



David Hoare
Consulting (Pty) Ltd

Address:
Postnet Suite #116
Private Bag X025
Lynnwood Ridge
0040

41 Soetdoring Avenue
Lynnwood Manor
Pretoria

Cell: 083 284 5111
david@davidhoareconsulting.co.za

PAARDE VALLEY PV2 SOLAR ENERGY FACILITY
ON PORTION 2 OF PAARDE VALLEY 145, DE AAR,
NORTHERN CAPE PROVINCE

Terrestrial Ecology walk-through survey report and
recommendation in terms of Extension of Validity of
the Environmental Authorisation for the
Paarde Valley PV2 Solar Energy Facility, De Aar in
Northern Cape Province.

Prepared by: Dr David Hoare
Pr.Sci.Nat. (Botany, Ecology) 400221/05

For: Paarde Valley PV2 (Pty) Ltd

21 April 2023

TABLE OF CONTENTS

| | |
|---|-----------|
| TABLE OF CONTENTS | 1 |
| SPECIALIST DETAILS | 2 |
| STATEMENT OF INDEPENDENCE: | 2 |
| INTRODUCTION | 3 |
| METHODOLOGY | 5 |
| SURVEY TIMING | 5 |
| FIELD SURVEY APPROACH | 5 |
| RESULTS | 6 |
| VEGETATION ON SITE..... | 6 |
| <i>Karroid shrubland</i> | 6 |
| <i>Drainage areas</i> | 7 |
| PROTECTED TREES | 8 |
| PROTECTED PLANT SPECIES | 8 |
| <i>Aizoon africanum</i> (AIZOACEAE) | 9 |
| <i>Aloe broomii</i> (ASPHODOLACEAE) | 11 |
| <i>Ammocharis coranica</i> (AMARYLLIDACEAE) | 12 |
| <i>Brunsvigia radulosa</i> (AMARYLLIDACEAE)..... | 13 |
| <i>Gomphocarpus fruticosus</i> (AIZOACEAE)..... | 14 |
| <i>Mesembryanthemum coriarium</i> (AIZOACEAE) | 15 |
| <i>Mesembryanthemum nodiflorum</i> (AIZOACEAE) | 16 |
| <i>Moraea pallida</i> (IRIDACEAE) | 17 |
| <i>Nemesia fruticans</i> (SCROPHULARIACEAE) | 18 |
| <i>Pelargonium malacoides</i> (GERANIACEAE)..... | 19 |
| <i>Ruschia intricata</i> (AIZOACEAE)..... | 20 |
| SENSITIVITIES IDENTIFIED ON SITE | 21 |
| CONCLUSIONS | 21 |
| RECOMMENDATION | 22 |
| APPENDIX 1: CHECKLIST OF PLANT SPECIES FOUND ON SITE | 23 |
| APPENDIX 2: LIST OF PROTECTED TREE SPECIES (NATIONAL FORESTS ACT) | 25 |
| APPENDIX 4: FLORA PROTECTED UNDER THE NORTHERN CAPE NATURE CONSERVATION ACT NO. 9 OF 2009 | 26 |
| APPENDIX 5: FLORA AND VERTEBRATE ANIMAL SPECIES PROTECTED UNDER THE NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT, 2004 (ACT 10 OF 2004) | 31 |

SPECIALIST DETAILS

The details of the Specialist are as follows –

Table 1: Details of Specialist

| Specialist | Qualification and accreditation |
|----------------|--|
| Dr David Hoare | <ul style="list-style-type: none">• PhD Botany• Pr.Sci.Nat. 400221/05 (Ecological Science, Botanical Science) |

Details of Author:

Dr David Hoare

PhD (Botany) – Nelson Mandela Metropolitan University, Port Elizabeth

Professional Natural Scientist, South African Council for Natural Scientific Professions, Reg. no. 400221/05 (Ecology, Botany)

Statement of independence:

I, David Hoare, as the appointed terrestrial biodiversity / plant species specialist, hereby declare/affirm the correctness of the information provided in this report, and that I:

1. meet the general requirements to be independent and
2. have no business, financial, personal, or other interest in the proposed development and that no circumstances have occurred that may have compromised my objectivity; and
3. am aware that a false declaration is an offence in terms of regulation 48 of the EIA Regulations (2014).



Dr David Hoare

21 April 2023

Date

INTRODUCTION

Mulilo intends to establish a Solar Energy Facility and associated infrastructure immediately to the north of the town of De Aar (Figure 1). The EIA process for the proposed PV facility was undertaken in 2012 and Environmental Authorisation (EA) for the proposed PV Facility was granted by DEA on 1 March 2013 (DFFE reference no: 12/12/20/2500). A Basic Assessment (BA) process was conducted separately for the proposed grid connection (self-build works), with EA for the grid connection obtained in December 2022 (DFFE Ref no : 14/12/16/3/3/1/2585).

The Paarde Valley PV2 project is a 75MW – 150MW solar PV facility with associated infrastructure. The Environmental Authorisation for this project lapses on 7 June 2023 and it is therefore required to extend the validity period of the EA for one year. This statement letter is in support of this EA extension application.

The proposed PV site is situated in the Emthanjeni Local Municipality in the Northern Cape Province. The site is approximately 370 ha in extent situated on Portion 2 of the farm Paarde Valley 145. The grid connection goes from the PV site to the Vetlaagte MTS, and is approximately 12.7 km in length. An aerial image of the site and surrounding areas is shown in Figure 2.

This report is applicable to all infrastructure and footprint areas covered by both of the above EA's (i.e. it is applicable to the PV facility and the Grid Connection). The infrastructure is located within a lowland plains area. The topography is flat to gently sloping (Figure 3). The elevation on site varies from 1217 m to 1247 m above sea level.

The entire site consists of natural vegetation with some localised farming infrastructure (access roads, camps, farm dams, and other). The vegetation is in moderate condition, with some grazing impacts more prominent in some parts than others.

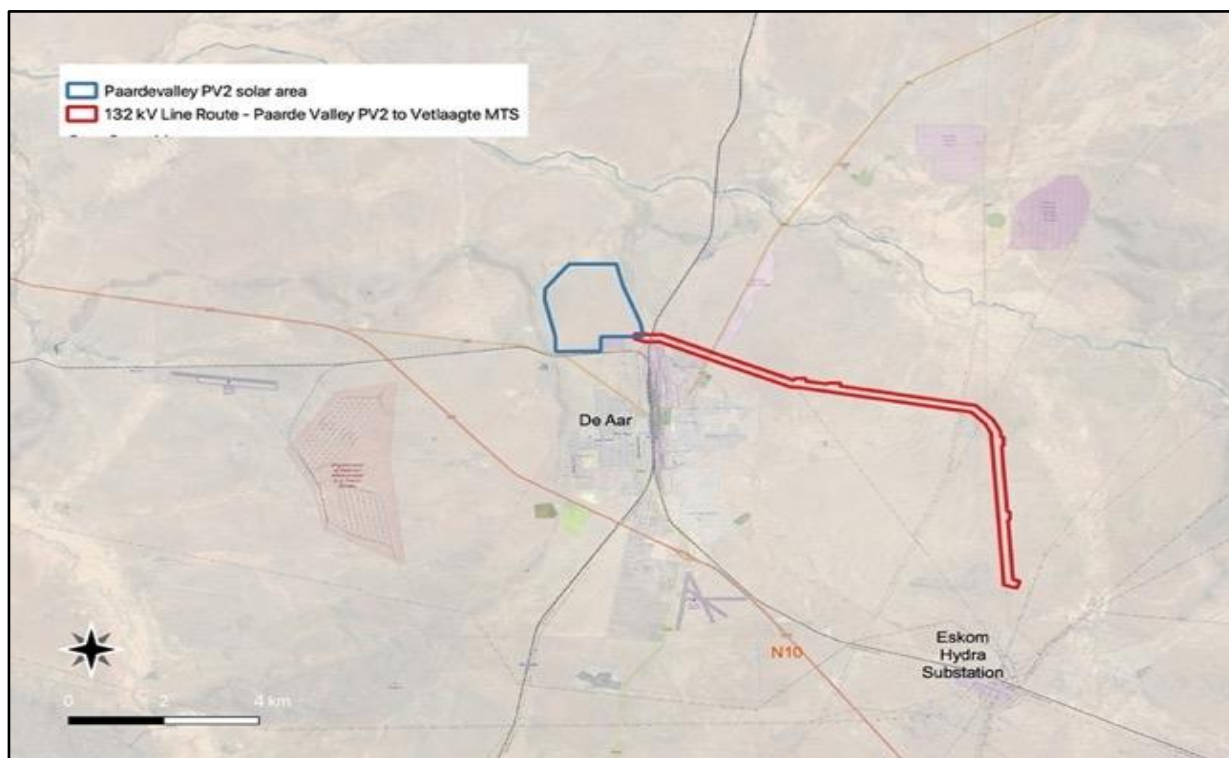


Figure 1: Location of the site near De Aar in the Northern Cape Province.



Figure 3: Aerial image of the site.



Figure 2: Landscape in the study area looking from east to west across the middle of the site.

METHODOLOGY

The detailed methodology followed as well as the sources of data and information used as part of this assessment is described below.

Survey timing

The fieldwork was conducted on 4 March 2022 and on 19 August 2022. The site is within the Nama-Karoo Biome. The climate is arid to semi-arid. Rainfall occurs from November to March, but peaks in mid- to late summer (February / March). Mean annual rainfall is 275 mm per year. There had been relatively good recent rainfalls prior to the field survey, both in the previous summer season and in the weeks prior to the field survey. The timing of the survey in early spring captured various flowering geophytes that tend to flower at that time of the year. Most other species were identifiable at the time of the field survey. The field survey was therefore acceptable in terms of assessing the flora and vegetation of the site.

Field survey approach

During the field survey, the entire footprint of the indicated infrastructure (both PV site and grid connection) was assessed on foot. A hand-held Garmin GPSMap 64s was used to record a track within which observations were made. Digital photographs were taken of features and habitats on site, as well as of all plant species that were seen. All plant species recorded were uploaded to the iNaturalist website and are accessible by viewing the observations for this site.

Digital photographs were taken of any other features of interest that were seen on site, as well as of habitat in different parts of the site.

RESULTS

Vegetation on site

Karroid shrubland

The vegetation on site is uniform to some extent, with some variation due to drainage. In general, the landscape is flat to gently undulating with almost no surface rockiness, and relatively deep soils. These general areas are mostly dominated by dwarf karroid shrubs, with some low shrubs and herbaceous species in between. Due to good recent rains, there is currently good grass cover, but this varies according to the amount of rainfall and may be absent at other times of the year.

The vegetation consists mostly of low dwarf shrubs, such as *Pentzia incana*, *Chrysocoma ciliata*, *Aizoon africanum*, *Eriocephalus ericoides*, and *Ruschia intricata*, along with various grasses, including *Aristida congesta*, *Fingerhuthia africana*, *Eragrostis lehmanniana*, *Eragrostis obtusa*, *Chloris virgata*, *Stipagrostis uniplumis*, *Enneapogon cenchroides*, and *Cynodon dactylon*. It is relatively species poor and is uniform across wide areas.



Figure 4: Vegetation on the site.

Drainage areas

The drainage areas on site are broad areas in the landscape where water may collect to some extent to flow into nearby watercourses. These may become waterlogged after rainfall events but are otherwise not much different to surrounding areas. There is one localised depression on site within these broad drainage systems that has developed because of constructing an erosion-control berm (Figure 5). This small area has a species composition that is different to broad terrestrial areas. This includes species such as *Cynodon incompletus*, *Panicum impeditum*, *Echinochloa colona*, *Echinochloa crus-galli*, *Schoenoplectus muricinux*, *Afroscirpoides dioeca*, and *Lasiopogon glomerulatus*.



Figure 5: Small depression on site upstream of constructed berm.

Protected trees

Tree species protected under the National Forest Act are listed in Appendix 2. There is one that has a geographical distribution that includes the study area, *Boscia albitrunca* (Shepherd's Tree / Witgatboom / !Xhi).

No individuals were found within the project footprint area, and none are likely to occur there. Therefore, there are no trees or designated forests occurring on site that are protected according to the National Forests Act, 1998, and no permits are required in terms of this legislation.

Protected plant species

Various plant and animal species are protected under the Northern Cape Nature Conservation Act no 9 of 2009 (see Appendix 4 for plants only), and under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) (see Appendix 5). The protected status of all species encountered on site are listed alongside each species in Appendix 1. The Northern Cape Act protects entire families of plant species. The result is that common and sometimes dominant plant species are listed as protected and for which a permit is required. The following protected plant species were encountered within footprint areas during the field survey and the required permits for removal thereof will be obtained prior to construction (estimated number of plants affected in entire servitude):

Aizoon africanum - 5 000 plants (Aizoaceae, Protected NCNCA Schedule 2)

Aizoon plinthoides - 25 plants (Aizoaceae, Protected NCNCA Schedule 2)

Aloe broomii - 1 plant (Asphodelaceae, Protected NCNCA Schedule 2)

Ammocharis coranica - 15 plants (Ammarillidaceae, Protected NCNCA Schedule 2)

Brunsvigia radulosa - 5 plants (Ammarillidaceae, Protected NCNCA Schedule 2)

Gomphocarpus fruticosus - 30 plants (Aizoaceae, Protected NCNCA Schedule 2)

Mesembryanthemum coriarium - 10 plants (Aizoaceae, Protected NCNCA Schedule 2)

Mesembryanthemum nodiflorum - 10 plants (Aizoaceae, Protected NCNCA Schedule 2)

Moraea pallida - 400 plants (Iridaceae, Protected NCNCA Schedule 2)

Nemesia fruticans - 100 plants (Scrophulariaceae: Nemesia, Protected NCNCA Schedule 2)

Pelargonium malacoides - 5 plants (Geraniaceae: Pelargonium, Protected NCNCA Schedule 1)

Ruschia intricata - 15 000 plants (Aizoaceae, Protected NCNCA Schedule 2)

***Aizoon africanum* (AIZOACEAE)**

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

Found throughout the site as a common element of the vegetation. May become more dominant in areas of localised disturbance. In some parts of South Africa, it is the dominant species on previously cultivated landscapes. Estimated total number occurring within the servitude and therefore potentially affected by project: 5 000 plants.



Figure 6: *Aizoon africanum*.

Aizoon plinthoides (AIZOACEAE)

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

Found at one location in grid corridor. Estimated total number occurring within the servitude and therefore potentially affected by project: 25 plants.



Figure 7: *Aizoon plinthoides*.

***Aloe broomii* (ASPHODOLACEAE)**

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

Found at one location in grid corridor. Estimated total number occurring within the servitude and therefore potentially affected by project: 1 plant.



Figure 8: *Aloe broomii*.

***Ammocharis coranica* (AMARYLLIDACEAE)**

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

Found at isolated locations scattered around site, often in small groups of 1 - 4 plants, usually in drainage areas. Estimated total number occurring within the servitude and therefore potentially affected by project: **15 plants**.



Figure 9: *Ammocharis coranica*.

***Brunsvigia radulosa* (AMARYLLIDACEAE)**

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

Found at one location along the northern boundary of the site but may occur elsewhere on site. Usually occurs in small groups of 1 - 4 plants. Estimated total number occurring within the servitude and therefore potentially affected by project: **5 plants**.



Figure 10: *Brunsvigia radulosa*.

***Gomphocarpus fruticosus* (AIZOACEAE)**

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

Found at locally disturbed locations in the grid corridor but could occur anywhere. Fairly rare in the study area, although a generally widespread species of indigenous weed. Estimated total number occurring within the servitude and therefore potentially affected by project: **30 plants**.



Figure 11: *Gomphocarpus fruticosus*.

***Mesembryanthemum coriarium* (AIZOACEAE)**

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

Found at locally disturbed locations in the northern part of the site. Fairly rare in the study area, although a generally widespread species. Estimated total number occurring within the servitude and therefore potentially affected by project: **10 plants**.

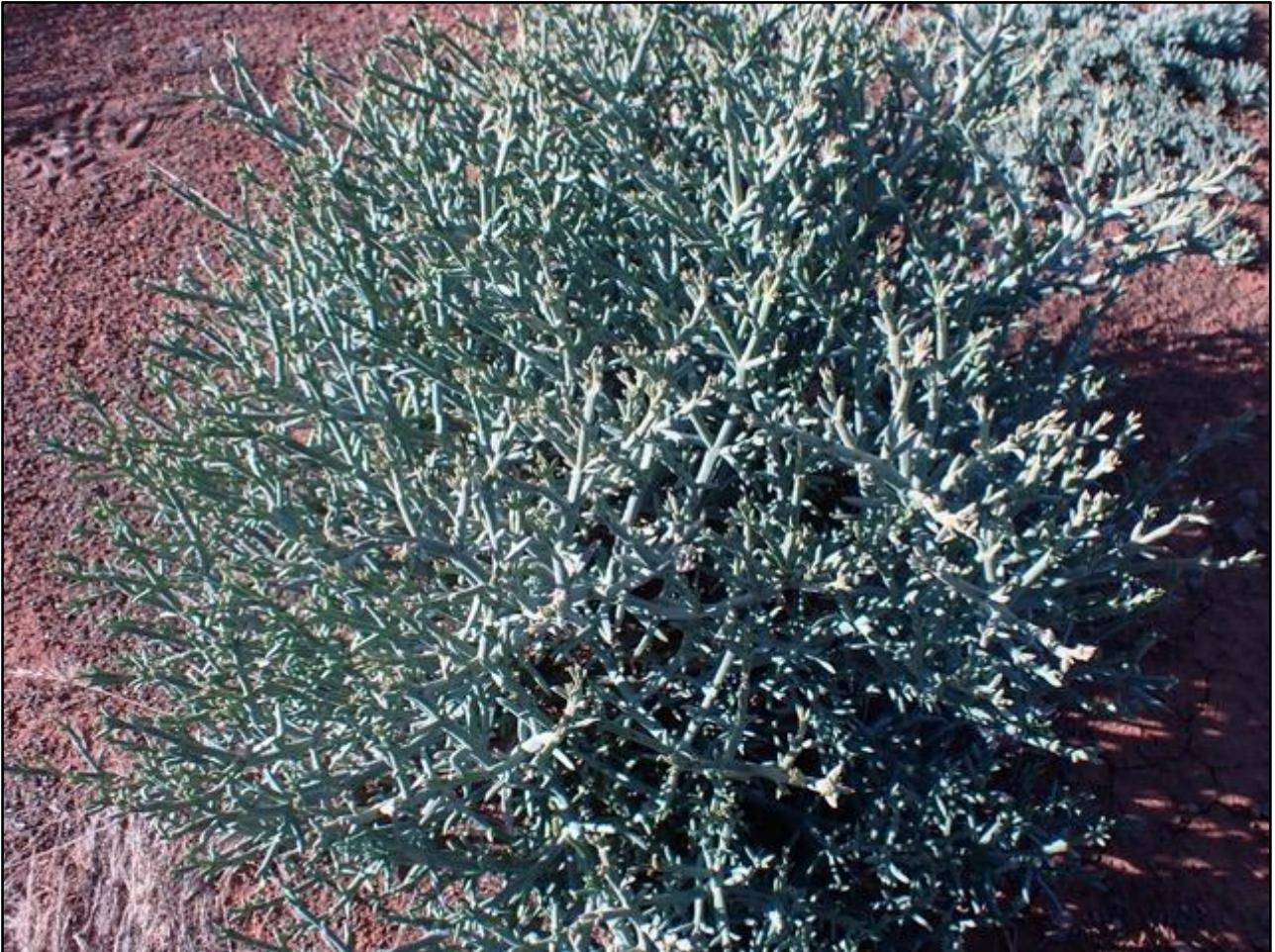


Figure 12: *Mesembryanthemum coriarium*.

***Mesembryanthemum nodiflorum* (AIZOACEAE)**

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

Estimated total number occurring within the servitude and therefore potentially affected by project: **10 plants**.



Figure 13: *Mesembryanthemum nodiflorum*.

***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: 1 - 2 plants / ha. Estimated total number occurring within the servitude and therefore potentially affected by project: **400 plants**.



Figure 14: *Moraea pallida*.

***Nemesia fruticans* (SCROPHULARIACEAE)**

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

Estimated total number occurring within the servitude and therefore potentially affected by project: **100 plants.**



Figure 15: *Nemesia fruticans*.

***Pelargonium malacoides* (GERANIACEAE)**

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

Found at one location. Estimated total number occurring within the servitude and therefore potentially affected by project: **5 plants**.



Figure 16: *Pelargonium malacoides*.

***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 occurring within the servitude and therefore potentially affected by project: **15 000 plants.**



Figure 17: *Ruschia intricata*.

Sensitivities identified on site

Site-specific sensitivities were identified during the recent walk-through. There are no "no-go" areas, but they are areas with elevated biodiversity value relative to the "common" condition or are more sensitive for other physical reasons. Construction of infrastructure within these areas therefore needs to proceed with more caution than in other general areas. Alternatively, small layout changes (if and where possible) would largely avoid these areas and further minimise any impacts on the ecological receiving environment.

Areas of slightly elevated sensitivity are small depressions. This a flat bottomland that becomes waterlogged during the rainy season. The plant species composition is indicative of these being temporary to seasonal wetlands or systems that function much like pans in semi-arid areas. Note that it is likely to be secondary in that it probably developed as a result of the construction of a berm, probably as an erosion control measure.

CONCLUSIONS

- A walk-through survey of the entire infrastructure footprint area was conducted on 4 March 2022 and again on 19 August 2022. A desktop study of potentially updated and available information was done in April 2023.
- According to the Screening Tool report for the current project (dated 3 April 2023), there are 29 renewable energy (wind and solar) projects within 30km of the Paarde valley Solar PV2 project that have either been approved or are in consideration of applications for approval. Cumulative impact can be described as follows:

The vegetation type in which the current project occurs (Northern Upper Karoo) is widespread and not threatened - it occupies a total area of more than 28 100 km². Most of the solar projects listed as occurring within 30km of the current site only affect lowland plains, which is where Northern Upper Karoo is found. Few areas within any other nearby vegetation types are affected, therefore impacts on these other vegetation types are not considered to be relevant for the cumulative assessment. If the entire area within 30km of the current site is developed, this would amount to approximately 10% of the entire vegetation type. Loss of this entire area would not affect the conservation status of the vegetation type.

The cumulative assessment can be rated as having medium significance based on being a permanent impact that will definitely happen, but the spatial extent, in terms of actual area affected, is very small. Recommended mitigation measures are adequate for ensuring that this is contained. On this basis the proposed development is supported.

- As recommended before, the following mitigation is still applicable and must be undertaken prior to commencement of construction activities in order to minimise impacts:

Apply for permit for permanent destruction/removal of the identified plant species protected under the Northern Cape Nature Conservation Act.

The following information is relevant:-

- Plant species protected according to the Northern Cape Nature Conservation Act were identified, where they occurred within footprint areas. Counts of plants observed were made and estimates compiled of the number of plants of each species affected by the entire project. Detailed information is provided for each protected species found on site,

including a photograph of each that can be used as a field guide. An application must be submitted for a permit to destroy those species that occur on site that are protected according to the Northern Cape Nature Conservation Act, 2009.

- No protected trees occur on site or are likely to occur there. Therefore, there are no trees or designated forests occurring on site that are protected according to the National Forests Act, 1998, and no permits are required in terms of this legislation.
 - No plant species protected under the National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004) were found on site. No permit is therefore required under this legislation.
 - According to the Alien Management Plan, the intention is to control (remove) any species listed as invasive under CARA (and under National Environmental Management: Biodiversity Act, 2004). It is only necessary to apply for a permit for any that would need to be retained on site, which is not the case, and therefore no CARA permits are required.
- The baseline status of the environment has not changed since the initial EIA was done in 2012.
 - Site verification :
The ecological assessment conducted in 2012 concluded that "the overall impacts of this proposed project are of LOW OR MODERATE significance. With mitigation measures implemented, it should be possible to reduce all negative impacts to LOW significance, except for the significance of impacts on natural vegetation, which remains MEDIUM. Relative to other parts of the country where similar assessments have been conducted, this site has low sensitivity and few conservation issues." This initial impact rating undertaken during the initial assessment is still valid.
 - The mitigation measures provided in the initial assessment are still applicable.
 - There are no new mitigation measures that should be added to the Environmental Authorisation if the DFFE decides to extend the commencement period as per the application..
 - The PV Layout as approved in 2012 is still applicable. Finalisation of a detailed layout will not result in an increased level or change in the nature of the ecological impacts originally assessed for the project.

RECOMMENDATION

The environment in terms of terrestrial biodiversity has not changed significantly since 2012; therefore there is no objection to the extension of the validity of the Environmental Authorisation of the Paarde Valley PV2 solar energy facility for another year.

Appendix 1: Checklist of plant species found on site.

Afroscirpoides dioeca
Aizoon africanum (Aizoaceae, Protected)
Aizoon plinthoides (Aizoaceae, Protected)
Albuca sp.
Aloe broomii
Alternanthera sessilis
Ammocharis coranica (Ammariyllidaceae, Protected)
Aptosimum marlothii
Aptosimum procumbens
Argemone ochroleuca* (NEMBA Alien Invasive Species)
Aristida adscensionis
Aristida congesta
Asparagus glaucus
Barleria rigida
Berkheya annectens
Berkheya pinnatifida
Bidens bipinnata
Bromus sp.
Brunsvigia radulosa (Ammariyllidaceae, Protected)
Bulbine frutescens
Chloris virgata
Chrysocoma ciliata
Cucumis africanus
Cylindropuntia fulgida* (NEMBA Alien Invasive Species)
Cylindropuntia imbricata* (NEMBA Alien Invasive Species)
Cynodon incompletus
Cyperus usitatus
Datura ferox* (NEMBA Alien Invasive Species)
Dipcade crispum
Echinochloa colona
Echinochloa crus-galli
Enneapogon cenchroides
Enneapogon desvauxii
Eragrostis bergiana
Eragrostis homomalla
Eragrostis lehmanniana
Eragrostis obtusa
Eriocephalus ericoides
Eriocephalus eximius
Eriocephalus spinescens
Felicia filifolia
Felicia sp.
Fingerhuthia africana
Gazania jurineifolia
Gomphocarpus fruticosus (Aizoaceae, Protected)
Heliophila minima
Hermannia cernua
Hermannia coccocarpa
Hermannia comosa
Heteropogon contortus
Hibiscus trionum

Indigofera alternans
Lasiopogon glomerulatus
Lotononis sp.
Lycium cinereum
Lycium horridum
Malva pusilla
Mesembryanthemum coriarium (Aizoaceae, Protected)
Mesembryanthemum nodiflorum (Aizoaceae, Protected)
Moraea pallida (Iridaceae, Protected)
Nemesia fruticans (Scrophulariaceae: Nemesia, Protected)
Opuntia engelmannii* (NEMBA Alien Invasive Species)
Opuntia robusta* (NEMBA Alien Invasive Species)
Osteospermum scariosum
Osteospermum spinescens
Panicum impeditum
Paspalum distichum
Pelargonium malacoides (Geraniaceae: Pelargonium, Protected)
Pentzia incana
Phragmites australis
Phymaspermum parvifolium
Prosopis glandulosa* (NEMBA Alien Invasive Species)
Pteronia glomerata
Rhigozum trichotomum
Ruschia intricata (Aizoaceae, Protected)
Salsola kali* (NEMBA Alien Invasive Species Category 1b)
Salvia verbenaca
Schoenoplectus muricinux
Senecio sp.
Setaria verticillata
Solanum elaeagnifolium* (NEMBA Alien Invasive Species)
Stipagrostis uniplumis
Tephrosia capensis
Tragus berteronianus
Tribulus terrestris
Xanthium strumarium* (NEMBA Alien Invasive Species Category 1b)
Zaluzianskya villosa
Zygophyllum sp.

Appendix 2: List of protected tree species (National Forests Act).

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

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

Appendix 4: 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 / Clivia |
| <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> | |

| | |
|--|--------------------------|
| Lotononis polycephala | |
| Lessertia spp. | |
| Sceletium tortuosum (=Aizoaceae, Mesembryanthemum tortuosum) | |
| Sutherlandia 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 | |
| <i>Barleria paillosa</i> | |
| <i>Monechme saxatile</i> | |
| <i>Peristrophe</i> spp. | All species |
| Family: ADIANTHACEAE | |
| <i>Adiantum</i> spp. | Maidenhair Fern, all species |
| Family: AGAPANTHACEAE | |
| <i>Agapanthus</i> spp. | All species |
| Family: (MESEMBRYANTHEMACEAE) AIZOACEAE | 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 |
| <i>Ilex mitis</i> | |
| Family: ARACEAE | |
| <i>Zantedeschia</i> spp. | Arum lilies, all species |
| Family: ARALIACEAE | |
| <i>Cussonia</i> spp. | Cabbage trees, all species |
| Family: ASPHODOLACEAE | All species except those listed in Schedule 1 and the species <i>Aloe ferox</i> |
| Family: ASTERACEAE | |
| <i>Helichrysum jubilatatum</i> | |
| <i>Felicia deserti</i> | |
| <i>Gnaphalium simii</i> | |
| <i>Lopholaena longipes</i> | |
| <i>Senecio albo-punctatus</i> | |
| <i>Senecio trachylaenus</i> | |
| <i>Trichogyne lerouxiae</i> | |
| <i>Tripteris pinnatiflobata</i> | |
| <i>Troglophyton acocksianum</i> | |
| <i>Vellereophyton lasianthum</i> | |
| Family: BURMANNIACEAE | |
| <i>Burmannia madagascariensis</i> | Wild ginger |
| Family: BURSERACEAE | |
| <i>Commiphora</i> spp. | All species |
| Family: CAPPARACEAE | |
| <i>Boscia</i> spp. | Shepherd's trees, all species |
| Family: CARYOPHYLLACEAE | |
| <i>Dianthus</i> spp. | All species |
| Family: CELASTRACEAE | |
| <i>Gymnosporia</i> spp. | All species |
| Family: COLCHICACEAE | |
| <i>Androcymbium</i> spp. | All species |
| <i>Gloriosa</i> spp. | All species |
| Family: COMBRETACEAE | |
| <i>Combretum</i> 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 |
| Argyrolobium petiolare | |
| Caesalpinia bracteata | |
| Calliandra redacta | |
| Crotalaria pearsonii | |
| Indigofera limosa | |
| Lebeckia bowieana | |
| Polhillia involucrate | |
| Rhynchosia emarginata | |
| Wiborgia humilis | |
| Family: HYACINTHACEAE | |
| Daubinya spp | |
| Lachenalia spp. | Daubinya, all species |
| Veltheimia spp. | Violtjie, all species |
| Eucomis spp. | Pineapple flower, all species |
| Neopatersonia 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 | |
| Nymanina 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 | |
| Phyllica 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 5: Flora and vertebrate animal 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
Diaphanathe 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

Reptilia

Loggerhead sea turtle
Leatherback sea turtle
Hawksbill sea turtle

Aves

Wattled crane
Blue swallow
Egyptian vulture
Cape parrot

Mammalia

Riverine rabbit
Rough-haired golden mole

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

Reptilia

Green turtle
Giant girdled lizard
Olive ridley turtle
Geometric tortoise

Aves

Blue crane
Grey crowned crane
Saddle-billed stork
Bearded vulture
White-backed vulture
Cape vulture
Hooded vulture
Pink-backed pelican
Pel's fishing owl
Lappet-faced vulture

Mammalia

Robust golden mole
Tsessebe
Black rhinoceros
Mountain zebra
African wild dog
Gunning's golden mole
Oribi
Red squirrel
Four-toed elephant-shrew

VULNERABLE SPECIES

Flora

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

Aves

White-headed vulture
Tawny eagle
Kori bustard
Black stork
Southern banded snake eagle
Blue korhaan
Taita falcon
Lesser kestrel
Peregrine falcon
Bald ibis
Ludwig's bustard

Martial eagle
Bataleur
Grass owl

Mammalia

Cheetah
Samango monkey
Giant golden mole
Giant rat
Bontebok
Tree hyrax
Roan antelope
Pangolin
Juliana's golden mole
Suni
Large-eared free-tailed bat
Lion
Leopard
Blue duiker

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

Amphibia

Giant bullfrog
African bullfrog

Reptilia

Gaboon adder
Namaqua dwarf adder
Smith's dwarf chameleon
Armadillo girdled lizard
Nile crocodile
African rock python

Aves

Southern ground hornbill
African marsh harrier
Denham's bustard
Jackass penguin

Mammalia

Cape clawless otter
South African hedgehog
White rhinoceros
Black wildebeest
Spotted hyaena
Black-footed cat
Brown hyaena
Serval
African elephant
Spotted-necked otter
Honey badger
Sharpe's grysbok
Reedbuck
Cape fox