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Terrestrial Ecology walk- through survey report for the Final Site Layout Plan and EMPr update process

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

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For: Mulilo De Aar 2 South (Pty) Ltd

10 November 2022

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SPECIALIST DETAILS

The details of the Specialist are as follows –

Table 1: Details of Specialist

Specialist	Qualification and accreditation
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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

23 September 2022
Date

INTRODUCTION

Mullilo De Aar 2 South (Pty) Ltd intends to establish a Wind Energy Facility (WEF) and associated infrastructure on the eastern plateau of De Aar (approximately 20 km to the east of the town). The EIA process for the proposed project was undertaken in 2012 and Environmental Authorisation (EA) for the proposed project was granted by DEA on 1 March 2013.

The original Environmental Authorisation (EA) for the project authorised 103 wind turbines with a potential capacity of 155 – 258MW and associated infrastructure. Amendments to the DEA (now DFFE) EA have been applied for by the Applicant, and granted by DFFE, in 2013, 2014, 2016, 2018, 2019, 2020 and 2021 respectively, including a change in the name of the holder of the EA, extensions of the EA validity period, amendments to Conditions of the EA, amendments to the project description and amendments to the turbine specifications. A further EA amendment (including non-substantive amendments to the project description) is currently underway, so that the project description in the EA aligns with the proposed Final Layout.

The authorised number of turbines for the WEF was reduced to 25 – 61 turbines in the Part 2 EA Amendment process in 2015. The proposed final turbine layout for the project consists of up to 28 Wind Turbine Generator (WTG) positions, of which a maximum of 26 WTG's will be constructed with a total capacity of up to 140 MW. The power generated by the project will be transmitted to the national grid via a proposed on-site Eskom Switching Station. This Switching Station will connect via a 132 kV overhead line to a new Main Transmission Substation (MTS). The proposed site is situated in the Emthanjeni and Renosterberg Local Municipalities in the Northern Cape Province. The project

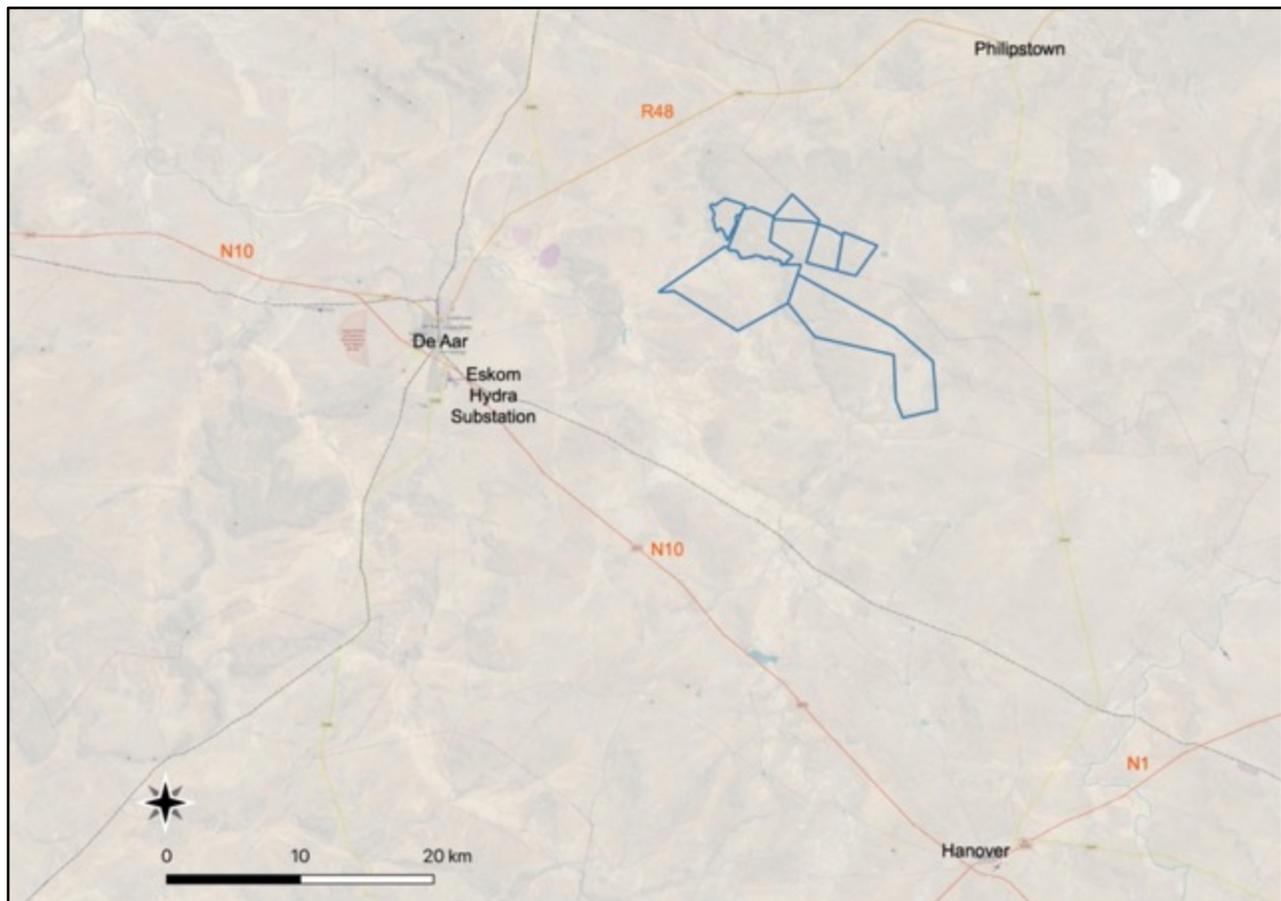


Figure 1: Location of the site near De Aar in the Northern Cape Province.

farms associated are approximately 9 200 ha in extent and consists of nine portions of four farms (Figure 1). A more detailed indication of the proposed infrastructure within the farm portions is shown in Figure 2.

The infrastructure is located within a low mountain range. The topography is moderate to steep (Figure 2). There is an increase in elevation within the mountains from east to west, ending in an escarpment that faces south-west. The elevation on site varies from 1415 m, at the southern access point, to 1571 m above sea level, with all turbine locations at around 1520 - 1550 m.

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

Description of proposed project

The infrastructure assessed here includes the following (Figure 3):

1. WTGs X 28 positions (of which up to 26 will be selected), each with 180 m hardstand buffer zone (within which the hardstand for each turbine would be located).
2. Internal roads: 6 m wide = 39.60kms, 4 m wide = 0.06 km
3. IPP Substation & Building Complex
4. De Aar 2 South WEF Substation Option 2 (next to IPP SS)



Figure 2: Landscape in the study area looking northwards from WTG28 (see Figure 3 on next page for layout of turbines).

5. Additional 33kV OHL (all others run parallel to internal roads)
6. Laydown Area 1
7. Laydown Area 2
8. Laydown Area 3
9. Access road north (orange - existing road to be upgraded)
10. Access road south (pink - separate BA process)

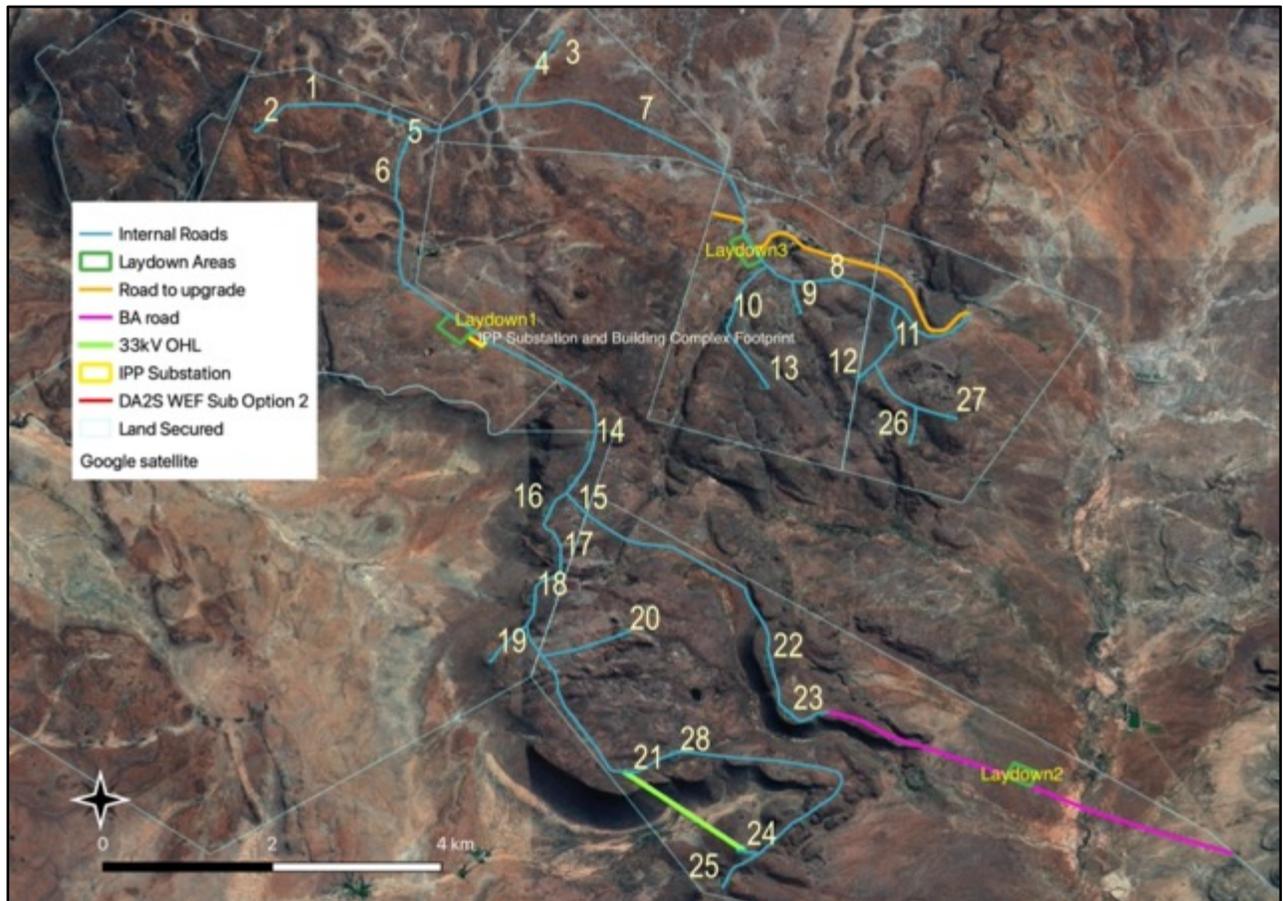


Figure 3: Aerial image of the proposed infrastructure.

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 from 15 - 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 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 topography, drainage and surface rockiness. In general, the landscape is moderately undulating with moderate to high levels of surface rockiness, and shallow 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.

Common and dominant plant species include the dwarf shrubs *Eriocephalus ericoides*, *Ruschia intricata*, *Pentzia incana*, *Chrysocoma ciliata*, *Felicia filifolia*, *Asparagus striatus*, *Asparagus suaveolens*, *Melolobium microphyllum*, *Pteronia glauca*, *Lasiosiphon polycephalus*, *Oedera humilis*, *Pegolettia retrofracta*, *Hermannia coccocarpa*, *Hermannia vestita*, *Euphorbia rhombifolia*, and *Dimorphotheca cuneata*, the low shrubs, *Dodonaea viscosa*, *Lycium cinereum*, and *Euryops lateriflorus*, and the herbaceous species, *Cheilanthes eckloniana*, *Felicia muricata*, *Gazania krebsiana*, *Aptosimum procumbens*, *Blepharis mitratis*, *Stachys rugosa*, and *Ursinia nana*. The shrubs / small tree, *Searsia burchellii*, is scattered throughout the site, varying in density from place to place, but generally present. Common grasses include *Aristida congesta*, *Aristida diffusa*, *Aristida adscensionis*, *Themeda triandra*, *Heteropogon contortus*, *Eragrostis obtusa*, *Eragrostis lehmanniana*, *Chloris virgata*, *Hyparrhenia hirta*, and *Eragrostis bergiana*, along with the sedge *Cyperus usitatus*.

This general species composition and structure is visible in almost all the photographs provided below for most of the WTG locations (see Figures 4 to 31).

Rocky outcrops

Where there are boulder outcrops or large, flat sheets of rock, the species composition changes. In boulder outcrops, there is a higher cover of low shrubs, including *Euclea crispa*, *Searsia burchellii*, *Tarchonanthus minor*, *Diospyros austro-africana*, *Diospyros lycioides*, and *Osyris lanceolata*. The understorey includes additional species, typically *Solanum tomentosum* and *Stachys rugosa*, along with the grass *Setaria verticillata*, and the herbaceous species, *Diascia alonsooides*, and *Nemesia fruticans*, amongst others.

Flat rocksheets contain a variety of the less common species in the landscape, often characterised by the presence of *Pelargonium abrotanifolium*. Notable species observed on site within these areas are *Freesia andersoniae*, *Babiana hypogaea*, *Adromischus trigynus*, *Crassula dependens*, *Crassula setulosa*, *Eucomis autumnalis*, *Hereroa* sp., *Pachypodium succulentum*, *Ruschia indurata*, *Stomatium mustelinum*, and *Trichodiadema setuliferum*, all of which are provincially protected species. The rock sheets harbour a large proportion of the unusual flora of the landscape and are important refuges for biodiversity.

Areas with high habitat diversity that includes a high proportion of rocky outcrops and rock sheets have been indicated as having higher biodiversity value and sensitivity.

Drainage and wetland areas

Many of the drainage areas on site are dry watercourses with little vegetation, but these coalesce into more defined areas with sandy beds and rocky banks, where species such as *Miscanthus junceus* and *Schoenoplectus* sp. indicate seasonal hydrological systems. There are also some rare areas where seasonally elevated moisture regimes are indicated, and where species such as *Isolepis* sp., *Gnaphalium simii*, and *Lasiopogon* sp. occur. There are some fairly extensive bottomland areas,

mostly dominated by grasses, in which deeper, dark clay soils occur. These become waterlogged after rainfall events and may even contain species more typical of permanent wetlands, such as *Potamogeton* sp. One of the dominant grasses in these areas is *Eragrostis bicolor* (speckled vlei grass), which grows in water, moist soil or dry pans. The habitat may be important for frogs, and the pygmy toad, *Poyntonophrynus vertebralis*, has been recorded on site within this habitat during wet parts of the season. The species composition and physical characteristics suggest that these are areas that function somewhat like pans and are important hydrological systems within this semi-arid landscape. Lowland areas that become waterlogged have been designated here as having higher sensitivity.

Steep scarp slopes

No species compositional data was collected in these areas during the walk-through because no WTG infrastructure is located within them. However, there are small sections of road infrastructure that cross steep slopes at local sites. They tend to have significantly higher shrub cover and rock cover. The main sensitivity associated with these areas is the high potential for erosion, especially if roads are built through them, due to the increased velocity of runoff. The woody plants associated with this habitat are not of concern, but the physical problem of erosion can cause downslope areas to become damaged, in the event of poor design and/or management.

WTG locations

WTG 1

Habitat conditions

Relatively flat area with some rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Asparagus suaveolens

Chrysocoma ciliata

Eriocephalus ericoides (dominant)

Euclea crispa

Gazania krebsiana

Moraea pallida - 3 plants (protected NCNCA Schedule 2)



Figure 4: Habitat at WTG 1.

WTG 2

Habitat conditions

Stony ledge on the edge of a small, shallow valley with some round rocks and pebbly surface. Vegetation short, with dwarf shrubs and grass, as well as some low shrubs amongst the rocks.

Plant species

Boophone disticha- 3 plants (protected NCNCA Schedule 2)

Cheilanthes eckloniana

Dodonaea viscosa

Eriocephalus ericoides

Euclea crispa

Felicia filifolia

Freesia andersoniae - 10 plants (protected NCNCA Schedule 2)

Pelargonium abrotanifolium - 10 plants (protected NCNCA Schedule 1)

Ruschia intricata - 40 plants (protected NCNCA Schedule 2)

Tarchonanthus minor



Figure 5: Habitat at WTG 2.

WTG 3

Habitat conditions

Relatively flat, open area with few rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Asparagus suaveolens

Felicia muricata

Hermannia sp.

Lycium cinereum

Moraea pallida - 5 plants (protected NCNCA Schedule 2)

Pentzia incana

Ruschia intricata - 100 plants (protected NCNCA Schedule 2)

Themeda triandra



Figure 6: Habitat at WTG 3.

WTG 4

Habitat conditions

Relatively flat, open area with few rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Chrysocoma ciliata

Eriocephalus ericoides (dominant)

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Pentzia incana



Figure 7: Habitat at WTG 4.

WTG 5

Habitat conditions

Relatively flat area with some rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Aptosimum procumbens

Asparagus suaveolens

Euclea crispa

Euphorbia rhombifolia - 4 plants (protected NCNCA Schedule 2)

Ruschia intricata - 40 plants (protected NCNCA Schedule 2)

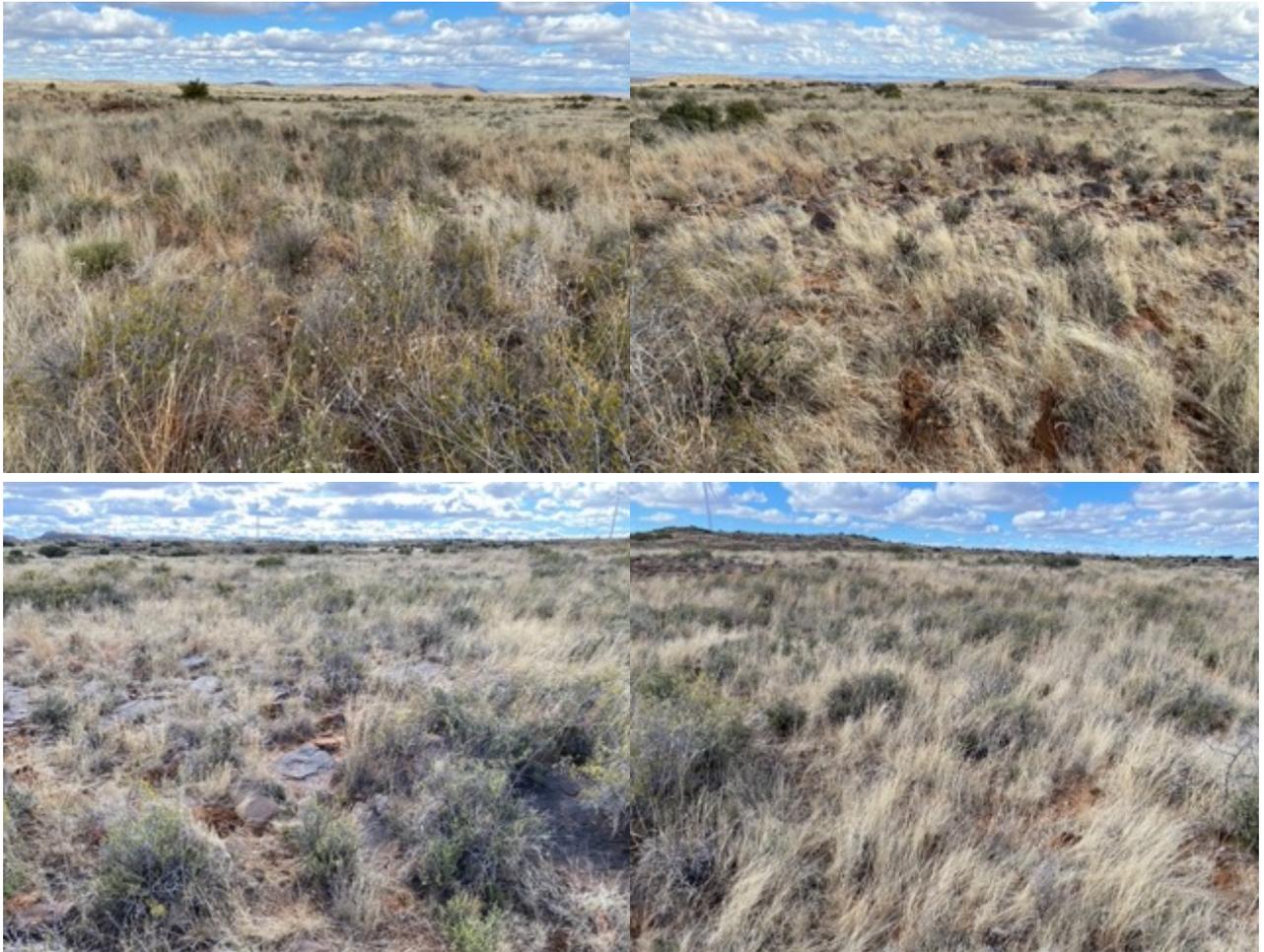


Figure 8: Habitat at WTG 5.

WTG 6

Habitat conditions

Moderately flat area with some rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Aptosimum procumbens

Babiana hypogaea - 10 plants (protected NCNCA Schedule 2)

Brunsvigia radulosa - 4 plants (protected NCNCA Schedule 2)

Cheilanthes eckloniana

Chrysocoma ciliata

Eragrostis obtusa

Eriocephalus ericoides

Euclea crispa

Euryops lateriflorus

Felicia filifolia

Asparagus

Lachenalia karooica - 2 plants (protected NCNCA Schedule 2)

Stomatium mustelinum - 20 plants (protected NCNCA Schedule 2)

Melolobium microphyllum

Pachypodium succulentum - 1 plant (protected NCNCA Schedule 2)

Ruschia intricata - 30 plants (protected NCNCA Schedule 2)

Stachys rugosa

Themeda triandra



Figure 9: Habitat at WTG 6.

WTG 7

Habitat conditions

Relatively flat, open area with few rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Chrysocoma ciliata

Eriosephalus ericoides

Family Fabaceae

Oedera humilis

Ruschia intricata - 30 plants (protected NCNCA Schedule 2)

Themeda triandra



Figure 10: Habitat at WTG 7.

WTG 8

Habitat conditions

Relatively flat area with some rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Dodonaea viscosa

Euphorbia rhombifolia - 3 plants (protected NCNCA Schedule 2)

Pteronia sp.

Hyparrhenia hirta

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 11: Habitat at WTG 8.

WTG 9

Habitat conditions

Undulating topography with scattered boulder outcrops amongst relatively rock-free areas. Open areas dominated by grasses, rocky areas by low shrubs.

Plant species

Aristida diffusa

Asparagus suaveolens

Cheilanthes eckloniana

Dodonaea viscosa

Euclea crispa

Lapeirousia plicata - 4 plants (protected NCNCA Schedule 2)

Gazania krebsiana

Melolobium microphyllum

Ruschia intricata - 10 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 12: Habitat at WTG 9.

WTG 10

Habitat conditions

Moderately steep, rocky area on the summit of a small, rounded hill. Central location relatively open but all nearby areas dominated by woody shrubs.

Plant species

Asparagus striatus

Cheilanthes eckloniana

Diospyros austro-africana

Eriocephalus ericoides

Euclea crispa

Pentzia incana

Searsia burchellii

Searsia erosa

Stachys rugosa

Tarchonanthus minor



Figure 13: Habitat at WTG 10.

WTG 11

Habitat conditions

Relatively flat area with some rocks, overgrazed. Vegetation with low shrubs, dwarf shrubs and grass.

Plant species

Dodonaea viscosa

Eriocephalus ericoides

Freesia andersoniae - 5 plants (protected NCNCA Schedule 2)

Dianthus sp - 3 plants (protected NCNCA Schedule 2)

Trichodiadema sp prob *T. setuliferum* - 2 plants (protected NCNCA Schedule 2)

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Ruschia intricata - 20 plants (protected NCNCA Schedule 2)

Searsia burchellii

Themeda triandra



Figure 14: Habitat at WTG 11.

WTG 12

Habitat conditions

Relatively flat area with some surface pebbles. Overgrazed and in poor condition. Vegetation short, with scattered dwarf shrubs (low cover) and grass.

Plant species

Aptosimum indivisum

Eriosephalus ericoides

Pteronia sp

Lycium cinereum

Moraea pallida - 5 plants (protected NCNCA Schedule 2)

Pentzia incana

Ruschia intricata - 25 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 15: Habitat at WTG 12.

WTG 13

Habitat conditions

Relatively flat area with some high cover of flat rocks and pebbles. Vegetation short, with low shrubs, dwarf shrubs and grass.

Plant species

Albuca setosa

Cheilanthes eckloniana

Diospyros austro-africana

Dodonaea viscosa

Euclea crispa

Euphorbia rhombifolia - 5 plants (protected NCNCA Schedule 2)

Hereroa sp - 4 plants (protected NCNCA Schedule 2)

Hermannia sp

Melolobium microphyllum

Oedera humilis

Searsia burchellii

Solanum tomentosum

Stachys rugosa



Figure 16: Habitat at WTG 13.

WTG 14

Habitat conditions

Relatively flat valley area inbetween hills - deeper soils and low rock cover. Vegetation short, with dwarf shrubs and grass.

Plant species

Felicia muricata

Chloris virgata

Setaria verticillata

Pentzia incana

Adromischus trigynus - 3 plants (protected NCNCA Schedule 2)

Lycium cinereum

Ruschia intricata - 15 plants (protected NCNCA Schedule 2)

Searsia burchellii

Caroxylon aphyllum



Figure 17: Habitat at WTG 14.

WTG 15

Habitat conditions

Relatively flat area a small distance away from the escarpment edge, with some rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Aristida adscensionis

Heteropogon contortus

Dodonaea viscosa

Pentzia incana

Themeda triandra

Pteronia glauca

Brunsvigia radulosa - 3 plants (protected NCNCA Schedule 2)

Euclea crispa

Moraea pallida - 5 plants (protected NCNCA Schedule 2)

Euphorbia rhombifolia - 5 plants (protected NCNCA Schedule 2)

Euryops lateriflorus

Ruschia indurata - 25 plants (protected NCNCA Schedule 2)

Ruschia intricata - 40 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 18: Habitat at WTG 15.

WTG 16

Habitat conditions

Very rocky area on edge of escarpment. Vegetation short, with low shrubs, dwarf shrubs and grass.

Plant species

Cheilanthes eckloniana

Cyperus usitatus

Dodonaea viscosa

Eriocephalus ericoides

Euryops lateriflorus

Felicia muricata

Freesia andersoniae - 6 plants (protected NCNCA Schedule 2)

Nemesia fruticans

Pelargonium abrotanifolium - 10 plants (protected NCNCA Schedule 1)

Pentzia incana

Ruschia intricata - 20 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 19: Habitat at WTG 16.

WTG 17

Habitat conditions

Very rocky area close to escarpment edge, includes large boulder face. Vegetation sparse, short, with dwarf shrubs and grass.

Plant species

Asparagus striatus

Boophone disticha - 1 plant (protected NCNCA Schedule 2)

Cheilanthes eckloniana

Crassula dependens - 2 plants (protected NCNCA Schedule 2)

Dodonaea viscosa

Eriocephalus ericoides

Euphorbia rhombifolia - 4 plants (protected NCNCA Schedule 2)

Felicia muricata

Melolobium microphyllum

Pelargonium abrotanifolium - 8 plants (protected NCNCA Schedule 1)

Ruschia intricata - 25 plants (protected NCNCA Schedule 2)

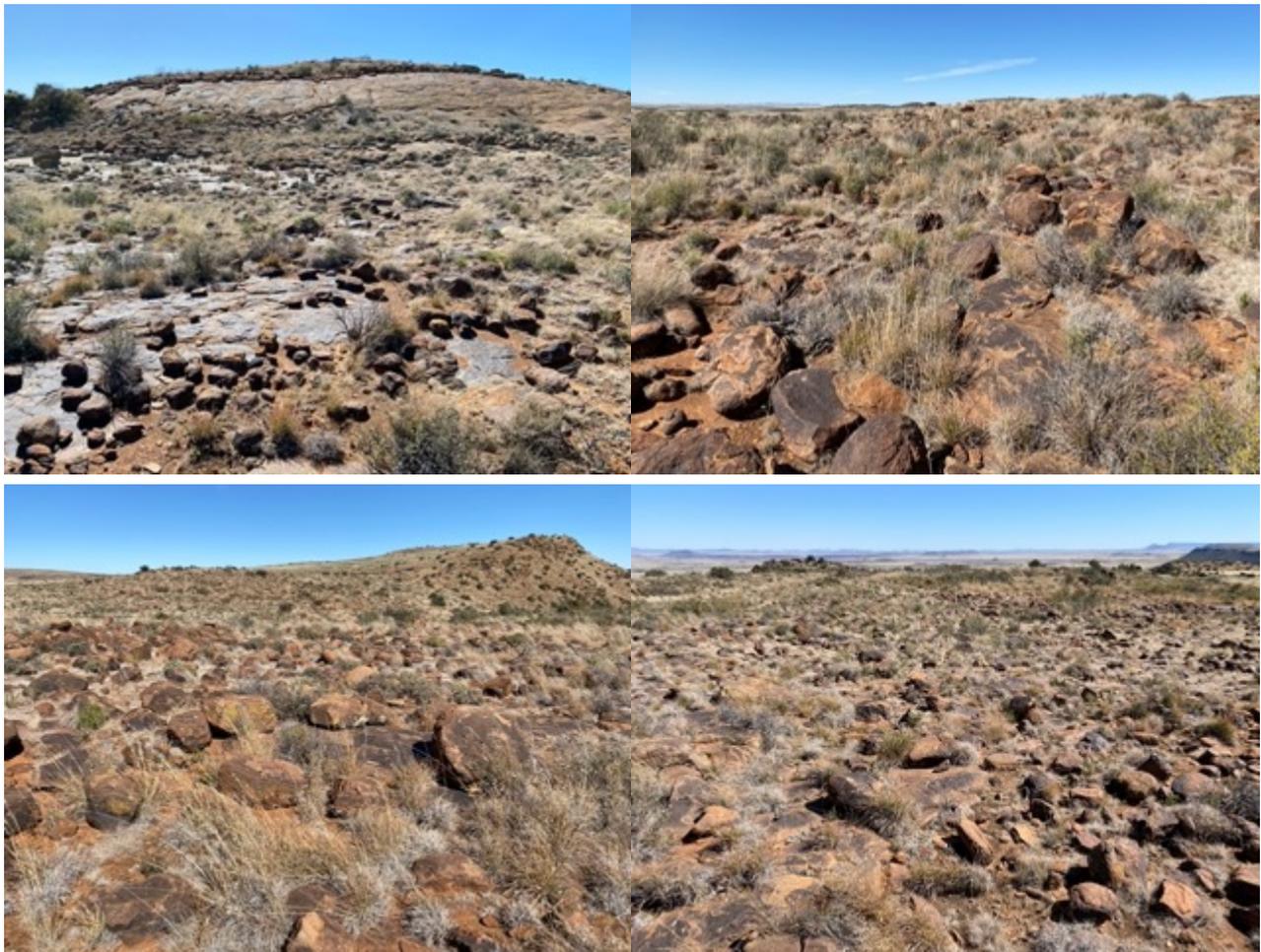


Figure 20: Habitat at WTG 17.

WTG 18

Habitat conditions

Relatively flat area with moderately high rock cover of round rocks. Vegetation short, with dwarf shrubs, grass and occasional low shrub.

Plant species

Asparagus lignosus

Asparagus striatus

Cheilanthes eckloniana

Diospyros austro-africana

Dodonaea viscosa

Eriocephalus ericoides

Euphorbia rhombifolia - 5 plants (protected NCNCA Schedule 2)

Euryops lateriflorus

Felicia muricata

Freesia andersoniae - 7 plants (protected NCNCA Schedule 2)

Lycium cinereum

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Pelargonium abrotanifolium - 8 plants (protected NCNCA Schedule 1)

Themeda triandra



Figure 21: Habitat at WTG 18.

WTG 19

Habitat conditions

Relatively flat area near to edge of escarpment, moderately high surface rock cover and shallow soil. Vegetation dominated by dwarf shrubs with occasional low shrub and grass.

Plant species

Asparagus striatus

Brunsvigia radulosa - 3 plants (protected NCNCA Schedule 2)

Cheilanthes eckloniana

Dodonaea viscosa

Eriocephalus ericoides

Felicia muricata

Freesia andersoniae - 6 plants (protected NCNCA Schedule 2)

Helichrysum asperum

Hermannia coccocarpa

Hermannia vestita

Osteospermum calendulaceum

Searsia burchellii

Themeda triandra

Moraea pallida - 3 plants (protected NCNCA Schedule 2)



Figure 22: Habitat at WTG 19.

WTG 20

Habitat conditions

Relatively flat and locally smoother area on upland plateaux, with some surface rocks. Vegetation dominated by grass, with dwarf shrubs and occasional low shrub.

Plant species

Asparagus striatus

Chrysocoma ciliata

Dodonaea viscosa

Eriocephalus ericoides

Felicia filifolia

Felicia muricata

Freesia andersoniae - 5 plants (protected NCNCA Schedule 2)

Lycium cinereum

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Pentzia incana

Pteronia glauca

Ruschia intricata - 20 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 23: Habitat at WTG 20.

WTG 21

Habitat conditions

Relatively flat area on plateau near to edge of escarpment, moderately high surface rock cover with some larger rocks. Flatter areas with dwarf shrubs and grass, low shrubs associated with larger rocks.

Plant species

Asparagus striatus

Asparagus suaveolens

Cheilanthes eckloniana

Chrysocoma ciliata

Dimorphotheca cuneata

Dodonaea viscosa

Eriocephalus ericoides

Euclea crispa

Felicia filifolia

Felicia muricata

Hermannia species

Heteropogon contortus

Melolobium microphyllum

Pegolettia retrofracta

Pelargonium abrotanifolium - 9 plants (protected NCNCA Schedule 1)

Rhigozum obovatum



Figure 24: Habitat at WTG 21.

Ruschia intricata - 35 plants (protected NCNCA Schedule 2)
Searsia burchellii
Solanum tomentosum
Stachys rugosa
Tarchonanthus minor
Themeda triandra

WTG 22

Habitat conditions

Steep area on secondary ridge with narrow ridge sloping towards the east, very rocky with flat rocks and boulders. Vegetation short with dwarf shrubs and grass, rocky areas with low shrubs.

Plant species

Asparagus striatus

Asparagus suaveolens

Cheilanthes eckloniana

Chrysocoma ciliata

Dodonaea viscosa

Drimia sp.

Euclea crispa

Felicia filifolia

Crassula setulosa - 5 plants (protected NCNCA Schedule 2)

Oedera humilis

Melolobium microphyllum

Pelargonium abrotanifolium - 6 plants (protected NCNCA Schedule 1)

Searsia burchellii

Solanum tomentosum

Tarchonanthus minor

Themeda triandra

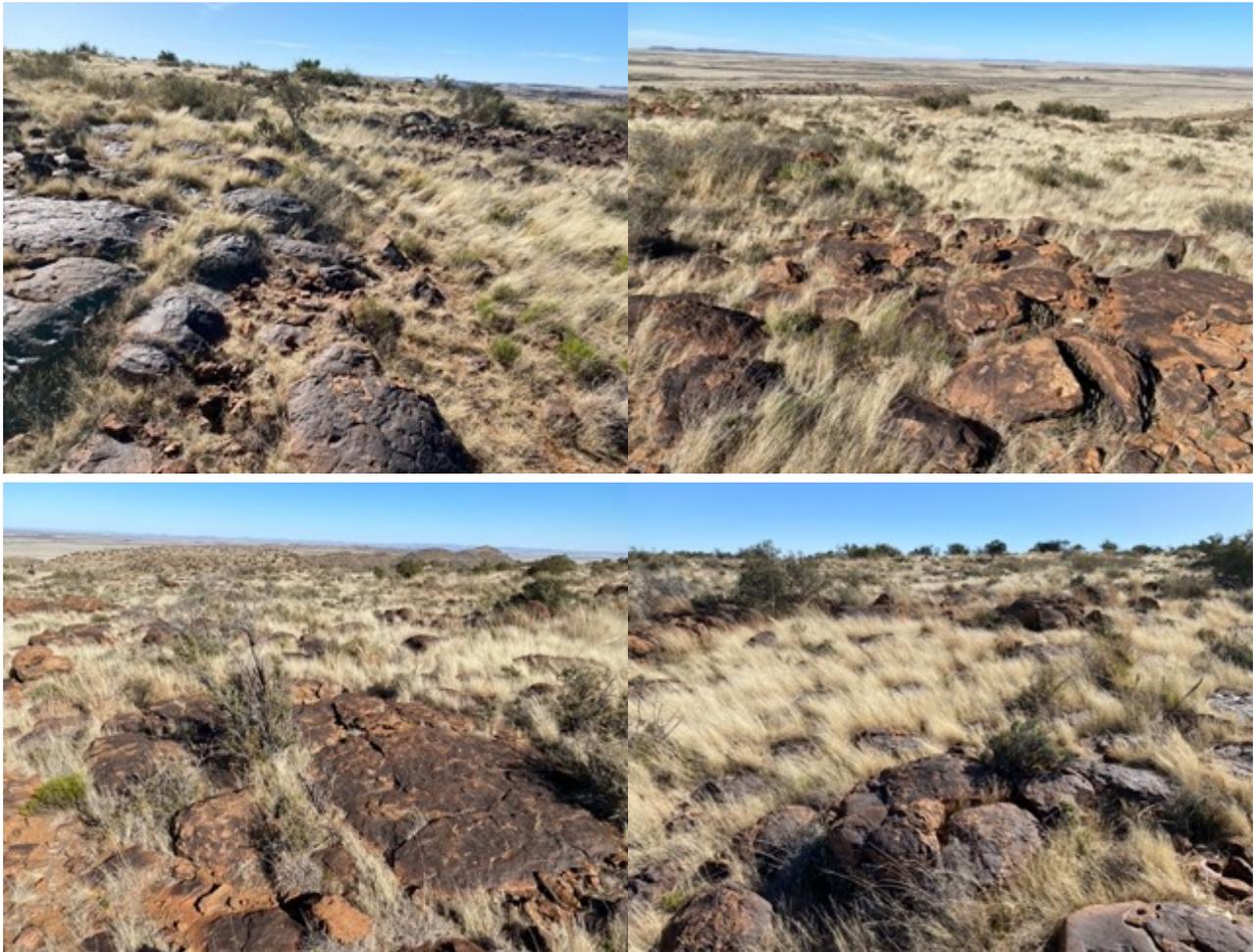


Figure 25: Habitat at WTG 22.

WTG 23

Habitat conditions

Steep area on secondary ridge with narrow ridge sloping towards the east, very rocky with flat rocks and boulders. Vegetation short with dwarf shrubs and grass, rocky areas with low shrubs.

Plant species

Asparagus striatus

Cheilanthes eckloniana

Chrysocoma ciliata

Dodonaea viscosa

Eriocephalus ericoides

Euclea crispa

Heteropogon contortus

Melolobium microphyllum

Searsia burchellii



Figure 26: Habitat at WTG 23.

WTG 24

Habitat conditions

Steep and rugged topography with lots of rocks, site on top of round hill. Vegetation with low shrubs, dwarf shrubs and grass.

Plant species

Aristida diffusa

Asparagus striatus

Cheilanthes eckloniana

Chrysocoma ciliata

Dodonaea viscosa

Eriocephalus ericoides

Felicia filifolia

Hermannia sp.

Gnaphalium simii

Heteropogon contortus

Lessertia frutescens - 2 plants (protected NCNCA Schedule 1)

Nemesia fruticans

Osteospermum sp.

Pelargonium abrotanifolium - 3 plants (protected NCNCA Schedule 1)

Ruschia intricata - 30 plants (protected NCNCA Schedule 2)

Searsia burchellii

Themeda triandra

Ursinia nana



Figure 27: Habitat at WTG 24.

WTG 25

Habitat conditions

Steep and rugged topography with lots of rocks. Vegetation with low shrubs, dwarf shrubs and grass.

Plant species

Asparagus striatus

Blepharis mitrata

Cheilanthes eckloniana

Chrysocoma ciliata

Diascia alonsooides - 7 plants (protected NCNCA Schedule 2)

Dodonaea viscosa

Eriocephalus ericoides

Hermannia sp.

Lasiopogon sp.

Nemesia sp.

Oxalis pocockiae - 10 plants (protected NCNCA Schedule 2)

Pegolettia sp.

Pelargonium abrotanifolium - 25 plants (protected NCNCA Schedule 2)

Pentzia incana

Ruschia intricata - 40 plants (protected NCNCA Schedule 2)

Searsia burchellii

Setaria verticillata

Solanum giffbergense

Solanum tomentosum



Figure 28: Habitat at WTG 25.

WTG 26

Habitat conditions

Gently to moderately sloping area with high surface rock cover of small round rocks. Vegetation in poor condition, dominated by grasses, with some dwarf shrubs and scattered low shrubs.

Plant species

Asparagus suaveolens

Chrysocoma ciliata

Eriosephalus ericoides (dominant)

Moraea pallida - 4 plants (protected NCNCA Schedule 2)

Pentzia incana

Searsia burchellii



Figure 29: Habitat at WTG 26.

WTG 27

Habitat conditions

Gently to moderately sloping area with high surface rock cover of small round rocks. Vegetation in poor condition, dominated by grasses, with some dwarf shrubs and scattered low shrubs.

Plant species

Asparagus striatus

Chrysocoma ciliata

Eriosephalus ericoides (dominant)

Ruschia intricata - 30 plants (protected NCNCA Schedule 2)

Searsia burchellii



Figure 30: Habitat at WTG 27.

WTG 28

Habitat conditions

Relatively flat area on plateau near to edge of escarpment, moderately high surface rock cover with some larger rocks. Flatter areas with dwarf shrubs and grass, low shrubs associated with larger rocks.

Plant species

Asparagus striatus

Asparagus suaveolens

Cheilanthes eckloniana

Chrysocoma ciliata

Dodonaea viscosa

Eriocephalus ericoides

Euclea crispa

Eucomis autumnalis - 2 plants (protected NCNCA Schedule 2)

Hermannia sp.

Melolobium microphyllum

Searsia burchellii

Tarchonanthus minor

Themeda triandra



Figure 31: Habitat at WTG 28.

Laydown areas

Laydown area 1

Habitat conditions

Relatively flat area with some boulder outcrops. Small dry stream passes through northern end of site. Vegetation short, with dwarf shrubs and grass. Boulder outcrops dominated by shrubs.

Plant species

Aptosimum procumbens

Babiana hypogaea - 20 plants (protected NCNCA Schedule 2)

Cheilanthes eckloniana

Cissampelos capensis

Diospyros austro-africana

Diospyros lycioides

Eriocephalus ericoides

Euclea crispa

Asparagus suaveolens

Hermannia sp

Leobordea sp

Schoenoplectus sp. (wetland indicator)

Lycium cinereum

Melolobium microphyllum



Figure 32: Habitat at Laydown Area 1.

Miscanthus junceus (wetland indicator)
Moraea pallida - 10 plants (protected NCNCA Schedule 2)
Osyris lanceolata
Pelargonium tragacanthoides - 3 plants (protected NCNCA Schedule 1)
Pentzia incana
Ruschia intricata - 70 plants (protected NCNCA Schedule 2)
Searsia burchellii
Solanum tomentosum
Stachys rugosa

Laydown area 2

Habitat conditions

Flat open area on lowland plains - no rocks. Vegetation short, with dwarf shrubs and grass.

Plant species

Aristida congesta

Chrysocoma ciliata

Eragrostis bergiana

Eragrostis obtusa

Leobordea sp

Pteronia glauca

Lasiosiphon polycephalus

Lycium cinereum

Oedera humilis

Pentzia incana

Ruschia intricata - 300 plants (protected NCNCA Schedule 2)

Salvia verbenaca



Figure 33: Habitat at Laydown Area 2.

Laydown area 3

Habitat conditions

Relatively flat area next to ridge with some scattered rocks. Vegetation short, with dwarf shrubs and grass, occasional shrub.

Plant species

Aristida diffusa

Asparagus suaveolens

Diospyros austro-africana

Eragrostis lehmanniana

Eragrostis obtusa

Heteropogon contortus

Lasiosiphon polycephalus

Lycium horridum

Moraea pallida - 9 plants (protected NCNCA Schedule 2)

Oedera humilis

Pentzia incana

Ruschia intricata - 60 plants (protected NCNCA Schedule 2)



Figure 34: Habitat at Laydown Area 3.

Substation

Substation and Building complex

Habitat conditions

Relatively flat area with some boulder outcrops. Vegetation short, with dwarf shrubs and grass. Boulder outcrops dominated by shrubs.

Plant species

Aptosimum procumbens

Diospyros austro-africana

Eriocephalus ericoides

Euclea crispa

Asparagus suaveolens

Hermannia sp

Leobordea sp

Lycium cinereum

Melolobium microphyllum

Moraea pallida - 3 plants (protected NCNCA Schedule 2)

Pelargonium tragacanthoides - 1 plants (protected NCNCA Schedule 1)

Pentzia incana

Ruschia intricata - 30 plants (protected NCNCA Schedule 2)



Figure 35: Habitat at the IPP Substation.

Internal roads

All internal roads

Habitat conditions

Includes the entire variation of habitat for all other infrastructure components combined.

Areas of possible environmental sensitivity are discussed in more detail in a section below.

Protected plant species

The following protected plants are estimated to be affected:

- Moraea pallida* - 120 plants (protected NCNCA Schedule 2)
- Ruschia intricata* - 4000 plants (protected NCNCA Schedule 2)
- Boophone disticha* - 20 plants (protected NCNCA Schedule 2)
- Freesia andersoniae* - 150 plants (protected NCNCA Schedule 2)
- Pelargonium abrotanifolium* - 400 plants (protected NCNCA Schedule 1)
- Euphorbia rhombifolia* - 100 plants (protected NCNCA Schedule 2)
- Brunsvigia radulosa* - 100 plants (protected NCNCA Schedule 2)
- Lachenalia karooica* - 10 plants (protected NCNCA Schedule 2)
- Stomatium mustelinum* - 200 plants (protected NCNCA Schedule 2)
- Crassula sp.* - 20 plants (protected NCNCA Schedule 2)

Power lines

33kV OHL

Habitat conditions

Extends from WTG24 to WTG21 across a valley. There is a steep slope next to each WTG (north-west of WTG24 and south-east of WTG21) up/down which the OHL must travel, but it is assumed no tower structures will be located on these steep slopes.

Plant species

Aristida diffusa

Asparagus striatus

Asparagus suaveolens

Cheilanthes eckloniana

Chrysocoma ciliata

Dimorphotheca cuneata

Dodonaea viscosa

Eriocephalus ericoides

Euclea crispa

Felicia filifolia

Felicia muricata

Gnaphalium simii

Hermannia species

Heteropogon contortus

Lessertia frutescens

Melolobium microphyllum

Nemesia fruticans



Figure 36: View from proposed location of WTG21 towards the proposed location of WTG24.

Osteospermum sp.
Pegolettia retrofracta
Pelargonium abrotanifolium - 10 plants (protected NCNCA Schedule 1)
Rhigozum obovatum
Ruschia intricata - 40 plants (protected NCNCA Schedule 2)
Searsia burchellii
Solanum tomentosum
Stachys rugosa
Tarchonanthus minor
Themeda triandra
Ursinia nana



Figure 37: View from the proposed location of WTG24 towards the proposed location of WTG21.

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.

Protected species affected

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:

***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 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.

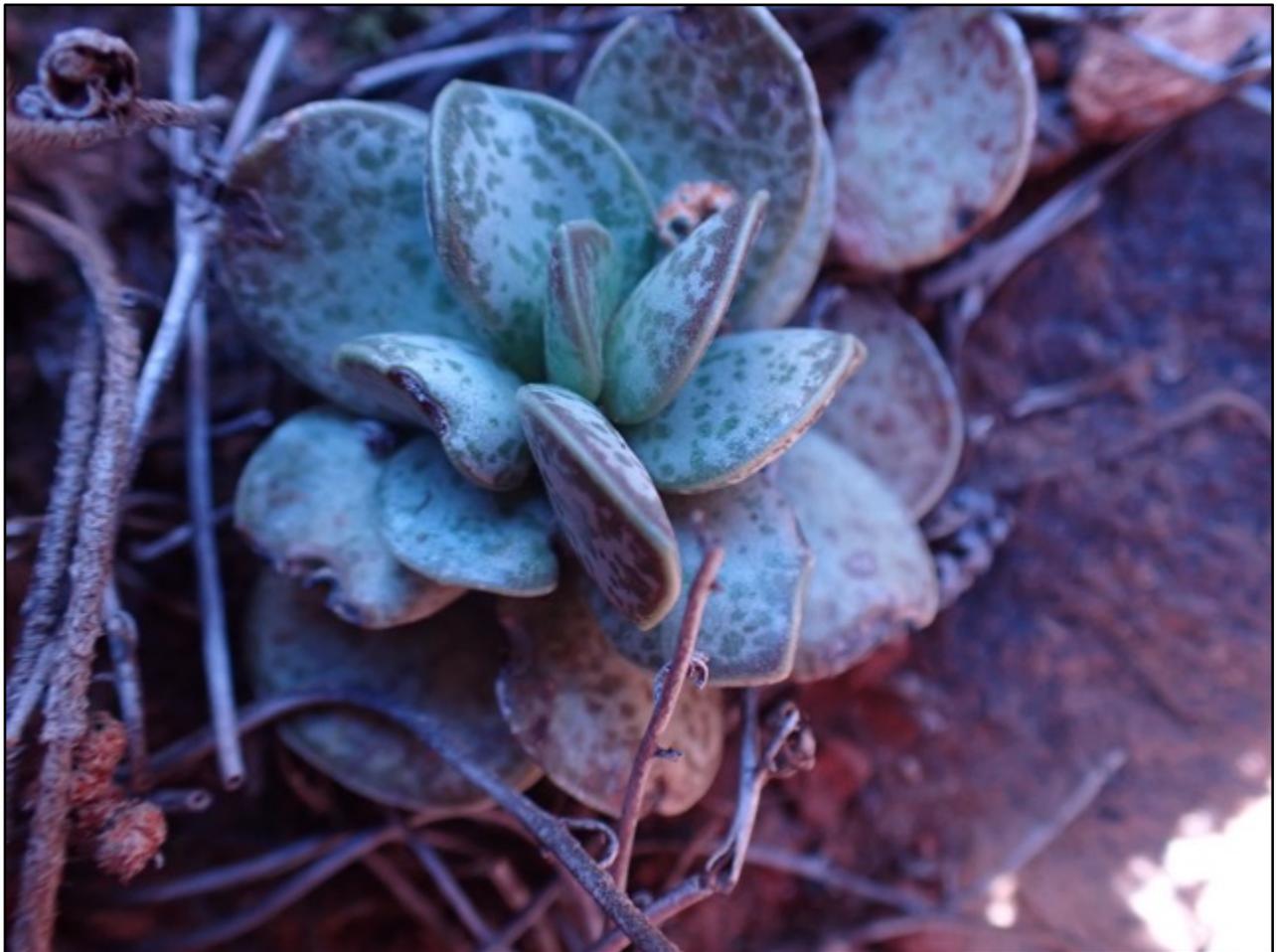


Figure 38: *Adromischus trigynus*

***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 39: 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 40: 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 41: *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 42: 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 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: **10 plants**.



Figure 43: *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 44: *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 45: *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 46: *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 47: *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 48: *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 49: *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 50: *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 group of 4 plants. Fairly cryptic, therefore may possibly occur at other locations but not seen. Estimated total number affected by project: **20 plants**.



Figure 51: *Hereroa* sp.

***Lachenalia karoica* (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 52: Lachenalia karoica.

***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**.

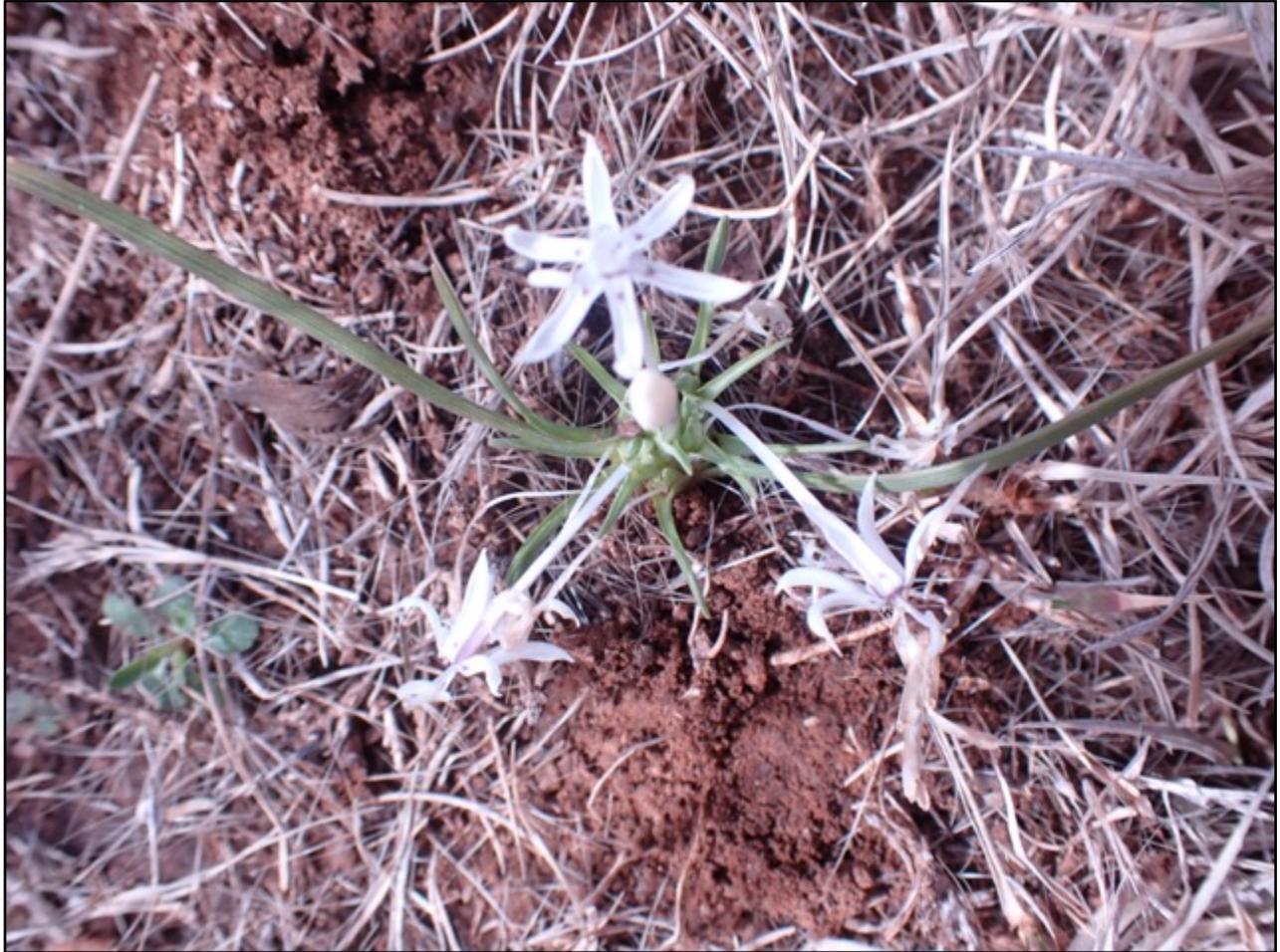


Figure 53: *Lapeirousia plicata* subsp. *foliosa*

***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 54: *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 55: *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 56: *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 57: *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 plant**.



Figure 58: *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 59: *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 60: *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 61: *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 62: *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 63: *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 64: *Trichodiadema* species, prob. *S. setuliferum*.

Assessment of infrastructure layout

The authorised number of turbines for the WEF was reduced to 25 – 61 in the Part 2 EA Amendment process in 2015. The proposed final turbine layout for the project consists of up to 28 Wind Turbine Generator (WTG) positions, of which a maximum of 26 WTG's will be constructed, with a total capacity of up to 140 MW. The power generated by the project will be transmitted to the national grid via a proposed on-site Eskom Switching Station. This Station will connect via a 132 kV overhead line to a new Main Transmission Substation.

According to the developer, the footprint of the current final proposed layout would remain the same (as authorised) or be reduced and would therefore possibly a smaller overall footprint than the authorised layout in terms of the overall area affected. There are now significantly fewer turbine locations, as well as a less extensive road network than the original authorised layout.

The original ecological assessment was undertaken in 2011 (ecological report dated 7 February 2012) and an ecological assessment was undertaken in 2015 that informed the Part 2 Amendment in 2015. The original assessment identified two impacts of the proposed WEF on the affected area, as follows:

- Loss or fragmentation of indigenous natural vegetation (Low significance for turbines and powerlines, Medium significance for internal road network)
- Establishment and spread of declared weeds and alien invader plants (Medium significance for all infrastructure).

Based on the walk-through survey of the site, reported here, and a review of the original Ecological report and Addendum Ecological Report (July 2015) for the Part 2 EA amendment in 2015, these assessments remain valid. The current final layout does not affect the significance level of the assessed impacts. The current layout is therefore deemed to be acceptable and is a good layout for minimising impacts on ecological systems, processes and patterns. Additional layout suggestions are provided below to further minimise impacts. These are not compulsory but would further minimise local impacts associated with proposed infrastructure.

Sensitivities identified on site

Site-specific sensitivities were identified during the current walk-through (see Figure 66 below). These are not "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, suggested below, would largely avoid these areas and further minimise any impacts on the ecological receiving environment.

Areas of slightly elevated sensitivity include the following:

1. Lowland drainage areas: these are flat bottomlands with deeper clay soils that become waterlogged during the rainy season. The plant species composition is highly suggestive of these being temporary to seasonal wetlands or systems that function much like pans in semi-arid areas. They are interconnected linear systems that should preferably be avoided.
2. Steep slopes: any steep slopes are vulnerable to erosion. Where possible, roads should follow as shallow a gradient as possible.
3. Areas of high habitat diversity: specifically, where these include a high proportion of rocky outcrops and rock sheet areas, in association with drainage lines, slopes with multiple orientations, and areas with localised steep slopes.

4. The above recommendations have been implemented into the updated layout as far as possible by the developer, and the layout is therefore suitable.

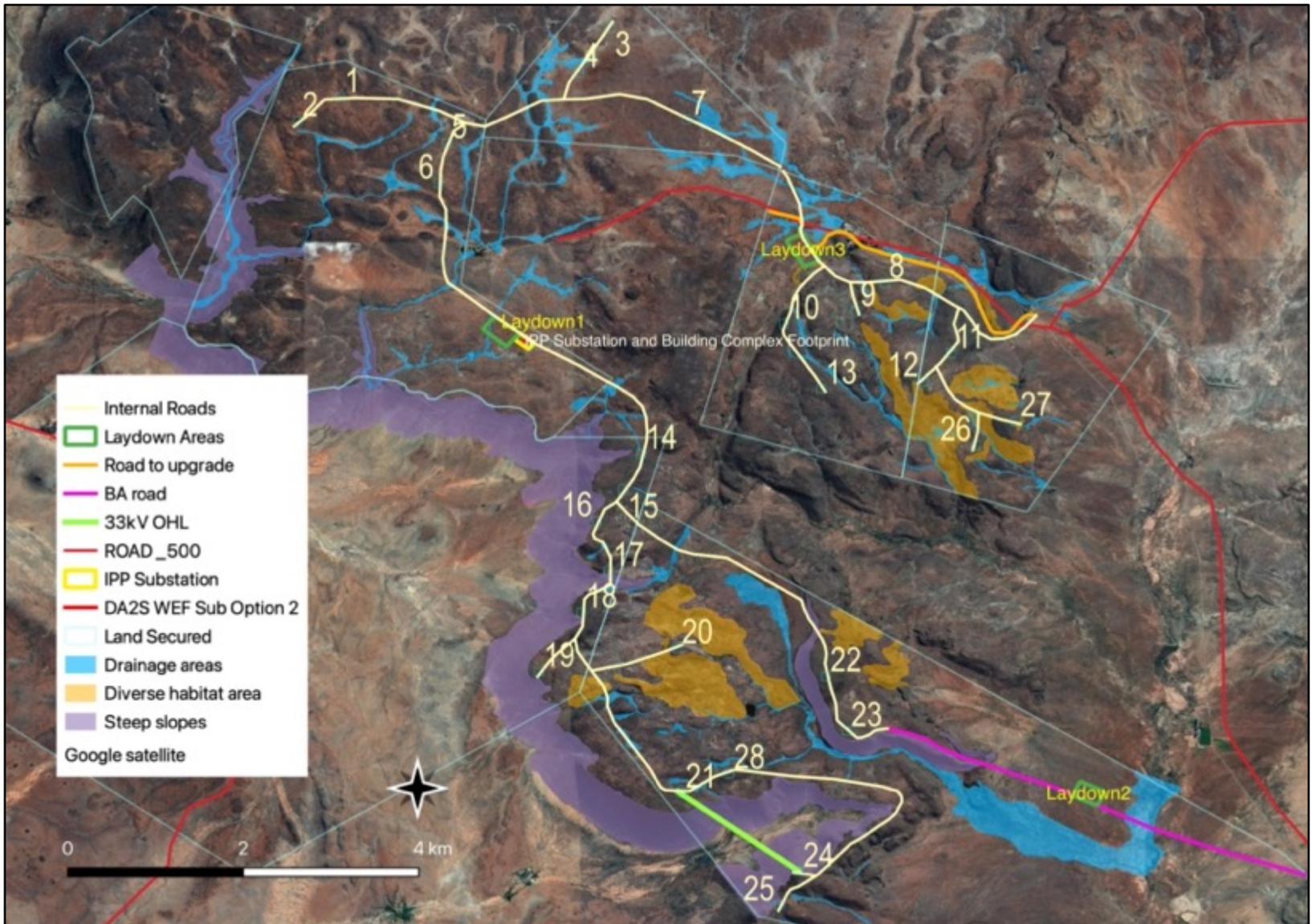


Figure 65: Areas of elevated sensitivity on site within the infrastructure footprint areas.

Proposed layout changes

In general, it is recommended that the internal roads take local topography into account more. For example, there are places where the road is shown as a straight line, going up and over obstacles, instead of curving around obstacles.

Specific locations are between WTG18 and WTG17, between WTG17 and WTG16, and a short distance north of WTG14. Following the topography will reduce cut-and-fill, as well as reduce unnecessary ups and downs that increase erosion risks.

These changes have subsequently been implemented in the final layout by the developer.

Road alignment near WTG26 and WTG27

There is a valley between WTG26 and WTG27. It is the catchment and origin of a small non-perennial stream. It contains numerous rocky boulder outcrops and high topographic variation leading to high habitat diversity (Figure 67). The road system connecting to these two turbines has been modified to avoid this valley. Avoidance of this valley has been achieved by following the ridgelines northwards from the WTG locations and connecting further northwards (Figure 68). **The road layout is now suitable and acceptable.**



Figure 66: Habitat diversity in road alignment between WTG26 and WTG27.

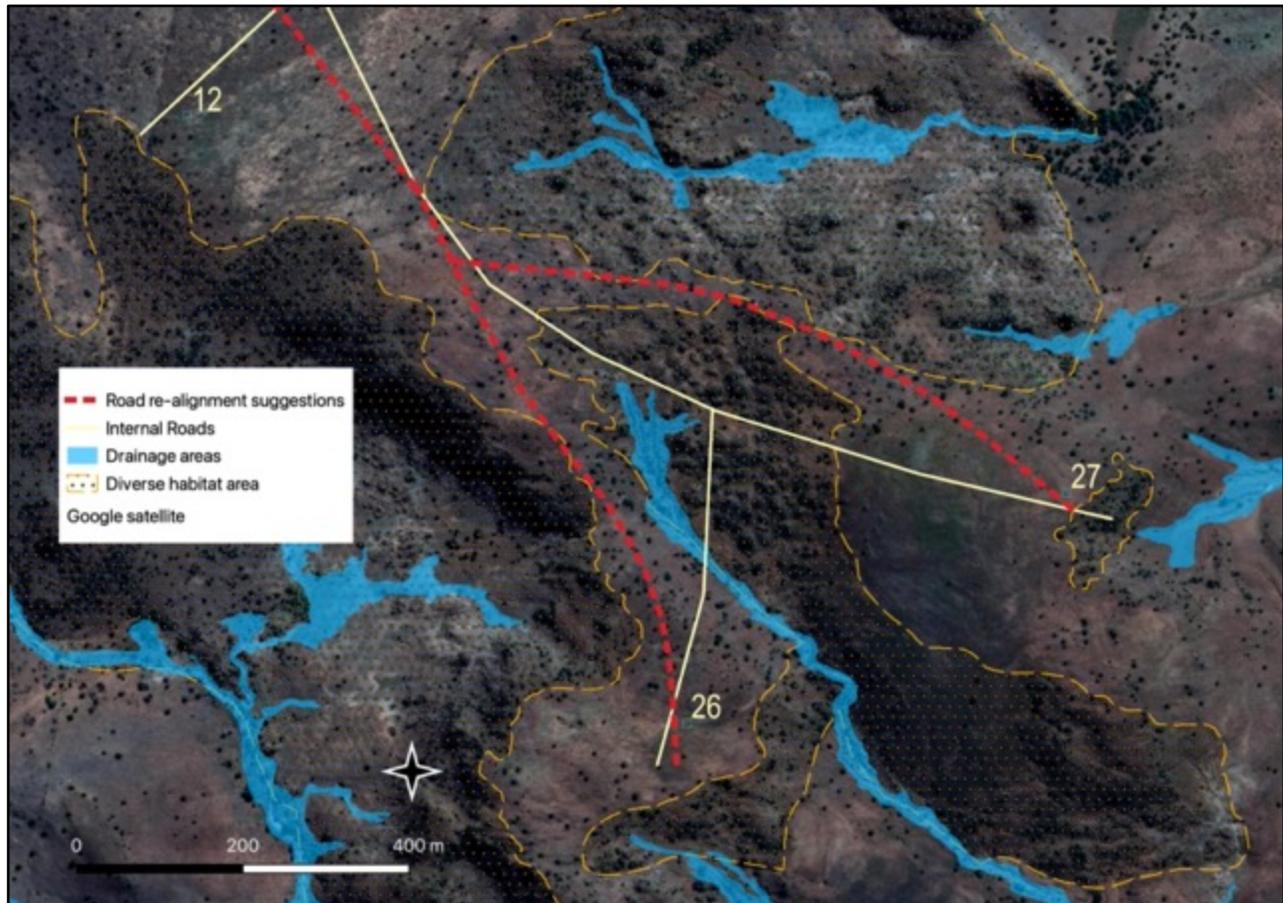


Figure 67: Proposed road layout change north of WTG26 and WTG27 - designed road in yellow, proposed change as dotted red lines.

Road alignment between WTG10 and WTG13

This is a minor recommendation to completely avoid a drainage area (Figure 69).

Road alignment between WTG8 and WTG9 and Laydown 3

This is a recommendation to follow more even topography and to avoid some local steeper slopes (Figure 70).

Road alignment north of WTG14

This is a recommendation to follow more even topography and to avoid some local steeper slopes (Figure 71).

Road alignment between WTG10 and WTG13

This is a recommendation to follow more favourable topography and to reduce the steepness of the alignment (Figure 69).

Road alignment between WTG19 and WTG21

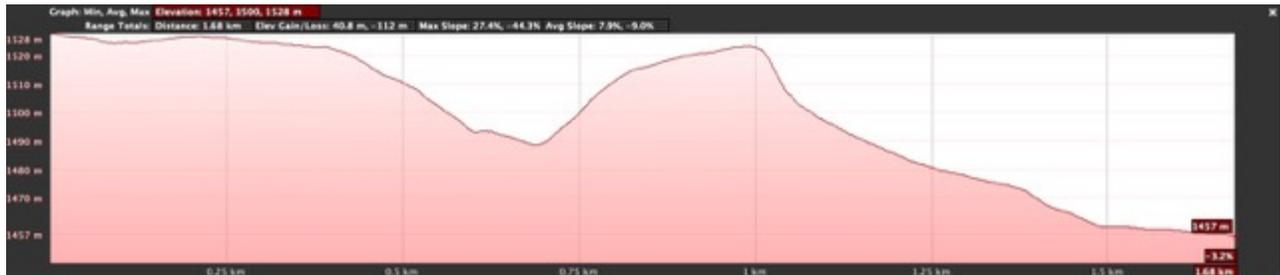
This is a recommendation to follow more favourable topography, avoid drainage areas, and to reduce the steepness of the alignment (Figure 73).

Road alignment between Laydown 2 and WTG23

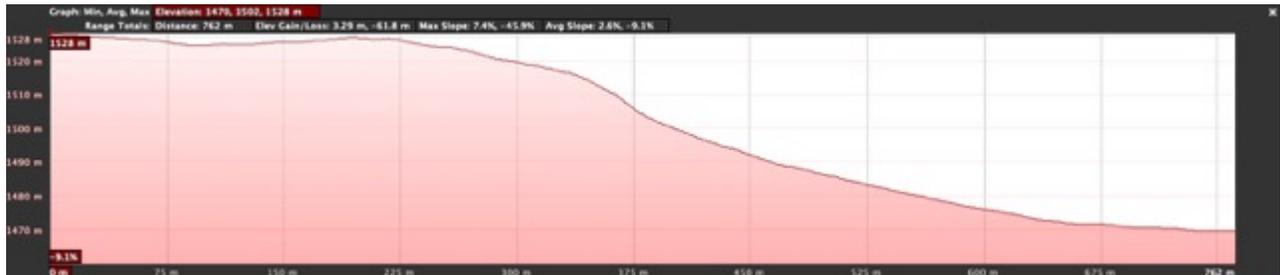
This is a separate BA process for this road, but the suggestion is made here to re-align this road slightly to avoid steep topography and a drainage line (Figure 74)

Alternative main access road

It is not known here whether there is a specific reason for the current alignment, but a suggestion is made here to have the access road rise up the slope further north-west than the current location so that it connects more directly to WTG8 (Figure 75). An alternative alignment can then be placed between WTG9 and WTG12. This entire suggestion is to avoid the current access diagonally up a steep slope, followed by the requirement to go through a relatively steep valley with a drainage line (see profile diagram below) and an area of moderately high topographic / habitat diversity.



The profile of the suggested alignment avoids an intermediate valley:



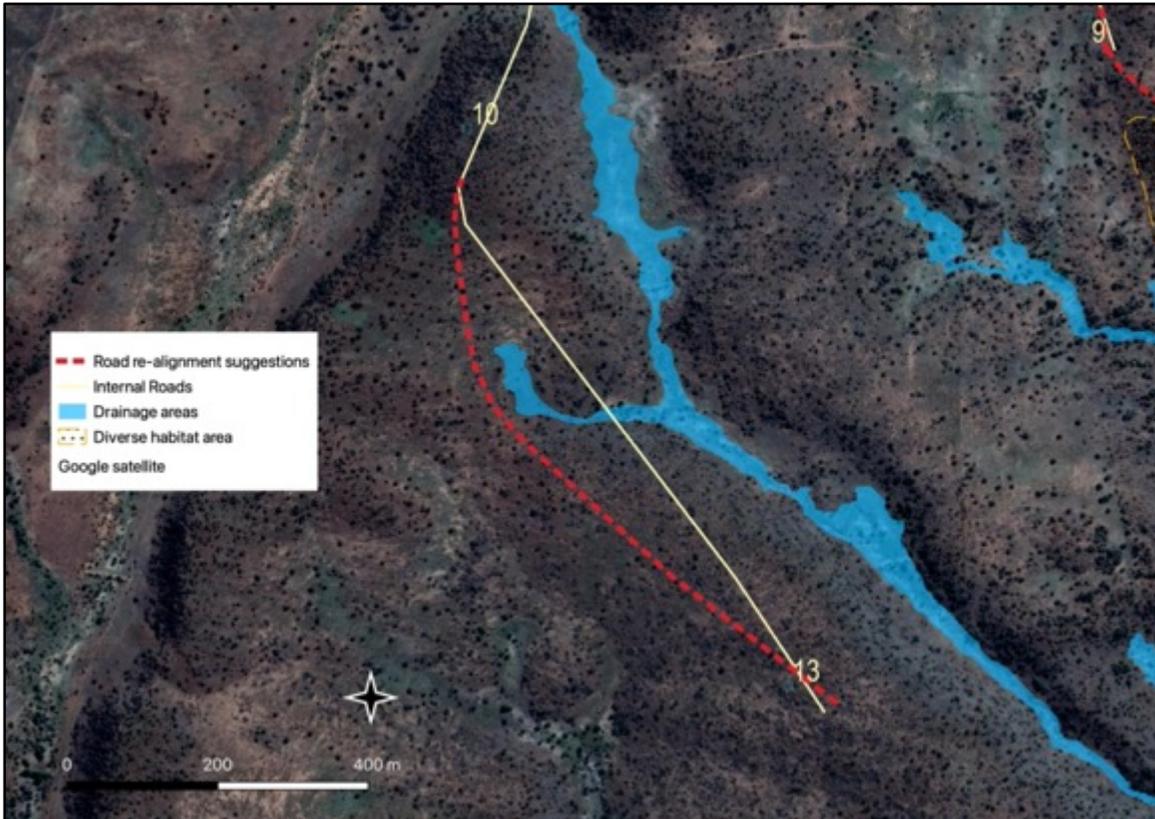


Figure 68: Proposed road layout change between WTG10 and WTG13 - designed road in yellow, proposed change as dotted red lines.

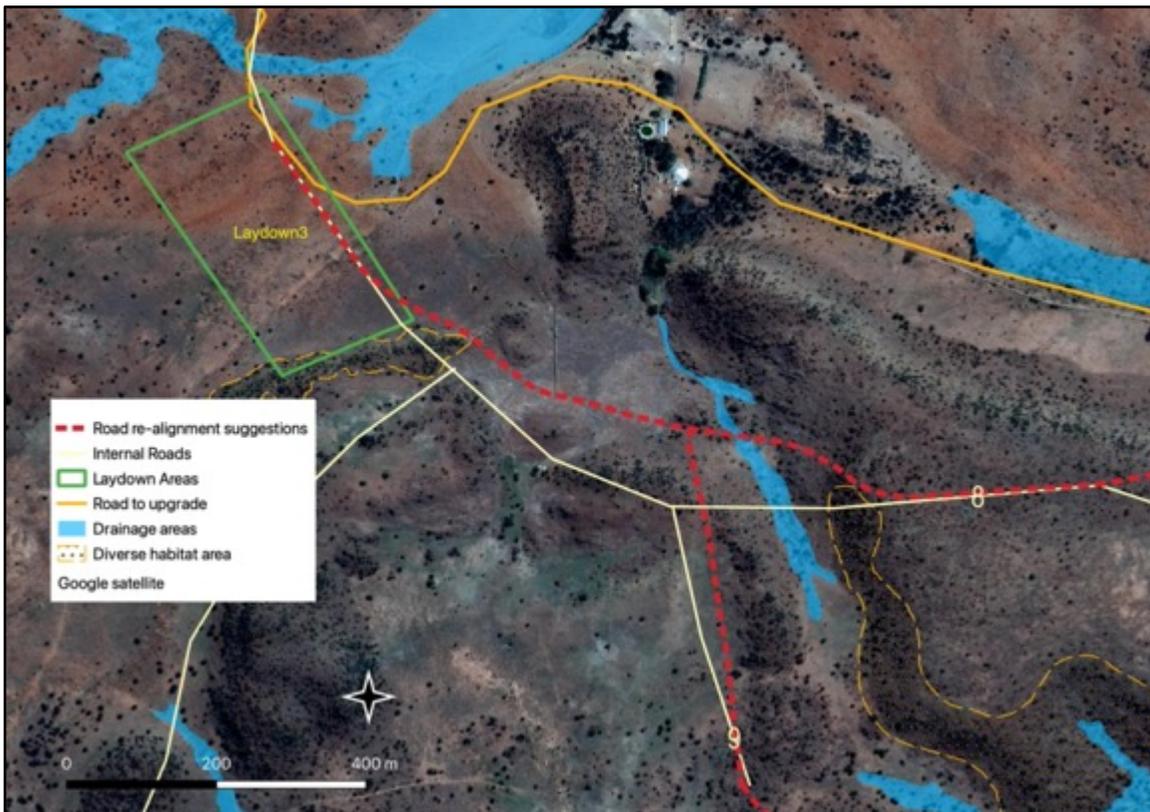


Figure 69: Proposed road layout between WTG8, WTG9 and Laydown3 - designed road in yellow, proposed change as dotted red lines.

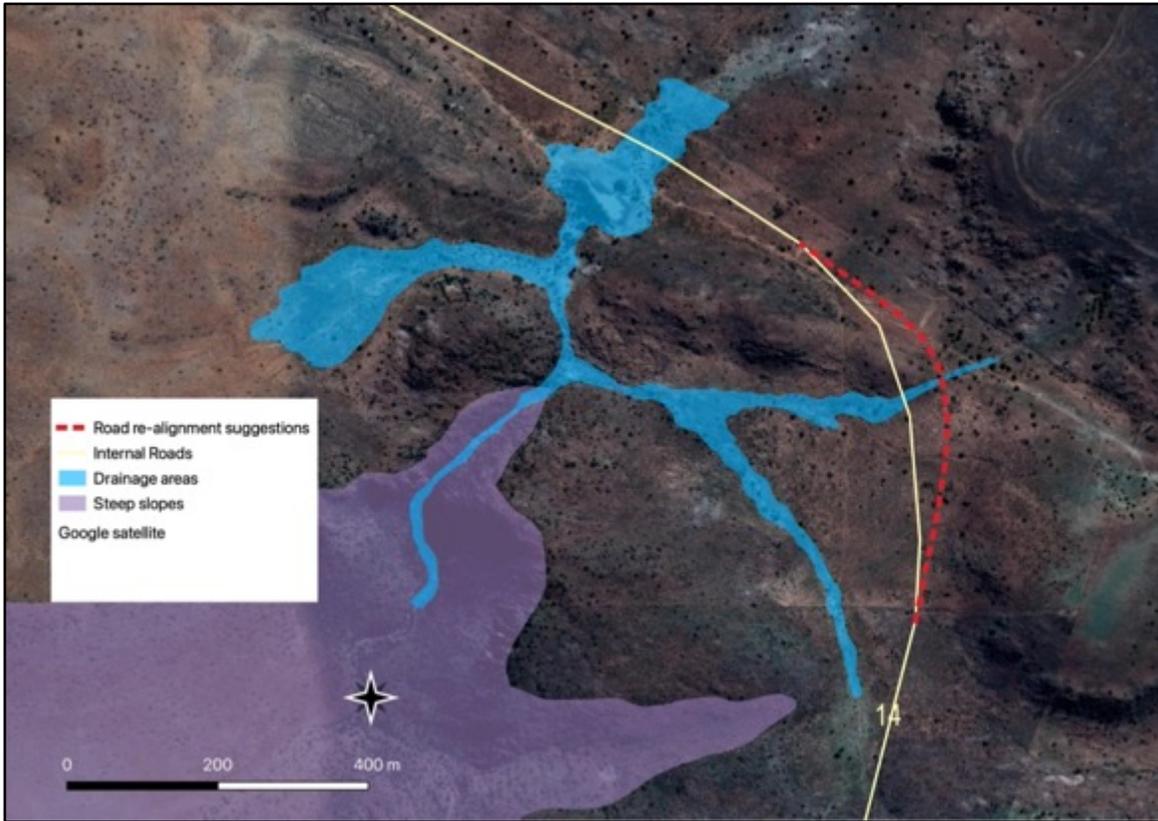


Figure 71: Proposed road layout change north of WTG14 - designed road in yellow, proposed change as dotted red lines.

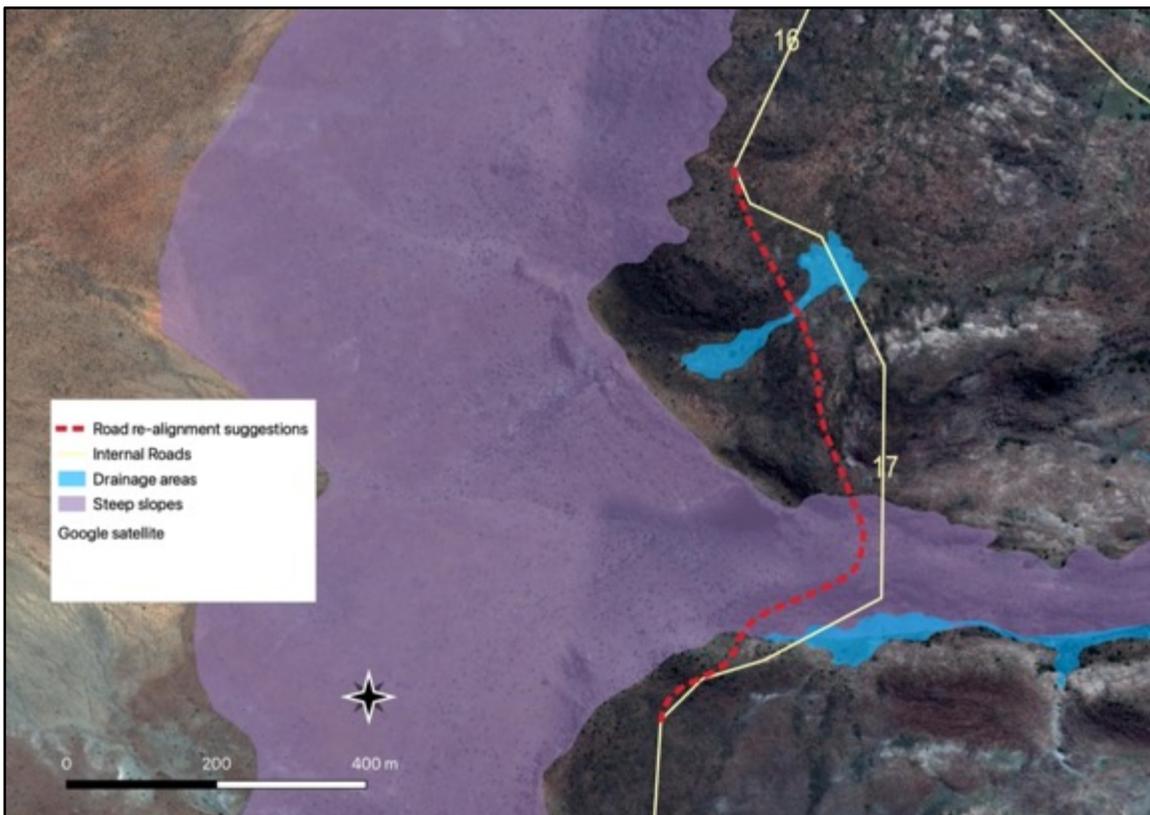


Figure 70: Proposed road layout between WTG16 and WTG18 - designed road in yellow, proposed change as dotted red lines.

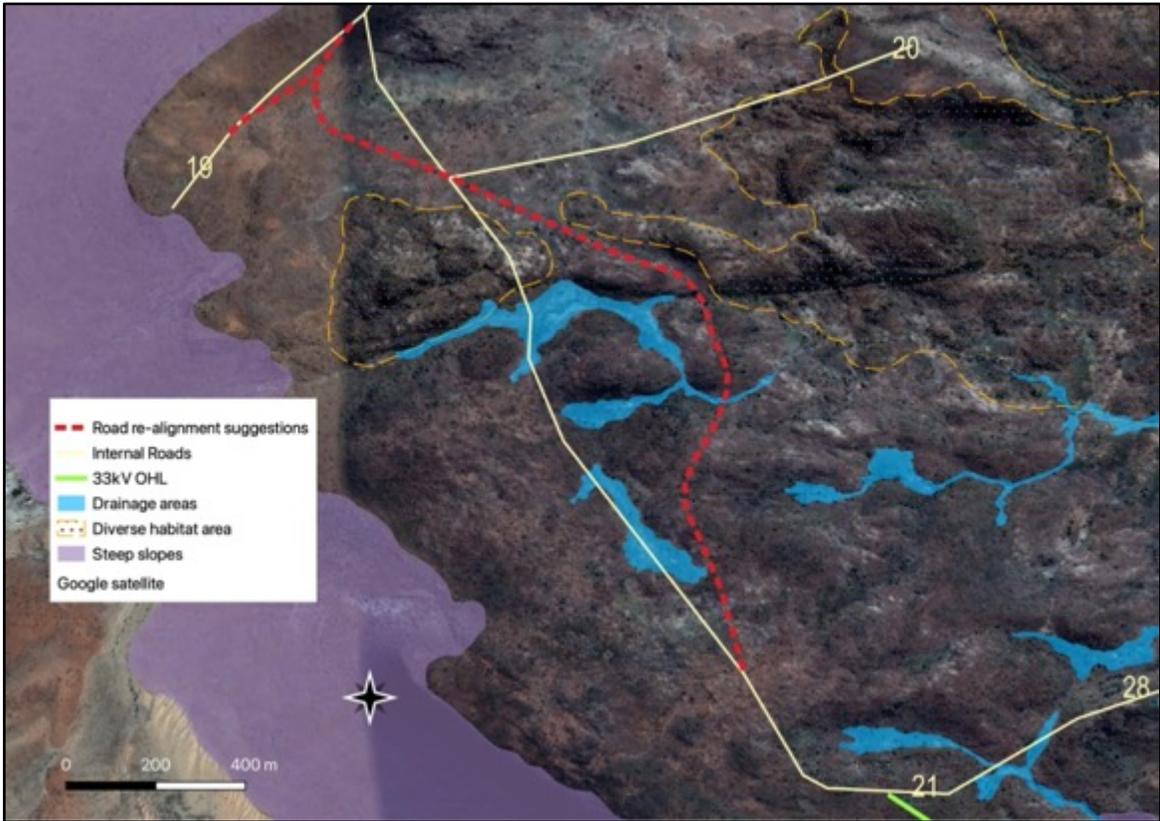


Figure 73: Proposed road layout change between WTG19 and WTG21 - designed road in yellow, proposed change as dotted red lines.

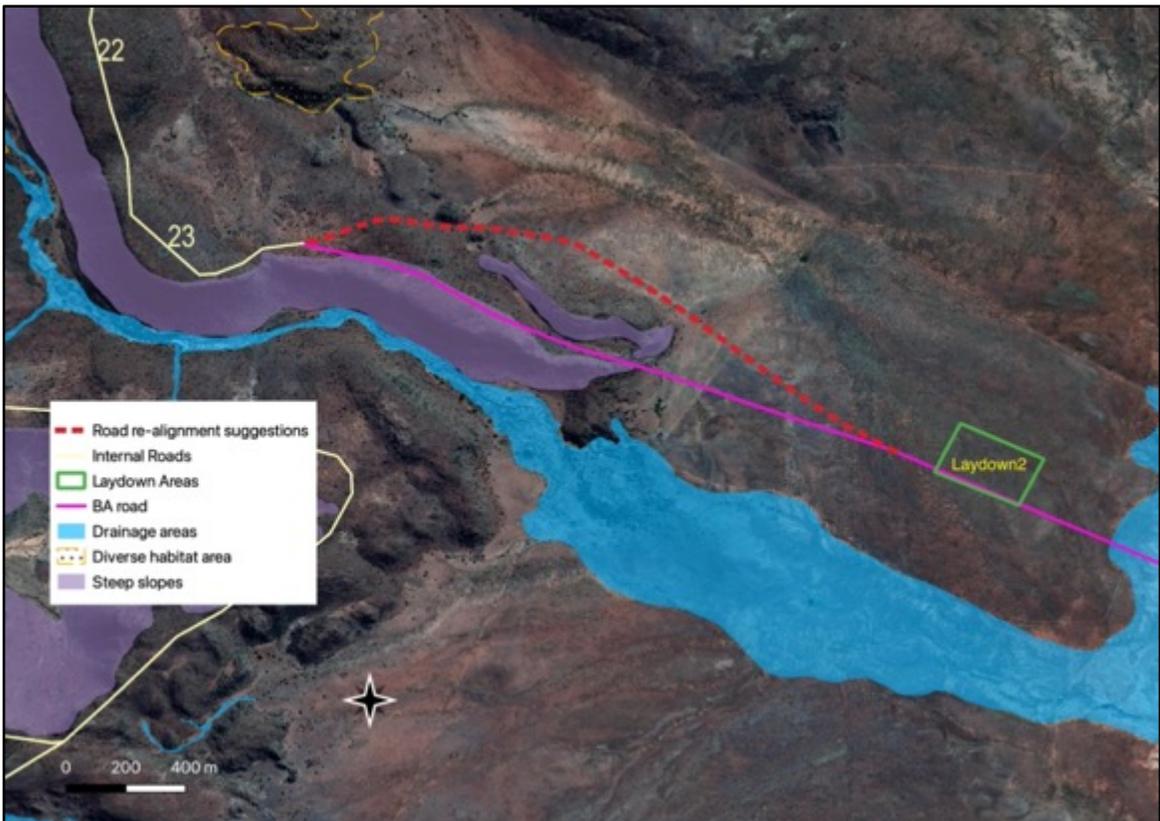


Figure 72: Proposed road layout change for Access Road South - designed road in yellow, proposed change as dotted red lines.

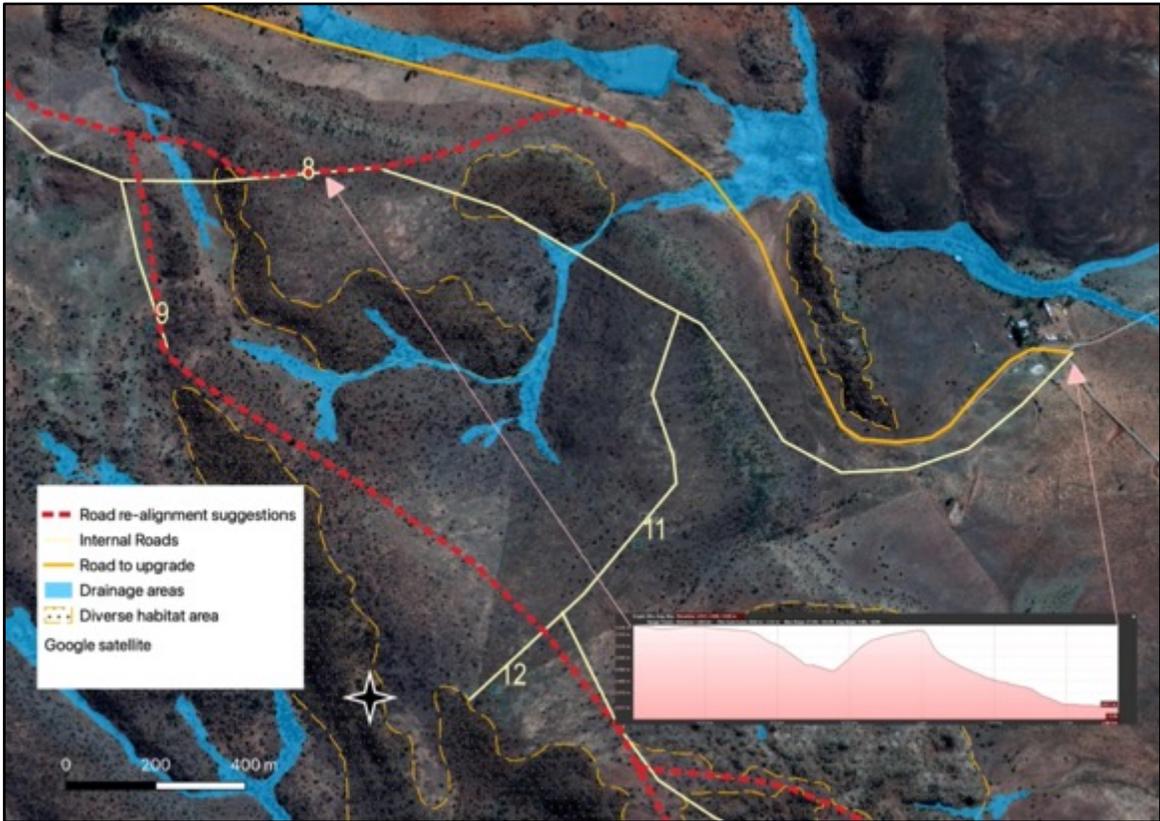


Figure 74: Proposed road layout change for Access Road North - designed road in yellow with profile shown, proposed change as dotted red lines.

CONCLUSIONS

- A walk-through survey of the entire infrastructure footprint area was conducted. Areas of concern were identified and recommendations made for possible layout changes.
- 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.
- The proposed final layout plan will not result in an increased level or change in the nature of the ecological impacts.
- The current layout is therefore deemed to be acceptable and is a good layout for minimising impacts on ecological systems, processes and patterns.

RECOMMENDATIONS

The following recommendations are made to minimise impacts:

- Some road alignment changes (detailed in the “Proposed Layout Changes” section above) are proposed (and are optional) , and the majority have now been implemented by the developer, to avoid drainage areas (specifically lowland flats that are seasonally waterlogged), areas of high topographic (habitat) diversity, and steep slopes.
- Apply for permits for permanent destruction/removal of the identified plant/tree species (note: the author has been commissioned by the applicant to carry out this permit application process, and permits will be obtained prior to construction commencing).

Appendix 1: Combined checklist of plant species found on site.

Adromischus trigynus (1 observation)
Albuca setosa (1 observation)
Aloe broomii (1 observation)
Ammocharis sp (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)
Osyris lanceolata (1 observation)
Oxalis pocockiae (1 observation)
Pachypodium succulentum (1 observation)
Pegolettia 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 cf mustelinum (2 observations)
Tarchonanthus minor (2 observations)
Themeda triandra (8 observations)
Trichodiadema cf setuliferum (1 observation)
Ursinia nana (1 observation)
Zaluzianskya villosa (1 observation)

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

Vachellia erioloba	Vachellia haematoxylon
Adansonia digitata	Afzelia quanzensis
Balanites subsp. maughamii	Barringtonia racemosa
Boscia albitrunca	Brachystegia spiciformis
Breonadia salicina	Bruguiera gymnhorrhiza
Cassipourea swaziensis	Catha edulis
Ceriops tagal	Cleistanthus schlechteri var. schlechteri
Colubrina nicholsonii	Combretum imberbe
Curtisia dentata	Elaedendron (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 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: APIACAEAE	
<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 tortuosum</i> (=Aizoaceae, <i>Mesembryanthemum tortuosum</i>)	
<i>Sutherlandia</i> spp.	Cancer Bush, all species
<i>Wiborgia fusca</i> subsp. <i>macrocarpa</i>	
Family: GERANIACEAE	
<i>Pelargonium</i> spp.	Pelargonium, all species
Family: HYACINTHACEAE	
<i>Drimia nana</i>	
<i>Ornithogalum bicornutum</i>	
<i>Ornithogalum inclusum</i>	
Family: IRIDACEAE	
<i>Babiana framesii</i>	
<i>Ferraria kamiesbergensis</i>	
<i>Freesia marginata</i>	
<i>Geissorhiza subrigida</i>	
<i>Hesperantha minima</i>	
<i>Hesperantha oligantha</i>	
<i>Hesperantha rivulicola</i>	
<i>Lapeirousia verecunda</i>	
<i>Moraea kamiesensis</i>	
<i>Moraea namaquana</i>	
<i>Romulea albiflora</i>	
<i>Romulea discifera</i>	
<i>Romulea maculata</i>	
<i>Romulea rupestris</i>	
Family: MOLLUGINACEAE	
<i>Hypertelis trachysperma</i>	
<i>Psammotropha spicata</i>	
Family: ORCHIDACEAE	
<i>Corycium ingeanum</i>	
<i>Disa macrostachya</i>	Disa
Family: OXALIDACEAE	
<i>Oxalis pseudo-hirta</i>	Sorrel
Family: PEDALIACEAE	
<i>Harpagophytum</i> spp.	Devils' claw
Family: POACEAE	
<i>Prionanthium dentatum</i>	
<i>Secale strictum</i> subsp. <i>africanum</i>	Wild rye
Family: PROTEACEAE	
<i>Leucadendron meyerianum</i>	Tolbos
<i>Mimetes</i> spp.	All species
<i>Orothamnus zeyheri</i>	
Family: ROSACEAE	
<i>Cliffortia arborea</i>	Sterboom
Family: SCROPHULARIACEAE	
<i>Charadrophila capensis</i>	Cape Gloxinia
Family: STANGERIACEAE	
<i>Stangeria</i> spp.	Cycads, all species
Family: ZAMIACEAE	
<i>Encephalartos</i> 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: 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
<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 pinnatilobata</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	
Daubenya spp	
Lachenalia spp.	Daubenya, 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	
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	
Afrolicon namaquanum	

Family: POACEAE	
<i>Brachiaria dura</i> var. <i>dura</i>	
<i>Dregeochloa calviniensis</i>	
<i>Pentaschistis lima</i>	
Family: PODOCARPACEAE	
<i>Podocarpus</i> spp.	Yellowwoods, all species
Family: PORTULACACEAE	
<i>Anacampseros</i> spp.	All species
<i>Avonia</i> spp.	All species
<i>Portulaca foliosa</i>	
Family: PROTEACEAE	All species except those listed in Schedule 1
Family: RESTIONACEAE	All species
Family: RHAMNACEAE	
<i>Phyllica</i> spp.	All species
Family: RUTACEAE	
<i>Agathosma</i> spp.	Buchu, all species
Family: SCROPHULARIACEAE	
<i>Diascia</i> spp.	All species
<i>Halleria</i> spp.	All species
<i>Jamesbrittenia</i> spp.	All species
<i>Manulea</i> spp.	All species
<i>Nemesia</i> spp.	All species
<i>Phyllopodium</i> spp.	All species
<i>Polycarena filiformis</i>	
<i>Chaenostoma longipedicellatum</i>	
Family: STRELITZIACEAE	
<i>Strelitzia</i> spp.	All species
Family: TECOPHILACEAE	
<i>Cyanella</i> spp.	All species
Family: THYMELAEACEAE	
<i>Gnidia leipoldtii</i>	
Family: ZINGIBERACEAE	
<i>Siphonochilus aethiopicus</i>	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
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

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