOCYNACEAE	Relatively conspicuous succulent forming finger-like branches. Often occurs in more rocky areas but could occur elsewhere.	FOUND
Pelargonium aestivale	GERANIACEAE	Relatively rare semi-succulent plant found primarily within the escarpment area, therefore probably restricted to mountains, hills and rocky areas.	Could occur on site and may be inconspicuous.
Pelargonium minimum	GERANIACEAE	Small herbaceous plant forming low rosette-like plants with divided leaves. Widespread and common and appears to favour open areas, including flat, stony soils.	Could occur on site and may be inconspicuous.
Pelargonium tragacanthoides	GERANIACEAE	Low herbaceous semi-succulent. Grows amongst rocks. Found primarily within the escarpment area, therefore probably restricted to mountains, hills and rocky areas	Could occur on site and may be inconspicuous.
Stapelia grandiflora	APOCYNACEAE	Typical stapeliad growth-form - small finger-like succulent. Widespread in the escarpment and mountain areas of SA and adjacent areas. Probably occurs primarily within or near to rocks.	Could occur on site and may be inconspicuous.
Tridentea virescens	APOCYNACEAE	Stony ground or hard loam in flood plains. Warmbad in southern Namibia to Kakamas and Prieska in the Northern Cape stretching east to Prince Albert and Aberdeen	Could occur on site and may be inconspicuous. Flagged in DEA Online Screening Tool for site.

Appendix 3: Flora protected under the Northern Cape Nature Conservation Act No. 9 of 2009.

SCHEDULE 1: SPECIALLY PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 1

Family: AMARYLLIDACEAE	
<i>Clivia mirabilis</i>	Oorlofskloof bush lily / <i>Clivia</i>
<i>Haemanthus graniticus</i>	April fool
<i>Hessea pusilla</i>	
<i>Strumaria bidentata</i>	
<i>Strumaria perryae</i>	
Family: ANACARDIACEAE	
<i>Ozoroa</i> spp.	All species
Family: APIACEAE	
<i>Centella tridentata</i>	
<i>Chamarea snijmaniae</i>	
Family: APOCYNACEAE	
<i>Hoodia gordonii</i>	
<i>Pachypodium namaquanum</i>	Elephant's trunk
Family: ASPHODOLACEAE	
<i>Aloe buhrii</i>	
<i>Aloe dichotoma</i>	
<i>Aloe dichotoma</i> var. <i>rumosissima</i>	Maiden quiver tree
<i>Aloe dabenorisana</i>	
<i>Aloe erinacea</i>	
<i>Aloe meyeri</i>	
<i>Aloe pearsonii</i>	
<i>Aloe pillansii</i>	
<i>Trachyandra prolifera</i>	
Family: ASTERACEAE	
<i>Athanasia adenantha</i>	
<i>Athanasia spathulata</i>	
<i>Cotula filifolia</i>	
<i>Euryops mirus</i>	
<i>Euryops rosulatus</i>	
<i>Euryops virgatus</i>	
<i>Felicia diffusa</i> subsp. <i>khamiesbergensis</i>	
<i>Othonna armiana</i>	
Family: CRASSULACEAE	
<i>Tylecodon torulosus</i>	
Family: DIOSCORACEAE	
<i>Dioscorea</i> spp.	Elephant's foot, all species
Family: ERIOSPERMACEAE	
<i>Eriospermum erinum</i>	
<i>Eriospermum glaciale</i>	
Family: FABACEAE	
<i>Amphithalea obtusiloba</i>	
<i>Lotononis acutiflora</i>	
<i>Lotononis polycephala</i>	
<i>Lessertia</i> spp.	
<i>Sceletium toruosum</i>	
<i>Sutherlandia</i> spp.	Cancer Bush, all species

Wiborgia fusca subsp. macrocarpa	
Family: GERANIACEAE	
Pelargonium spp.	Pelargonium, all species
Family: HYACINTHACEAE	
Drimia nana	
Ornithogalum bicornutum	
Ornithogalum inclusum	
Family: IRIDACEAE	
Babiana framesii	
Ferraria kamiesbergensis	
Freesia marginata	
Geissorhiza subrigida	
Hesperantha minima	
Hesperantha oligantha	
Hesperantha rivulicola	
Lapeirousia verecunda	
Moraea kamiesensis	
Moraea namaquana	
Romulea albiflora	
Romulea discifera	
Romulea maculata	
Romulea rupestris	
Family: MOLLUGINACEAE	
Hypertelis trachysperma	
Psammotropha spicata	
Family: ORCHIDACEAE	
Corycium ingeanum	
Disa macrostachya	Disa
Family: OXALIDACEAE	
Oxalis pseudo-hirta	Sorrel
Family: PEDALIACEAE	
Harpagophytum spp.	Devils' claw
Family: POACEAE	
Prionanthium dentatum	
Secale strictum subsp. africanum	Wild rye
Family: PROTEACEAE	
Leucadendron meyerianum	Tolbos
Mimetes spp.	All species
Orothamnus zeyheri	
Family: ROSACEAE	
Cliffortia arborea	Sterboom
Family: SCROPHULARIACEAE	
Charadrophila capensis	Cape Gloxinia
Family: STANGERIACEAE	
Stangeria spp.	Cycads, all species
Family: ZAMIACEAE	
Encephalartos spp.	Cycads, all species

SCHEDULE 2: PROTECTED SPECIES

As per the Northern Cape Nature Conservation Act, No. 9 of 2009, Schedule 2

Family: ACANTHACEAE	
Barleria paillosa	
Monechme saxatile	

Peristrophe spp.	All species
Family: ADIANTHACEAE	
Adiantum spp.	Maidenhair Fern, all species
Family: AGAPANTHACEAE	
Agapanthus spp.	All species
Family: AIZOACEAE (MESEMBRYANTHEMACEAE)	All species
Family: AMARYLLIDACEAE	All species except those listed in Schedule 1
Family: ANTHERICACEAE	All species
Family: APIACEAE	All species except those listed in Schedule 1
Family: APOCYNACEAE	All species except those listed in Schedule 1
Family: AQUIFOLIACEAE	All species
Ilex mitis	
Family: ARACEAE	
Zantedeschia spp.	Arum lilies, all species
Family: ARALIACEAE	
Cussonia spp.	Cabbage trees, all species
Family: ASPHODOLACEAE	All species except those listed in Schedule 1 and the species <i>Aloe ferox</i>
Family: ASTERACEAE	
Helichrysum jubilatam	
Felicia deserti	
Gnaphalium simii	
Lopholaena longipes	
Senecio albo-punctatus	
Senecio trachylaenus	
Trichogyne lerouxiae	
Tripteris pinnatilobata	
Troglophyton acocksianum	
Vellereophyton lasianthum	
Family: BURMANNIACEAE	
Burmannia madagascariensis	Wild ginger
Family: BURSERACEAE	
Commiphora spp.	All species
Family: CAPPARACEAE	
Boscia spp.	Shepherd's trees, all species
Family: CARYOPHYLLACEAE	
Dianthus spp.	All species
Family: CELASTRACEAE	
Gymnosporia spp.	All species
Family: COLCHICACEAE	
Androcymbium spp.	All species
Gloriosa spp.	All species
Family: COMBRETACEAE	
Combretum spp.	All species
Family: CRASSULACEAE	All species except those listed in Schedule 1
Family: CUPPRESSACEAE	
Widdringtonia spp.	Wild cypress, all species
Family: CYATHEACEAE	
Cyathea spp.	Tree ferns, all species
Cyathea capensis	Tree Fern
Family: CYPERACEAE	
Carex acocksii	
Family: DROSERACEAE	
Drosera spp.	Sundews, all species

Family: DRYOPTERIDACEAE	
Rumohra spp.	Seven Weeks Fern, all species
Family: ERICACEAE	Erica, all species
Family: EUPHORBIACEAE	
Alchornea laxiflora	Venda Bead-string
Euphorbia spp.	All species
Family: FABACEAE	
Aspalathus spp.	Tea Bush, all species
Erythrina zeyheri	Ploughbreaker
Argyrobium petiolare	
Caesalpinia bracteata	
Calliandra redacta	
Crotalaria pearsonii	
Indigofera limosa	
Lebeckia bowieana	
Polhillia involucrate	
Rhynchosia emarginata	
Wiborgia humilis	
Family: HYACINTHACEAE	
Daubenia spp	
Lachenalia spp.	Daubenia, all species
Veltheimia spp.	Violtjie, all species
Eucomis spp.	Pineapple flower, all species
Neopaterosonia namaquensis	
Ornithogalum spp.	All species
Family: IRIDACEAE	All species except those listed in Schedule 1
Family: LAURACEAE	
Ocotea spp.	Stinkwood, all species
Family: MESEMBRYANTHEMACEAE	All species
Family: MELIACEAE	
Nymania capensis	Chinese Lantern
Family: OLEACEAE	
Olea europea subsp. africana	Wild olive
Family: ORCHIDACEAE	Orchids, all species except those listed in Schedule 1
Family: OROBANCHACEAE	
Harveya spp.	Harveya, all species
Family: OXALIDACEAE	
Oxalis spp.	Sorrel, all species except those listed in Schedule 1
Family: PLUMBAGINACEAE	
Afrolimon namaquanum	
Family: POACEAE	
Brachiaria dura var. dura	
Dregeochloa calviniensis	
Pentaschistis lima	
Family: PODOCARPACEAE	
Podocarpus spp.	Yellowwoods, all species
Family: PORTULACACEAE	
Anacampseros spp.	All species
Avonia spp.	All species
Portulaca foliosa	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	

Phylica spp.	All species
Family: RUTACEAE	
Agathosma spp.	Buchu, all species
Family: SCROPHULARIACEAE	
Diascia spp.	All species
Halleria spp.	All species
Jamesbrittenia spp.	All species
Manulea spp.	All species
Nemesia spp.	All species
Phyllopodium spp.	All species
Polycarena filiformis	
Chaenostoma longipedicellatum	
Family: STRELITZIACEAE	
Strelitzia spp.	All species
Family: TECOPHILACEAE	
Cyanella spp.	All species
Family: THYMELAEACEAE	
Gnidia leipoldtii	
Family: ZINGIBERACEAE	
Siphonochilus aethiopicus	Wild ginger

Appendix 4: List of protected tree species (National Forests Act).

Vachellia erioloba	Vachellia haematoxylon
Adansonia digitata	Azelia quanzensis
Balanites subsp. maughamii	Barringtonia racemosa
Boscia albitrunca	Brachystegia spiciformis
Breonadia salicina	Bruguiera gymnorhiza
Cassipourea swaziensis	Catha edulis
Ceriops tagal	Cleistanthus schlechteri var. schlechteri
Colubrina nicholsonii	Combretum imberbe
Curtisia dentata	Elaeodendron (Cassine) transvaalensis
Erythrophysa transvaalensis	Euclea pseudebenus
Ficus trichopoda	Leucadendron argenteum
Lumnitzera racemosa var. racemosa	Lydenburgia abottii
Lydenburgia cassinoides	Mimusops caffra
Newtonia hildebrandtii var. hildebrandtii	Ocotea bullata
Ozoroa namaensis	Philenoptera violacea (Lonchocarpus capassa)
Pittosporum viridiflorum	Podocarpus elongatus
Podocarpus falcatus	Podocarpus henkelii
Podocarpus latifolius	Protea comptonii
Protea curvata	Prunus africana
Pterocarpus angolensis	Rhizophora mucronata
Sclerocarya birrea subsp. caffra	Securidaca longependunculata
Sideroxylon inerme subsp. inerme	Tephrosia pondoensis
Warburgia salutaris	Widdringtonia cedarbergensis
Widdringtonia schwarzii	

Boscia albitrunca has a geographical distribution that includes the study area.

Appendix 5: Flora species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)

(as updated in R. 1187, 14 December 2007)

CRITICALLY ENDANGERED SPECIES

Flora

Adenium swazicum
Aloe pillansii
Diaphananthe millarii
Dioscorea ebutsniorum
Encephalartos aemulans
Encephalartos brevifoliolatus
Encephalartos cerinus
Encephalartos dolomiticus
Encephalartos heenanii
Encephalartos hirsutus
Encephalartos inopinus
Encephalartos latifrons
Encephalartos middelburgensis
Encephalartos nubimontanus
Encephalartos woodii

ENDANGERED SPECIES

Flora

Angraecum africae
Encephalartos arenarius
Encephalartos cupidus
Encephalartos horridus
Encephalartos laevifolius
Encephalartos lebomboensis
Encephalartos msinganus
Jubaeopsis caffra
Siphonochilus aethiopicus
Warburgia salutaris
Newtonia hilderbrandi

VULNERABLE SPECIES

Flora

Aloe albida
Encephalartos cycadifolius
Encephalartos Eugene-maraisii
Encephalartos ngovanus
Merwillia plumbea
Zantedeschia jucunda

PROTECTED SPECIES

Flora

Adenia wilmsii
Aloe simii
Clivia mirabilis
Disa macrostachya
Disa nubigena

Disa physodes
Disa procera
Disa sabulosa
Encephelartos altensteinii
Encephelartos caffer
Encephelartos dyerianus
Encephelartos frederici-guilielmi
Encephelartos ghellinckii
Encephelartos humilis
Encephelartos lanatus
Encephelartos lehmannii
Encephelartos longifolius
Encephelartos natalensis
Encephelartos paucidentatus
Encephelartos princeps
Encephelartos senticosus
Encephelartos transvenosus
Encephelartos trispinosus
Encephelartos umbeluziensis
Encephelartos villosus
Euphorbia clivicola
Euphorbia meloformis
Euphorbia obesa
Harpagophytum procumbens
Harpagophytum zeyherii
Hoodia gordonii
Hoodia currorii
Protea odorata
Stangeria eriopus

Appendix 6: Field guide to protected species found on site

Various plant species are protected under the Northern Cape Nature Conservation Act no 9 of 2009 (see Appendix 3 for plants only), and under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (see Appendix 5). The following protected plant species were encountered within footprint areas during the field survey:

***Adromischus trigynus* (CRASSULACEAE)**

Northern Cape Nature Conservation Act no 9 of 2009, Schedule 2 - CRASSULACEAE, all species

Found at one location within the project area (at WTG14) in a small groups of 3 plants. Grows between cracks in rocks, as well as deeply under the protection of shrubs. Fairly cryptic, therefore may possibly occur at other locations and not seen. Estimated total number affected by project: 20 plants.

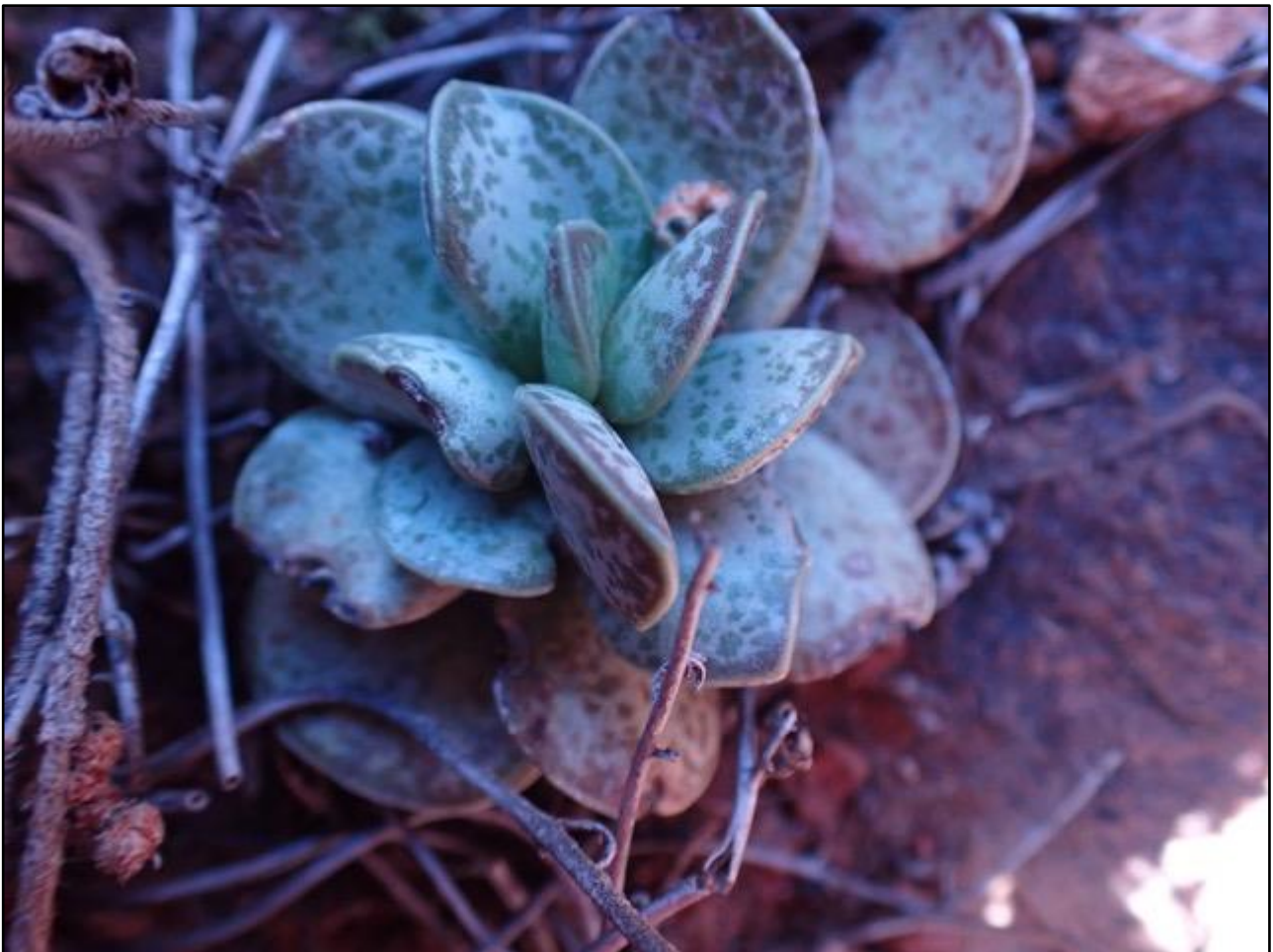


Figure 1: Adromischus trigynus

***Aloe broomii* (ASPHODOLACEAE)**

Northern Cape Nature Conservation Act no 9 of 2009, Schedule 2 - ASPHODELACEAE, all species

Found at one location within the project area (road corridor north of WTG11) as a single plant. Grows in the open or amongst rocks. Also seen numerous times as dead plants. In recent years occurred more widely but extreme drought resulted in high mortality directly as well as due to targeted browsing by kudu. Estimated total number affected by project: 2 plants.



Figure 2: Aloe broomii

***Babiana hypogaea* (IRIDACEAE)**

Northern Cape Nature Conservation Act no 9 of 2009, Schedule 2 - IRIDACEAE, all species.

Found scattered throughout the project area, usually within rocky areas where plants are wedged between rocks in small colonies. They often have their leaf tips trimmed by grazing animals. Estimated total number affected by project: 50 plants.



Figure 3: Babiana hypogaea.

***Boophone disticha* (IRIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AMARYLLIDACEAE, all species.

Found at isolated locations in rocky areas near to escarpment, often in small groups of 1 - 4 plants. Recent years of drought may have caused high natural mortality - not seen as often as expected. Estimated total number affected by project: 10 plants.



Figure 4: *Boophone disticha*.

***Brunsvigia radulosa* (IRIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AMARYLLIDACEAE, all species

Found at isolated locations in flat areas between rocky areas, often in small groups of 1 - 4 plants. Estimated total number affected by project: 30 plants.



Figure 5: *Brunsvigia radulosa*.

***Crassula dependens* (CRASSULACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - CRASSULACEAE, all species

Found at one location within the project area (at WTG17) in a small groups of 3 plants. Grows between cracks in rocks, as well as deeply under the protection of shrubs. Fairly cryptic, therefore may possibly occur at other locations but not seen. Estimated total number affected by project: 10 plants.



Figure 6: *Crassula dependens*

***Crassula setulosa* (CRASSULACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - CRASSULACEAE, all species

Found at one location within the project area (at WTG22) in a small group of 5 plants. Grows in shady places between cracks in rocks, as well as deeply under the protection of shrubs. Fairly cryptic, therefore may possibly occur at other locations but not seen. Estimated total number affected by project: 20 plants.



Figure 7: *Crassula setulosa*

***Dianthus micropetalus* (CARYOPHYLLACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Dianthus*, all species.

Found at one location within the project area (at WTG11) in a small clump of 15 plants. Grows between rocks. Fairly rare in the study area, although a generally widespread species. Estimated total number affected by project: 20 plants.



Figure 8: *Dianthus micropetalus*

***Diascia alonsooides* (SCROPHULARIACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Diascia*, all species.

Found at one location within the project area (at WTG25) in a loose group of 7 plants. Grows between rocks. Fairly rare in the study area, although a generally widespread species. Estimated total number affected by project: 7 plants.



Figure 9: *Diascia alonsooides*

***Eucomis autumnalis* (ASPARAGACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Eucomis*, all species.

Found at one location within the project area (at WTG28) where 2 plants were found wedged between the rocks. Rare in the study area, although a generally widespread species. Estimated total number affected by project: 2 plants.



Figure 10: *Eucomis autumnalis*

***Euphorbia rhombifolia* (EUPHORBIACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Euphorbia*, all species.

Found scattered throughout the project area, individual scattered plants, growing within other low shrubs. Estimated total number affected by project: 40 plants.



Figure 11: *Euphorbia rhombifolia*.

***Freesia andersoniae* (IRIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - IRIDACEAE, all species.

Found scattered throughout the project area, small groups of plants, locally concentrated, wedged between rocks or growing through low, spiky dwarf shrubs. Estimated density: 20 - 50 plants / ha. Estimated total number affected by project: 250 plants.



Figure 12: *Freesia andersoniae*.

***Gnaphalium simii* (ASTERACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Gnaphalium simii*.

Found at one location within the project area (at WTG24) as a single plant. This is a poorly known species only previously recorded from Hanover. It is described as occurring in calcareous vleis and may indicate a seepage area. Estimated total number affected by project: 2 plants.



Figure 13: *Gnaphalium simii*

Hereroa sp (AIZOACEAE)

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AIZOACEAE, all species.

Found at one location within the project area (at WTG13) in a small groups of 4 plants. Fairly cryptic, therefore may possibly occur at other locations but not seen. Estimated total number affected by project: 20 plants.



Figure 14: *Hereroa sp.*

***Lachenalia karoocica* (HYACINTHACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - Lachenalia, all species.

Found at one location within the project area in a small group of 3 plants. Estimated total number affected by project: 5 plants.



Figure 15: Lachenalia karoocica.

***Lapeirousia plicata* ssp. *foliosa* (IRIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - Iridaceae, all species.

Found at one location within the project area (at WTG9) in a loose group of 4 plants in an open area with deep soil. Fairly rare in the study area, although a generally widespread species. Estimated total number affected by project: 4 plants.



Figure 16: *Lapeirousia plicata* subsp. *foliosa*

***Lessertia frutescens* (FABACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 1 - *Lessertia*, all species.

Found at one location within the project area (at WTG24) as a single plant. It was also seen one other time outside the infrastructure footprint and may occur elsewhere, but scattered and in small overall numbers. Estimated total number affected by project: 2 plants.



Figure 17: *Lessertia frutescens*

***Moraea pallida* (IRIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - IRIDACEAE, all species

Found scattered throughout the project area, individual plants, no concentrations of plants. Estimated density: 10 - 15 plants / ha. Estimated total number affected by project: 90 plants.



Figure 18: *Moraea pallida*.

***Nemesia fruticans* (SCROPHULARIACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Nemesia*, all species

Found at two locations on site (at WTG16 and WTG24) each as a single plant growing in the shade of shrubs. It probably occurs more widely but was not detected due to being hidden in the shade of other plants. Estimated total number affected by project: 20 plants.



Figure 19: *Nemesia fruticans*.

***Oxalis pocockiae* (OXALIDACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - *Oxalis*, all species

Found scattered throughout the project area, individual plants, or in small groups, scattered groups of plants. Estimated density: 100 - 150 plants / ha. Estimated total number affected by project: 900 plants.



Figure 20: *Oxalis pocockiae*.

***Pachypodium succulentum* (APOCYNACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - APOCYNACEAE, all species.

Appendix II of CITES

Currently listed as Least Concern (<http://redlist.sanbi.org/species.php?species=983-10>), but shown as Near Threatened on iNaturalist website.

Found at one location within the project area as a single plant at WTG6. Recorded in general study area one other time (outside footprint). Estimated total number affected by project: 1 plants.



Figure 21: Pachypodium succulentum.

***Pelargonium abrotanifolium* (GERANIACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 1 - *Pelargonium*, all species.

Found mostly in rocky areas near to the summit of slopes, or at places where there are distinct rocky outcrops. These high points in the landscape are often selected as the preferred location of wind turbines. Usually multiple plants at locations where it occurs and none in intermediate areas. Estimated total number affected by project: 150 plants.



Figure 22: *Pelargonium abrotanifolium*.

***Pelargonium tragacanthoides* (GERANIACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 1 - *Pelargonium*, all species.

Found at one location (Laydown area 1). Estimated total number affected by project: 3 plants.



Figure 23: *Pelargonium tragacanthoides*.

***Ruschia intricata* (AIZOACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AIZOACEAE, all species.

One of the most widespread and common plant species in the project area, occurs at high densities in flat plains areas, but also occurs elsewhere. Estimated density: 30 - 50 plants / ha. Estimated total number affected by project: 5000 plants.



Figure 24: *Ruschia intricata*.

***Ruschia indurata* (AIZOACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AIZOACEAE, all species

Found at one location (WTG15) but may occur more widely at isolated locations in areas with extensive flat rock-sheets and pockets of soil, often in scattered colonies of 5 - 10 plants. Estimated total number affected by project: 100 plants.



Figure 25: *Ruschia indurata*.

Stomatium sp. cf. mustellinum (AIZOACEAE)

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AIZOACEAE, all species

Found at isolated locations in areas with extensive flat rock-sheets and pockets of soil, often in scattered colonies of 20 - 40 plants. Estimated total number affected by project: 100 plants.



Figure 26: Stomatium species, prob. *S. mustellinum*.

***Trichodiadema* sp prob *T. setuliferum* (AIZOACEAE)**

Northern Cape Nature Conservation Act No 9 of 2009, Schedule 2 - AIZOACEAE, all species.

Found at one location within the project area (at WTG14) in a small group of 3 plants. Grows between cracks in rocks, as well as deeply under the protection of shrubs. Fairly cryptic, therefore may possibly occur at other locations but not seen. Estimated total number affected by project: 20 plants.



Figure 27: *Trichodiadema* species, prob. *S. setuliferum*.