TERRESTRIAL BIODIVERSITY COMPLIANCE STATEMENT

ROMA ENERGY, VANRHYNSDORP

THE PROPOSED DEVELOPMENT OF A 10MW PV SOLAR- AND A HYDROGEN PLANT ON PORTION 7 OF THE FARM DUINEN NO 258, NEAR VANRHYNSDORP, MATZIKAMA LOCAL MUNICIPALITY, WESTERN CAPE PROVINCE.

PREPARED FOR:

ENVIROAFRICA CC

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31 JANUARY 2023

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EXECUTIVE SUMMARY

VEGETATION TYPE	**Vanrhynsdorp Gannabosveld** The vegetation type is considered **Least Threatened** in terms of the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022). According to the 2004 National Spatial Biodiversity Assessment (NSBA), approximately 79% of the Vanrhynsdorp Gannabosveld vegetation remains, with the main reasons for the transformation of the remainder being cultivation and open-cast gypsum mining. A conservation target of 28% has been set for this vegetation type (none of which was formally conserved during 2004), but with the recent proclamation of the Knersvlakte Nature Reserve, some of this vegetation type is now formally conserved.
LAND-USE	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
VEGETATION ENCOUNTERED	The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell. At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species. Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed (Refer to Heading 4.2 & 4.3 for a full description of vegetation and flora).
CONSERVATION PRIORITY AREAS	The proposed site falls within the **Knersvlakte Centre of Endemism**, but is located on the sandy soils, dominated by Gannabos (*Salsola* species), to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation. According to the Western Cape Biodiversity Spatial Plant, the site is located within an **ecological support area** identified as a water recharge area. In this case the proposed site is located on a sandy plain sloping towards the Droë River to its northwest), but with developed vineyards adjacent and directly in the path of any surface drainage. Underground water recharge will not be significantly hampered by the proposed development; since the surface area is very small and will not be impregnable (underground water recharge will still be able from the site).
CONNECTIVITY	The location (adjacent to existing agricultural land) and relatively small size of the site will also not lead to a significant reduction in connectivity.
PROTECTED PLANT SPECIES	No Red list species was encountered (Heading 4.6.1), or species protected in terms of NEMBA (Heading 4.6.2), or species protected in terms of the NFA (Heading 4.6.3). A small number of the alien *Prosopis* trees and the shrub *Atriplex lindleyi* were observed and an alien eradication plan should be implemented to ensure the control of these species within the development footprint.
ANIMAL SPECIES THEME SENSITIVITY	According to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the Animal Species Theme Sensitivity is **high sensitive** because of the potential presence of two bird species (two invertebrate species (Refer to Table 5) and one sensitive species 13: They are: Aves – *Circus maurus* (Black Harrier): With regards to this species the sensitivity rating should be **low sensitive** (Refer to Table 7); Aves – *Neotis ludwigii* (Ludwig's Bustard): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 7);

Reptile – Sensitive species 13: With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 6);

Invertebrate – *Brinckiella mauerbergerorum* (The Sandveld Winter Katydid): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 5);

Invertebrate – *Brinckiella aptera* (The Mute Winter Katydid): With regards to this species the sensitivity rating should be **low sensitive**. (Refer to Table 5);

WATER COURSES AND WETLANDS

There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

TERRESTRIAL BIODIVERSITY THEME SENSITIVITY

According to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the Terrestrial Biodiversity Theme Sensitivity is **very high sensitive** because of it being located within a ESA 1 and within the Knersvlakte Centre of Endemism. The CBA is discussed under Heading 4.4 and Knersvlakte under Heading 4.5. The overall impact on terrestrial biodiversity is discussed under Heading 7. The proposed development site is not considered sensitive in terms of terrestrial biodiversity.

Because of the small scale of the development, the impact on the CBA, the Knersvlakte Centre of Endemism and Connectivity will be minimal. The vegetation is considered disturbed, and no protected or endangered fauna or flora was observed. In addition, the potential impact on fauna and avifauna is expected to be very low to insignificant. As a result, the overall impact on **Terrestrial Biodiversity Sensitivity should be Low sensitive** (Refer to Table 15).

MAIN CONCLUSION

The proposed development will result in the permanent transformation of <20ha of natural veld covered by a vegetation type considered least threatened. There are no special habitats within or near the proposed footprint that will be impacted by the development (even though it falls within the Knersvlakte Centre of Endemism). It is highly unlikely that the proposed development will have any significant impact on protected or endangered fauna or flora.

According to the impact assessment given in Table 15, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

WITH THE AVAILABLE INFORMATION IT IS RECOMMENDED THAT PROJECT BE APPROVED SINCE IT IS UNLIKELY TO RESULT IN A SIGNIFICANT TERRESTRIAL BIODIVERSITY IMPACT.

NO-GO OPTION

The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "*status quo*" on the site. On the other hand, the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production.

DETAILS OF THE AUTHOR

This is a specialist report compiled by Peet Botes from PB Consult.

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INDEPENDENCE & CONDITIONS

PB Consult is an independent entity with no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and the company have no interest in secondary or downstream development because of the authorization of this project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. The author reserves the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTR and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity en environmental legal compliance audits.

During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes NEMA EIA applications, environmental management plans for various industries, environmental compliance audits, environmental control work as well as more than 70 biodiversity & botanical specialist studies.

Towards the end of 2017, Mr Botes started his own small environmental consulting business focusing on biodiversity & botanical assessments, biodiversity management plans and environmental compliance audits.

Mr. Botes is a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005 (SACNASP no. 400184/05).

DECLARATION OF INDEPENDENCE

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

I Petrus, Jacobus, Johannes Botes, as the appointed independent specialist hereby declare that I:

- act/ed as the independent specialist in this application;
- regard the information contained in this report as it relates to my specialist input/study to be true and correct, and
- do not have and will not have any financial interest in the undertaking of the activity, other than remuneration for work performed in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014, as amended, and any specific environmental management Act;
- have and will not have no vested interest in the proposed activity proceeding;
- have disclosed, to the applicant, EAP and competent authority, any material information that have or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the NEMA, the Environmental Impact Assessment Regulations, 2014 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2014 (specifically in terms of regulation 13 of GN No. R. 326) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- have ensured that information containing all relevant facts in respect of the specialist input/study was distributed or made available to interested and affected parties and the public and that participation by interested and affected parties was facilitated in such a manner that all interested and affected parties were provided with a reasonable opportunity to participate and to provide comments on the specialist input/study;
- have ensured that the comments of all interested and affected parties on the specialist input/study were considered, recorded and submitted to the competent authority in respect of the application;
- have ensured that the names of all interested and affected parties that participated in terms of the specialist input/study were recorded in the register of interested and affected parties who participated in the public participation process;
- have provided the competent authority with access to all information at my disposal regarding the application, whether such information is favourable to the applicant or not; and
- am aware that a false declaration is an offence in terms of regulation 13 of GN No. R. 326.

Note: The terms of reference must be attached.

Signature of the specialist:

PB Consult (Sole Proprietor)

Name of company:

31 January 2023

Date:

COMPLIANCE WITH APPENDIX 6 OF GN. 982 (4 DECEMBER 2014)

Specialist reports

1. A specialist report prepared in terms of these regulations must contain -	
a) Details of –	**Refer to:**
(i) The specialist who prepared the report; and	Refer to Page iii, iv & Appendix 1
(ii) The expertise of the specialist to compile a specialist report including a curriculum vitae;	Refer to Page iii, iv & Appendix 1
b) A declaration that the specialist is independent in a form as may be specified by the competent authority;	Refer to Page iv
c) An indication of the scope of, and the purpose for which the report was prepared;	Refer to Heading 1.2
d) The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	Refer to Heading 3
e) A description of the methodology adopted in preparing the report or carrying out the specialist process inclusive of equipment and modeling used;	Refer to Heading 3
f) Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructures, inclusive of a site plan identifying site alternative;	Refer to Headings 7 & 8
g) An identification of any areas to be avoided, including buffers;	Refer to Heading 7, Figure 14
h) A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Refer to Heading 7, Figure 14
i) A description of any assumptions made and any uncertainties or gaps of knowledge;	Refer to Heading 3.1
j) A description of the findings and potential implications of such findings on the impact of the proposed activity, [including identified alternatives on the environment] or activities;	Refer to Heading 4, 5 & 7, Figure 14
k) Any mitigation measures for inclusion in the EMPr;	Heading 8.1
l) Any conditions for inclusion in the environmental authorization;	None
m) Any monitoring requirements for inclusion in the EMPr or environmental authorization;	Refer to Heading 8.1
n) A reasoned opinion -	
(i) [as to] whether the proposed activity, activities or portions thereof should be authorized;	Refer to the "*Executive Summary*" (Page i & ii)
(iA) regarding the acceptability of the proposed activity or activities; and	
(ii) if the opinion is that the proposed activity, activities or portions thereof should be authorized, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable the closure plan;	Refer to the "*Executive Summary*" (Page i & ii)
o) A description of any consultation process that was undertaken during the course of preparing the specialist report;	N/a
p) A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	N/a
q) Any information requested by the competent authority.	N/a
2. Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	

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ABBREVIATIONS

BAR	Basic Assessment Report
BGIS	Biodiversity Geographical Information System
CBA	Critical biodiversity area (in terms of the 2017 City of Cape Town Biodiversity Network)
DEA	Department of Environmental Affairs
EA	Environmental Authorization (Record of Decision)
EAP	Environmental assessment practitioner
ECO	Environmental Control Officer
EIA	Environmental impact assessment
EMP	Environmental Management Plan or Program
EMS	Environmental management system
EN	Endangered
ESA	Ecological support area (in terms of the 2017 City of Cape Town Biodiversity Network)
LT	Least Threatened
NSBA	National Spatial Biodiversity Assessment
NEMA	National Environmental Management Act, 1998 (Act no. 107 of 1998)
SANBI	South African National Biodiversity Institute
VU	Vulnerable

1. INTRODUCTION

Roma Energy Vanrhynsdorp is proposing the establishment of a 10 MW concentrated photovoltaic solar energy facility and an electrolysis hydrogen plant on portion 7 of the farm Duinen No 258, near Vanrhynsdorp, (Western Cape Province). The farm Duinen 258/7 is approximately 271.7 ha in size. The proposed PV Solar- and Hydrogen Plant will be located within a 20 ha portion of this farm (refer to Figure 2). The purpose of the proposed facility is to sell electricity to Eskom as part of the Renewable Energy Independent Power Producers Procurement Programme. This programme has been introduced by the Department of Energy to promote the development of renewable power generation facilities.

PB Consult had previously done two botanical/biodiversity assessments on the same property and basically for the same project. During 2012, PB Consult was appointed by EnviroAfrica to assessed and reported on the potential biodiversity impacts of this project on the proposed footprint (Refer to Botes, 2012) as part an environmental impact assessment application to the Department of Environmental Affairs. Environmental authorisation (EA) was granted but the EA expired before physical work on the site could commence. During 2017, PB Consult was again appointed to submit an updated report for the same project (Refer to Botes, 2017), but the solar plant had been reduced to a 5 MW plant to be located within the same 20 ha portion of land. This application was lawfully approved by the then National Department of Environmental Affairs for the development of the Vanrhynsdorp Solar Photovoltaic (PV) Facility (DEA Ref no. 14/12/16/3/3/1/1854) on the same 20 .

The applicant would now like to increase the Solar PV plant to a 10MW plant and also add a Hydrogen Plant within the same 20 ha portion of land. The DEA&DP advised that a substantive amendment application would have to be submitted and that all specialists reports needs to be updated (which could be in the form of a statement).

PB Consult was again appointed to submit an updated report that must consider the new project description and the latest legal requirements for specialist reports. Since the proposed site had been visited twice on previous occasions no further site visit was performed. To ensure that all requirements for specialist reports are met, the previous reports was re-written into this report, which replaces all previous reports.

Only one vegetation type is expected, namely Vanrhynsdorp Gannabosveld, a vegetation type that is still considered “Least Threatened” in terms of the revised National list of ecosystems that are threatened and in need of protection (2022). . The vegetation on site is described as an arid landscape supporting a *Salsola* dominated low open shrubland with a sparse vegetation cover. There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

1.1. LEGISLATION GOVERNING THIS REPORT

The proposed development will trigger listed activities under the National Environmental Management Act, (Act 107 of 1998) (NEMA) and the EIA regulations (as amended). EnviroAfrica was appointed as the Environmental Assessment Practitioners (EAP) to facilitate the NEMA EIA application. PB Consult was appointed to conduct a terrestrial biodiversity scan of the proposed footprint area and

its immediate surroundings.

This is a 'specialist report', compiled in terms of:

- The National Environmental Management Act, Act. 107 of 1998 (NEMA);
- Appendix 6 of the Environmental Impact Assessment Regulations, 2014 (as amended);
- The "Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes" in terms of Sections 24(5)(a) and (h) and 44 of the NEMA (Government Notice No. 320 of 20 March 2020).
- The National Environmental Management: Biodiversity Act, Act 10 of 2004, which allows for the conservation of endangered ecosystems and restriction of activities according to the status of the ecosystem;
- The National Forest Act, Act 84 of 1998, which provide a list of protected trees species in SA;

1.2. TERMS OF REFERENCE

The terms of reference for this appointment were to:

- Evaluate the proposed site(s) to determine whether any significant botanical or other terrestrial biodiversity features will be impacted as a result of the proposed development.
- Determine and record the position of any plant species of special significance (e.g., protected species, or rare or endangered species) that should be avoided or that may require "search & rescue" intervention.
- Locate and record sensitive areas from a terrestrial biodiversity perspective within the proposed development footprint that may be interpreted as obstacles to the proposed development.
- Make recommendations on impact minimization should it be required
- Consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

2. STUDY AREA

2.1. LOCATION & LAYOUT

Vanrhynsdorp falls within the Matzikama Local Municipality of the Western Cape Province, and is located just off the N7, just north of Klawer. Portion 7 of the Farm Duinen no. 258 is located about 2 km north of the Vanrhynsdorp urban edge and about 1.3 km west-northwest of Maskamsig (refer to Figure 1 & Figure 2). The farm itself is about 271, 7 , located to the east of the N7. The proposed solar and hydrogen plant will be located within a 20 ha portion of the larger farm (the same 20 ha area already lawfully approved for the establishment of a 5 MW solar plant).

Figure 2, shows the location of the farm (in green) and the proposed development footprint (red) in relation to Vanrhynsdorp and Maskamsig, existing agriculture and the nearest water courses.

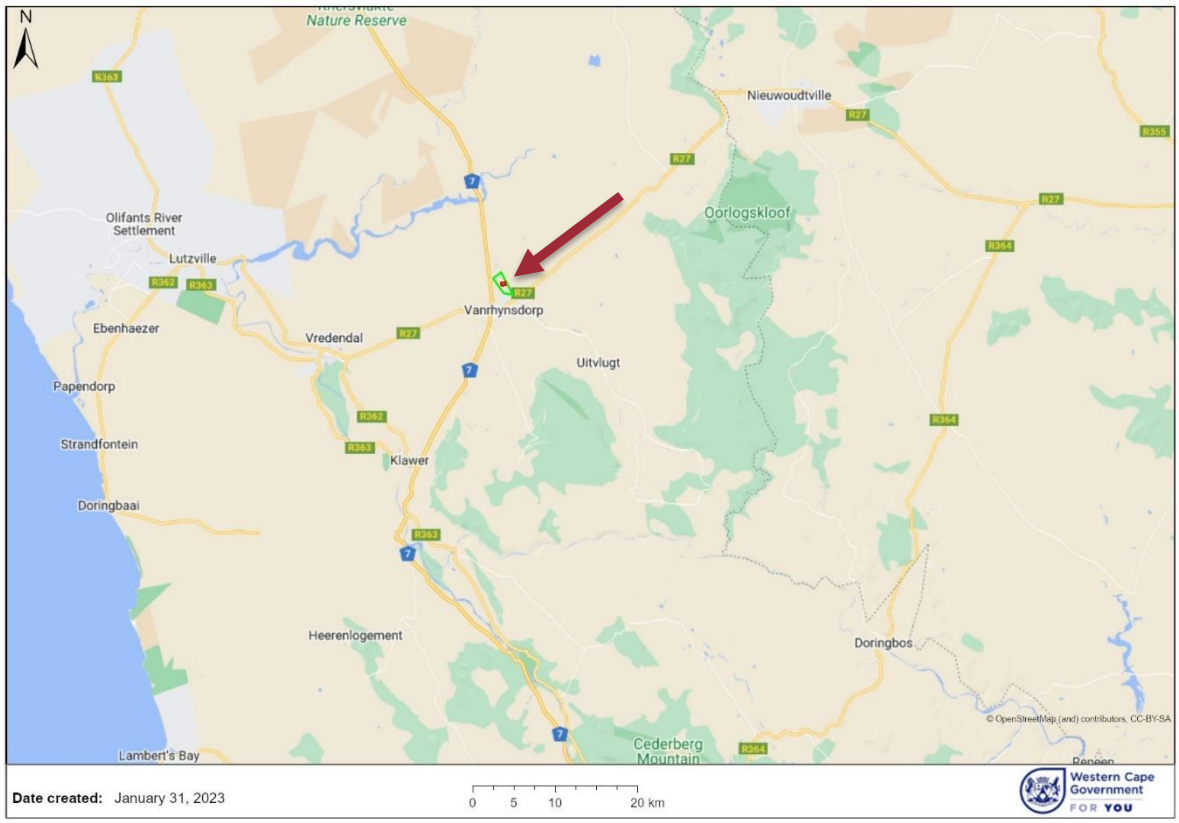


Figure 1: A map showing the location of the farm (Green) and the proposed development site (red) in the Western Cape

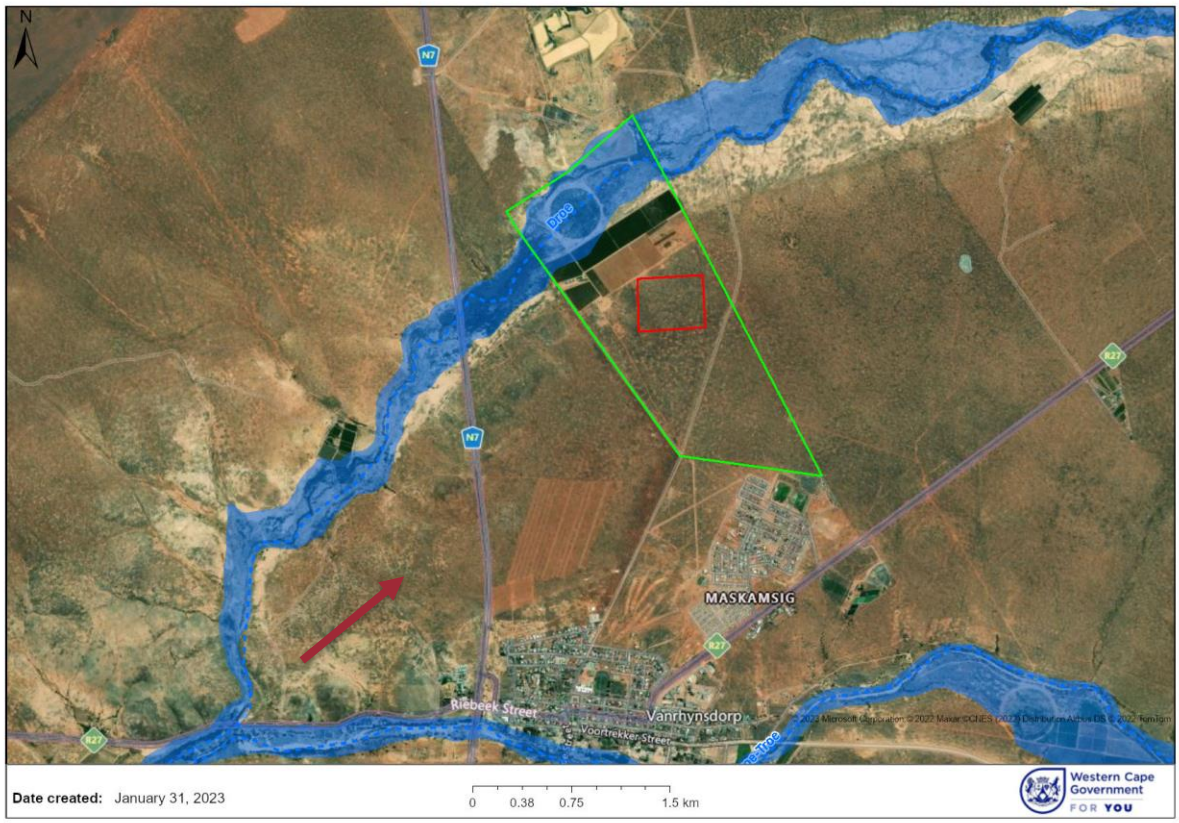


Figure 2: The location of the farm (green) and the proposed footprint (red) in relation to Vanrhynsdorp and Maskamsig

Table 1: GPS coordinates for the boundaries of the proposed solar & hydrogen plant location (WGS 84 format)

DESCRIPTION	LATITUDE AND LONGITUDE
North-west corner	S31° 34' 44.0" E18° 44' 32.0"
North-east corner	S31° 34' 43.6" E18° 44' 43.2"
South-east corner	S31° 34' 57.1" E18° 44' 44.3"
South-west corner	S31° 34' 57.0" E18° 44' 32.4"

2.2. ACTIVITY DESCRIPTION

Roma Energy Vanrhynsdorp proposes the establishment of a 10 MW concentrated photovoltaic solar energy facility and an electrolysis hydrogen plant on portion 7 of the farm Duinen No 258, near Vanrhynsdorp, (Western Cape Province). The facility will be established within an area of less than 20 ha on the Farm (Figure 1).

The proposed facility will utilise Concentrated Photovoltaic (CPV) technology, which aims to concentrate the light from the sun, using Fresnel lenses, onto individual PV cells. This method increases the efficiency of the PV panels as compared to conventional PV technology. An inverter is then used to convert the direct current electricity produced into alternating current for connection into the Eskom grid. A single solar generator produces approximately 66kV. In order to produce 10 MW, the proposed facility will require a number of generators arranged in multiples/arrays. The CPV panels will be elevated by a support structure, and will be able to track the path of the sun during the day for maximum efficiency. Approximately 1.8 ha is required per installed MW. A 10 MW capacity facility will thus require a development footprint of approximately 20 ha (including associated infrastructure – ancillary infrastructure).

The typical footprint of a 5MW electrolysis hydrogen plant is aproximately 120 m x 60 m.

The site can be accessed from Vanrhynsdorp, taking the Maskamsig road north onto the existing secondary road leading north towards the Farm De Duinen (Figure 3). Site preparation will include clearance of vegetation within the footprint to support the following infrastructure:

- Support structures (approximately 148 units are proposed) (excavations of 1 m^2 by 5 m deep)
- Switchgear
- Inverters
- Workshops
- Trenches for the underground cabling
- The hydrogen plant with a footprint of approximately 120 m x 60 m.

The activities will require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site.

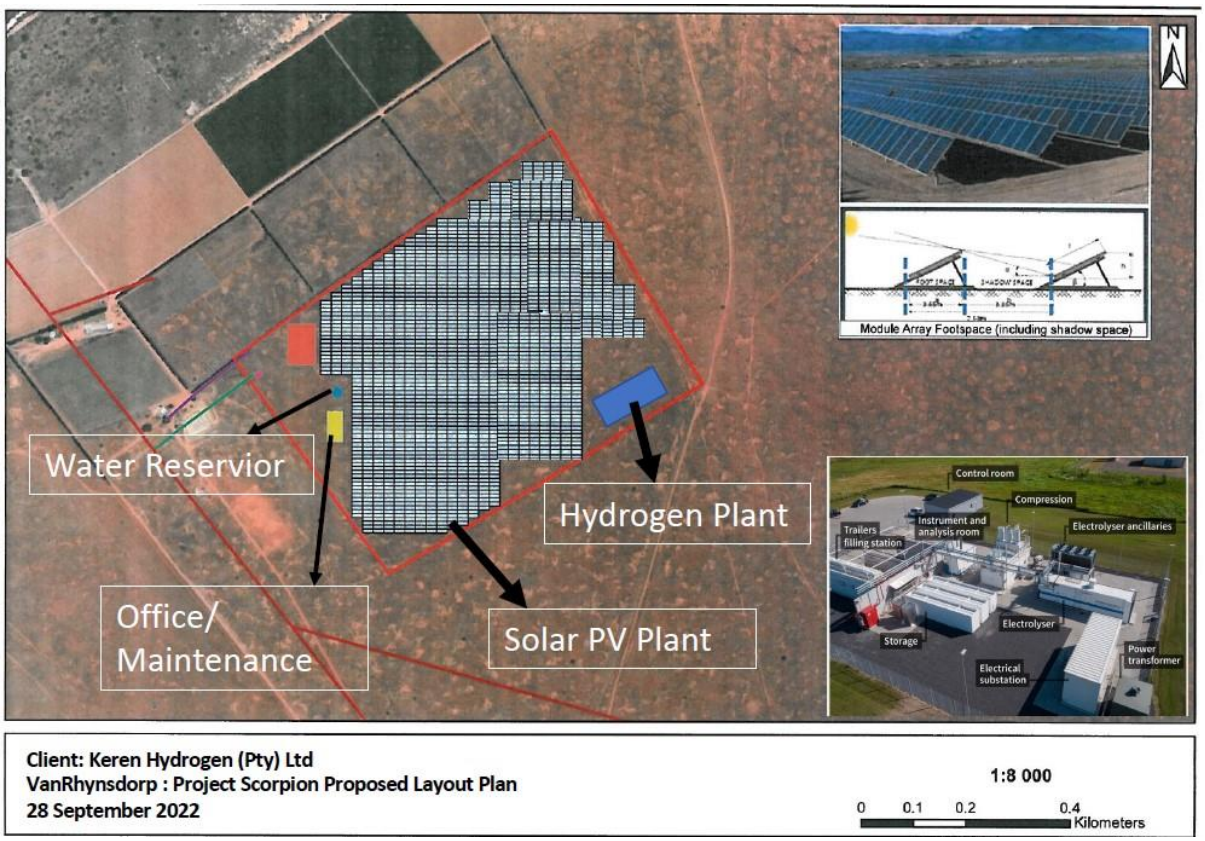


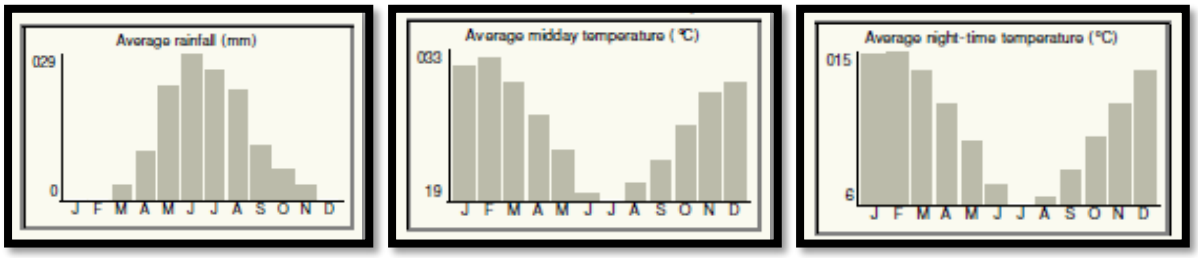
Figure 3: A schematic layout (as an example) of the proposed development footprint

2.3. CLIMATE

The Succulent Karoo Biome is primarily determined by the presence of low winter rainfall and extreme summer aridity. Rainfall varies between 20 and 290 mm per year. The rains are cyclonic and not in the form of thunderstorms, which means that its erosive power is far less than what is experienced in the summer rainfall biomes and the rain itself is more penetrative. During summer, temperatures in excess of 40°C are common. Fog is common nearer the coast. Frost is infrequent. Desiccating, hot, Berg Winds may occur throughout the year. However, the main feature of this climate is the predictability of its rainy season (Van Wyk & Smith, 2001 and Mucina *et al*, 2006).

All regions with a rainfall of less than 400 mm per year are regarded as arid. Vanrhynsdorp normally receives about 133 mm of rain per year and because it receives most of its rainfall during winter it has a Mediterranean climate. It receives the lowest rainfall (0 mm) in January and February and the highest (29 mm) in June. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Vanrhynsdorp range from 19.3°C in July to 32.3°C in February. The region is the coldest during July when the temperature drops to 5.9°C on average during the night (www.saexplorer.co.za).

Figure 4: A summary of climate data as given by saexplorer



2.4. TOPOGRAPHY

The landscape is mainly flat, or only slightly undulating, supporting succulent shrubland dominated by *Salsola* species (ganna), including representatives of the genera *Galenia*, *Psilocaulon*, *Caulipsolon* and *Mesembryanthemum*. The footprint of the proposed solar site is almost flat, but with a slight slope towards the Droë River (Figure 5). Elevation varies from 138 m at the south-east corner (the higher point) to approximately 129 m at the north-western corner of the site (lowest point) with an average slope of 1.5% and an elevation loss of about 9 m.

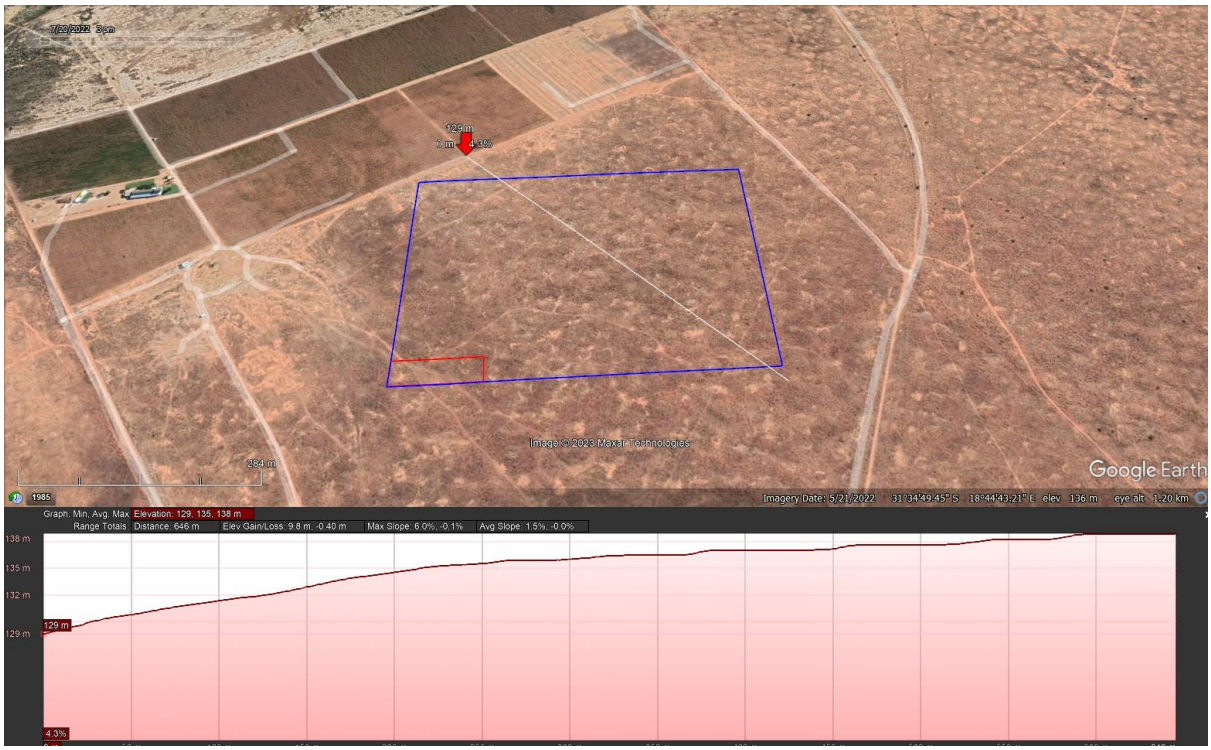


Figure 5: Google image, showing the topography of the site as it site slopes from east to west (towards the Droë River).

There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

It is highly unlikely that topography will have a significant impact on plant or animal communities within this relatively small and level site.

2.5. GEOLOGY AND SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the greater part of this area is underlain by schist's, phyllite and sandstones of the Gariep Supergroup, which outcrop when they are not covered by recent superficial deposits of alluvium and duripan crusts (calcrete). Soils are described as soils with minimal development usually shallow on hard weathered rock, with intermitted diverse soils (lime generally present in part or most of the landscape). Soils are generally sandy-loamy, slightly acid to alkaline, with high skeletal content. More than half of the area is classified as Ag land type, followed by Fc land type, with Db and Ae land types only of minor importance. This correlates with the Geology map of South Africa (Figure 6) which described the Lithology of the site as "Alluvium, colluvium, eluvium, boulder gravel, gravel, scree, sand, soil, debris" (Council for Geoscience Interactive Web Portal - https://maps.geoscience.org.za/) (Figure 6).

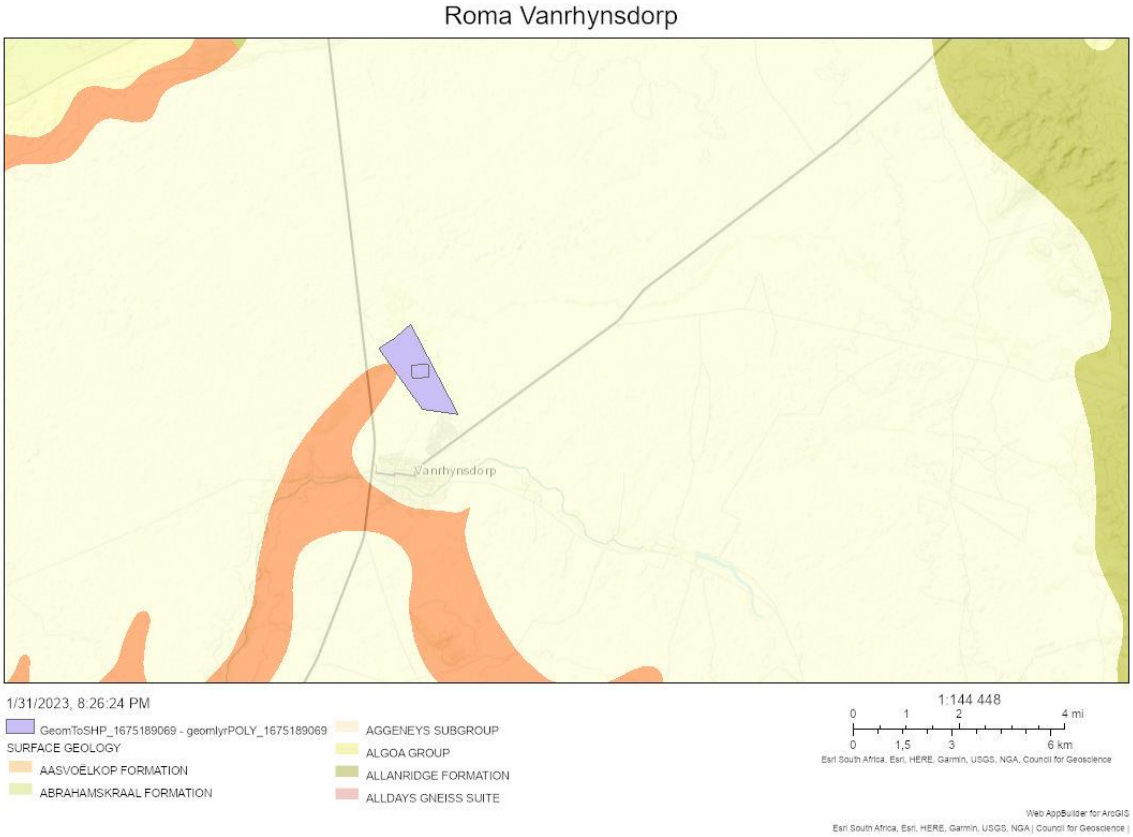


Figure 6: Geology of South Africa showing the site location (Council for Geoscience Interactive Web Portal)

2.6. LANDUSE AND COVER

The study area is located on an almost level area in a slightly undulating landscape, just north of Vanrhynsdorp and south-east of the Droë River. The property is zoned as agriculture and used for stock grazing. Smaller game species is still expected in the larger area (refer to).

Vanrhynsdorp is situated at the outskirts of the immense, semi-desert Nama-Karoo with its vegetation of succulents and semi-arid climate. It has a prominent tourism sector and socio-economic

development is supported by this industry. Due to the availability of land, it has been reported that industrial land near Vanrhynsdorp is intended for power generation, manufacturing, industrial plants, distribution hubs, or major infrastructural facilities. Such developments require sizeable capital investment and often generate consequential economic growth in terms of labour and peripheral industries. The proposed site is geographically close to Vanrhynsdorp. The main land use of the study area is grazing, with power transmission lines running to the south and west of the proposed site. Natural vegetation can be described as an open sparse shrub layer, dominated by *Salsola* over a shorter grassy/shrub layer. Occasional individuals of the invasive alien tree, *Prosopis,* were encountered. The site is adjacent to an area which is intensively cultivated but will not impact on the existing agricultural footprint (Refer to Figure 2 - Figure 5).

3. APPROACH & METHODOLOGY

Various a desktop studies of the proposed footprint and its immediate surroundings was conducted over the years (since 2012). Spatial information from online databases such as CapeFarmMapper, SANBI BGIS and Google Earth were used to evaluate the site in terms of vegetation, critical biodiversity areas and other potential significant features that might be encountered (e.g., variations in soil type, rocky outcrops etc.) and obvious differences in landscape or vegetation densities, which might indicate differences in plant community or species composition. This information is used to prepare a study area map, which is used as a reference during the physical site visit.

Plant species lists (of the expected plant species for this vegetation type) are prepared and species of special significance are flagged (used as reference during the site visit). The desktop study led to the following conclusions:

- It is almost certain that the proposed footprint still supports indigenous vegetation;
- The vegetation type is expected to be Vanrhynsdorp Gannabosveld, which is considered “Least Threatened” in terms of the revises National list of threatened terrestrial ecosystems (2022);
- According to CapeFarmMapper the proposed footprint does not overlap Critical Biodiversity Area’s, but is considered an Ecological Support Area (Refer to Figure 9);

Two formal site visits were performed, one during 2012 (27/02/2012) and one during 2017 (02/06/2017), but the site was also visited on various other occasions over the recent years. The site assessment surveys were conducted by walking the site and sampling the vegetation, using a modified approach, based on the Braun-Blanquet vegetation survey method (Werger, 1974). During the site visit areas or plants of specific significance was, marked, and photographed (Figure 7). A hand-held Garmin GPSMAP 62s was used to track the sampling route and for recording waypoints of locations of specific importance. During the survey notes, and photographic records were collected. The author endeavoured to identify and locate all significant botanical features, including special plant species and or specific soil conditions which might indicate special botanical features (e.g., rocky outcrops or heuweltjies) and watercourses.

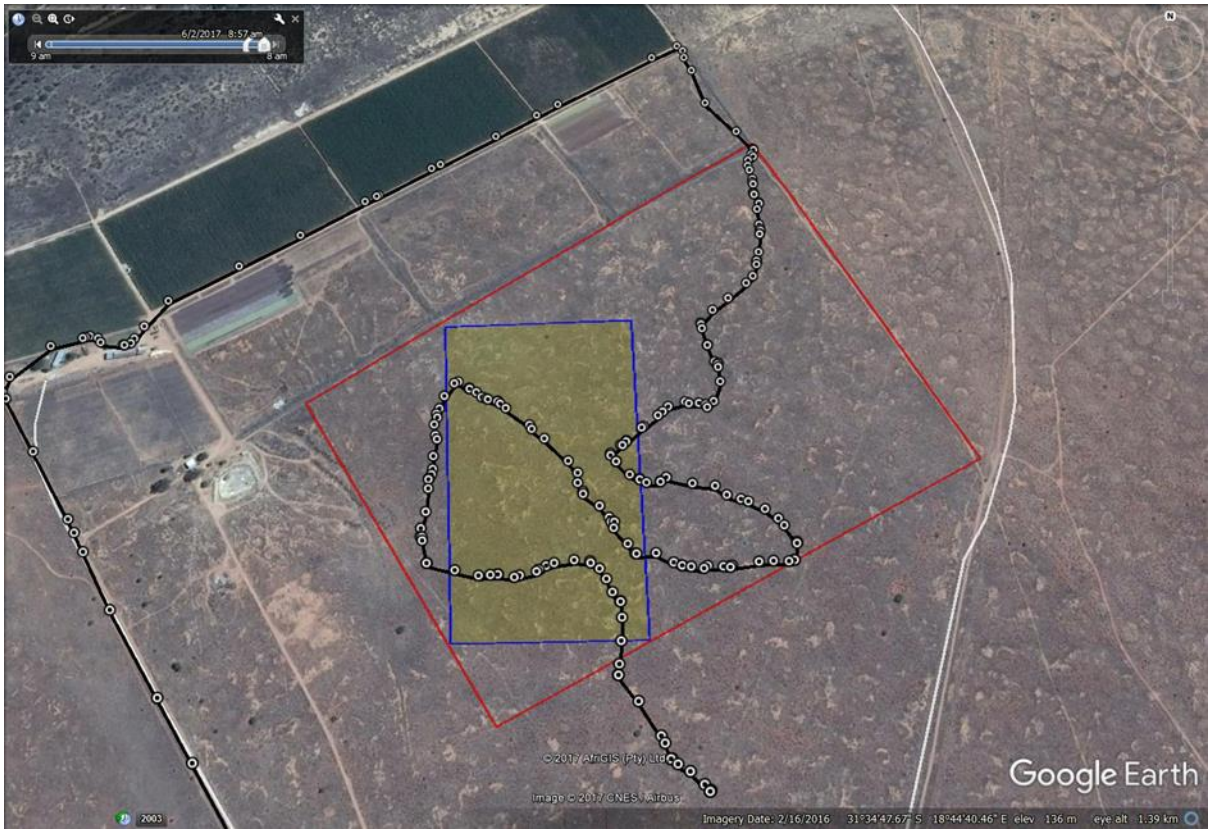


Figure 7: Google overview, showing the footprint area (red) and the routes walked (black) during the site visit.

3.1. ASSUMPTIONS AND UNCERTAINTIES

Botanical assessments were based on two one-day site assessments (one during January 2012, and one during June 2017). At the time of the second site visit the veld still showed the aftereffects of a severe drought period (although recent rains had fallen over the area). Because of the long term drought very few annual plants were visible, and some plants were difficult to identify to species level (no flowers and sometimes even no leaves). However, the author is confident that a good understanding of the biodiversity status of the site was still possible, because of the previous site visit and other work done in the vicinity of the site. The Vanrhynsdorp Gannabosveld is part of the Succulent Karoo Biome (Mucina & Rutherford, 2006) and is strongly influenced by winter rainfall and fog.

The timing of the site visit was relatively good, in that recent rains had already fallen, but they were still struggling to alleviate the effects of the severe long term drought period. Fortunately, most of the perennial plant species were identifiable and together with the previous studies in the same site, a good understanding of the status of the vegetation and plant species in the study areas was obtained, although there is always the possibility that a few plant species might have been missed (some of which may only flower for short periods of time or after rains).

However, there should be no limiting factors which could significantly alter the outcome of this study (keeping in mind that this assessment is not based on long term repetitive sampling).

4. THE VEGETATION & FLORA

According to the 2018 update of the Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely Vanrhynsdorp Gannabosveld (Figure 8). Acocks (1953) described this vegetation as Succulent Karoo while Low & Rebelo (1996) described this vegetation as Lowland Succulent Karoo. Photo 1 & 2 gives an indication of the vegetation encountered during the site visit.

The site visit confirmed that only Vanrhynsdorp Gannabosveld is present in the larger study area. This vegetation type occurs in the Western Cape Province: Namaqualand, southern Knersvlakte between Vredendal and Vanrhynsdorp at the foot of the Matsikamma and Gifberg Mountains as well as northeast of Vanrhynsdorp. About half of the area lies at altitudes between 100–200 m and most of the rest at altitudes of between 200–300 m. It occurs mainly on flat or only slightly undulating landscapes supporting succulent shrubland dominated by *Salsola* (over large stretches), *Drosanthemum, Ruschia* and some disturbance indicators such as (mainly) short-lived Aizoaceae, including representatives of the genera *Galenia, Psilocaulon, Caulipsolon* and *Mesembryanthemum*. In the south, the shale plains can acquire a grassland appearance through seasonal dominance of *Bromus pectinatus* and *Stipa capensis*. Spectacular annual and geophyte flora can appear in spring after good winter rains.

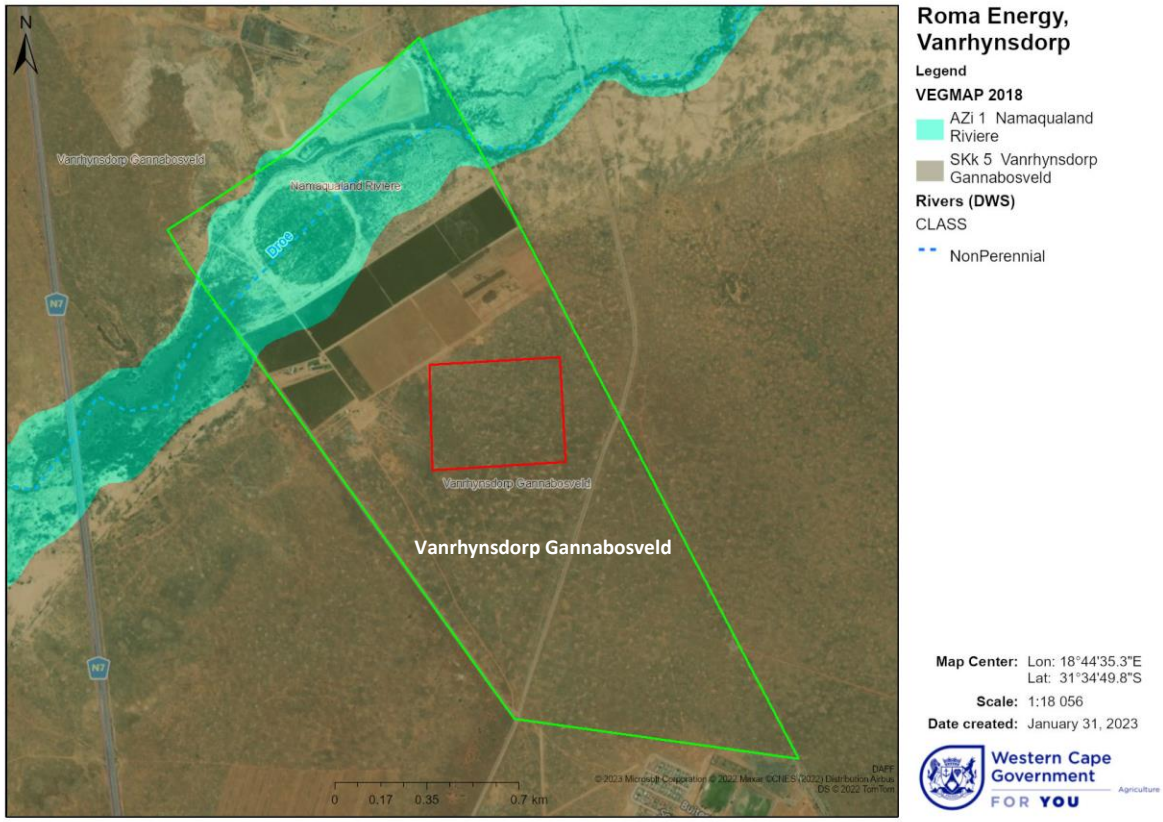


Figure 8: Vegetation map of South Africa (2018), showing the expected vegetation in the vicinity of the footprint.

According to the 2004 National Spatial Biodiversity Assessment (NSBA), approximately 79% of the Vanrhynsdorp Gannabosveld vegetation remains, with the main reasons for the transformation of the remainder being cultivation and open-cast gypsum mining. A conservation target of 28% has been set

for this vegetation type (none of which was formally conserved during 2004), but with the recent proclamation of the Knersvlakte Nature Reserve, at least some of this vegetation type should now be formally conserved. The 2004 NSBA originally classified this vegetation type as vulnerable. However, with more information now available, it was declassified to "least threatened" in the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011).

During 2022 the "*Revised List of ecosystems that are threatened and in need of protection*" (GN 47526 of 18 November 2022), was promulgated in terms of the National Environmental Management Biodiversity Act, Act 10 of 2004. Vanrhynsdorp Gannabosveld vegetation remains classified as "**Least Threatened**" in terms of this updated classification.

4.1. ECOLOGICAL DRIVERS AND THE VEGETATION IN CONTEXT

Vanrhynsdorp Gannabosveld is part of the Succulent Karoo Biome (Mucina & Rutherford, 2006). The Succulent Biome vegetation is strongly influenced by winter rainfall and fog and has been compared to a desert rich in succulents. It is located at altitudes mostly below 800 m, but in the east, it may reach 1 500 m. A variety of geological units occur in the region. There is little difference between the soils of the Succulent Karoo and Nama Karoo Biomes - both are lime-rich, weakly developed soils on rock.

The vegetation is dominated by dwarf, succulent shrubs, of which the Vygies (Mesembryanthemaceae) and Stonecrops (Crassulaceae) are particularly prominent. Mass flowering displays of annuals (mainly Daisies, Asteraceae) occur in spring, often on degraded or fallow lands. Grasses are rare, except in some sandy areas, and are of the C3 type. The number of plant species (mostly succulents) is very high and unparalleled elsewhere in the world for an arid area of this size (Mucina et al, 2006). The unique plant species diversity is thought to be maintained and even thrive because of the reliable rainy season, with prolonged droughts almost non-existent. This climatic predictability is considered one of the main reasons for the remarkably rapid diversification of at least one of the key plant families, namely the Aizoaceae. One viewpoint is that succulents (with their limited water storage capacity and shallow root system) are highly successful in the Namaqualand, because of its predictable rainfall patterns and because extensive droughts periods are almost non-existent, since succulents are also highly sensitive to periodic drought (Mucina et al, 2006).

The Karoo used to support millions of antelope, mainly springbuck, but also numerous other larger antelope. These animals roamed the vast plains of the Karoo, utilizing different selections of plants and allowing for long "rest" periods as they move around, and as a result preventing overgrazing (Shearing, 1994). The Succulent Karoo has little agricultural potential due to the lack of water. The scarcity of grasses limits grazing, and the low carrying capacity requires extensive supplementary feeds.

In semi-arid environments such as the Succulent Karoo, nutrients are generally located near the soil surface, making it vulnerable to sheet erosion and it is generally accepted that much of the topsoil has already been lost, through sheet erosion, because of nearly 200 years of grazing. It is important to note that less than 0.5% of the Succulent Karoo Biome is formally conserved. The high species richness, high number of rare and Red Data Book species and unique global status of the biome require urgent conservation attention (Mucina *et. al*., 2006). Tourism, is a major industry with the coastal scenery and the spring mass flower displays the main attractions, while mining, although to a lesser degree is also important, especially in the north (Mucina *et al*, 2006).

4.2. VEGETATION ENCOUNTERED

The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell (Refer to Photo 1 & Photo 2), so much so that most of the Mesembryanthemaceae and even the *Euphorbia* plants had died back. Recent rains brought some relieve with few plants starting to bud and grasses growing in the open areas.

The impact of the drought made positive identification of some species difficult (no flowers and plants without leaves). Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed.

Photo 1: Typical low open shrubland encountered on site, dominated by *Salsola zeyheri* and lower grasses (grazed). Note the Prosopis trees in the far background.

At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species, most notably *Drosanthemum* cf. *hispidum, Mesembryanthemum* cf. *noctiflorum* (=*Aridaria* species) and *Mesembryanthemum junceum* (=Psilocaulon) . The following species were also encountered scattered throughout the site: *Aloe claviflora* (occasionally), *Asparagus* cf. *capensis, Euphorbia mauritania*, *Galenia africana, Mesembryanthemum barkly, M. guerichianum* and *Pteronia* species (no flowers and only dried out remains of the leaves). Grasses were showing in the open areas. The most noteworthy being *Bromus pectinatus*, the spiny *Cladoraphis spinosa* and *Stipa capensis*.

Several alien *Prosopis* trees and some *Atriplex* cf. *lindleyi* (Klappiesbrak) were also observed.

Photo 2: A grassy bottom layer sometimes dominates open patches between the shrubs (probably the result of grazing pressure and the recent rains).

Species like *Galenia africana*, many of the Aizoaceae and *Atriplex* cf. *lindleyi* are normally pioneer species and often disturbance indicators. Together with the observations of *Bromus pectinatus* and *Stipa capensis* it is very likely that the veld has been subjected to grazing (over grazing) over a long period of time by domestic stock (which is more specialized in their grazing habits and tends to have a more severe impact on the veld).

Photo 3: Looking from southeast to northwest over the site, standing in the middle of the site. Note the agricultural area in the background.

Photo 4: Looking from northwest to southeast from the middle of the site. Note the existing power lines running along the entrance road to the site.

4.3. FLORA ENCOUNTERED

Table 2 gives a list of the plant species encountered during this study. Plant species diversity was lower than expected, most likely a combination of long term grazing practices together with the ongoing severe drought experienced in the northern parts of the country. The drought had left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell (many of them only showing dried out remains). No red-listed or protected plant species were observed.

Table 2: List of plant species encountered within or near the proposed footprint.

NO.	SPECIES NAME	FAMILY	STATUS	LOCATION
1.	*Aloe claviflora*	ASPHODELACEAE	LC	Circle forming patches of Aloe, occasionally observed.
2.	*Asparagus* cf. *capensis*	ASPARAGACEAE	LC	Occasionally in between some thicker shrubs.
3.	*Atriplex* cf. *lindleyi*	AMARANTHACEAE	**CARA, Cat 3 invader, NEMBA, Cat. 1b invader**	Scattered throughout
4.	*Bromus pectinatus*	POACEAE	LC	Within the open patches.
5.	*Cladoraphis spinosa*	POACEAE	LC	Occasionally within open patches.
6.	*Drosanthemum* cf. *hispidum*	AIZOACEAE	LC	Relatively common, but in poor condition.
7.	*Euphorbia mauritanica*	EUPHORBIACEAE	LC	Larger shrub occasionally observed.
8.	*Galenia africana*	AIZOACEAE	LC (disturbance indicator)	Common throughout, especially the disturbed open areas.
9.	*Mesembryanthemum barkly*	AIZOACEAE	LC (disturbance indicator)	Mostly in disturbed open areas.
10.	*Mesembryanthemum* cf. *noctiflorum* (= *Aridaria* species).	AIZOACEAE	LC	Relatively common within the larger site.
11.	*Mesembryanthemum guerichianum*	AIZOACEAE	LC (disturbance indicator)	Mostly in disturbed open areas.
12.	*Mesembryanthemum junceum*	AIZOACEAE	LC (disturbance indicator)	Occasionally observed throughout, but usually affected by the drought.
13.	*Prosopis* species	FABACEAE	**CARA, Cat 2 invader, NEMBA, Cat. 1b invader**	A few individuals scattered over the site.
14.	*Pteronia* species (no flowers and only occasionally with leaves).	ASTERACEAE	LC	Occasionally observed throughout the ite.
15.	*Salsola zeyheri*	AMARANTHACEAE	LC	A dwarf semi-succulent shrub dominating the study area
16.	*Stipa capensis*	POACEAE	LC	In open areas between shrubs.

4.4. CRITICAL BIODIVERSITY AREAS MAPS

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans. The CBA's underneath is based on the

definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.
- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

From a land-use planning perspective it is useful to think of the difference between CBA's and ESA's in terms of where in the landscape the biodiversity impact of any land-use activity action is most significant:

- For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat).
- For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity).

4.4.1. CBA'S ENCOUNTERED

Vanrhynsdorp and the proposed site location fall within the Western Cape Biodiversity Spatial Plan (WCBSP). The WCBSP aims at the most efficient selection of planning units required to meet all biodiversity, ecological sustainability, and climate resilience targets, while favouring persistence and avoiding areas of competing land-uses.

According to the WCBSP (Refer to Figure 9) the proposed site overlaps an area identified as an ecological support area (ESA 1), identified as a water recharge area. The larger area is not essential for meeting biodiversity targets but can play an important role in supporting the functioning of protected areas or critical biodiversity area.

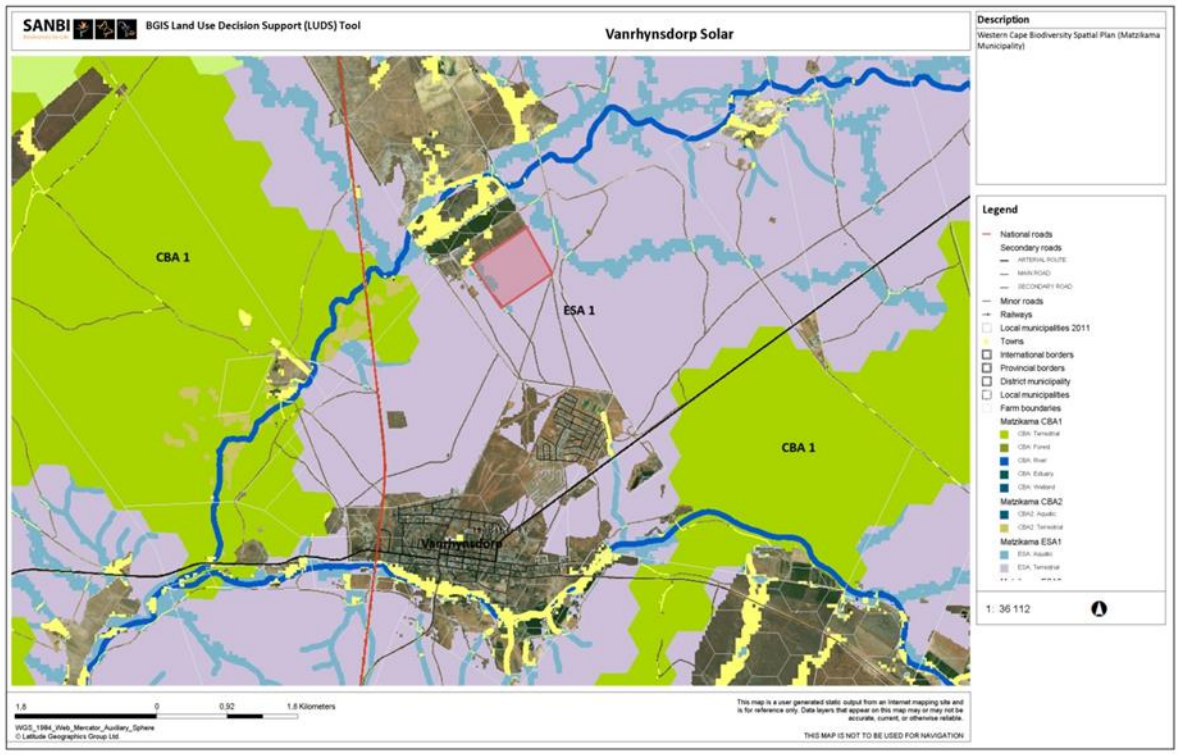


Figure 9: The Western Cape Biodiversity spatial plan showing the location of the proposed development footprint (Red)

4.5. KNERSVLAKTE CENTRE OF ENDEMISM

The Knersvlakte is known for its characteristic white quartzite gravel that can conceal a myriad of succulent species (many of them rare dwarf plants). Of the 1 500 plant species in the Knersvlakte, about 190 species are endemic to the region, while approximately 155 of are threatened with extinction, as they succumb easily to climatic conditions and changes (www.capenature.co.za/knersvlakte-nature-reserve-proclaimed-vital-biodiversity-hotspot). The Knersvlakte Centre (KVC) of endemism is named after the Knersvlakte north of Vanrhynsdorp.

There are various explanations for origin of its name. One of the common views is that it originates from the crunching noise made by the wagon wheels of old when driving over the extensive fields of hard quartz pebbles commonly found in the area north of Vanrhynsdorp. The KVC is demarcated by Van Wyk & Smith (2001) as the extensive plain bounded in the south by the Olifants River, in the east by the Bokkeveld Escarpment and in the west by the Sandveld and granite hills of the Spektakel and Little Namaqualand Suite (the Hardeveld), and in the north by the Namaqualand Rocky Hills (near Bitterfontein). It is encountered on an area of mostly level plains and rolling, generally low relief hills.

Topographically it is one of the most featureless of all the centres of endemism's in South Africa. The climate is mild, with light frost in winter. Offshore bergwind conditions can result in high temperatures and very arid conditions, even in winter. Rainfall occurs mainly in winter, while the prevailing onshore winds from the Atlantic Ocean produce occasional fog (providing additional precipitation for the plants). The geology is complex, but the KVC corresponds roughly with the various litho-stratigraphic units of the Vanrhynsdorp Group.

Soils are usually clayey, alkaline and saline in places and can play an important role in the distribution

of plant species. The extensive fields of small white quartz pebbles encountered to the north of Vanrhynsdorp is one of the most conspicuous features of this landscape. The vegetation is typically low and dominated by succulents, with grasses more prominent in sandy areas. Trees are almost absent and are only encountered along watercourses and its tributaries. Pebble strewn areas can appear almost without vegetation, but, they support a multitude of almost subterranean dwarf succulents. The KVC is especially rich in dwarf succulents, most of which is associated with the quartz pebble fields and rocky areas, while the sandy plains have a less specialised flora (Van Wyk en Smith, 2001).

The KVC is considered the **centre of diversity of the quartz-field flora of Southern Africa** and is clearly linked to the other centres of high endemism in the Succulent Karoo region, notably the Gariep Centre and to a lesser degree the Little Karoo. The flora of the KVC is threatened mainly by selective overgrazing and trampling by sheep, especially during periods of drought.

According to Van Wyk & Smith (2001) Vanrhynsdorp, and its immediate surroundings, falls within the Knersvlakte Centre of Endemism, meaning that the proposed development will also fall within larger demarcation of the KVC. However, the proposed development is located on the sandy soils to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

4.6. THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of threats like, habitat loss (e.g. infrastructure development, urban expansion, crop cultivation and mines), invasive alien plant infestation (e.g. outcompeting indigenous plant species), habitat degradation (e.g. overgrazing, inappropriate fire management etc.), unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Northern Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).

4.6.1. RED LIST OF SOUTH AFRICAN PLANT SPECIES

The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015). Categories marked with [N] are non-IUCN, national Red List categories for species not in danger of extinction, but considered of conservation concern (Refer to **Error! R eference source not found.**). The IUCN equivalent of these categories is Least Concern (LC) (SANBI, 2015).

Table 3: Definitions of the South African national red list categories (SANBI, 2015)

Extinct (EX): A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
Extinct in the Wild (EW): A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
Regionally Extinct (RE): A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
Critically Endangered, Possibly Extinct (CR PE): Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
Critically Endangered (CR): A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Endangered (EN): A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
Vulnerable (VU): A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
Near Threatened (NT): A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
[N]Critically" Rare A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
[N]Rare: A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows: ➢ Restricted range: Extent of Occurrence (EOO) <500 km2, OR ➢ Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km2, OR ➢ Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR ➢ Small global population: Less than 10 000 mature individuals.
[N]Declining: A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
Least Concern (LC): A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
Data Deficient - Insufficient Information (DDD): A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
Data Deficient - Taxonomically Problematic (DDT): A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
Not Evaluated (NE): A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

Red listed plant species associated with this veld type

According to the Red List of South African Plants (version 2017.1., www.redlist.sanbi.org, accessed on 2017/06/30) several listed plant species is associated with Vanrhynsdorp Gannabosveld namely:

- *Agathosma elata* Sond. EN
- *Aspalathus cuspidata* R.Dahlgren VU
- *Aspalathus obtusata* Thunb. VU
- *Babiana salteri* G.J.Lewis VU
- *Babiana toximontana* J.C.Manning & Goldblatt EN
- *Bulbine melanovaginata* G.Will. VU
- *Cephalophyllum pulchrum* L.Bolus VU
- *Eriospermum attenuatum* P.L.Perry DDD
- *Eriospermum eriophorum* P.L.Perry CR
- *Eriospermum spirale* Schult. VU
- *Euphorbia fasciculata* Thunb. VU
- *Euphorbia pedemontana* L.C.Leach VU
- *Euphorbia schoenlandii* Pax VU
- *Haemanthus lanceifolius* Jacq. VU
- *Heliophila leptophylla* Schltr. VU
- *Lachenalia minima* W.F.Barker VU
- *Moraea quartzicola* Goldblatt & J.C.Manning VU
- *Ornithogalum hallii* Oberm. EN
- *Oxalis blastorrhiza* T.M.Salter EN
- *Oxalis dines* Ornduff VU
- *Phyllobolus tenuiflorus* (Jacq.) Gerbaulet VU
- *Quaqua pulchra* (Bruyns) Plowes EN
- *Romulea multisulcata* M.P.de Vos VU
- *Steirodiscus linearilobus* DC. CR
- *Tylecodon suffultus* Bruyns ex Toelken Critically Rare

No red list plant species was encountered on the proposed site.

4.6.2. NEM:BA PROTECTED PLANT SPECIES

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007).

- No species protected in terms of NEM: BA was observed.

4.6.3. NFA PROTECTED SPECIES

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species their List of Protected tree species, updated on a yearly basis.

- No species protected in terms of NFA (as updated) was encountered.

4.7. INVASIVE ALIEN PLANTS

Alien and invasive plant (AIP) species were introduced into South Africa more than 1 000 years ago *via* trading routes from other countries in southern Africa (Alberts & Moolman, 2013). Since the arrival of settlers from Europe these numbers have increased dramatically. At present, AIPs are encountered on large portions of land in South Africa (10 million hectares) and it is reportedly consuming nearly 330 million cubic meters of water annually, or 7% of the annual run-off. But what is scary is that this water consumption levels are increasing rapidly and could reach 50% of the mean annual run-off in the not too distant future (Alberts & Moolman, 2013). The aggressive behaviour of the AIPs in their unnatural habitat is a direct threat to the vast wealth of biodiversity in South Africa. South Africa is a relatively small country that comprises only 2% of the total surface of the Earth, but it contains 10% of the plant species, 7% of the vertebrates, and is home to a number of biodiversity hotspots.

In South Africa, alien plant species is regulated by two regulations promulgated in terms of CARA and NEM:BA, namely:

- The list of weeds and invader plants declared in terms of Regulations 15 and 16 (as Amended, March 2001) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) administered by the Department of Agriculture, Forestry and Fisheries (DAFF);
- Alien and invasive species list 2016 (GN R. 864 of 29 July 2016) promulgated in terms of sections 66(1), 67(1), 70(1)(a), 71(3) and 71A of the National Environmental Management, Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), administered by the Department of Environmental Affairs (DEA).

4.7.1. CONSERVATION OF AGRICULTURAL RESOURCES ACT

The **CARA** sets out the regulations (amended March 2001) regarding the control of weeds and invasive plants and provides a list of declared plants. The amended regulations make provision for four groups of invader plants. The first three groups consist of undesirable alien plants and are covered by Regulation 15, namely:

- **Category 1** declared weeds (Section 15A of the amended act) are prohibited plants that will no longer be tolerated on land or on water surfaces, neither in rural or urban areas. These plants may no longer be planted or propagated, and all trade in their seeds, cuttings or other propagative material is prohibited. Plants included in this category because their harmfulness outweighs any useful properties or purpose they may have.
- **Category 2** declared plant invaders (Section 15B of the amended act) are plants with a proven potential of becoming invasive, but which nevertheless have certain beneficial properties that warrant their continued presence in certain circumstances. May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- **Category 3** declared plant invaders (Section 15C of the amended act) are undesirable because they have the proven potential of becoming invasive, but most of them are nevertheless popular ornamentals or shade trees that will take a long time to replace. May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent

the spreading thereof, provided they are not within 30 metres of the 1:50 year flood line of a river, stream, lake or other type of inland water body. The "executive officer" can impose further conditions on Category 3 plants already in existence, which might include removing them if the situation demands it.

- **Bush encroachers**, which are indigenous plants that require sound management practices to prevent them from becoming problematic, are covered separately by Regulation 16.

4.7.2. NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

NEMBA aims to provide the framework, norms, and standards for the conservation, sustainable use, and equitable benefit-sharing of South Africa's biological resources. The purpose of NEMBA as it relates to Alien and Invasive Species (AIS) is to prevent the unauthorised introduction and spread of such species to ecosystems and habitats where they do not naturally occur; manage and control such species to prevent or minimise harm to the environment and to biodiversity in particular; and to eradicate alien invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. The Regulations on Alien and Invasive Species, referred to as the "**AIS Regulations"** combine invasive species already listed in the CARA, with two new lists relating to invasive species and prohibited species.

The AIS Regulations list 4 different categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa, namely:

- **Category 1a:** invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled on your property, and officials from the Department of Environmental Affairs must be allowed access to monitor or assist with control.
- **Category 1b**: invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases, they already fall under a government sponsored management programme.
- **Category 2**: These are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.
- **Category 3:** These are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all Category 3 plants become Category 1b plants.

4.7.3. ALIEN AND INVASIVE PLANTS ENCOUNTERED

A number of *Prosopis* trees as well as a number of Atriplex shrubs were observed on the property and they seems to be spreading (Refer to Table 4). It has been observed that the alien invader *Prosopis glandulosa* is becoming dominant in some sections of the Gannabosveld, especially towards the southern parts of the Knersvlakte (CapeNature 2020).

Table 4: List of alien and invasive species encountered within the proposed development site.

SPECIES	CARA	NEM: BA	MANAGEMENT RECOMMENDATIONS
Atriplex cf. *lindleyi*	Category 3 invader	Category 1b AIP	Remove all plants physically and burn
Prosopis glandulosa	Category 2 invader	Category 1B AIP (Western Cape)	Remove all plants physically (including root system) and burn or use registered herbicide on the cut-stump as treatment. Leave-spray smaller plants with registered herbicide.

4.8. VELD FIRE RISK

The revised veldfire risk classification (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998 was promulgated in March 2010. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to provide a basis for setting priorities for veldfire management interventions such as the promotion of and support to Fire Protection Associations. In the fire-ecology types and municipalities with High to Extreme fire risk, comprehensive risk management strategies are needed.

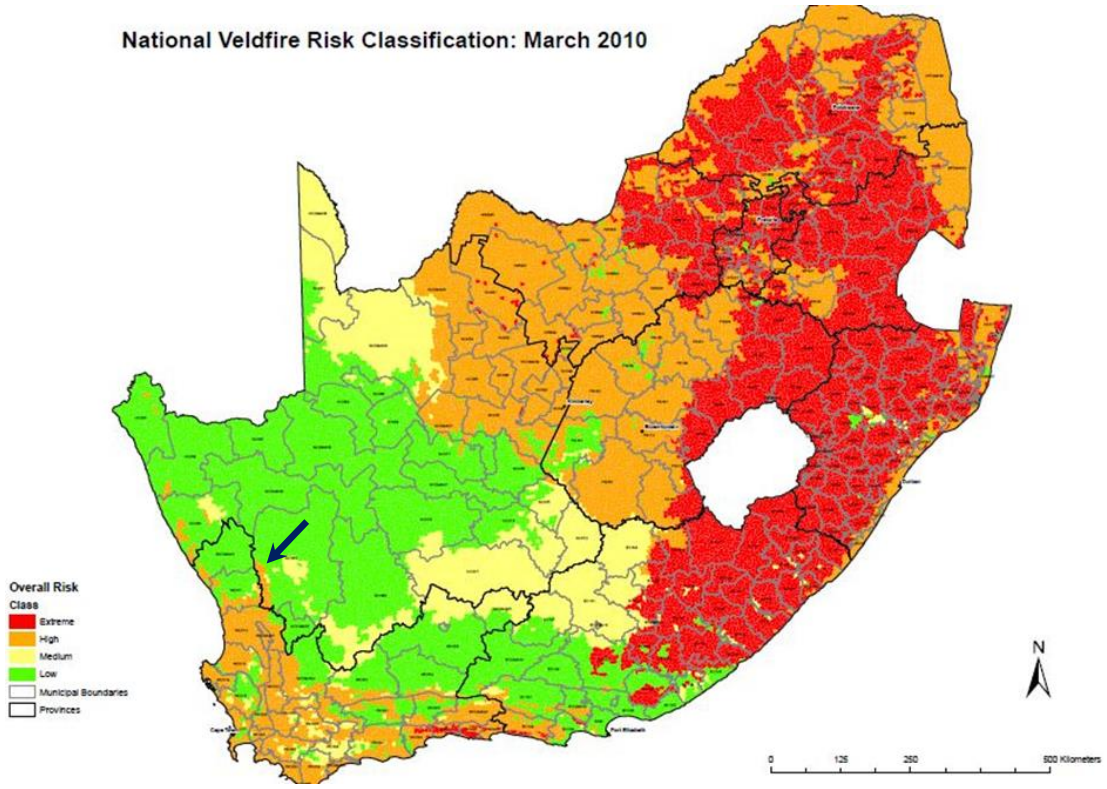


Figure 10: South African National Veldfire Risk Classification (March 2010)

The proposed site is located in an area supporting a very sparse semi-desert low shrubland which has been classified with a **High fire risk classification** (Refer to Figure 10). It is important that during construction and operatio n the site must adhere to all the requirements of the local Fire Protection Association (FPA), if applicable, or must adhere to responsible fire prevention and control measures.

5. FAUNA AND AVIFAUNA

Because of its aridity and unpredictable rainfall patterns, the Succulent-Karoo region (in which this site falls) favours free moving herbivores such as ostrich and springbok, nomadic birds and invertebrates with variable dormancy cued by rain. Plant defence against herbivores and seed adaption for dispersal by mammals are relatively uncommon, except along rivers and seasonal pans, suggesting the transient nature of herbivores, except near water where they would have lingered longer. However, since the 19th century the vast herds of migratory ungulates indigenous to this biome have been almost completely replaced by domestic stock. Once farmers started fencing their properties into camps (following the Fencing Act of 1912), stock numbers were dramatically increased with dire consequences to plant diversity. Grazing during and immediately after droughts periods is regarded as a major cause of detrimental change in vegetation composition and were ultimately responsible for the decline of large numbers of palatable plants (Mucina *et. al*., 2006).

No fauna or avi-fauna screening was done as part of this study, but observations were made during the site visit. The location of the study area, relatively near to areas of intensive agriculture, the current land-use (livestock grazing), and the adjacent farming practices would all have contributed to a disturbance factor. It is considered highly unlikely that a true reflection of potential game species can still be encountered on the property. This in turn would have affected the food chain and ultimately the density of tertiary predators, particularly mammals and larger birds of prey, while smaller predators and scavengers such as jackal and caracal would have been eradicated by farmers in fear of their livestock. Because of the long-term impact of human settlement on the larger areas a comprehensive faunal or avi-fauna survey is not deemed necessary.

However, according to the **NEMA EIA Sensitivity** scan for the site generated on 03/05/2022 by EnviroAfrica the:

- Animal Species Theme Sensitivity is high sensitive because of the potential presence of two bird species (Refer to Table 7), two invertebrate species (Refer to Table 5) and one sensitive species 13, a reptile species (Refer to Table 6);
- Plant Species Theme Sensitivity is medium sensitive because of the potential presence of various plant species (Refer to Heading 4.2 & 4.3 for a full discussion of the vegetation encountered);
- Terrestrial Biodiversity Theme Sensitivity is **very high** sensitive because of the site overlapping an ESA1 area. The CBA is discussed under Heading 4.4.

5.1. MAMMALS

According to the Protected areas management plan for the Knersvlakte Nature Reserve (CapeNature, 2020) the Knersvlakte has a diverse mammal species community but no species endemic or near-endemic to the province. Most species are representative of the arid landscape and well adapted to survive in the Succulent Karoo Biome. Currently there are 20 mammal species recorded from the Knersvlakte Nature Reserve (some indicated in Figure 2.14) with at least 14 additional species expected to occur in the reserve. The majority of the mammal species known from the reserve are small to medium sized carnivore species (e.g., small spotted genet (*Genetta genetta*), bat-eared fox (*Otocyon megalotis*) etc.), with shrews, rodents, even-toed ungulates such as springbok (*Antidorcas*

marsupialis marsupialis), hares and aardvark (*Orycteropus afer*) making up the rest of the species component. Two ecotypical games species occur on the reserve, namely the common duiker (*Sylvicapra grimmia grimmia*) and the steenbok (*Raphicerus campestris*).

These species are currently listed as Least Concern but are a priority for data collection and monitoring on population trends to inform the next red list assessment. Several other species may be present or migratory within the Knersvlakte Nature Reserve. The reserve is located within the historical range of the brown hyena (*Parahyaena brunnea*) (Stuart & Stuart, 1988). No records post 1999 has been detected in or near the reserve (Yarnell *et al*. 2016) and their presence has not been recorded to date. This species is currently listed as Near Threatened (Yarnell *et al*. 2016). Species listed as Vulnerable that may occur on the reserve include the leopard (Panthera pardus pardus) and the black footed cat (Felis nigripes) (Birss, 2017). Leopards are unlikely to be resident as this species is dependent on available open water, but dispersing animals may cross through the reserve. Similarly, greater kudu (*Tragelaphus strepsiceros strepsiceros*) is likely to disperse through the reserve and a single distribution record was recorded in the Bitterfontein area just north of the reserve (CapeNature, 2020).

No mammals, large or small was observed on the larger farm during any of the site visits performed for this scan. The only evidence of any mammal activity was droppings of what is expected to be genet and a bat-eared fox (which will roam the whole farm and its surroundings). Two to three deserted aardvark burrows were also observed, but none of these showed any signs of recent activity (not even by from other animals).

Thus, although the site is likely to contain at least some smaller mammals (e.g., rodents and other fauna) none was observed, apart from the droppings mentioned above. Considering that the site is located next to an area intensively cultivated and in close vicinity of Vanrhynsdorp (with its associated anthropogenic impacts), while the veld itself is considered degraded (supporting mostly unpalatable plant species) the site is not expected to support any significant number of mammal species.

5.2. INVERTEBRATE

Invertebrates are a vital component of terrestrial and aquatic ecosystems (McGeoch 2002; Samways et al. 2010; Samways et al. 2012) and constitute more than 80% of all animal diversity, yet they are grossly under-represented in studies of African diversity (Veldtman *et al.* 2017). They are essential for nutrient recycling *via* leaf-litter and wood degradation, carrion and dung disposal and soil turnover. Moreover, they play integral roles in plant pollination, especially in the Cape Floristic Region where the flora is dependent on specialised pollination guilds. In addition, this group maintains plant community structure *via* phytophagy (including seed feeding), and supports insectivorous animals, such as many birds, mammals and reptiles.

It is speculated that the area in which the Knersvlakte Nature Reserve is situated constitutes the southern end of a south-west African centre of tenebrionid endemism and diversity (Scholtz & Holm 1985; Penrith 1986a & b; Penrith & Endrödy-Younga 1994). Furthermore, narrow flowers of plants such as *Lycium cinereum*, *Hermannia cuneifolia* and *Conophytum* spp. that occur in the Knersvlakte will attract specialist pollinators with long mouth parts (Struck 1995). Struck (1995) observed a wide range of bees (14 solitary species plus the honey bee), masarine wasps (eight species), flies (seven species), beetles (13 species) and butterflies (three species) that pollinate flowers in the area. Bees, masarine wasps and bee flies (Bombyliidae) were the most important in terms of diversity and

abundance, while butterflies occurred in a highly erratic fashion. However, some plant species (e.g. *Conophytum* spp.) are dependent on butterfly species as pollinators (Struck, 1995). In addition, *Fidelia paradoxa* bees are specialist pollinators of *Mesembryanthemum fastigiatum* (Whitehead 1984). Many of these pollinators are endemic to the area, possibly because their distributions are restricted by their host plants, many of which also show a high degree of endemism.

A total of 966 Arachnida species represented by 365 genera and 68 families have been recorded in the Western Cape (Dippenaar-Schoeman et al. 2015) of which 361 species are endemic to the Western Cape (37.4%). Unfortunately to date very little information has been collected in the Knersvlakte Nature Reserve and there is no spider species list available for the reserve (CapeNature, 2020).

Several scorpion species have been recorded inside the Knersvlakte Nature Reserve, including *Uroplectes carinatus*, *Parabuthus capensis*, *Opistophthalmus granifrons* and a possible new species of *Opistophthalmus*. Observations in the field revealed that scorpions like *Parabuthus capensis* prefer red sand with leafy succulent shrubs e.g., *Drosanthemopsis diversifolia* and *Drosanthemum pulverulentum* as habitat. *Uroplectes carinatus* is more likely to be found on *Phyllobolus* spp. where they hide or wait during full moon nights for prey to pass by. On cold moonless nights *Uroplectes carinatus* predominates because they can cope better with low temperatures. In contrast, *Opistophthalmus granifrons* are more common in areas with clay soil where they occur out in the open between shrubs (CapeNature, 2020).

The main threat to invertebrate populations in this area include habitat destruction and/or degradation and illegal collection. It is likely that a number of invertebrate might be found (or might migrate) within the proposed footprint area. However, the site is already degraded, and the disturbance footprint will be relatively small. The impact on invertebrate is not expected to be high or in any way significant.

Table 5: Animal species theme results: Invertebrate

SENSITIVITY	FEATURES	MOTIVATION
Medium	Invertebrate: *Brinckiella mauerbergerorum*	The Sandveld Winter Katydid is one of South Africa's flightless spring katydids (grasshopper) and considered vulnerable. The name katydid comes from the noise emitted by the small insect. This group of hemimetabolous insects, while common and occasionally abundant in Fynbos vegetation of the Western Cape had been under collected and overlooked by the entomological community for over a century, before being re-discovered in 2002 (Picker et. al. 2002, In Naskrecki & Bazelet, 2009). This is ascribed to the fact that the Mantophasmatodea achieve adulthood during the winter months, and the adult retain an apterous (without wings) nymphal appearance, which at first glance resembles immature forms of other insects. *Brinckiella* appears to be a genus endemic to Western and Northern Cape provinces of South Africa with all its known species restricted to either the fynbos or succulent karoo biomes. It is likely that many additional species of this genus remain undiscovered in different parts of South Africa (Naskrecki & Bazelet, 2009). The Sandveld Winter Katydid was originally collected in the Northern Cape, 10.8 km SE of Port Nolloth (quite a distance away from Vanrhynsdorp). Although this species might occur in this area, it is considered highly unlikely that the establishment of this relatively small-scale solar plant could have any significant impact on the survival of this

SENSITIVITY	FEATURES	MOTIVATION
		species. With regards to this project the sensitivity rating should be **low sensitive**.
Medium	Invertebrate: *Brinckiella aptera*	The Mute Winter Katydid is endemic to the Fynbos and Succulent Karoo Biomes (refer above for further background about this species). It probably feeds on flowers and leaves of a very narrow range of host plants and occurs primarily on low, herbaceous shrubs. This species feeds and stridulates at night but can be found basking in the daytime on sunny days during the winter and early spring, from August until October, a time when very few insects are active. Very unusually for the genus and for katydids in general, this species is the first in its subfamily to display a complete lack of stridulatory organs, raising interesting evolutionary questions regarding mate attraction and intraspecies communication (Naskrecki and Bazelet 2009). The Mute Winter Katydid was originally collected in the Western Cape, near Pearly Beach, Bredasdorp area (the fynbos biome, geographically far removed from- and with a very different vegetation cover than the Vanrhynsdorp site). It is unlikely that the species will occur in this area, and even more unlikely that the establishment of this relatively small-scale solar plant could have any significant impact on the survival of this species. With regards to this project the sensitivity rating should be **low sensitive**.

5.3. REPTILE & AMPHIBIANS

The local occurrences of reptiles and amphibians are closely dependent on broadly defined habitat types, in particular terrestrial, arboreal (tree-living), rupicolous (rock-dwelling) and wetland-associated vegetation cover. It is possible to deduce the presence or absence of reptile and amphibian species by evaluating the habitat types within the proposed footprint in the context of reptile distribution ranges. From a habitat perspective, the proposed Vanrhynsdorp footprint area only supports one of the four major habitats, namely terrestrial. However, there are no rocky outcrops on the site, which minimise the available terrestrial habitat for reptiles significantly. A few deserted aardvark burrows were observed, which might house rodents or snakes (although no evidence of recent activity was seen at any of these burrows).

The Knersvlakte Nature Reserve currently have 17 reptile species recorded. In addition to these, there are at least as many or more species that are expected to occur within the reserve that have not yet been formally recorded. Many of these are associated with rocky outcrops or rocky areas such as the speckled padloper (*Chersobius signatus*), which is one of the threatened reptile species in this area (Hofmeyr et al. 2018). Several reptile species in the reserve are desirable in the pet trade, for example armadillo girdled lizard (*Ouroborus cataphractus*), also only found in rocky areas (CapeNature, 2020).

It is certain that some reptile species will occur on site or visit the site from time-to-time. However, because of the small development footprint and lack of rocky areas the impact on reptile species is likely to be neglectable. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

Table 6: Animal species theme results: Invertebrate

SENSITIVITY	FEATURES	MOTIVATION
Medium	Sensitive species 13	Sensitive species 13 refers to a small **Endangered** reptile, only occurring in a small area in the Namaqualand (it is endemic to South Africa). These animals live on rocky outcrops and forage among the rocks, where they feed on small succulents. They are reclusive animals, that are most active in the early morning. Because of its habitat and breeding preferences (and the fact that they are not highly mobile), all of which require rocky outcrops, it is highly unlikely that this species will occur within the proposed footprint are or its immediate surroundings. With regards to this project the sensitivity rating should be **low sensitive**.

5.4. AVIFAUNA

According to the Protected areas management plan for the Knersvlakte Nature Reserve (CapeNature, 2020) the Knersvlakte and its immediate surroundings has very little to offer in terms of bird habitat diversity with most of the area dominated by low growing karroid type vegetation interspersed with gravel/quartz patches. Lark and korhaan are typical of these arid areas. At present only about 90 bird species had been recorded in the reserve. Avifaunal species associated with riverine habitat e.g. African Reed-warbler (*Acrocephalus baeticatus*) have been recorded, but in very low numbers. An added complexity is that the reserve is situated just north of the Succulent Karoo/Fynbos interface. The distribution of a number of species e.g. Levaillant's Cisticola (*Cisticola tinniens*), Cape Spurfowl (*Pternistis capensis*) and Cape White-eye (*Zosterops virens*) ends relatively abruptly along the escarpment just south of the reserve.

Seven threatened bird species have been recorded in the Knersvlakte Nature Reserve (Taylor *et a*l. 2015, in CapeNature 2020). These include Black Harrier (*Circus maurus*), Ludwig's Bustard (*Neotis ludwigii*), Secretarybird (*Sagittarius serpentarius*), Southern Black Korhaan (*Afrotis afra*), Lanner Falcon (*Falco biarmicus*), Verreaux's Eagle (*Aquila verreauxii*) and Karoo Korhaan (*Eupodotis vigorsii*).

In terms of distribution, however, the two species that were recorded over a large area were the Ludwig's Bustard and Karoo Korhaan, suggesting that the reserve could be important for these two species. In the case of the Ludwig's Bustard, evidence for this was presented by Shaw (2013) who found that the species occurred in higher concentrations within the Succulent Karoo Biome.

In the original assessment (Botes, 2012) as well as the more resent addendum (Botes, 2017), the author only touched briefly on Avifauna. The main reason being that the solar facility will have a relatively small footprint of which the main aspect will be the construction of < 20 ha of solar panels (at ground level). The only other aspect of the proposed solar project that may potentially impact on bird species will be the addition of new (11KVa) overhead power line. However, the proposed power lines will follow existing overhead lines for the most part (as a result the potential additional impact was considered very low). This coupled with the fact that during four site visits (over various seasons), the author did not observe any significant larger bird species on or in the vicinity of the proposed site especially collision prone larger birds (apart from one Karoo Korhaan to the east of Maskamsig, about 1 km away). The site itself is located near to existing agricultural land (and its associated activities),

and more than 850 m away from the nearest watercourse, which is the seasonal Droë River (a tributary to the Troe-Troe River).

Collision prone birds are generally associated with larger terrestrial bird species with a high ratio of body weight to wing surface (birds with low manoeuvrability) or species that fly at high speed when foraging or commuting through the area.

With regards to the potential impact on bird species:

- The proposed site is not expected to have any significant impact on bird habitat, as no natural roosting or breeding areas were observed (larger birds of prey in this area tend to keep closer to the Maskam and Bokkeveld Mountains – personal observance).
- The proposed site is also located well away from any mountains or ridges that might facilitate natural updrafts, meaning that it is highly unlikely to have any impact on soaring birds (e.g., storks or cranes and most raptors).
- The Droë River is a seasonal stream, which seemingly does not support any significant larger bird life (although this might alter somewhat when the stream is in flow).
- Most importantly, however, is the fact that the proposed development will only add a very small potential additional impact zone as the site and its immediate surroundings are already criss-crossed by existing overhead cables (both electrical infrastructure and telephone lines) (Figure 11 and Photo 5 - Photo 7).
- As precautionary measure bird flappers could be installed on the section of the new line that does not run parallel with existing infrastructure.

Table 7: Animal species theme results: Aves

SENSITIVITY	FEATURES	MOTIVATION
High	Aves – *Circus maurus*	The Black harrier is one of southern Africa's rarest endemic raptors and is currently considered endangered. No Black Harriers were observed during any of the site visits, and the only evidence of these birds, according to the Knersvlakte Protected areas management plan (CapeNature, 2020) are observation made by M. Garcia-Heras 2018 and Percy FitzPatrick Institute of African Ornithology (in CapeNature, 2020). According to these observations there is evidence of Black Harrier breeding in the river courses to the east of the Knersvlakte). Although the breading habitat for Black Harrier is fynbos, renosterveld or low shrubland it has not been observed within the Knersvlakte itself. As a result, it is considered unlikely that the relatively smaal footprint associated with this development will have any significant impact on the breading or feeding patters of these birds. With regards to this project the sensitivity rating is considered **low sensitive.**
High	Aves – *Neotis ludwigii*	Ludwig's Bustard is a near endemic and classified as endangered because of a projected rapid population decline. It has a large range centred on the dry biomes of the Karoo and Namib in southern Africa, being found in the extreme south-west of **Angola**, western **Namibia** and in much of **South Africa** (Del Hoyo *et al.* 1996, Anderson 2000). Today if occurs predominantly in the dry Karoo region of South Africa (Herold, 1988), but historically id is believed that its distribution extended to the eastern and

SENSITIVITY	FEATURES	MOTIVATION
		north-eastern portions of the Grassland Biome (Brooke, 1984). This species inhabits open lowland and upland plains with grass and light thornbush, sandy open shrub veld and semi-desert in the arid and semi-arid Namib and Karoo biomes. The breeding season spans from August-December, with the species nesting on bare ground with a clutch of 2-3 eggs (del Hoyo *et al.* 1996, Jenkins and Smallie 2009) Although not observed, the bird may potentially feed and nest on the farm, but it is highly unlikely that the relatively small quarry and short additional road will have any impact on breading or feeding potential for this bird. With regards to this project the sensitivity rating is considered **low sensitive**.

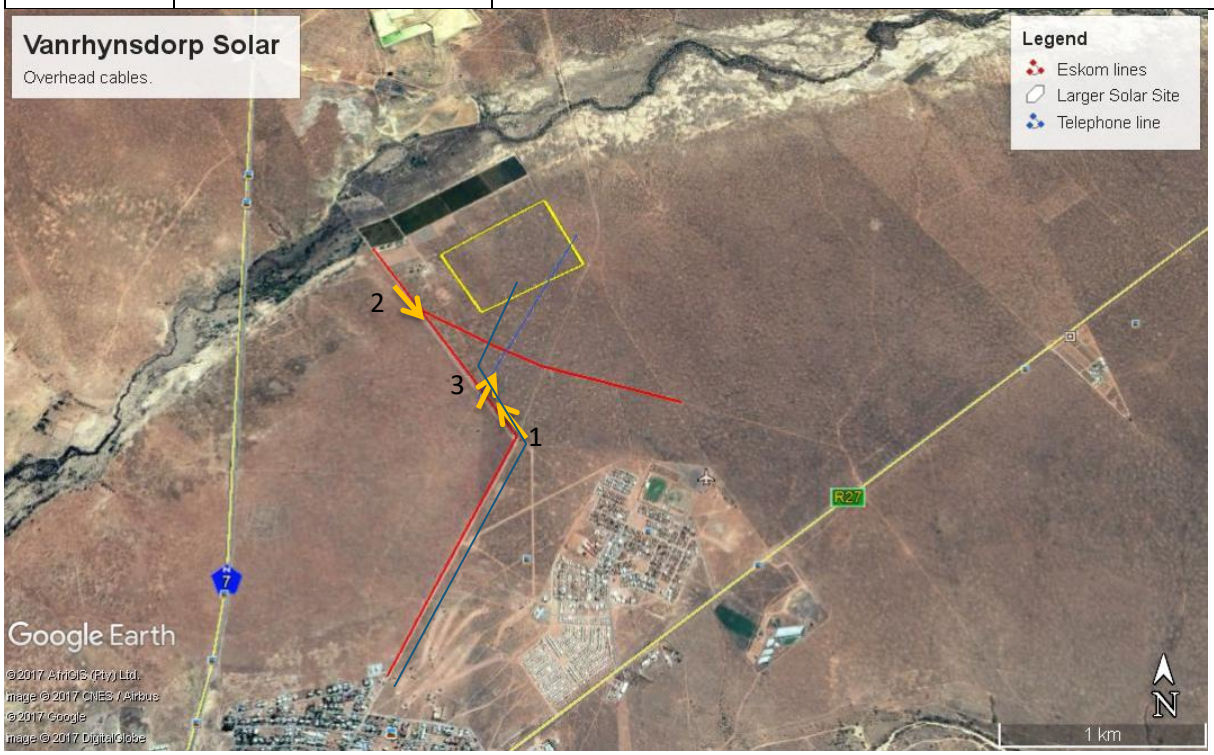


Figure 11: Google image showing the existing overhead cables (red) and the proposed new power line (blue).

Photo 5: A photo showing some of the existing overhead power and telephone lines nearby the proposed solar and hydrogen facilities (Taken from position 1 in Figure 11).

Photo 6: A photo showing a further view of the existing overhead lines in the vicinity of the proposed development (taken from position 2 in Figure 11)

Photo 7: Photo showing telephone lines running next to the (Taken from position 3 in Figure 11).

6. IMPACT ASSESSMENT METHOD

The concept of environmental impact assessment in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) was developed to identify and evaluate the nature of potential impact to determine whether an activity is likely to cause significant environmental impact on the environment. The concept of significance is at the core of impact identification, evaluation and decision making, but despite this the concept of significance and the method used for determining significance remains largely undefined and open to interpretation (DEAT, 2002).

The objective of this study was to evaluate the remaining biodiversity of the study area to identify significant environmental features which might have been impacted as a result of the development. The Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al*., 2005), were used to evaluate the botanical significance of the property with emphasis on:

- Significant ecosystems
    - Threatened or protected ecosystems
    - Special habitats
    - Corridors and or conservancy networks
- Significant species
    - Threatened or endangered species
    - Protected species.

6.1. DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria.

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

6.1.1. CRITERIA USED

***Conservation value*:** Conservation value refers to the intrinsic value of an attribute (e.g. an ecosystem, a vegetation type, a natural feature or a species) or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species (Refer to Table 8 for categories used).

Likelihood refers to the probability of the specific impact occurring because of the proposed activity (Refer to Table 9, for categories used).

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 10).

Extent refers to the spatial area that is likely to be impacted or over which the impact will have

influence, should it occur (Refer to Table 11).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 12).

Table 8: Categories used for evaluating conservation status.

CONSERVATION VALUE	
Low (1)	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium/low (2)	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium (3)	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.
Medium/high (4)	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.
High (5)	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

Table 9: Categories used for evaluating likelihood.

LIKELIHOOD	
Highly Unlikely (1)	Under normal circumstances it is almost certain that the impact will not occur.
Unlikely (2)	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.
Possible (3)	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.
Probable (4)	It is very likely that the impact will occur under normal circumstances.
Certain (5)	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.

Table 10: Categories used for evaluating duration.

DURATION	
Short (1)	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).
Medium/short (2)	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).
Medium (3)	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require ongoing mitigation. Rehabilitation time is expected to be longer (5-15 years).
Long (4)	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require ongoing mitigation. Rehabilitation time is expected to be longer (15-50 years).
Permanent (5)	The impact is expected to be permanent.

Table 11: Categories used for evaluating extent.

EXTENT	
Site (1)	Under normal circumstances the impact will be contained within the construction footprint.
Property (2)	Under normal circumstances the impact might extent outside of the construction site (e.g., within a 2 km radius), but will not affect surrounding properties.
Surrounding properties (3)	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding landowners or –users, but still within the local area (e.g., within a 50 km radius).
Regional (4)	Under normal circumstances the impact might extent to the surrounding region (e.g., within a 200 km radius), and will impact on land owners in the larger region (not only surrounding the site).
Provincial (5)	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).

Table 12: Categories used for evaluating severity.

SEVERITY	
Low (1)	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.
Medium/low (2)	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium (3)	It is expected that the impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium/high (4)	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.
High (5)	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

6.2. SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. To do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact, and evaluate the significance of that impact should it occur.

Potential significant impacts are evaluated, using the method described above, to determine its potential significance. The potential significance is then described in terms of the categories given in Table 13. Mitigation options are evaluated, and comparison is then made (using the same method) of potential significance before mitigation and potential significance after mitigation (to advise the EAP).

Table 13: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact, or the impact is insignificant in scale or magnitude because of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude because of low sensitivity to change or low intrinsic value of the site or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is easily achieved. Social, cultural, and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and easily possible but may require modification of the project design or layout. Social, cultural, and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial, and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural, and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural, and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural, and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, beyond site boundaries, national or international.

7. BIODIVERSITY SENSITIVITY EVALUATION

The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell. At the time of the study the vegetation was described as a low open shrubland (< 0.5 m high), supporting a disturbed version of Gannabosveld, dominated by *Salsola zeyheri* (Gannabos), and hardy *Mesembryanthemum* species. Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a combination of the ongoing drought (leaf succulents being very susceptible to extended dry spells) together with historic and present grazing practices. Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g., no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches). Scattering of quartz pebbles were sometimes exposed, but no true quartz patches was observed.

In terms of its ecological status the following was considered:

- The proposed development footprint overlaps an area that still supports natural veld, albeit a disturbed version of Gannabosveld. The vegetation was dominated by Gannabos in combination with a few hardy *Mesembryanthemum* species. the veld shows signs of severe drought and having been degraded as a result of decades of grazing by domestic livestock (low species diversity);
- The development footprint will be relatively small (± 20ha) and is located adjacent to existing agricultural land.
- The site still has good connectivity to the south, east and northeast, but borders on intensive cultivation to the northwest.
- The site fall within the larger Knersvlakte Centre of Endemism;
- Vanrhynsdorp Gannabosveld is classified as "*Least Threatened*" with approximately 79% remaining. However, it is unsure whether the conservation target of 28% had been reached with the recent declaration of the Knersvlakte Nature Reserve;
- No protected or red-listed plants were observed, but observations are based on a two day site visit which did not co-inside with the main annual and geophyte flowering time.

7.1. BIOPHYSICAL ENVIRONMENT

Centres of Endemism: The proposed site falls within the Knersvlakte Centre of Endemism, but is located on the sandy soils, dominated by Gannabos (*Salsola* species), to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

Heuweltjies: No "heuweltjies" (ascribed as ancient termite mounds with soils more fertile that that of its surroundings) were observed on the site or its immediate surroundings. There is a marked difference in biodiversity on and between these heuweltjies.

CBA or ESA: According to the Western Cape Biodiversity Spatial Plant, the site is located within an ecological support area identified as a water recharge area. In this case the proposed site is located

on a sandy plain sloping towards the Droë River to its northwest), but with developed vineyards adjacent and directly in the path of any surface drainage. Underground water recharge will not be significantly hampered by the proposed development; since the surface area is very small and will not be impregnable (underground water recharge will still be able from the site).

Connectivity: The location (adjacent to existing agricultural land) and relatively small size of the site will also not lead to a significant reduction in connectivity.

Other: The site visit showed no other significant geographical features such as watercourses, wetlands, upland- down land gradients or vegetation boundaries on the site or limited to the site. The site will be located next to existing cultivated lands (vineyards next to the Droë River).

7.2. THREATENED AND PROTECTED ECOSYSTEMS

The Vanrhynsdorp Gannabosveld vegetation type is not vulnerable or threatened with more 79% remaining in its natural state. However, at present little of this vegetation type is formally conserved in South Africa. It is thus important the viable areas are considered for inclusion into Conservation areas or CBA's or ESA's. Although it is located within the larger Knersvlakte Centre of Endemism and within an ecological support area, it is unlikely that the proposed footprint will have any significant impact on local or national conservation targets.

No Red list species was encountered (Heading 4.6.1), or species protected in terms of NEMBA (Heading 4.6.2), or species protected in terms of the NFA (Heading 4.6.3). A small number of the alien *Prosopis* trees and the shrub *Atriplex lindleyi* were observed and an alien eradication plan should be implemented to ensure the control of these species within the development footprint.

7.3. FAUNA AND AVIFAUNA

Mammals: No mammals, large or small was observed on the larger farm during any of the site visits performed for this scan. The only evidence of any mammal activity was droppings of what is expected to be genet and a bat-eared fox (which will roam the whole farm and its surroundings). Two to three deserted aardvark burrows were also observed, but none of these showed any signs of recent activity (not even by from other animals). Smaller mammals (e.g., rodents and other fauna) is still expected on the site (although none was observed), apart from the droppings mentioned above. Considering that the site is located next to an area intensively cultivated and in close vicinity of Vanrhynsdorp (with its associated anthropogenic impacts), while the veld itself is considered degraded (supporting mostly unpalatable plant species) the site is not expected to support any significant number of mammal species.

Invertebrate: The main threat to invertebrate populations in this area include habitat destruction and/or degradation and illegal collection. It is likely that a number of invertebrate might be found (or might migrate) within the proposed footprint area. However, the site is already degraded, and the disturbance footprint will be relatively small. The impact on invertebrate is not expected to be high or in any way significant, including the two invertebrate species flagged by the NEMBA Sensitivity screening tool (Refer to Table 5).

Reptile & amphibians: From a habitat perspective, the proposed Vanrhynsdorp footprint area only

supports one of the four major habitats, namely terrestrial. However, there are no rocky outcrops on the site, which minimise the available terrestrial habitat for reptiles significantly. It is certain that some reptile species will occur on site or visit the site from time-to-time. However, because of the small development footprint and lack of rocky areas the impact on reptile species should be neglectable. No amphibian species are likely to occur due to a lack of aquatic and wetland habitat in the proposed footprint.

Avifauna: The proposed site is not expected to have any significant impact on bird habitat, as no natural roosting or breeding areas were observed (larger birds of prey in this area tend to keep closer to the Mountains and river areas). Including the two invertebrate species flagged by the NEMBA Sensitivity screening tool (Refer to Table 7).The proposed site is located well away from any mountains or ridges that might facilitate natural updrafts, meaning that it is highly unlikely to have any impact on soaring birds (e.g., storks or cranes and most raptors). The Droë River is a seasonal stream, which seemingly does not support any significant larger bird life (although this might alter somewhat when the stream is in flow). Most importantly, however, is the fact that the proposed development will only add a very small potential additional impact zone as the site and its immediate surroundings are already criss-crossed by existing overhead cables (both electrical infrastructure and telephone lines) (Figure 11 and Photo 5 - Photo 7).

7.4. SOLAR DEVELOPMENT - CUMULATIVE IMPACTS

The Department of Environmental Affairs requires that specialist evaluates the accumulative impacts of all other renewable energy sites within a 30 km radius of the proposed development. According to the information obtained from the Department of Environmental Affairs renewable energy database website for South Africa (https://dea.maps.arcgis.com/apps/webappviewer), there are potentially three renewable energy sites within a 30 km radius of the proposed Vanrhynsdorp site (**Error! R eference source not found.**), not including the Keren Vanrhynsdorp site, which refers to this application. Seven potential other renewable energy facilities are mapped within a 30 km radius (Refer to **Error! Reference source not found.** and **Error! Reference source not found.**. However, the Si te 6 application was withdrawn, and the Site 7 application refers to the same site as this application.

Table 14: Potential renewable energy sites within 30km of the proposed Vanrhynsdorp solar site

Name	Type	MW	Vegetation type
1. Orlight SA Solar PV Plant (Approved)	Solar PV	20	Vanrhynsdorp Gannabosveld
2. Romano Solar on Pr. 334 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Vanrhynsdorp Gannabosveld
3. Matzikama Solar Park on Pr. 414 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Namaqualand Strandveld
4. Solar plant northwest of Vredendal (Approved)	Solar PV	30	Namaqualand Strandveld Namaqualand Spinescent Grassland
5. Inca Wind Energy facility on Farm 293 (Approved)	Wind	30	Namaqualand Strandveld
6. Proposed Keren Energy Solar (Withdrawn)	-	-	N/a
7. N/a Refers to the same site as this application	-	-	N/a

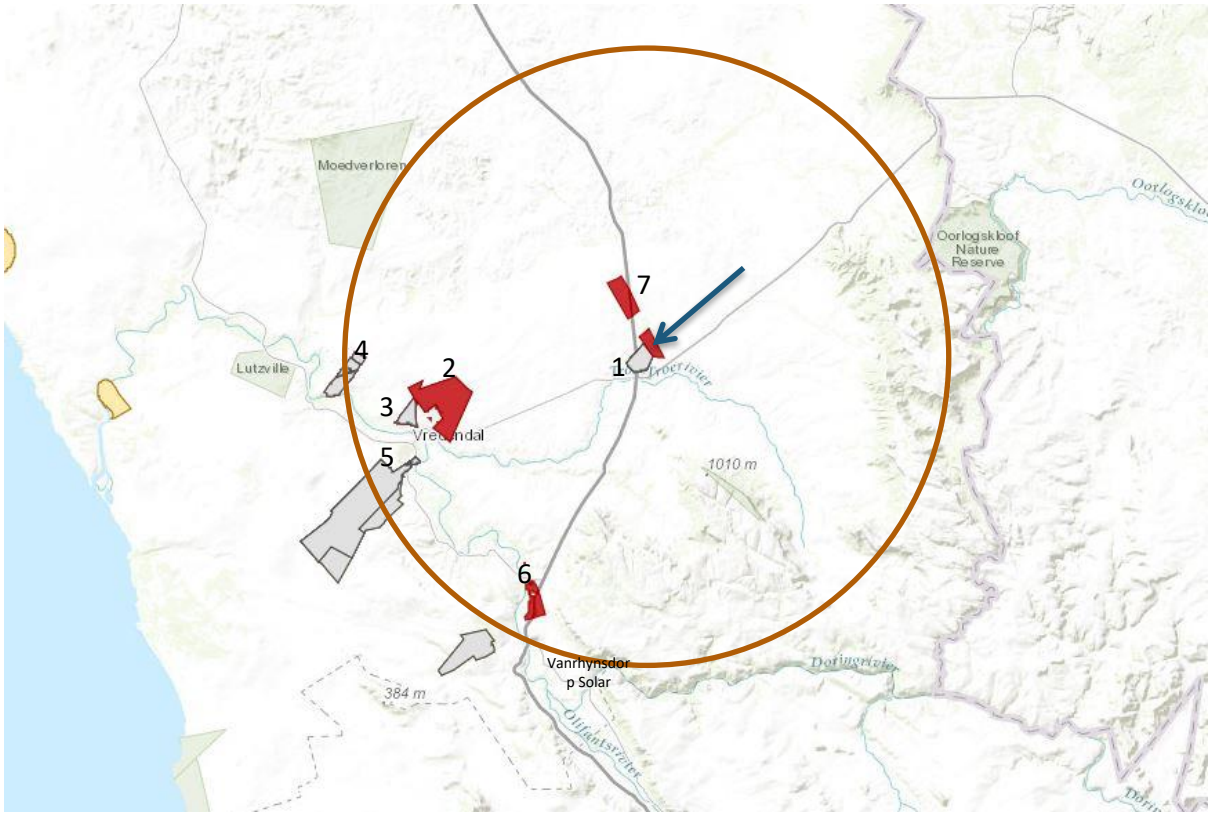


Figure 12: Potential renewable energy sites within 30km radius of the proposed Vanrhynsdorp Solar & Hydrogen site

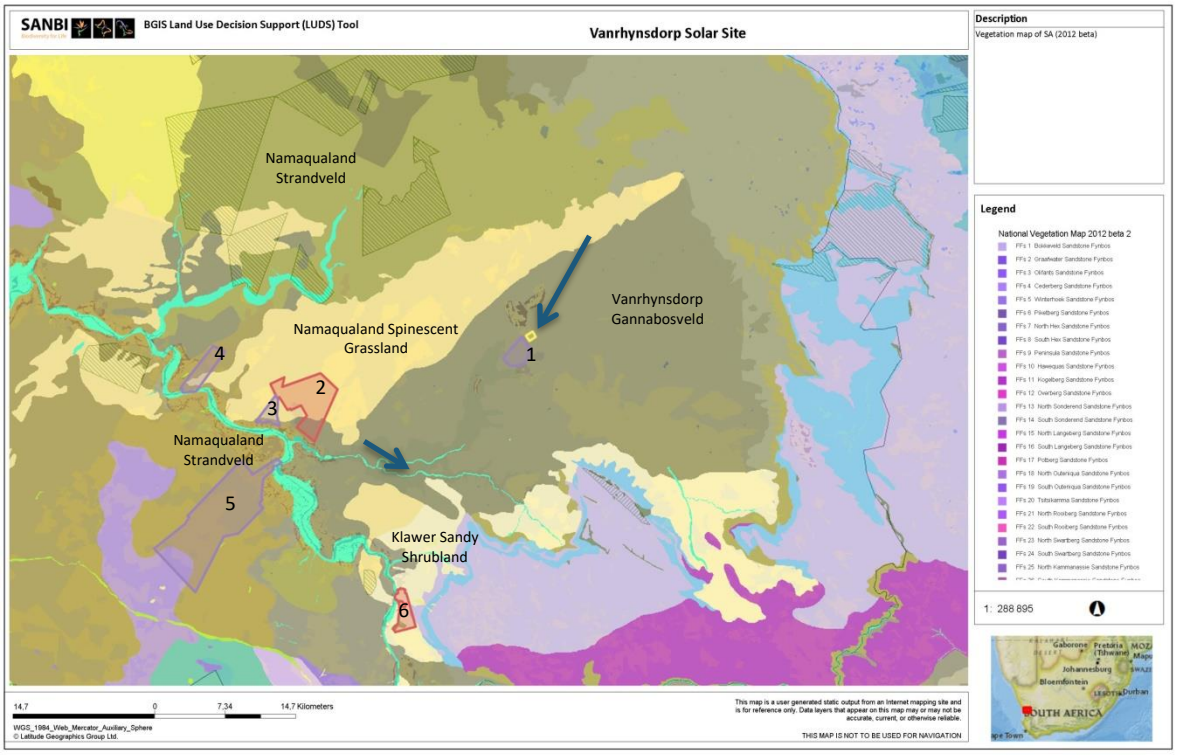


Figure 13: Vegetation map of SA, showing the vegetation types associated with the various RE sites within 30 km from the study area.

The proposed Vanrhynsdorp solar and hydrogen plant will be relatively small (<20ha) and will impact only one vegetation type, namely Vanrhynsdorp Gannabosveld. Vanrhynsdorp Gannabosveld vegetation type is not considered vulnerable or threatened with more 79% still remaining in its natural state. Because of its small size, the proposed footprint is unlikely to have any significant impact on connectivity within the ecological support area. Floristically, no protected plant species or red-listed plant species were encountered. In the case of the Vanrhynsdorp Solar site, two other renewable energy sites, within 30km, may impact on the same vegetation type namely Site 1 and 2 in Figure 12 & Figure 13. Both sites are relatively small (10 MW & 20 MW), which should relate to approximately 30 ha in total. Together with the Vanrhynsdorp Solar site it relates to approximately a 40-50 ha impact on this vegetation type out of roughly 540 700 ha (of which almost 79% are still believed to be fairly natural). The impact of the Vanrhynsdorp solar site is thus roughly 0.0018%, while the cumulative impact is roughly 0.0092%.

Cumulative impacts for this project was calculated taking into account the small size of the proposed development, the impact of similar developments within a 30km radius on the same vegetation type, connectivity, potential critical biodiversity areas or ecological support areas and the impact on protected species as well as land-use, geology and soils, fauna and avi-fauna.

7.5. IMPACT ASSESSMENT

The following table rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 15: Impact assessment associated with the proposed development.

Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Geology & soils	Possible impact on special habitats (e.g. true quartz or "heuweltjies")	2	1	3	1	1	12	2	1	3	1	1	12	No special features encountered. The impact on geology and soils is expected to be very low. No mitigation required.
Land use and cover.	Possible impact on socio-economic activities as a result of the physical footprint or associated activities.	3	4	3	1	1	27	3	3	3	1	1	24	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
Vegetation type	Possible loss of vegetation and associated habitat.	3	4	3	1	2	30	3	3	3	1	1	24	More than 79% of this vegetation remains in its natural state, but little formally conserved. Mitigation - Minimise development footprint.
Corridors and conservation priority areas	Possible loss of identified terrestrial and aquatic critical biodiversity areas, ecological support areas or ecological corridors.	3	4	3	1	2	30	3	3	3	1	1	24	The development will impact on an ESA and the Knersvlakte Centre of Endemism. However, because of the small footprint it is not expected to have a significant impact on conservation targets. Mitigation - minimise footprint.
Watercourses and wetlands	Possible impact on natural water resources and its associated ecosystem.	0	0	0	0	0	0	0	0	0	0	0	0	Not applicable
Flora	Possible loss of threatened or protected species.	3	4	3	1	2	30	3	3	3	1	1	24	No protected or red-data species encountered (although it is possible that some annuals or geophytes that could not be observed during the study might be found). However, it is highly unlikely that they will be restricted to this area alone or that any significant impact may result).
Fauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.

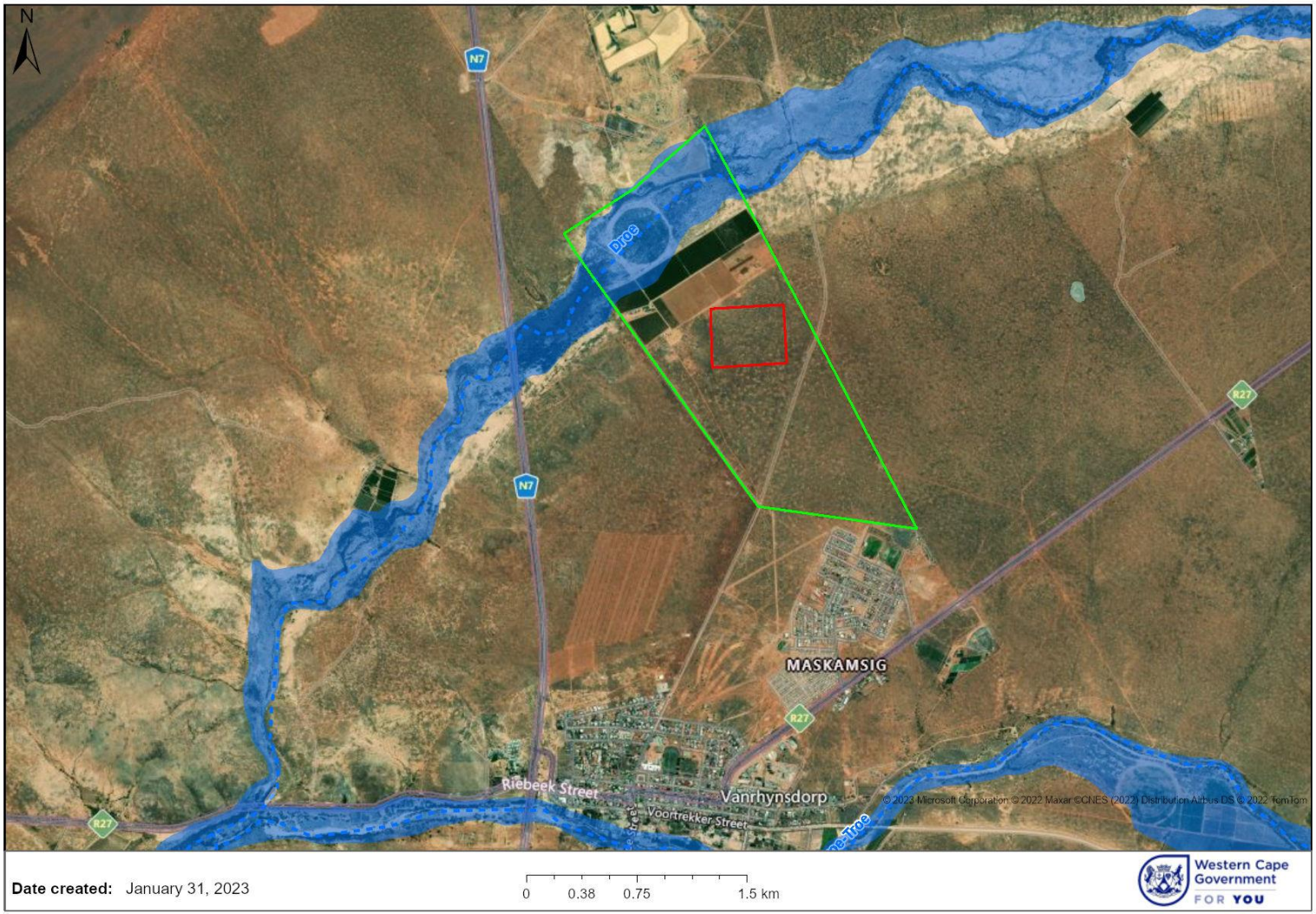
Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Avifauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.
Invasive alien species	Possible alien infestation as a result of activities.	3	3	3	1	2	27	3	1	3	1	1	18	Both alien species encountered must be eradicated from the footprint as part of construction and an on-going eradication program must be part of maintenance.
Veld fire	The risk of veld fires as a result of the proposed activities.	3	3	2	3	2	30	3	1	2	1	1	15	Veld fire risk is considered high and must be addressed appropriately through the construction EMP.
Accumulative	Accumulative impact associated with the proposed activity.	3	4	3	3	2	36	3	4	3	1	1	27	The overall impact is considered to be relatively low, because of the small size, but good environmental control during construction is imperative.
No-Go alternative	Potential environmental impact associated with the no-go alternative.	3	1	1	1	1	12						0	The above impacts will not occur, and the status quo will remain (livestock grazing as the main land use).

Significance before mitigation: The impact assessment suggests that the proposed Vanrhynsdorp development is expected to have a **Low cumulative** impact (even without mitigation). The evaluation considers the relatively small size of the proposed development and its location adjacent to existing agricultural land (transformed land).

Significance after mitigation: Even though the impact is already considered low it will still be possible to reduce direct impacts during construction. The potential impact on the regional status of the vegetation type and associated biodiversity features (e.g., corridor function or special habitats) is considered low. No irreversible species-loss, habitat-loss, connectivity or associated impact can be foreseen from locating and operating the solar facility on the proposed site. With mitigation the impact on biodiversity features can be reduced but will stay **Low**.

The NO-GO option: The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "status quo" on the site. On the other hand, the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production.

Figure 14: Site sensitivity map: The proposed development footprint is not considered sensitive in terms of terrestrial biodiversity, but it falls within the Knersvlakte Centre of Endemism and as such the focus must be on footprint minimisation (Refer to the impact minimisation recommendations)



8. IMPACT MINIMISATION RECOMMENDATIONS

The proposed development will result in the permanent transformation of <20ha of natural veld covered by a vegetation type considered least threatened. There are no special habitats within or near the proposed footprint that will be impacted by the development (even though it falls within the Knersvlakte Centre of Endemism). It is highly unlikely that the proposed development will have any significant impact on protected or endangered fauna or flora.

According to the impact assessment given in Table 15, the proposed development is unlikely to result in any significant impact and with good environmental control, the development is likely to result in a Low impact on the environment.

With the correct mitigation it is considered highly unlikely that the proposed development will contribute significantly to any of the following:

- Significant loss of vegetation type and associated habitat.
- Loss of ecological processes (e.g., migration patterns, pollinators, river function etc.) due to construction and operational activities.
- Loss of local biodiversity and threatened plant species.
- Loss of ecosystem connectivity.

8.1. MITIGATION MEASURES

The proposed development site is not considered sensitive in terms of terrestrial biodiversity. As a result, impact minimisation should focus on mitigation measures during construction (and operational) phases, of which the overriding goal should be to clearly define the final layout and to minimise the disturbance footprint.

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and any other conditions pertaining to specialist studies.
- Before any work is done the footprint must be clearly demarcated. The demarcation must aim at minimum footprint and minimisation of disturbance.
- All alien invasive species within the footprint and or within 10 m of the footprint must be removed responsibly.
    - Care must be taken with the eradication method to ensure that the removal does not impact or lead to additional impacts (e.g., spreading of the AIP due to incorrect eradication methods);
    - Care must be taken to dispose of alien plant material responsibly.
- Topsoil (the top 15-20 cm) must be removed and protected and re-used for rehabilitation purposes of suitable areas on site or within the immediate surroundings (Seedbed protection).
- Lay-down areas or construction camp sites must be located within areas already disturbed or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- All construction areas must be suitably rehabilitated on completion of the project.

  - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
  - This must include re-using the protected topsoil as well as shaping the area to represent the original shape of the environment.

- An integrated waste management approach must be implemented during construction.
  - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
  - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.

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APPENDIX 1: CURRICULUM VITAE – P.J.J. BOTES

Curriculum Vitae: Peet JJ Botes

Address: 22 Buitekant Street, Bredasdorp, 7280; **Cell**: 082 921 5949

Nationality:	South African
ID No.:	670329 5028 081
Language:	Afrikaans / English
Profession:	Environmental Consultant & Auditing
Specializations:	Botanical & Biodiversity Impact Assessments
	Environmental Compliance Audits
	Environmental Impact Assessment
	Environmental Management Systems
Qualifications:	**BSc** (Botany & Zoology), with Nature Conservation III & IV as extra subjects; Dept. of Natural Sciences, Stellenbosch University 1989.
	Hons. BSc (Plant Ecology), Stellenbosch University, 1989
	More than 20 years of experience in the Environmental Management Field (Since 1997 to present).
Professional affiliation:	Registered Professional Botanical, Environmental and Ecological Scientist at SACNASP (South African Council for Natural Scientific Professions) since 2005.
SACNAP Reg. No.:	400184/05

BRIEF RESUME OF RELEVANT EXPERIENCE

1997-2005: Employed by the Overberg Test Range (a Division of Denel), responsible for managing the environmental department of OTB, developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve).

2005-2010: Joined Enviroscientific, as an independent environmental consultant specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits.

2010-2017: Joined EnviroAfrica, as an independent Environmental Assessment Practitioner and Biodiversity Specialist, responsible for Environmental Impact Assessments, Biodiversity & Botanical specialist reports and Environmental Compliance Audits. During this time Mr Botes compiled more than 70 specialist Biodiversity & Botanical impact assessment reports ranging from agricultural-, infrastructure pipelines- and solar developments.

2017-Present: Establish a small independent consultancy (PB Consult) specialising in Environmental Audits, Biodiversity and Botanical specialist studies as well as Environmental Impact Assessment.

LIST OF MOST RELEVANT BOTANICAL & BIODIVERSITY STUDIES

Botes. P. 2007: Botanical assessment. Schaapkraal, Erf 644, Mitchell's Plain. A preliminary assessment of the vegetation in terms of the Fynbos Forum: Ecosystem guidelines. 13 November 2007.

Botes. P. 2008: Botanical assessment. Schaapkraal Erf 1129, Cape Town. A preliminary assessment of the vegetation using the Fynbos Forum Terms of Reference: Ecosystem guidelines for environmental Assessment in the Northern Cape. 20 July 2008.

Botes, P. 2010(a): Botanical assessment. Proposed subdivision of Erf 902, 34 Eskom Street, Napier. A Botanical scan and an assessment of the natural vegetation of the site to assess to what degree the site contributes towards conservation targets for the ecosystem. 15 September 2010.

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Botes, P. 2012(b): Proposed Disselfontein Keren Energy Holdings Solar Facility on Farm Disselfontein no. 77, Hopetown. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 28 March 2012.

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Botes, P. 2012(d): Proposed Keimoes Keren Energy Holdings Solar Facility at Keimoes. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 9 March 2012.

Botes, P. 2012(e): Proposed Leeu-Gamka Keren Energy Holdings Solar Facility on Portion 40 of the Farm Kruidfontein no. 33, Prince Albert. A Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa. 27 March 2012.

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Botes, P. 2013(a): Groot Mier proposed low cost housing, Mier Municipality Residential Project, Northern Cape. A preliminary Biodiversity & Botanical scan in order to identify significant environmental features (and to identify the need for additional studies if required. January 2013.

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Botes, P. 2014(b): Kalahari-East Water Supply Scheme Extension: Phase 1. Proposed extension of the Kalahari-East Water Supply Scheme and associated infrastructure to the Mier Municipality, ZF Mgcawu District Municipality, Mier Local Municipality (Northern Cape Province). Biodiversity & Botanical scan of the proposed route to determine the possible impact on biodiversity with emphasis on vegetation and plant species. 1 July 2014.

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Botes, P. 2015(b): Steenkampspan proving ground. Proposed establishment of a high speed proving (& associated infrastructure) on the farm Steenkampspan (No. 419/6), Upington, ZF Mgcawu (Siyanda) District

Municipality, Northern Cape Province. Biodiversity and Botanical Scan of the proposed footprint. 20 February 2015.

Botes, P 2015(c): Proposed Bredasdorp Feedlot, Portion 10 of Farm 159, Bredasdorp, Cape Agulhas Municipality, Northern Cape Province. A Botanical scan of the area that will be impacted. 28 July 2015.

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Botes, P. 2016(b): Onseepkans Agricultural development. The proposed development of ±250 ha of new agricultural land at Onseepkans, Northern Cape Province. Biodiversity and Botanical Scan. January 2016.

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Botes, P. 2018(b): Rooifontein Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Rooifontein, Northern Cape Province. Botanical scan of the proposed footprint. 23 February 2018

Botes, P. 2018(c): Paulshoek Bulk Water Supply – Ground water desalination, borehole- and reservoir development, Paulshoek, Northern Cape Province. Botanical scan of the proposed footprint. 27 March 2018.

Botes, P. 2018(d): Kakamas Waste Water Treatment Works Upgrade – Construction of a new WWTW and rising main, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 1 August 2018.

Botes, P. 2018(e): Kakamas Bulk Water Supply – New bulk water supply line for Kakamas, Lutzburg & Cillie, Khai !Garib Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 4 August 2018.

Botes, P. 2018(f): Wagenboom Weir & Pipeline – Construction of a new pipeline and weir with the Snel River, Breede River Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint. 7 August 2018.

Botes, P. 2018(g): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(h): Tripple D farm agricultural development – Development of a further 60 ha of vineyards, Erf 1178, Kakamas, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2018(i): Steynville (Hopetown) outfall sewer pipeline – Proposed development of a new sewer outfall pipeline, Hopetown, Northern Cape Province. Botanical assessment of the proposed footprint. 8 October 2018.

Botes, P. 2019(a): Lethabo Park Extension – Proposed extension of Lethabo Park (Housing Development) on the remainder of the Farm Roodepan No. 70, Erf 17725 and Erf 15089, Roodepan Kimberley. Sol Plaaitje Local Municipality, Northern Cape Province. Botanical assessment of the proposed footprint (with biodiversity inputs). 15 May 2019.

Botes, P. 2019(b): Verneujkpan Trust agricultural development – The proposed development of an additional ±250 ha of agricultural land on Farms 1763, 2372 & 2363, Kakamas, Northern Cape Province. 27 June 2019.

Botes, P. 2020(a): Gamakor & Noodkamp Low cost housing – Botanical Assessment of the proposed formalization of the Gamakor and Noodkamp housing development on the remainder and portion 128 of the Farm Kousas No. 459 and Ervin 1470, 1474 and 1480, Gordonia road, Keimoes. Kai !Gariep Local Municipality, Northern Cape Province. 6 February 2020.

Botes, P. 2020(b): Feldspar Prospecting & Mining, Farm Rozynen Bosch 104, Kakamas. Botanical assessment of the proposed prospecting and mining activities on Portion 5 of The Farm Rozynen Bosch No. 104, Kakamas, Khai !Garib Local Municipality, Northern Cape Province. 12 February 2020.

Botes, P. 2020(c): Boegoeberg housing project – Botanical assessment of the proposed formalization and development of 550 new erven on the remainders of farms 142 & 144 and Plot 1890, Boegoeberg settlement, !Kheis Local Municipality, Northern Cape Province. 1 July 2020.

Botes, P. 2020(d): Komaggas Bulk Water supply upgrade – Botanical assessment of the proposed upgrade of the existing Buffelsrivier to Komaggas BWS system, Rem. of Farm 200, Nama Khoi Local Municipality, Northern Cape Province. 8 July 2020.

Botes, P. 2020(e): Grootdrink housing project – Botanical assessment of the proposed formalization and development of 370 new erven on Erf 131, Grootdrink and Plot 2627, Boegoeberg Settlement, next to Grootdrink, !Kheis Local Municipality, Northern Cape Province. 14 July 2020.

Botes, P. 2020(f): Opwag housing project – Botanical assessment of the proposed formalization and development of 730 new erven on Plot 2642, Boegoeberg Settlement and Farm Boegoeberg Settlement NO.48/16, Opwag, !Kheis Local Municipality, Northern Cape Province. 16 July 2020.

Botes, P. 2020(g): Wegdraai housing project – Botanical assessment of the Proposed formalization and development of 360 new erven on Erven 1, 45 & 47, Wegdraai, !Kheis Local Municipality, Northern Cape Province. 17 July 2020.

Botes, P. 2020(h): Topline (Saalskop) housing project – Botanical assessment of the pproposed formalization and development of 248 new erven on Erven 1, 16, 87, Saalskop & Plot 2777, Boegoeberg Settlement, Topline, !Kheis Local Municipality, Northern Cape Province. 18 July 2020.

Botes, P. 2020(i): Gariep housing project – Botanical assessment of the proposed formalization and development of 135 new erven on Plot 113, Gariep Settlement, !Kheis Local Municipality, Northern Cape Province. 20 July 2020.

APPENDIX 2: VANRHYNSDORP ROMA ENERGY – NEMA EIA SCREENING REPORT

Appendix D2: Updated Biodiversity Assessment and Botanical Scan Addendum (2017)

PB Consult
Ecological & Botanical management services

ADDENDUM

TO THE BIODIVERSITY ASSESSMENT & BOTANICAL SCAN

for the,

VANRHYNSDORP SOLAR PROJECT

A re-assessment of the area that will be impacted by the proposed solar project at Vanrhynsdorp, Western Cape Province.

DATE: 20 June 2017

PREPARED BY: PB CONSULT

PREPARED FOR: ENVIROAFRICA CC

Peet Botes (Pr.Sci.Nat: 400184/05) Registered Professional Environmental and Ecological Scientist
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SUMMARY - MAIN CONCLUSIONS

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MAIN VEGETATION TYPE(S)	**Vanrhynsdorp Gannabosveld** **Least Threatened:** But conservation targets not yet achieved (it is however, unclear what impact the recently established Knersvlakte Nature Reserve had, had on conservation targets for this vegetation type).
CRITICAL BIODIVERSITY AREAS	According to the Western Cape Biodiversity Spatial Plan (Figure 4) the proposed site will be located within an ecological support area (ESA 1), identified as a water recharge area. The larger area is not essential for meeting biodiversity targets, but can play an important role in supporting the functioning of protected areas or critical biodiversity area. The objective for CBA 1 areas is to maintain these areas in a functional near natural state. Some habitat loss may be acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised. The site is still covered by natural veld dominated by Gannabos. Although it is difficult to ascertain, it is likely that the veld has been impacted by domestic livestock grazing (a possible reason for the low species diversity – apart from the recent drought).However, because of its small size (±10 ha) and its location next to transformed land (vineyards), it is unlikely to result in a significant impact on the ecological support area.
CENTRES OF ENDEMISM	According to Van Wyk & Smith (2001) the site falls within the Knersvlakte Centre of Endemism. However, the proposed development is located on the sandy soils to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.
LAND USE AND COVER	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
SIGNIFICANT PLANT SPECIES	**No red list plant species were encountered** (Refer to Heading 5.3.1). **No species protected in terms of NEM: BA encountered** (Heading 5.3.2). **No species protected in terms of the NFA** were encountered (Heading 5.3.3).
IMPACT ASSESSMENT	**Significance before mitigation:** The impact assessment suggests that the proposed Vanrhynsdorp development is expected to have a **Low cumulative** impact, with the most significant aspect being the low potential impacts on vegetation type, corridor and conservation priority areas, flora and accidental veld fires. The evaluation takes into account on the relative small size of the proposed development and its location adjacent to existing agricultural land (transformed land). **Significance after mitigation:** Since the proposed development footprint needs only be approximately 50% of the 20ha, there is great potential for micro-adjustment of the final layout plans. Even though the impact is already considered low it will still be possible to reduce direct impacts on other features of significance through layout adjustments, search & rescue and topsoil management. The potential impact on the regional status of the vegetation type and associated biodiversity features (e.g. corridor function or special habitats) is considered low. No irreversible species-loss, habitat-loss, connectivity or associated impact can be foreseen from locating and operating the solar facility on the proposed site. With mitigation the impact on biodiversity features can be reduced but will stay **Low**. Please refer to Table 11 for the full impact assessment.

SUMMARY & RECOMMENDATION	**The NO-GO option:** The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "*status quo*" on the site. On the other hand the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production. Having evaluated and discussed the various biodiversity aspects associated with the development, the most significant impacts are expected to be the potential impacts on: • The ecological support area; • The Knersvlakte Centre of Endemism; • The small potential impact on conservation worthy plants relating to potential red-data species not visible during the two site visits (e.g. annuals and bulbs). However, it is considered unlikely that the proposed project will contribute significantly to any of the following: • Significant loss of vegetation and associated habitat in terms of local or national conservation targets; • Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to development and operational activities; • Significant loss of local biodiversity and threatened plant species; • Significant loss of ecosystem connectivity (e.g. corridor function). **WITH THE AVAILABLE INFORMATION AT THE AUTHOR'S DISPOSAL IT IS RECOMMENDED THAT THE DEVELOPMENT BE APPROVED, BUT THAT ALL MITIGATION MEASURES DESCRIBED IN THIS DOCUMENT BE IMPLEMENTED.**

INDEPENDENCE & CONDITIONS

PB Consult is an independent consultant and has no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

RELEVANT QUALIFICATIONS & EXPERIENCE OF THE AUTHOR

Mr. Peet Botes holds a BSc. (Hons.) degree in Plant Ecology from the University of Stellenbosch (Nature Conservation III & IV as extra subjects). Since qualifying with his degree, he had worked for more than 20 years in the environmental management field, first at the Overberg Test Range (a Division of Denel) managing the environmental department of OTB and being responsible for developing and implementing an ISO14001 environmental management system, ensuring environmental compliance, performing environmental risk assessments with regards to missile tests and planning the management of the 26 000 ha of natural veld, working closely with CapeNature (De Hoop Nature Reserve). In 2005 he joined Enviroscientific, an independent environmental consultancy specializing in wastewater management, botanical and biodiversity assessments, developing environmental management plans and strategies, environmental control work as well as doing environmental compliance audits and was also responsible for helping develop the biodiversity part of the Farming for the Future audit system implemented by Woolworths. During his time with Enviroscientific he performed more than 400 biodiversity and environmental legal compliance audits. During 2010 he joined EnviroAfrica in order to move back to the biodiversity aspects of environmental management. Experience with EnviroAfrica includes EIA applications, biodiversity assessment, botanical assessment, environmental compliance audits and environmental control work.

Mr. Botes is also a registered Professional Botanical, Environmental and Ecological Scientists at SACNASP (South African Council for Natural Scientific Professions) as required in terms of Section 18(1)(a) of the Natural Scientific Professions Act, 2003, since 2005.

Yours sincerely,

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Registered Professional Environmental and Ecological Scientist

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LIST OF PHOTOS

1. INTRODUCTION

Roma Energy Holdings is proposing the establishment of a solar energy facility on the remainder of Farm Duinen No. 258, Vanrhynsdorp (Western Cape Province, Matzikama Local Municipality). Please note, that approximately 20 ha of the property was evaluated (Red area in Figure 1), but the actual footprint will only be about half of the 20 ha (approximately 10 ha, Refer to the Blue area in Figure 1). There is thus ample room for micro-adjustment of the infrastructure to minimise potential impact on any significant environmental feature encountered. The purpose of the proposed facility is to supply electricity to Eskom as part of the Renewable Energy Independent Power Producers Procurement Programme.

During 2012, PB Consult was appointed by EnviroAfrica to assessed and reported on the potential biodiversity impacts of this project on the proposed footprint (Refer to the revised Biodiversity Assessment & Botanical Scan report dated 13 April 2012) as part an environmental impact assessment application to the Department of Environmental Affairs (in terms of the NEMA EIA Regulations). Environmental authorisation (EA) was granted by the Department of Environmental Affairs (DEA) for the above application but the EA expired before physical work on the site could commence. To continue with the development, reapplication is required.

PB Consult was instructed to re-visit the site and re-evaluate the original biodiversity report in order to determine if the findings of the original report (PB Consult, 2012) is still applicable. **The terms of reference and the physical footprint remains the same.**

1.1 STATUS OF THE ORIGINAL REPORT

In terms of the above a further site visit was performed on the 2nd of June 2017, during which the author re-evaluated the site. The additional site visit did not reveal any new biodiversity features that were not evaluated during the original study. The site visit and updated desk studies did not resulted in any significant additional impacts being identified by the author, which was not considered in the original report. The site is still described as an arid landscape supporting a *Salsola* dominated low open shrubland with a sparse vegetation cover. There are no watercourses or wetlands on or nearby the site. The nearest watercourse is the Droë River, approximately 850m north-north-west of the proposed site.

The author would like to confirm that the original report still stands, but must be read in conjunction with this addendum, which includes the following:

- Updated legal requirements register;
- Potential impacts on centres of Endemism of South Africa;
- Updated plant species lists,
- Updated impact evaluation on endangered or protected plant species;
- Updated impact assessment to include cumulative impacts (based on the latest available information).
- Updated recommendations.

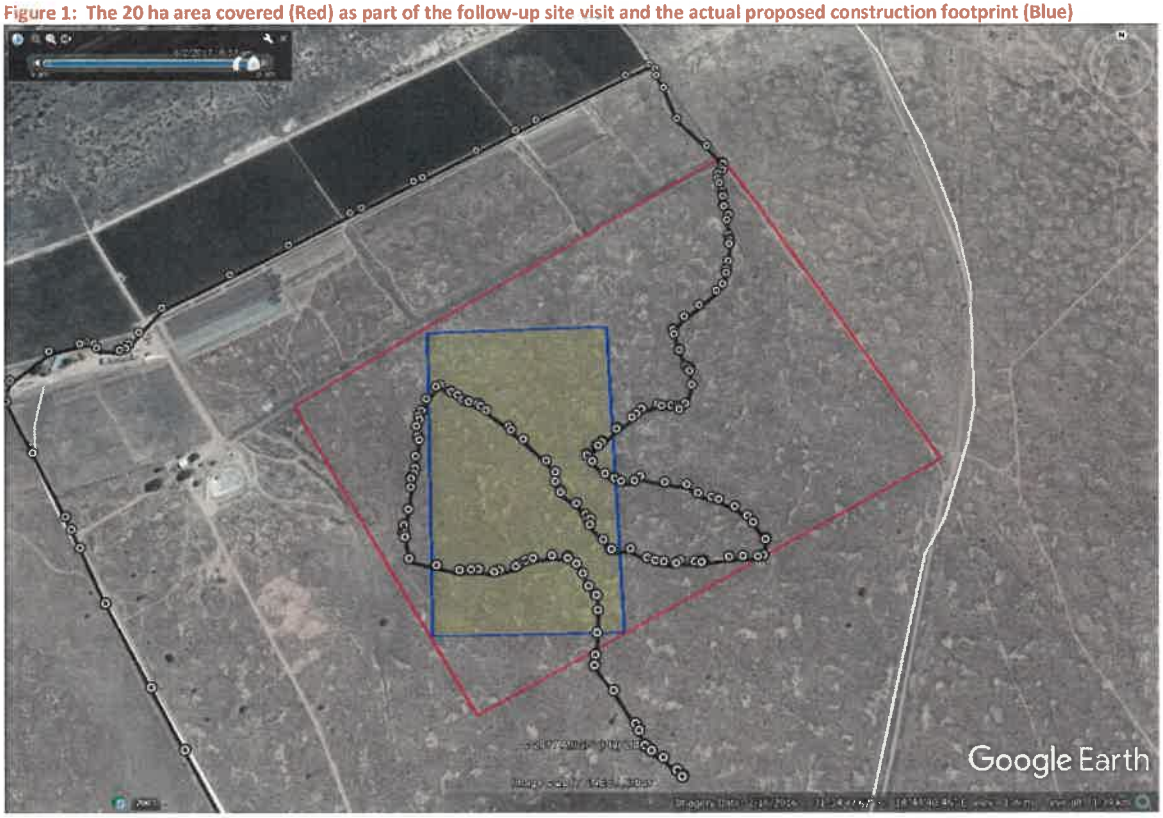
2. METHODS USED

The objective of this study was to re-evaluate the biological diversity associated with the study area in order to identify significant environmental features which should be avoided during development activities and to re-evaluate short and long term impact and possible mitigation actions in context of the proposed development.

2.1 SITE VISIT

The original site visit was done during January 2012. The follow-up site visit was done on the 2nd of June 2017. The site visit compromises walking the site, examining and photographing any area of interest. During the site visit and desktop studies, a fairly good understanding of the environment was achieved. At the time of the site visit the veld still showed the effects of a severe drought period (although recent rains did fell over the area). As a result the timing of the site visit could have been better in that very few annual plants were visible. Also because of the drought, many of the plants were difficult to identify to species level. However, the author is confident that a good understanding of the biodiversity status of the site was still possible.

Figure 1: The 20 ha area covered (Red) as part of the follow-up site visit and the actual proposed construction footprint (Blue)



3. APPLICABLE LEGISLATION (UPDATED)

Constitution of the Republic of South Africa (1996): of special relevance in terms of environment is section 24

Conservation of Agricultural Resources Act 43 of 1983 (CARA): supports conservation of natural agricultural resources (soil, water, plant biodiversity) by maintaining the production potential of the land and combating/preventing erosion; for example, by controlling or eradicating declared weeds and invader plants.

Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947), to control the sell, purchase, use and disposal of agricultural or stock remedies.

Hazardous Substances Act 15 of 1973: to control substances that may cause injury, ill-health, or death through their toxic, corrosive, irritant, strongly sensitizing or flammable nature, or by the generation of pressure

National Environmental Management Act 107 of 1998 (as amended): replaces the Environmental Conservation Act (ECA) and establishes principles for decision-making on matters affecting the environment, and for matters connected therewith.

- **Environmental Impact Assessment Regulations** (R543 of 2010): procedures to be followed for application to conduct a listed activity.

National Environmental Management: Air Quality Act 39 of 2004 (NEMAQA): replaces the Atmospheric Pollution Prevention Act (No. 45 of 1965).

National Environmental Management: Biodiversity Act 10 of 2004 (NEMBA): supports conservation of plant and animal biodiversity, including the soil and water upon which it depends.

- **National list of ecosystems that are threatened and in need of protection** (GN 1002 of 9 December 2011).
- **Alien and invasive species list 2016** (GN R. 864 of 29 July 2016).

National Environmental Management: Protected Areas Act 57 of 2003 (as amended Act 31 of 2004) (NEMPAA): To provide for the protection and conservation of ecologically viable areas representative of South Africa's biological diversity and its natural landscapes and seascapes.

National Environmental Management: Waste Act 59 of 2008 (NEMWA): To reform the law regulating waste management in order to protect health and the environment by providing reasonable measures for the prevention of pollution and ecological degradation and for securing ecologically sustainable development.

- **List of Waste Management Activities that have, or are likely to have a detrimental effect on the environment** (GN 718 of 3 July 2009): Identifies activities in respect of which a waste management license is required.

National Forests Act 84 of 1998 (as amended): supports sustainable forest management and the restructuring of the forestry sector.

- **List of protected tree species** (as updated)

National Heritage Resources Act 25 of 1999: supports an integrated and interactive system for the management of national heritage resources, including supports soil, water and animal and plant biodiversity.

National Veld and Forest Fire Act 101 of 1998 (NVFFA): protects soil, water and plant life through the prevention and combating of veld, forest, and mountain fires

National Water Act 36 of 1998 (NWA): promotes the protection, use, development, conservation, management, and control of water resources in a sustainable and equitable manner.

4. DEFINITIONS & ABBREVIATIONS

4.1 DEFINITIONS

Contaminated water: means water contaminated by the activities associated with construction, *e.g.* concrete water and runoff from plant/ personnel wash areas.

Environment: means the surroundings within which humans exist and that are made up of:

- the land, water and atmosphere of the earth;
- micro-organisms, plant and animal life;
- any part of the combination of the above two bullets and the interrelationships between them;
- the physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being

Environmental Aspect: any element of any construction activity, product or services that can interact with the environment.

Environmental Control Officer: a suitably qualified environmental agent responsible for overseeing the environmental aspects of the Construction phase of the EMP.

Environmental Impact: any change to the environment, whether adverse or beneficial, wholly or partially resulting from any construction activity, product or services.

No-Go Area(s): an area of such (environmental/aesthetical) importance that no person or activity are allowed within a designated boundary surrounding this area.

Owner: the owner, or dedicated person, responsible for the management of the property on which the proposed activity will be performed.

Solid waste: means all solid waste, including construction debris, chemical waste, excess cement/concrete, wrapping materials, timber, tins and cans, drums, wire, nails, food and domestic waste (e.g. plastic packets and wrappers).

Precautionary principle: means the basic principle, that when in doubt or having insufficient or unreliable information on which to base a decision, to then limit activities in order to minimise any possible environmental impact.

Watercourse: in this report the author uses the following, very simplified, classification system to define the difference between a river, a water course and an ephemeral drainage line.

- River: A river is a natural watercourse with a riverbed wider than 3m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.
- Stream: A small river or natural watercourse with a riverbed of less than 3 m, usually freshwater, flowing toward an ocean, a lake, a sea or another river. In a few cases, a river simply flows into the

ground or dries up completely before reaching another body of water. The flow could be seasonal or permanent.

- Ephemeral drainage line: A very small and poorly defined watercourse, mostly on relatively flat areas, which only flows for a short period after heavy rainfall events, which usually dissipate before reaching another body of water (typically found on the flattish undulating plains of the Northern Cape).

4.2 ABBREVIATIONS

AIP	Alien and invasive plants
AIS	Alien and invasive species
BGIS	Biodiversity Geographical Information System
CARA	Conservation of Agricultural Resources Act 43 of 1983
CBA	Critical Biodiversity Areas (Municipal)
DEA	Department of Environmental Affairs
EAP	Environmental Assessment Practitioner
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment
EMF	(Municipal) Environmental Management Framework
EMP	Environmental management plan
GWC	Griqualand West Centre of endemism
IDP	Integrated development plan
IUCN	International Union for Conservation of Nature
NEMA	National Environmental Management Act, Act 107 of 1998
NEMAQA	National Environmental Management Air Quality Act 39 of 2004
NEMBA	National Environmental Management Biodiversity Act, Act 10 of 2004
NEMPAA	National Environmental Management Protected Areas Act 57 of 2003
NEMWA	National Environmental Management Waste Act 59 of 2008
NFA	National Forests Act 84 of 1998
NSBA	National Spatial Biodiversity Assessment
NVFFA	National Veld and Forest Fire Act 101 of 1998
NWA	National Water Act 36 of 1998
SABIF	South African Biodiversity Information Facility
SANBI	South African National Biodiversity Institute
SIBIS	SANBI's Integrated Biodiversity Information System
SKEP	Succulent Karoo Ecosystem Project

5. VEGETATION (UPDATED)

The vegetation described in the original report remains the same and still stands. The following should be read in addition to the original report. The vegetation encountered is described as Vanrhynsdorp Gannabosveld, which is part of the Succulent Karoo Biome (Mucina & Rutherford, 2006, as updated in the 2012 beta version). The Succulent Biome vegetation is strongly influenced by winter rainfall and fog and has been compared to a desert rich in succulents. According to the 2004 National Spatial Biodiversity Assessment (NSBA), approximately 79% of the Vanrhynsdorp Gannabosveld vegetation still remains, with the main reasons for the transformation of the remainder being cultivation and open-cast gypsum mining. A conservation target of 28% has been set for this vegetation type (none of which was formally conserved during 2004), but with the recent proclamation of the Knersvlakte Nature Reserve, at least some of this vegetation type should now be formally conserved. The 2004 NSBA originally classified this vegetation type as vulnerable. However, with more information now available, it was declassified to **"Least Threatened"** in the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011).

Photo 1: Low open succulent shrubland encountered on the site (note Prosopis trees in background)

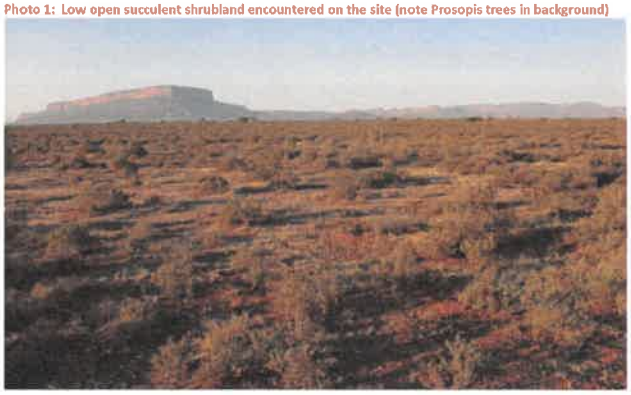


Photo 2: Grassy components sometimes dominating open areas in between the shrubs

The recent ongoing drought left its mark on the veld, and many plants within the study area and surroundings showed signs of being severely affected by the dry spell (Refer to Photo 1 & Photo 2), so much so that even some of the *Euphorbia* plants had died back. However, the site visit also showed signs of recent rains, and a few plants was starting to bud. The impact of the drought, however, made positive identification of some of species difficult (no flowers and sometimes also without leaves) and the author had to rely on previous identification and knowledge of the veld for identification of some species. Gannabosveld is normally not known to have a high species turnover, but even so, the number of plant species encountered was lower than expected, which is probably a result of the recent drought (leaf succulents being very susceptible to extended dry spells). Apart from the vegetation itself, no other biodiversity feature of note was observed within the study area (e.g. no streams or watercourses, "heuweltjies" – Termite mounds, or true quartz patches).

The open dwarf shrub layer was dominated by *Salsola* cf. *zeyheri* (Gannabos) and a number of succulent species, most notably *Drosanthemum* cf. *hispidum* and *Mesembryanthemum* species (previously *Aridaria* species). The following species were also encountered: *Aloe claviflora* (occasionally), *Asparagus* cf. *capensis, Euphorbia spinea, Galenia africana, Mesembryanthemum barkly* and *M. guerichianum.* Grasses were mostly sparsely distributed, but sometimes covered extended areas. The most noteworthy being *Bromus pectinatus*, the spiny *Cladoraphis spinosa* and *Stipa capensis*. A number of the alien *Prosopis* trees and some *Atriplex* cf. *lindleyi* (Klappiesbrak) were also observed.

Species like *Galenia africana*, many of the Aizoaceae and *Atriplex* cf. *lindleyi* are normally pioneer species and also indicators of disturbance. Together with the observations of *Bromus pectinatus* and *Stipa capensis* it is very likely that the veld has been subjected to constant grazing (even possibly overgrazing) over a long period of time by domestic stock (which is more specialized in their grazing habits and tends to have a more severe impact on the veld).

Please note that the original document did not list plant species within its own table (which has been added in this document, Please refer to Table 1). In addition the South African National Biodiversity Institute's biodiversity website added the function of being able to download plant species checklists per vegetation type. This checklist was also added as Appendix 1.

5.1 KNERSVLAKTE CENTRE OF ENDEMISM

The Knersvlakte is known for its characteristic white quartzite gravel that can conceal a myriad of succulent species (many of them rare dwarf plants). Of the 1 500 plant species in the Knersvlakte, about 190 species are endemic to the region, while approximately 155 of are threatened with extinction, as they succumb easily to climatic conditions and changes (www.capenature.co.za/knersvlakte-nature-reserve-proclaimed-vital-biodiversity-hotspot). The Knersvlakte Centre (KVC) of endemism is named after the Knersvlakte north of Vanrhynsdorp. There are various explanations for origin of its name. One of the common views is that it originates from the crunching noise made by the wagon wheels of old when driving over the extensive fields of hard quartz pebbles commonly found in the area north of Vanrhynsdorp. The KVC is demarcated by Van Wyk & Smith (2001) as the extensive plain bounded in the south by the Olifants River, in the east by the Bokkeveld Escarpment and in the west by the Sandveld and granite hills of the Spektakel and Little Namaqualand Suite (the Hardeveld), and in the north by the Namaqualand Rocky Hills (near Bitterfontein). It is encountered on an area of mostly level plains and rolling, generally low relief hills. Topographically it is one of the most featureless of all the centres of endemism's in South Africa. The climate is mild, with light frost in winter. Offshore bergwind conditions can result in high temperatures and very arid conditions, even in winter. Rainfall occurs mainly in winter, while the prevailing onshore winds from the Atlantic Ocean produce occasional fog (providing additional precipitation for the plants). The geology is complex, but the KVC corresponds roughly with the various litho-stratigraphic units of the Vanrhynsdorp Group. Soils are usually clayey, alkaline and saline in places and can play an important role in the distribution of plant species. The extensive fields of small white quartz pebbles encountered to the north of Vanrhynsdorp is one of the most conspicuous features of this landscape. The vegetation is typically low and dominated by

Figure 2: The Knersvlakte Centre of endemism (highlighted) taken from Van Wyk & Smith (2001)

succulents, with grasses more prominent in sandy areas. Trees are almost absent and are only encountered along watercourses and its tributaries. Pebble strewn areas can appear almost without vegetation, but in reality they support a multitude of almost subterranean dwarf succulents. The KVC is especially rich in dwarf succulents, most of which is associated with the quartz pebble fields and rocky areas, while the sandy plains have a less specialised flora (Van Wyk en Smith, 2001). The KVC is mostly considered the **centre of diversity of the quartz-field flora of Southern Africa** and is clearly linked to the other centres of high endemism in the Succulent Karoo region, notably the Gariep Centre and to a lesser degree the Little Karoo. The flora of the KVC is threatened mainly by selective overgrazing and trampling by sheep, especially during periods of drought.

According to Van Wyk & Smith (2001) Vanrhynsdorp, and its immediate surroundings, falls within the Knersvlakte Centre of Endemism, meaning that the proposed development will also fall within larger demarcation of the KVC. However, the proposed development is located on the sandy soils to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

5.2 FLORA ENCOUNTERED (UPDATED)

Please note that this study never intended to be full botanical assessment. However, a scan of significant species was done during the site visit, and even though the author does not claim that all species encountered were identified, all efforts were made to do just that. Table 1 gives an updated list of the species encountered within the study area (for both site visits) as well as their status and further actions needed where applicable.

Table 1: List of flora encountered on the property

No.	Species name	FAMILY	Status Red list, NFA	Alien & invader species (AIS)	Legal requirements
1.	*Aloe claviflora*	ASPHODELACEAE			
2.	*Asparagus cf. capensis*	ASPARAGACEAE			
3.	*Atriplex cf. lindleyi*	AMARANTHACEAE		CARA, Cat 3 invader, NEMBA, Cat. 1b invader	Implement an alien eradication program
4.	*Bromus pectinatus*	POACEAE			
5.	*Cladoraphis spinosa*	POACEAE			
6.	*Drosanthemum cf. hispidum*	AIZOACEAE			

No.	Species name	FAMILY	Status Red list, NFA	Alien & invader species (AIS)	Legal requirements
7.	*Euphorbia spinea*	EUPHORBIACEAE			
8.	*Galenia africana*	AIZOACEAE			
9.	*Mesembryanthemum barkly*	AIZOACEAE			
10.	*Mesembryanthemum guerichianum*	AIZOACEAE			
11.	*Mesembryanthemum* species (previously *Aridaria* species).	AIZOACEAE			
12.	*Prosopis* species	FABACEAE		CARA, Cat 2 invader, NEMBA, Cat. 1b invader	Implement an alien eradication program
13.	*Salsola* cf. *zeyheri*	AMARANTHACEAE			
14.	*Stipa capensis*	POACEAE			

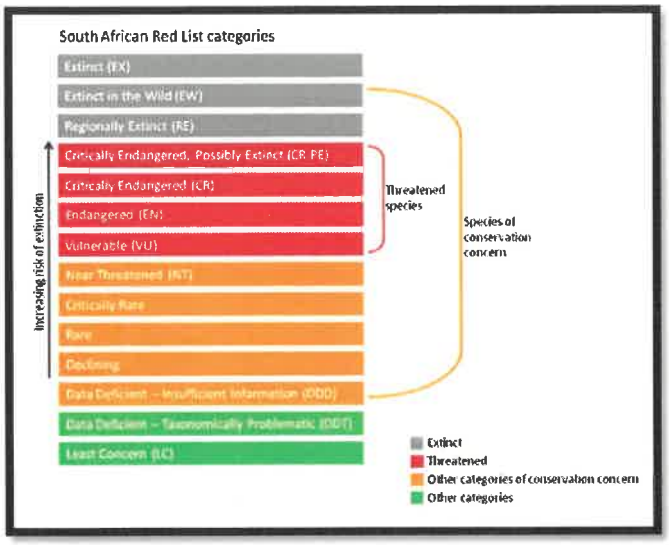
5.3 THREATENED AND PROTECTED PLANT SPECIES

South Africa has become the first country to fully assess the status of its entire flora. Major threats to the South African flora are identified in terms of the number of plant taxa Red-Listed as threatened with extinction as a result of habitat loss, invasive alien plant infestation, habitat degradation, unsustainable harvesting, demographic factors, pollution, loss of pollinators or dispersers, climate change and natural disasters (e.g. such as droughts and floods). South Africa uses the internationally endorsed IUCN Red List Categories and Criteria in the Red List of South African plants. However, due to its strong focus on determining risk of extinction, the IUCN system does not highlight species that are at low risk of extinction, but may nonetheless be of high conservation importance. As a result a SANBI uses an amended system of categories in order to highlight species that may be of low risk of extinction but are still of conservation concern (SANBI, 2015).

In the Western Cape, species of conservation concern are also protected in terms of national and provincial legislation, namely:

- The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "*Lists of critically endangered, endangered, vulnerable and protected species*" (GN. R. 152 of 23 February 2007).
- National Forest Act, Act 84 of 1998, provides for the protection of forests as well as specific tree species through the "*List of protected tree species*" (GN 908 of 21 November 2014).

5.3.1 RED LIST OF SOUTH AFRICAN SPECIES



The Red List of South African Plants online provides up to date information on the national conservation status of South Africa's indigenous plants (SANBI, 2015). The South African red list categories are given in Figure 3.

Figure 3: South African red list categories (SANBI, 2015)

5.3.1.1 *Definitions of the national Red List categories*

Categories marked with [N] are non-IUCN, national Red List categories for species not in danger of extinction, but considered of conservation concern (Refer to Table 2). The IUCN equivalent of these categories is Least Concern (LC) (SANBI, 2015).

Table 2: Definitions of the South African national red list categories (SANBI, 2015)

Extinct (EX): A species is Extinct when there is no reasonable doubt that the last individual has died. Species should be classified as Extinct only once exhaustive surveys throughout the species' known range have failed to record an individual.
Extinct in the Wild (EW): A species is Extinct in the Wild when it is known to survive only in cultivation or as a naturalized population (or populations) well outside the past range.
Regionally Extinct (RE): A species is Regionally Extinct when it is extinct within the region assessed (in this case South Africa), but wild populations can still be found in areas outside the region.
Critically Endangered, Possibly Extinct (CR PE): Possibly Extinct is a special tag associated with the category Critically Endangered, indicating species that are highly likely to be extinct, but the exhaustive surveys required for classifying the species as Extinct has not yet been completed. A small chance remains that such species may still be rediscovered.
Critically Endangered (CR): A species is Critically Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Critically Endangered, indicating that the species is facing an extremely high risk of extinction.
Endangered (EN): A species is Endangered when the best available evidence indicates that it meets at least one of the five IUCN criteria for Endangered, indicating that the species is facing a very high risk of extinction.
Vulnerable (VU): A species is Vulnerable when the best available evidence indicates that it meets at least one of the five IUCN criteria for Vulnerable, indicating that the species is facing a high risk of extinction.
Near Threatened (NT): A species is Near Threatened when available evidence indicates that it nearly meets any of the IUCN criteria for Vulnerable, and is therefore likely to become at risk of extinction in the near future.
[N]Critically" Rare A species is Critically Rare when it is known to occur at a single site, but is not exposed to any direct or plausible potential threat and does not otherwise qualify for a category of threat according to one of the five IUCN criteria.
[N]Rare: A species is Rare when it meets at least one of four South African criteria for rarity, but is not exposed to any direct or plausible potential threat and does not qualify for a category of threat according to one of the five IUCN criteria. The four criteria are as follows: ➢ Restricted range: Extent of Occurrence (EOO) <500 km2, OR ➢ Habitat specialist: Species is restricted to a specialized microhabitat so that it has a very small Area of Occupancy (AOO), typically smaller than 20 km2, OR ➢ Low densities of individuals: Species always occurs as single individuals or very small subpopulations (typically fewer than 50 mature individuals) scattered over a wide area, OR ➢ Small global population: Less than 10 000 mature individuals.

Declining: A species is Declining when it does not meet or nearly meet any of the five IUCN criteria and does not qualify for Critically Endangered, Endangered, Vulnerable or Near Threatened, but there are threatening processes causing a continuing decline of the species.
Least Concern (LC): A species is Least Concern when it has been evaluated against the IUCN criteria and does not qualify for any of the above categories. Species classified as Least Concern are considered at low risk of extinction. Widespread and abundant species are typically classified in this category.
Data Deficient - Insufficient Information (DDD): A species is DDD when there is inadequate information to make an assessment of its risk of extinction, but the species is well defined. Listing of species in this category indicates that more information is required and that future research could show that a threatened classification is appropriate.
Data Deficient - Taxonomically Problematic (DDT): A species is DDT when taxonomic problems hinder the distribution range and habitat from being well defined, so that an assessment of risk of extinction is not possible.
Not Evaluated (NE): A species is Not Evaluated when it has not been evaluated against the criteria. The national Red List of South African plants is a comprehensive assessment of all South African indigenous plants, and therefore all species are assessed and given a national Red List status. However, some species included in Plants of southern Africa: an online checklist are species that do not qualify for national listing because they are naturalized exotics, hybrids (natural or cultivated), or synonyms. These species are given the status Not Evaluated and the reasons why they have not been assessed are included in the assessment justification.

5.3.1.2 ***Red listed plant species associated with this veld type***

According to the Red List of South African Plants (version 2017.1., www.redlist.sanbi.org, accessed on 2017/06/30) a number of listed plant species is associated with Vanrhynsdorp Gannabosveld namely:

- *Agathosma elata* Sond. EN
- *Aspalathus cuspidata* R.Dahlgren VU
- *Aspalathus obtusata* Thunb. VU
- *Babiana salteri* G.J.Lewis VU
- *Babiana toximontana* J.C.Manning & Goldblatt EN
- *Bulbine melanovaginata* G.Will. VU
- *Cephalophyllum pulchrum* L.Bolus VU
- *Eriospermum attenuatum* P.L.Perry DDD
- *Eriospermum eriophorum* P.L.Perry CR
- *Eriospermum spirale* Schult. VU
- *Euphorbia fasciculata* Thunb. VU
- *Euphorbia pedemontana* L.C.Leach VU
- *Euphorbia schoenlandii* Pax VU
- *Haemanthus lanceifolius* Jacq. VU
- *Heliophila leptophylla* Schltr. VU
- *Lachenalia minima* W.F.Barker VU
- *Moraea quartzicola* Goldblatt & J.C.Manning VU
- *Ornithogalum hallii* Oberm. EN
- *Oxalis blastorrhiza* T.M.Salter EN
- *Oxalis dines* Ornduff VU
- *Phyllobolus tenuiflorus* (Jacq.) Gerbaulet VU
- *Quaqua pulchra* (Bruyns) Plowes EN
- *Romulea multisulcata* M.P.de Vos VU
- *Steirodiscus linearilobus* DC. CR
- *Tylecodon suffultus* Bruyns ex Toelken Critically Rare

No red list plant species was encountered on the proposed site.

5.3.2 NEM: BA PROTECTED SPECIES

The National Environmental Management: Biodiversity Act, Act 10 of 2004, provides for the protection of species through the "Lists of critically endangered, endangered, vulnerable and protected species" (GN. R. 152 of 23 February 2007).

No species protected in terms of NEM: BA was encountered.

5.3.3 NFA PROTECTED SPECIES

The National Forests Act (NFA) of 1998 (Act 84 of 1998) provides for the protection of forests as well as specific tree species their List of Protected tree species, updated on a yearly basis. The latest list on which this evaluation is based was published on the 23rd of December 2016 (GN 1602). One species protected in terms of the NFA was observed (refer to **Error! Reference source not found.**).

No species protected in terms of NFA was encountered.

5.4 CRITICAL BIODIVERSITY AREAS

Critical biodiversity areas (CBA's) are terrestrial and aquatic features in the landscape that are critical for retaining biodiversity and supporting continued ecosystem functioning and services (SANBI 2007). The primary purpose of CBA's is to inform land-use planning in order to promote sustainable development and protection of important natural habitat and landscapes. CBA's can also be used to inform protected area expansion and development plans. The CBA's underneath is based on the definition laid out in the guideline for publishing bioregional plans (Anon, 2008):

- **Critical biodiversity areas (CBA's)** are areas of the landscape that need to be maintained in a natural or near-natural state in order to ensure the continued existence and functioning of species and ecosystems and the delivery of ecosystem services. In other words, if these areas are not maintained in a natural or near-natural state then biodiversity conservation targets cannot be met. Maintaining an area in a natural state can include a variety of biodiversity-compatible land uses and resource uses.
- **Ecological support areas (ESA's)** are areas that are not essential for meeting biodiversity representation targets/thresholds but which nevertheless play an important role in supporting the ecological functioning of critical biodiversity areas and/or in delivering ecosystem services that support socio-economic development, such as water provision, flood mitigation or carbon sequestration. The degree of restriction on land use and resource use in these areas may be lower than that recommended for critical biodiversity areas.

From a land-use planning perspective it is useful to think of the difference between CBA's and ESA's in terms of where in the landscape the biodiversity impact of any land-use activity action is most significant:

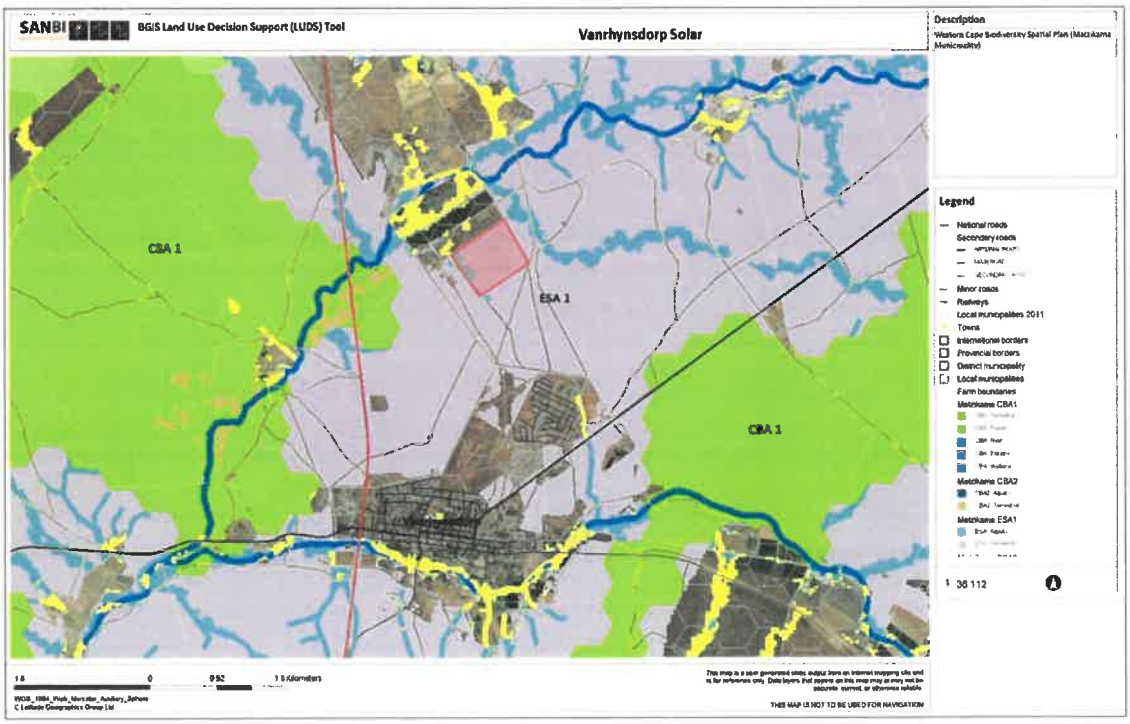
- For CBA's the impact on biodiversity of a change in land-use that results in a change from the desired ecological state is most significant locally at the point of impact through the direct loss of a biodiversity feature (e.g. loss of a populations or habitat).
- For ESA's a change from the desired ecological state is most significant elsewhere in the landscape through the indirect loss of biodiversity due to a breakdown, interruption or loss of an ecological process pathway (e.g. removing a corridor results in a population going extinct elsewhere or a new plantation locally results in a reduction in stream flow at the exit to the catchment which affects downstream biodiversity).

5.4.1 CRITICAL BIODIVERSITY AREAS ENCOUNTERED

Vanrhynsdorp and the proposed site location fall within the Western Cape Biodiversity Spatial Plan (WCBSP). The WCBSP aims at the most efficient selection of planning units required to meet all biodiversity, ecological sustainability and climate resilience targets, while favouring persistence and avoiding areas of competing land-uses.

According to the WCBSP (Refer to Figure 4) the proposed site will be located within an ecological support area (ESA 1), identified as a water recharge area. The larger area is not essential for meeting biodiversity targets, but can play an important role in supporting the functioning of protected areas or critical biodiversity area. The objective for CBA 1 areas is to maintain these areas in a functional near natural state. Some habitat loss may be acceptable, provided the underlying biodiversity objectives and ecological functioning are not compromised.

Figure 4: Western Cape Biodiversity spatial plan showing the proposed site (red) within an ESA 1 area



In terms of its status it is important to note the following:

- The site is still covered by natural veld dominated by Gannabos. Although it is difficult to ascertain, it is likely that the veld has been impacted by domestic livestock grazing (a possible reason for the low species diversity – apart from the recent drought);
- The proposed development will be relative small (± 10ha) and is located adjacent to existing agricultural land.
- The site still has good connectivity to the south, east and northeast, but borders on intensive cultivation to the northwest.
- The site fall within the larger Knersvlakte Centre of Endemism;
- Vanrhynsdorp Gannabosveld is classified as "*Least Threatened*" with approximately 79% remaining. However, it is unsure whether the conservation target of 28% had been reached with the recent declaration of the Knersvlakte Nature Reserve;
- No protected or red-listed plants were observed, but observations are based on a two day site visit which did not co-inside with the main annual and geophyte flowering time.

5.5 INVASIVE ALIEN PLANTS

Alien and invasive plant (AIP) species were introduced into South Africa more than 1 000 years ago *via* trading routes from other countries in southern Africa (Alberts & Moolman, 2013). Since the arrival of settlers from Europe these numbers have increased dramatically. At present, AIPs are encountered on large portions of land in South Africa (10 million hectares) and it is reportedly consuming nearly 330 million cubic meters of water annually, or 7% of the annual run-off. But what is really scary is that this water consumption levels are increasing rapidly and could reach 50% of the mean annual run-off in the not too distant future (Alberts & Moolman, 2013). The aggressive behaviour of the AIPs in their unnatural habitat is a direct threat to the vast wealth of biodiversity in South Africa. South Africa is a relatively small country that comprises only 2% of the total surface of the Earth, but it contains 10% of the plant species, 7% of the vertebrates, and is home to a number of biodiversity hotspots.

In South Africa, there are currently three pieces of national legislation that relate to the control of Alien and Invasive Species (AIS) namely the:

- Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947), administered by the Department of Agriculture, forestry and Fisheries.
- List of weeds and invader plants declared in terms of Regulations 15 and 16 (as Amended, March 2001) of the Conservation of Agricultural Resources Act, 1983 (Act No. 43 of 1983) (CARA) administered by the Department of Agriculture, Forestry and Fisheries (DAFF);
- Alien and invasive species list 2016 (GN R. 864 of 29 July 2016) promulgated in terms of sections 66(1), 67(1), 70(1)(a), 71(3) and 71A of the National Environmental Management, Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA), administered by the Department of Environmental Affairs (DEA).

5.5.1 FERTILIZER, FARM FEEDS, AGRICULTURAL REMEDIES AND STOCK REMEDIES ACT

According to Government Notice No. 13424 dated 26 July 1992, it is an offence to "acquire, dispose, sell or use an agricultural or stock remedy for a purpose or in a manner other than that specified on the label on a container thereof or on such a container".

Contractors using herbicides need to have a valid Pest Control Operators License (limited weeds controller) according to the Fertilizer, Farm Feeds, Agricultural Remedies and Stock Remedies Act (Act No. 36 of 1947).

5.5.2 CONSERVATION OF AGRICULTURAL RESOURCES ACT

The **CARA** sets out the regulations (amended March 2001) regarding the control of weeds and invasive plants and provides a list of declared plants. The amended regulations make provision for four groups of invader plants. The first three groups consist of undesirable alien plants and are covered by Regulation 15, namely:

- **Category 1** declared weeds (Section 15A of the amended act) are prohibited plants that will no longer be tolerated on land or on water surfaces, neither in rural or urban areas. These plants may no longer be planted or propagated, and all trade in their seeds, cuttings or other propagative material is prohibited. Plants included in this category because their harmfulness outweighs any useful properties or purpose they may have.
- **Category 2** declared plant invaders (Section 15B of the amended act) are plants with a proven potential of becoming invasive, but which nevertheless have certain beneficial properties that warrant their continued presence in certain circumstances. May be grown in demarcated areas provided that there is a permit and that steps are taken to prevent their spread.
- **Category 3** declared plant invaders (Section 15C of the amended act) are undesirable because they have the proven potential of becoming invasive, but most of them are nevertheless popular ornamentals or shade trees that will take a long time to replace. May no longer be planted. Existing plants may be retained as long as all reasonable steps are taken to prevent the spreading thereof, provided they are not within 30 metres of the 1:50 year flood line of a river, stream, lake or other type of inland water body. The "executive officer" can impose further conditions on Category 3 plants already in existence, which might include removing them if the situation demands it.
- **Bush encroachers**, which are indigenous plants that require sound management practices to prevent them from becoming problematic, are covered separately by Regulation 16.

Refer to heading 5.5.4 for listed weeds and invader species encountered in terms of CARA.

5.5.3 NATIONAL ENVIRONMENTAL MANAGEMENT: BIODIVERSITY ACT

NEMBA aims to provide the framework, norms, and standards for the conservation, sustainable use, and equitable benefit-sharing of South Africa's biological resources. The purpose of NEMBA as it relates to Alien and Invasive Species (AIS) is to prevent the unauthorised introduction and spread of such species to ecosystems and habitats where they do not naturally occur; manage and control such species to prevent or minimise harm to the environment and to biodiversity in particular; and to eradicate alien invasive species from ecosystems and habitats where they may harm such ecosystems or habitats. The Regulations on Alien and Invasive Species, referred to as the **"AIS Regulations"** combine invasive species already listed in the CARA, with two new lists relating to invasive species and prohibited species.

The AIS Regulations list 4 different categories of invasive species that must be managed, controlled or eradicated from areas where they may cause harm to the environment, or that are prohibited to be brought into South Africa, namely:

- **Category 1a:** invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. These species need to be controlled on your property, and officials from the Department of Environmental Affairs must be allowed access to monitor or assist with control.
- **Category 1b**: invasive species that may not be owned, imported into South Africa, grown, moved, sold, given as a gift or dumped in a waterway. Category 1b species are major invaders that may need government assistance to remove. All Category 1b species must be contained, and in many cases they already fall under a government sponsored management programme.
- **Category 2**: These are invasive species that can remain in your garden, but only with a permit, which is granted under very few circumstances.
- **Category 3:** These are invasive species that can remain in your garden. However, you cannot propagate or sell these species and must control them in your garden. In riparian zones or wetlands all Category 3 plants become Category 1b plants.

Refer to heading 5.5.4 for listed alien and invasive species encountered in terms of NEM: BA.

5.5.4 ALIEN AND INVASIVE PLANTS ENCOUNTERED

Approximately 10 *Prosopis* trees were observed on the property, but no alien plant species was observed within the proposed footprint area (Refer to Table 3).

Table 3: List of alien and invasive species encountered within the larger footprint

SPECIES	CARA	NEM: BA	MANAGEMENT RECOMMENDATIONS
Atriplex cf. *lindleyi*	Category 3 invader	Category 1b AIP	Remove all plants physically and burn
Prosopis glandulosa	Category 2 invader	Category 1B AIP (Western Cape)	Remove all plants physically (including root system) and burn, or use Registered herbicide to on cut-stump as treatment. Leave-spray smaller plants with registered herbicide.

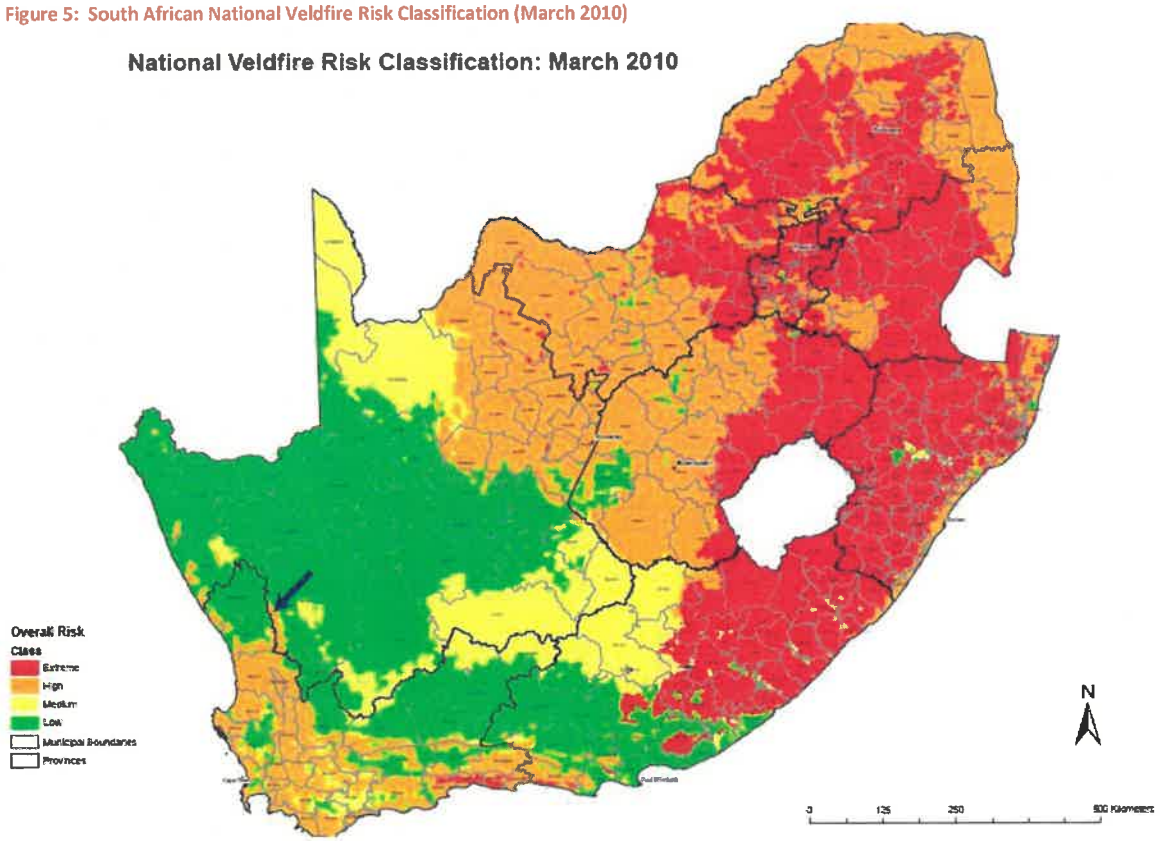
There are various means of managing alien and invasive plant species, which can include mechanical-, chemical- and biological control methods or a combination of these. Control methods prescribed by the author are usually based on used by the Working for Water Programme (Bold, 2007) and or the CapeNature alien control guideline (Martens *et. al.,* 2003).

5.6 VELD FIRE RISK

The revised veldfire risk classification (Forsyth, 2010) in terms of the National Veld and Forest Fire Act 101 of 1998 was promulgated in March 2010. The purpose of the revised fire risk classification is to serve as a national framework for implementing the National Veld and Forest Fire Act, and to provide a basis for setting priorities for veldfire management interventions such as the promotion of and support to Fire Protection Associations. In the fire-ecology types and municipalities with High to Extreme fire risk, comprehensive risk management strategies are needed.

The proposed site is located in an area supporting a very sparse semi-desert low shrubland which has been classified with a **High fire risk classification** (Refer to Figure 5). Still it is important that during construction and operation the site must adhere to all the requirements of the local Fire Protection Association (FPA), if applicable, or must adhere to responsible fire prevention and control measures.

Figure 5: South African National Veldfire Risk Classification (March 2010)



6. IMPACT ASSESSMENT METHOD

The concept of environmental impact assessment in terms of the National Environmental Management Act, Act 107 of 1998 (NEMA) and the Environmental Impact Assessment (EIA) was developed to identify and evaluate the nature of potential impact in order to determine whether an activity is likely to cause significant environmental impact on the environment. The concept of significance is at the core of impact identification, evaluation and decision making, but despite this the concept of significance and the method used for determining significance remains largely undefined and open to interpretation (DEAT, 2002).

6.1 DETERMINING SIGNIFICANCE

Determining impact significance from predictions of the nature of the impact has been a source of debate and will remain a source of debate. The author used a combination of scaling and weighting methods to determine significance based on a simple formula. The formula used is based on the method proposed by Edwards (2011). However, the criteria used were adjusted to suite its use for botanical assessment. In this document significance rating was evaluated using the following criteria.

Significance = Conservation Value x (Likelihood + Duration + Extent + Severity) (Edwards 2011)

6.1.1 CRITERIA USED

Conservation value: Conservation value refers to the intrinsic value of an attribute (e.g. an ecosystem, a vegetation type, a natural feature or a species) or its relative importance towards the conservation of an ecosystem or species or even natural aesthetics. Conservation status is based on habitat function, its vulnerability to loss and fragmentation or its value in terms of the protection of habitat or species (Refer to Table 4 for categories used).

Table 4: Categories used for evaluating conservation status

CONSERVATION VALUE	
Low (1)	The attribute is transformed, degraded not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium/low (2)	The attribute is in good condition but not sensitive (e.g. Least threatened), with unlikely possibility of species loss.
Medium (3)	The attribute is in good condition, considered vulnerable (threatened), or falls within an ecological support area or a critical biodiversity area, but with unlikely possibility of species loss.
Medium/high (4)	The attribute is considered endangered or, falls within an ecological support area or a critical biodiversity area, or provides core habitat for endemic or rare & endangered species.
High (5)	The attribute is considered critically endangered or is part of a proclaimed provincial or national protected area.

Likelihood refers to the probability of the specific impact occurring as a result of the proposed activity (Refer to Table 5, for categories used).

Table 5: Categories used for evaluating likelihood

LIKELHOOD	
Highly Unlikely (1)	Under normal circumstances it is almost certain that the impact will not occur.
Unlikely (2)	The possibility of the impact occurring is very low, but there is a small likelihood under normal circumstances.
Possible (3)	The likelihood of the impact occurring, under normal circumstances is 50/50, it may or it may not occur.
Probable (4)	It is very likely that the impact will occur under normal circumstances.
Certain (5)	The proposed activity is of such a nature that it is certain that the impact will occur under normal circumstances.

Duration refers to the length in time during which the activity is expected to impact on the environment (Refer to Table 6).

Table 6: Categories used for evaluating duration

DURATION	
Short (1)	Impact is temporary and easily reversible through natural process or with mitigation. Rehabilitation time is expected to be short (1-2 years).
Medium/short (2)	Impact is temporary and reversible through natural process or with mitigation. Rehabilitation time is expected to be relative short (2-5 years).
Medium (3)	Impact is medium-term and reversible with mitigation, but will last for some time after construction and may require ongoing mitigation. Rehabilitation time is expected to be longer (5-15 years).
Long (4)	Impact is long-term and reversible but only with long term mitigation. It will last for a long time after construction and is likely to require ongoing mitigation. Rehabilitation time is expected to be longer (15-50 years).
Permanent (5)	The impact is expected to be permanent.

Extent refers to the spatial area that is likely to be impacted or over which the impact will have influence, should it occur (Refer to Table 7).

Table 7: Categories used for evaluating extent

EXTENT	
Site (1)	Under normal circumstances the impact will be contained within the construction footprint.
Property (2)	Under normal circumstances the impact might extent outside of the construction site (e.g. within a 2 km radius), but will not affect surrounding properties.
Surrounding properties (3)	Under normal circumstances the impact might extent outside of the property boundaries and will affect surrounding land owners or –users, but still within the local area (e.g. within a 50 km radius).
Regional (4)	Under normal circumstances the impact might extent to the surrounding region (e.g. within a 200 km radius), and will regional land owners or –users.
Provincial (5)	Under normal circumstances the effects of the impact might extent to a large geographical area (>200 km radius).

Severity refers to the direct physical or biophysical impact of the activity on the surrounding environment should it occur (Refer to Table 8).

Table 8: Categories used for evaluating severity

SEVERITY	
Low (1)	It is expected that the impact will have little or no affect (barely perceptible) on the integrity of the surrounding environment. Rehabilitation not needed or easily achieved.
Medium/low (2)	It is expected that the impact will have a perceptible impact on the surrounding environment, but it will maintain its function, even if slightly modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium (3)	It is expected that he impact will have an impact on the surrounding environment, but it will maintain its function, even if moderately modified (overall integrity not compromised). Rehabilitation easily achieved.
Medium/high (4)	It is expected that the impact will have a severe impact on the surrounding environment. Functioning may be severely impaired and may temporarily cease. Rehabilitation will be needed to restore system integrity.
High (5)	It is expected that the impact will have a very severe to permanent impact on the surrounding environment. Functioning irreversibly impaired. Rehabilitation often impossible or unfeasible due to cost.

6.2 SIGNIFICANCE CATEGORIES

The formal NEMA EIA application process was developed to assess the significance of impacts on the surrounding environment (including socio-economic factors), associated with any specific development proposal in order to allow the competent authority to make informed decisions. Specialist studies must advise the environmental assessment practitioner (EAP) on the significance of impacts in his field of specialty. In order to do this, the specialist must identify all potentially significant environmental impacts, predict the nature of the impact and evaluate the significance of that impact should it occur.

Potential significant impacts are evaluated, using the method described above, in order to determine its potential significance. The potential significance is then described in terms of the categories given in Table 9. Mitigation options are evaluated and comparison is then made (using the same method) of potential significance before mitigation and potential significance after mitigation (to advise the EAP).

Table 9: Categories used to describe significance rating (adjusted from DEAT, 2002)

SIGNIFICANCE	DESCRIPTION
Insignificant or Positive (4-22)	There is no impact or the impact is insignificant in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or the impact may be positive.
Low (23-36)	An impact barely noticeable in scale or magnitude as a result of low sensitivity to change or low intrinsic value of the site, or will be of very short-term or is unlikely to occur. Impact is unlikely to have any real effect and no or little mitigation is required.
Medium Low (37-45)	Impact is of a low order and therefore likely to have little real effect. Mitigation is either easily achieved. Social, cultural and economic activities can continue unchanged, or impacts may have medium to short term effects on the social and/or natural environment within site boundaries.
Medium (46-55)	Impact is real, but not substantial. Mitigation is both feasible and fairly easily possible, but may require modification of the project design or layout. Social, cultural and economic activities of communities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long term effect on the social and/or natural environment, within site boundary.
Medium high (56-63)	Impact is real, substantial and undesirable, but mitigation is feasible. Modification of the project design or layout may be required. Social, cultural and economic activities may be impacted, but can continue (albeit in a different form). These impacts will usually result in medium to long-term effect on the social and/or natural environment, beyond site boundary within local area.
High (64-79)	An impact of high order. Mitigation is difficult, expensive, time-consuming or some combination of these. Social, cultural and economic activities of communities are disrupted and may come to a halt. These impacts will usually result in long-term change to the social and/or natural environment, beyond site boundaries, regional or widespread.
Unacceptable (80-100)	An impact of the highest order possible. There is no possible mitigation that could offset the impact. Social, cultural and economic activities of communities are disrupted to such an extent that these come to a halt. The impact will result in permanent change. Very often these impacts are un-mitigatable and usually result in very severe effects, beyond site boundaries, national or international.

7. BIODIVERSITY ASSESSMENT

Vanrhynsdorp Gannabosveld is part of the Succulent-Karoo Biome (Mucina *et al.*, 2006). The Succulent Karoo is strongly influence by winter rainfall and fog and has been compared to a desert harbouring a range of succulent plants beyond compare. It has a bulb flora richer than any other arid region and produces spectacular displays of annual flowers after good rains. The rainfall predictability sets it apart from other deserts and is commonly accepted as the main reason for the abundance of leaf succulents (which with their shallow root system is not well adapted to prolonged drought), bulbs and spring flowers. Unfortunately, only a small percentage of the Succulent Karoo is formally protected (Mucina *et. al.*, 2006) although the resent proclamation of the Knersvlakte Nature Reserve would have added to the protection level, and it was also felt that the (then) protected area system did not adequately incorporate key ecological components and evolutionary biodiversity drivers like riverine and sand movement corridors, quartz patches, edaphic interfaces, climatic and upland-lowland gradients. Land use is primarily focused on agriculture, with livestock grazing the dominant land use in 90% of the region. Before widespread human settlement indigenous antelope would have migrated across the landscape in search of grazing, no doubt having an overall positive influence on biodiversity. However, fences, permanent watering points and high domestic stock densities almost certainly led to degradation, loss of vegetation cover, loss of seed bank and a negative influence on soil quality (Mucina *et. al.*, 2006).

7.1 BIOPHYSICAL ENVIRONMENT

Centres of Endemism: The proposed site falls within the Knersvlakte Centre of Endemism, but is located on the sandy soils, dominated by Gannabos (*Salsola* species), to the south of the true quarts-field flora and although it is likely that the veld will support a number of annual and geophyte flora (which can result in spectacular flower displays in spring after good rains), it is unlikely that the proposed development (given its relative small size and location) will result in any significant impact on the true Knersvlakte vegetation.

Heuweltjies: No "heuweltjies" (ascribed as ancient termite mounds with soils more fertile that that of its surroundings) were observed on the site or its immediate surroundings. There is a marked difference in biodiversity on and between these heuweltjies.

CBA or ESA: According to the Western Cape Biodiversity Spatial Plant, the site is located within an ecological support area identified as a water recharge area. In this case the proposed site is located on a sandy plain sloping towards the Droë River to its northwest), but with developed vineyards adjacent and directly in the path of any surface drainage. Underground water recharge will not be significantly hampered by the proposed development; since the surface area is very small and will not be impregnable (underground water recharge will still be able from the site).

Connectivity: The location (adjacent to existing agricultural land) and relative small size of the site will also not lead to a significant reduction in connectivity.

Other: The site visit showed no other significant geographical features such as watercourses, wetlands, upland- down land gradients or vegetation boundaries on the site or limited to the site. The site is located near an area already transformed as a result of intensive agriculture (vineyards next to the Droë River).

7.2 THREATENED OR PROTECTED ECOSYSTEMS

The Vanrhynsdorp Gannabosveld vegetation type is not vulnerable or threatened with more 79% still remaining in its natural state. However, at present little of this vegetation type is formally conserved in South Africa. It is thus important the viable areas are considered for inclusion into Conservation areas or CBA's or ESA's. Although it is located within the larger Knersvlakte Centre of Endemism and within an ecological support area, it is unlikely that the proposed footprint will have any significant impact on local or national conservation targets.

No Red list species was encountered (Heading 5.3.1), or species protected in terms of NEMBA (Heading 5.3.2), or species protected in terms of the NFA (Heading 5.3.3). A small number of the alien *Prosopis* trees and the shrub *Atriplex lindleyi* were observed and an alien eradication plan should be implemented to ensure the control of these species within the development footprint.

7.3 CUMMULATIVE IMPACTS

The Department of Environmental Affairs requires that specialist evaluates the accumulative impacts of all other renewable energy sites within a 30 km radius of the proposed development. According to the information obtained from the Department of Environmental Affairs renewable energy database website for South Africa (https://dea.maps.arcgis.com/apps/webappviewer), there are potentially three renewable energy sites within a 30 km radius of the proposed Vanrhynsdorp site (Figure 6), not including the Keren Vanrhynsdorp site, which refers to this application. Seven potential other renewable energy facilities are mapped within a 30 km radius (Refer to Table 10 and Figure 6. However, the Site 6 application was withdrawn and the Site 7 application refers to the same site as this application.

Table 10: Potential renewable energy sites within 30km of the proposed Vanrhynsdorp Solar site

Name	Type	MW	Vegetation type
1. Orlight SA Solar PV Plant (Approved)	Solar PV	20	Vanrhynsdorp Gannabosveld
2. Romano Solar on Pr. 334 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Vanrhynsdorp Gannabosveld
3. Matzikama Solar Park on Pr. 414 of Farm 292, Vredendal (Approved)	Solar PV	10	Namaqualand Spinescent Grassland Namaqualand Strandveld
4. Solar plant northwest of Vredendal (Approved)	Solar PV	30	Namaqualand Strandveld Namaqualand Spinescent Grassland
5. Inca Wind Energy facility on Farm 293 (Approved)	Wind	30	Namaqualand Strandveld
6. Proposed Keren Energy Solar (Withdrawn)	-	-	N/a
7. N/a Refers to the same site as this application	-	-	N/a

Figure 6: Indicating potential renewable energy sites within 30km radius of the proposed Vanrhynsdorp Solar site

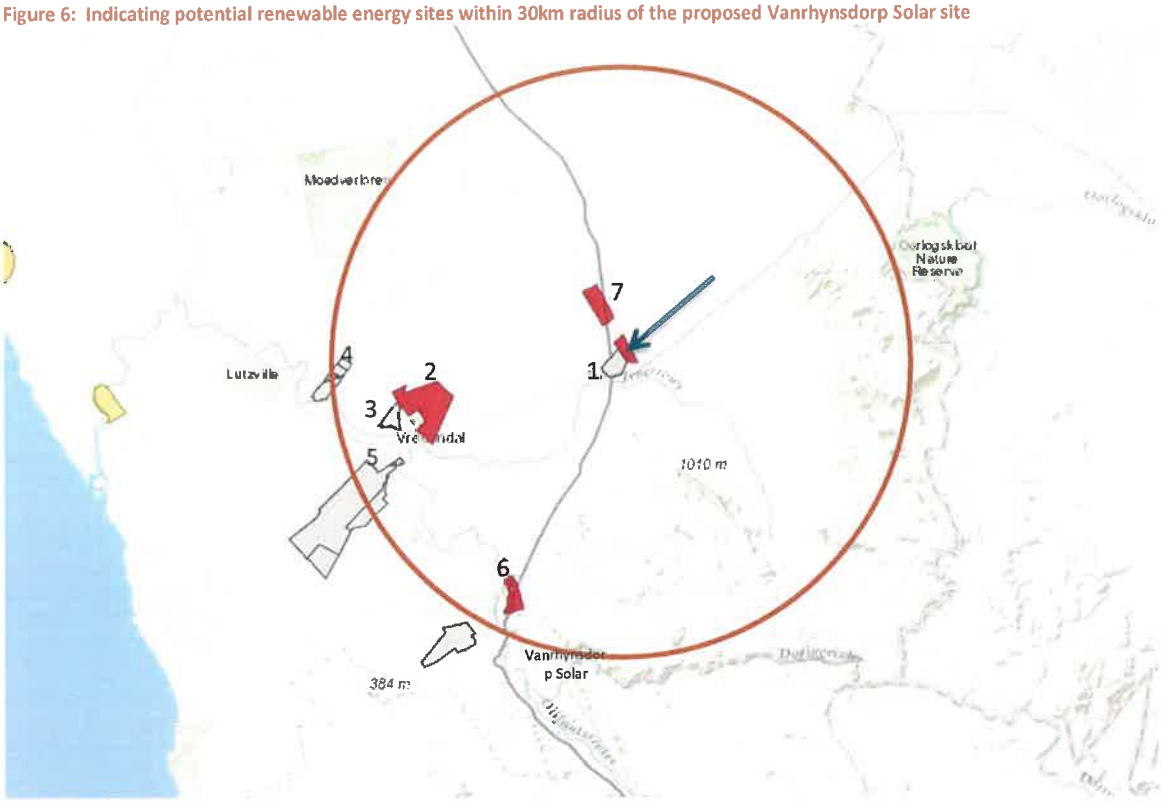
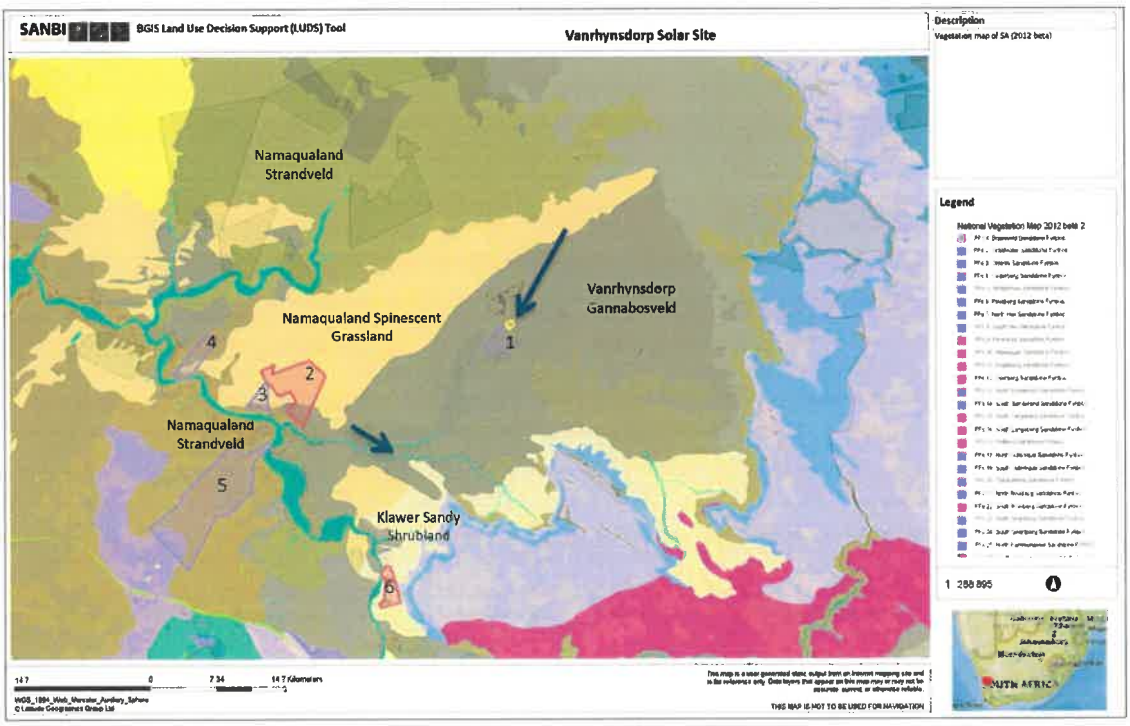


Figure 7: The vegetation map of South Africa (2012, beta version) showing the vegetation associated with the RE sites within 30km



The proposed Vanrhynsdorp development is small (±10ha) and will impact on Vanrhynsdorp Gannabosveld. Vanrhynsdorp Gannabosveld vegetation type is not considered vulnerable or threatened with more 79% still remaining in its natural state. Ecological connectivity is still very good for most of the Vanrhynsdorp area (the

veld being mainly natural grazing land). Because of the small size of the proposed footprint is unlikely to have any significant impact on connectivity the ecological support area. Floristically, no protected plant species or red-listed plant species were encountered. In the case of the Vanrhynsdorp Solar site, two other renewable energy sites, within 30km, may impact on the same vegetation type namely Site 1 and 2 in Figure 6 & Figure 7. Both sites are relative small (10 MW & 20 MW), which should relate to approximately 30 ha in total. Together with the Vanrhynsdorp Solar site it relates to approximately a 40-50 ha impact on this vegetation type out of roughly 540 700 ha of this vegetation type (of which almost 79% are still believed to be in fairly natural state). The impact of the Vanrhynsdorp solar site is thus roughly 0.0018%, while the cumulative impact is roughly 0.0092%.

Cumulative impacts for this project was calculated taking into account the small size of the proposed development, the impact of similar developments within a 30km radius on the same vegetation type, connectivity, potential critical biodiversity areas or ecological support areas and the impact on protected species as well as land-use, geology and soils, fauna and avi-fauna (Refer to Table 11).

7.4 IMPACT EVALUATION

Table 11 rates the significance of environmental impacts associated with the proposed development. It also evaluates the expected accumulative effect of the proposed development as well as the No-Go option.

Table 11: Significant rating of impacts associated with the proposed development (including the No-Go option)

Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Geology & soils	Possible impact on special habitats (e.g. true quartz or "heuweltjies")	2	1	3	1	1	12	2	1	3	1	1	12	No special features encountered. The impact on geology and soils is expected to be very low. No mitigation required.
Land use and cover.	Possible impact on socio-economic activities as a result of the physical footprint or associated activities.	3	4	3	1	1	27	3	3	3	1	1	24	The proposed development will impact on a small area used for grazing by the landowner. Loss of grazing will be barely perceptible within the larger property.
Vegetation type	Possible loss of vegetation and associated habitat.	3	4	3	1	2	30	3	3	3	1	1	24	More than 79% of this vegetation remains in its natural state, but little formally conserved. Mitigation - Minimise development footprint.
Corridors and conservation priority areas	Possible loss of identified terrestrial and aquatic critical biodiversity areas, ecological support areas or ecological corridors.	3	4	3	1	2	30	3	3	3	1	1	24	The development will impact on an ESA and the Knersvlakte Centre of Endemism. However, because of the small footprint it is not expected to have a significant impact on conservation targets. Mitigation - minimise footprint.
Watercourses and wetlands	Possible impact on natural water resources and its associated ecosystem.	0	0	0	0	0	0	0	0	0	0	0	0	Not applicable
Flora	Possible loss of threatened or protected species.	3	4	3	1	2	30	3	3	3	1	1	24	No protected or red-data species encountered (although it is possible that some annuals or geophytes that could not be observed during the study might be found). However, it is highly unlikely that they will be restricted to this area alone or that any significant impact may result).
Fauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.

Aspect	Short description	CV	Lik	Dur	Ext	Sev	Sig. before Mit.	CV	Lik	Dur	Ext	Sev	Sig. after Mit.	Short discussion
Avi-fauna	Possible impact on species as well as potential loss of threatened or protected species.	3	2	3	1	1	21	3	2	3	1	1	21	Unlikely to impact significantly on any single species. No mitigation required.
Invasive alien species	Possible alien infestation as a result of activities.	3	3	3	1	2	27	3	1	3	1	1	18	Both alien species encountered must be eradicated from the footprint as part of construction and an on-going eradication program must be part of maintenance.
Veld fire	The risk of veld fires as a result of the proposed activities.	3	3	2	3	2	30	3	1	2	1	1	15	Veld fire risk is considered high and must be addressed appropriately through the construction EMP.
Accumulative	Accumulative impact associated with the proposed activity.	3	4	3	3	2	36	3	4	3	1	1	27	The overall impact is considered to be relatively low, because of the small size, but good environmental control during construction is imperative.
No-Go alternative	Potential environmental impact associated with the no-go alternative.	3	1	1	1	1	12						0	The above impacts will not occur, and the status quo will remain (livestock grazing as the main land use).

Significance before mitigation: The impact assessment suggests that the proposed Vanrhynsdorp development is expected to have a **Low cumulative** impact, with the most significant aspect being the low potential impacts on vegetation type, corridor and conservation priority areas, flora and accidental veld fires. The evaluation takes into account on the relative small size of the proposed development and its location adjacent to existing agricultural land (transformed land).

Significance after mitigation: Since the proposed development footprint needs only be approximately 50% of the 20ha, there is great potential for micro-adjustment of the final layout plans. Even though the impact is already considered low it will still be possible to reduce direct impacts on other features of significance through layout adjustments, search & rescue and topsoil management. The potential impact on the regional status of the vegetation type and associated biodiversity features (e.g. corridor function or special habitats) is considered low. No irreversible species-loss, habitat-loss, connectivity or associated impact can be foreseen from locating and operating the solar facility on the proposed site. With mitigation the impact on biodiversity features can be reduced but will stay **Low**.

The NO-GO option: The "No-Go Alternative" alternative will not result in significant gain in regional conservation targets, the conservation of rare & endangered species or gain in connectivity. At the best the No-Go alternative will only support the "status quo" on the site. On the other hand the pressure on Eskom facilities, most of which is currently still dependant on fossil fuel electricity generation, will remain. Solar power remains a much cleaner and more sustainable option for electricity production.

8. RECOMMENDATIONS

Having evaluated and discussed the various biodiversity aspects associated with the development, the most significant impacts are expected to be the potential impacts on:

- The ecological support area;
- The Knersvlakte Centre of Endemism;
- The small potential impact on conservation worthy plants relating to potential red-data species not visible during the two site visits (e.g. annuals and bulbs).

However, it is considered unlikely that the proposed project will contribute significantly to any of the following:

- Significant loss of vegetation and associated habitat in terms of local or national conservation targets;
- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to development and operational activities;
- Significant loss of local biodiversity and threatened plant species;
- Significant loss of ecosystem connectivity (e.g. corridor function).

Lastly it is felt that good environmental planning and control during construction, the appointment of a suitably qualified ECO and the implementation of an approved EMP, could further reduce the risk of potential environmental impact.

With the available information to the author's disposal it is recommended that project be approved since it is not associated with irreversible environmental impact, provided that mitigation is adequately addresses.

9. IMPACT MINIMIZATION

There are numerous possibilities for mitigation measures to lessen the direct impact during construction (and operational) phases, of which the overriding goal should be to clearly define the final layout which must aim at minimising the disturbance footprint.

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase in terms of the EMP and the Biodiversity study recommendations as well as any other conditions pertaining to other specialist studies and requirements of any competent authority.
- Before any work is done the footprint must be clearly demarcated. The demarcation must aim at minimum footprint and minimisation of disturbance.
- Topsoil (the top 15-20 cm) must be removed and protected and re-used for rehabilitation purposes of suitable areas on site or within the immediate surroundings (Seedbed protection).
- Before construction the footprint must be scanned by a botanist or suitably qualified ECO in order to identify the plants listed for Search & Rescue. The Botanist must advise on the best way for search & rescue and must also take the following into account:
    - These plants must be transplanted outside of the disturbance footprint, but within the same vegetation type (preferably the immediate surroundings of the site).
    - A watering program must be implemented for transplanted plants.
- Lay-down areas or construction camp sites must be located within areas already disturbed or areas of low ecological value and must be pre-approved by the ECO.
- Indiscriminate clearing of any area outside of these footprints may not be allowed.
- All construction areas must be suitably rehabilitated on completion of the project.
    - This includes the removal of all excavated material, spoil and rocks, all construction related material and all waste material.
    - This must include re-using the protected topsoil as well as shaping the area to represent the original shape of the environment.
- An integrated waste management approach must be implemented during construction.
    - Construction related general and hazardous waste may only be disposed of at approved waste disposal sites.
    - Clean spoil from excavation work should be used as fill where possible.
    - All rubble and rubbish should be collected and removed from the site to a Municipal approved waste disposal site.

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APPENDIX 1

Plant species checklist for Vanrhynsdorp Gannabosveld (SANBI: BGIS)

FAMILY NAME	GROWTH FORM	SPECIES NAME
MOLLUGINACEAE	Herbs	*Adenogramma glomerata*
CRASSULACEAE	Succulent Shrubs	*Adromischus sphenophyllus*
ASTERACEAE	Herbs	*Amellus microglossus*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Antimima dasyphylla*
MESEMBRYANTHEMACEAE	Succulent Herbs	*Apatesia helianthoides*
MESEMBRYANTHEMACEAE	Succulent Herbs	*Apatesia sabulosa*
ASTERACEAE	Herbs	*Arctotis hirsuta*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Aridaria brevicarpa*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Aridaria noctiflora subsp. noctiflora*
ASPARAGACEAE	Low Shrubs	*Asparagus capensis var. capensis*
ASPARAGACEAE	Low Shrubs	*Asparagus suaveolens*
IRIDACEAE	Geophytic Herbs	*Babiana minuta*
IRIDACEAE	Geophytic Herbs	*Babiana salteri*
IRIDACEAE	Geophytic Herbs	*Babiana sambucina var. longibracteata*
POACEAE	Graminoids	*Bromus pectinatus*
MESEMBRYANTHEMACEAE	Succulent Herb	*Brownanthus glareicola*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Caulipsolon rapaceum*
ASTERACEAE	Low Shrubs	*Chrysocoma longifolia*
ASTERACEAE	Herbs	*Cotula microglossa*
ASTERACEAE	Herb	*Cotula pedunculata*
SCROPHULARIACEAE	Herbs	*Cromidon corrigioloides*
TECOPHILAEACEAE	Geophytic Herbs	*Cyanella orchidiformis*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Delosperma crassum*
ASTERACEAE	Herbs	*Dimorphotheca sinuata*
HYACINTHACEAE	Geophytic Herbs	*Dipcadi crispum*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Drosanthemum deciduum*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Drosanthemum hispidum*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Drosanthemum latipetalum*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Drosanthemum schoenlandianum*
POACEAE	Graminoids	*Ehrharta ramosa subsp. aphylla*
POACEAE	Graminoids	*Enneapogon desvauxii*
ASTERACEAE	Low Shrubs	*Eriocephalus microphyllus var. pubescens*
ERIOSPERMACEAE	Geophytic Herbs	*Eriospermum eriophorum*
EUPHORBIACEAE	Succulent Shrubs	*Euphorbia aspericaulis*
EUPHORBIACEAE	Succulent Shrub	*Euphorbia fasciculata*
EUPHORBIACEAE	Succulent Shrubs	*Euphorbia mauritanica*
ASTERACEAE	Herbs	*Felicia namaquana*
ASTERACEAE	Herbs	*Felicia tenella*

FAMILY NAME	GROWTH FORM	SPECIES NAME
CYPERACEAE	Graminoids	*Ficinia argyropa*
ASTERACEAE	Herbs	*Foveolina dichotoma*
AIZOACEAE	Low Shrubs	*Galenia africana*
AIZOACEAE	Low Shrubs	*Galenia fruticosa*
ASTERACEAE	Herbs	*Gazania krebsiana subsp. arctotoides*
ASTERACEAE	Herbs	*Gazania lichtensteinii*
ASTERACEAE	Herbs	*Gorteria diffusa subsp. diffusa*
NEURADACEAE	Herbs	*Grielum humifusum*
BRASSICACEAE	Herbs	*Heliophila pendula*
MALVACEAE	Low Shrubs	*Hermannia cuneifolia*
POACEAE	Graminoids	*Karroochloa tenella*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Lampranthus uniflorus*
IRIDACEAE	Geophytic Herbs	*Lapeirousia exilis*
IRIDACEAE	Geophytic Herbs	*Lapeirousia simulans*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Malephora purpureo-crocea*
CHENOPODIACEAE	Succulent Shrubs	*Manochlamys albicans*
SCROPHULARIACEAE	Herbs	*Manulea altissima subsp. longifolia*
HYACINTHACEAE	Geophytic Herbs	*Massonia echinata*
IRIDACEAE	Geophytic Herbs	*Moraea galaxia*
IRIDACEAE	Geophytic Herbs	*Moraea miniata*
ASTERACEAE	Herbs	*Nestlera biennis*
ASTERACEAE	Herbs	*Oncosiphon suffruticosum*
HYACINTHACEAE	Geophytic Herbs	*Ornithogalum diluculum*
ASTERACEAE	Herbs	*Osteospermum pinnatum*
OXALIDACEAE	Geophytic Herbs	*Oxalis annae*
OXALIDACEAE	Geophytic Herbs	*Oxalis compressa*
OXALIDACEAE	Geophytic Herbs	*Oxalis copiosa*
OXALIDACEAE	Geophytic Herbs	*Oxalis pes-caprae*
OXALIDACEAE	Geophytic Herbs	*Oxalis purpurea*
POACEAE	Graminoids	*Pentaschistis patula*
MESEMBRYANTHEMACEAE	Succulent Herbs	*Phyllobolus nitidus*
PLANTAGINACEAE	Herbs	*Plantago cafra*
MESEMBRYANTHEMACEAE	Succulent Herbs	*Psilocaulon junceum*
MESEMBRYANTHEMACEAE	Succulent Herbs	*Psilocaulon leptarthron*
ASTERACEAE	Low Shrubs	*Pteronia paniculata*
ASTERACEAE	Herbs	*Rhynchopsidium pumilum*
MESEMBRYANTHEMACEAE	Succulent Shrubs	*Ruschia fugitans*
CHENOPODIACEAE	Succulent Shrubs	*Salsola namibica*

FAMILY NAME	GROWTH FORM	SPECIES NAME
CHENOPODIACEAE	Succulent Shrubs	*Salsola zeyheri*
SCROPHULARIACEAE	Low Shrubs	*Selago albida*
IRIDACEAE	Geophytic Herbs	*Sparaxis galeata*
POACEAE	Graminoids	*Stipa capensis*
POACEAE	Graminoids	*Stipagrostis ciliata*
POACEAE	Graminoids	*Stipagrostis zeyheri subsp. macropus*
AMARYLLIDACEAE	Geophytic Herbs	*Strumaria unguiculata*
AIZOACEAE	Succulent Shrubs	*Tetragonia hirsuta*
AIZOACEAE	Succulent Shrubs	*Tetragonia sarcophylla*
ASPHODELACEAE	Geophytic Herbs	*Trachyandra falcata*
ASPHODELACEAE	Geophytic Herbs	*Trachyandra jacquiniana*
ASPHODELACEAE	Geophytic Herbs	*Trachyandra scabra*
POACEAE	Graminoids	*Tribolium pusillum*
ZYGOPHYLLACEAE	Herbs	*Tribulus terrestris*
ASTERACEAE	Herbs	*Tripteris microcarpa*
ASTERACEAE	Low Shrubs	*Tripteris sinuata*
CRASSULACEAE	Succulent Shrubs	*Tylecodon reticulatus*
CRASSULACEAE	Succulent Shrubs	*Tylecodon ventricosus*
ASTERACEAE	Herbs	*Ursinia pygmaea*
ZYGOPHYLLACEAE	Succulent Shrubs	*Zygophyllum cordifolium*

PB CONSULT
ENVIRONMENTAL MANAGEMENT SERVICES

4 December 2017

Ms Vivienne Thomson
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Helderberg
7135

Dear Ms Thomson

VANRHYNSDORP SOLAR PROJECT: BIODIVERSITY ASSESSMENT & BOTANICAL SCAN

With regards to the potential impact on bird species, I would like to add the following. Although I am not an avi-faunal specialist, I do have a keen interest in bird species in general. In my original assessment (Dated 13 April 2012) as well as the more resent addendum (Dated 20 June 2017), I only touched very briefly on the potential impact on bird species as I thought it highly unlikely that the proposed solar panels will impact significantly on any bird species. The main reason being that the solar facility will have a relative small footprint of which the main aspect will be the construction of approximately 10 ha of solar panels (at ground level).

The only other aspect of the proposed solar project that may potentially impact on bird species will be the addition of new (11KVa) overhead power line. However, since the power lines will follow existing overhead cable lines for the most part the potential additional impact was considered very low. This coupled with the fact that during four site visits (over various seasons), the author did not observe any significant larger bird species on or in the vicinity of the proposed site especially collision prone larger birds (apart from one Korhaan to the east of the property). The site itself is located near to existing agricultural land (and its associated activities), and for the most part further than 500 m away from the nearest watercourse, which is the seasonal Droë River (a tributary to the Troe-Troe River). The vineyards may attract a number of smaller bird species during the harvesting season, which in turn might attract some larger birds of prey (e.g. hawks & falcons).

Collision prone birds are generally associated with larger terrestrial bird species with a high ratio of body weight to wing surface (birds with low manoeuvrability) or species that fly at high speed when foraging or commuting through the area.

With regards to the potential impact on bird species:

- The proposed site is not expected to have any significant impact on bird habitat, as no natural roosting or breeding areas were observed (larger birds of prey in this area tend to keep closer to the Maskam and Bokkeveld Mountains – personal observance).

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- The proposed site is also located well away from any mountains or ridges that might facilitate natural updrafts, meaning that it is highly unlikely to have any impact on soaring birds (e.g. storks or cranes and most raptors).
- The Droë River is a seasonal stream, which seemingly does not support any significant larger bird life (although this might alter somewhat when the stream is in flow).
- Most importantly, however, is the fact that the proposed development will only add a very small potential additional impact zone as the site and its immediate surroundings are already criss-crossed by existing overhead cables (both electrical infrastructure and telephone lines) (Figure 1).
- As precautionary measure bird flappers could be installed on the section of the new line that does not run parallel with existing infrastructure.

Figure 1: Google image showing the existing nearby Eskom lines (red) & telephone lines (blue) and the proposed new power line (green) in approximate relation to each other.

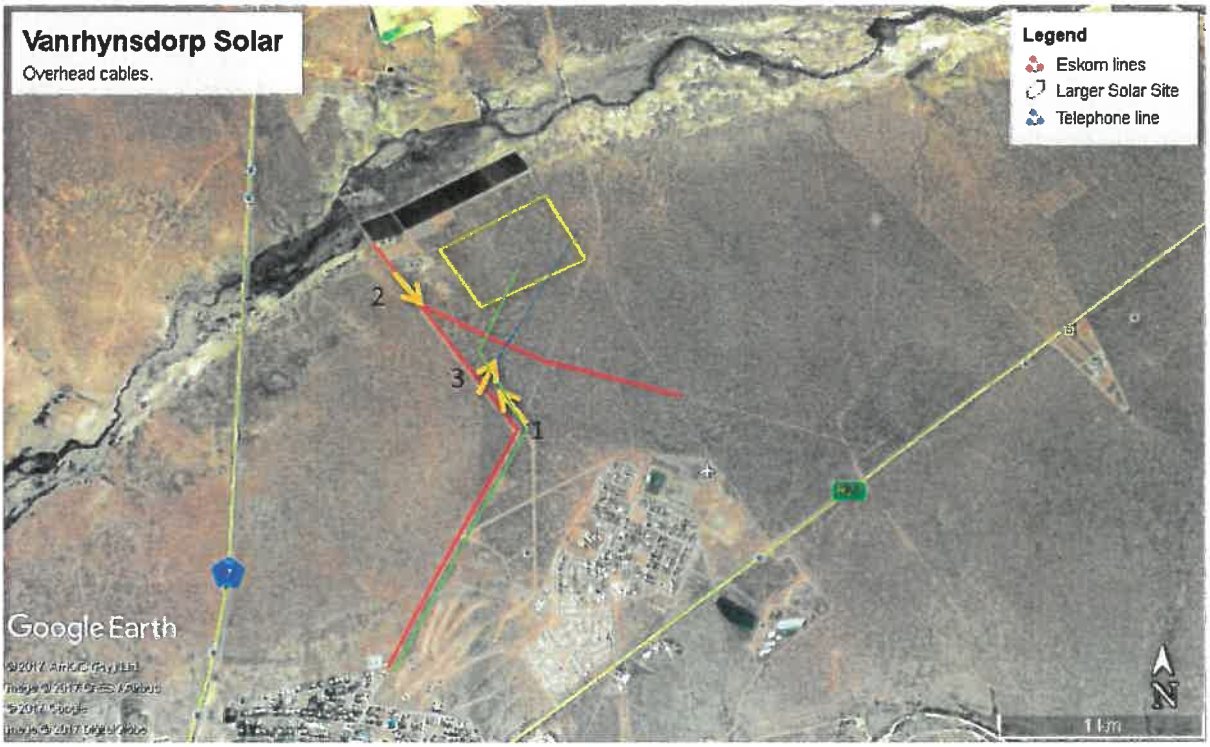


Photo 1: Photo indicating the overhead power and the telephone lines (Taken from position 1 in Figure 1)

Photo 2: Photo indicating the power lines looking from west to east near the location (Taken from Position 2 in Fig. 1)

Photo 3: Photo showing the telephone lines running next to the site (Photo taken from Position 3 in Figure 1)

As a result of the existing overhead infrastructure and the low bird activity that was observed in the open plains near the proposed site, the potential impact of the additional power lines was not considered to have any significant additional environmental impact.

However, as a pre-cautionary measure the power lines can be made more visible by adding (for instance) bird flappers to the line.

Kindest regards

Peet Botes

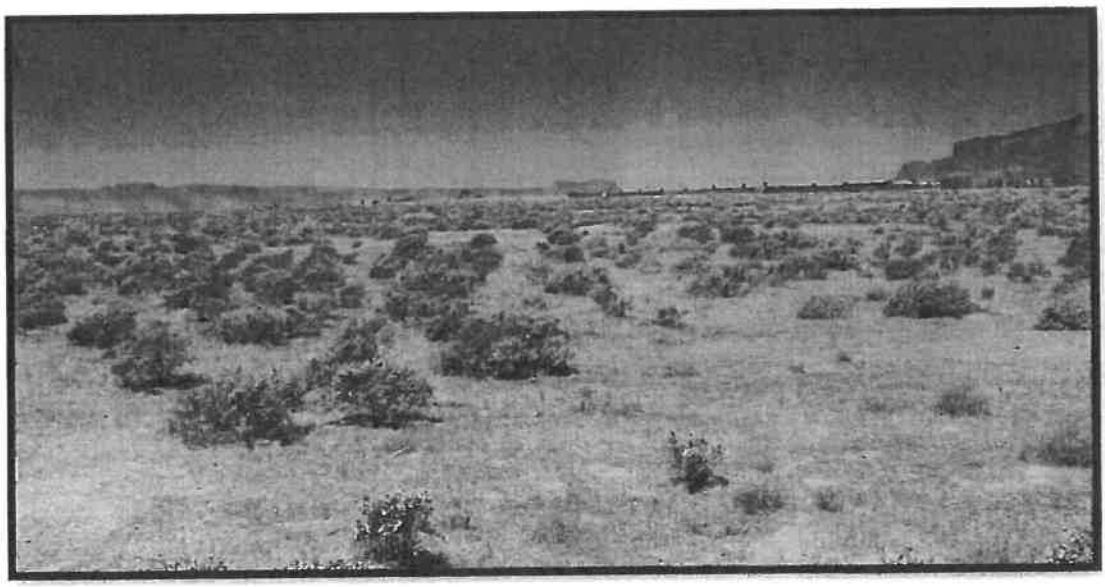
Appendix D2: Original Biodiversity Assessment and Botanical Scan (2012)

VANRHYNSDORP
KEREN ENERGY HOLDINGS

BIODIVERSITY ASSESSMENT & BOTANICAL SCAN

A preliminary Biodiversity Assessment (with botanical input) taking into consideration the findings of the National Spatial Biodiversity Assessment of South Africa.

APRIL 13, 2012 (Revised)



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EXECUTIVE SUMMARY - MAIN CONCLUSIONS

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MAIN VEGETATION TYPES	**Vanrhynsdorp Gannabosveld** is part of the succulent Karoo Biome and described as occurring mainly on flat or very slightly undulating landscape supporting succulent shrubland dominated by *Salsola*, *Drosanthemum*, *Rushia* and some disturbance indicators such as short lived *Aizoaceae*, including representatives of the genera *Galenia*, *Psilocaulon*, *Caulipsolon* and *Mesembryanthemum* (Mucina & Rutherford, 2006) **Least Threatened:** Although more than 79% of this vegetation type remains, none is formally conserved. **Critical Biodiversity Area:** Please note that the proposed Vanrhynsdorp solar site location falls within such a Critical Biodiversity Area (Figure 10).
LAND USE AND COVER	The study area is situated on agricultural farmland mainly used for stock grazing. Overhead cables are located on the property.
RED DATA PLANT SPECIES	No threatened or endangered species were recorded during the site visit, however, this does not rule out their presence as they may be subject to seasonable rainfall and may not have been observable during the time of the site visit. It is, however, considered unlikely that any red data species will be confined to this site alone. Protected Trees: None observed.
IMPACT ASSESSMENT	Development without mitigation: Significance = 52% Development with mitigation Significance = 20% Where values of ≤15% indicate an insignificant environmental impact and values >15% constitute ever increasing environmental impact.

RECOMMENDATION

In summary, all areas with remaining natural vegetation, especially when these features show good connectivity with the surrounding natural veld (e.g. corridors) should be considered as significant. In this case the proposed location also co-insides with an area identified as a **Critical Biodiversity Area** within the Matzikama Municipality. As such it places extra emphasis on the ecological importance of the area in which the site is to be located. On the other hand, the placement of a 20 ha solar site in this location is not expected to have significant impact on any single biodiversity feature but it may **put pressure on regional conservation targets in that it might impede corridor connectivity.**

The site visit and desktop studies described and evaluated in this document led to the conclusion that the "No-Go" alternative may result in significant gain in regional conservation targets (not through the conservation of significant vegetation, rare & endangered species or special habitats, but through corridor conservation) **and it should be considered to move the proposed final site location out of the CBA** (Refer to Figure 11 for possible options).

It was also clear that the specific site location cannot be rejected on the grounds of:

- the significance of the specific vegetation type (which are classified as Least Threatened),
- nor due to the impact on populations of individual species (regarded as low),
- nor due to the conservation of rare & endangered species (considered not be to be significantly impacted),
- nor for the protection of protected species (of which none was encountered),
- nor due to the impact on special or sensitive habitats (none encountered).

Thus, although the placement of the solar site location is not expected to have significant impact on any single biodiversity feature, it is expected to put **pressure on regional conservation targets** (possible impediment of corridor connectivity) due to its CBA status

On the other hand the pressure on Eskom facilities, most of which are currently still dependant on fossil fuel electricity generation, will remain. Solar power is seemingly a much cleaner, biodiversity friendly, and more sustainable long term option for electricity production. The socio-economical gain for the area could also be significant.

From the information available and the site visit, it is clear that the proposed final Vanrhynsdorp site location was fairly well chosen, but for the fact that it is situated within a Critical Biodiversity Area. It is recommended that all mitigating measures must be implemented in order to minimise the impact of the construction and operation of the facility. Although solar energy is presently not seen as a viable stand-alone technology for electricity production it will lighten the pressure on the fossil burning facilities of Eskom and in so doing will add to a more sustainable way of electricity production.

With the available information at the author's disposal it is recommended that the possibility of locating the proposed site out of the CBA must be investigated. If not possible, all mitigation measures described in this document must be implemented and the site should be located to minimise the impact on the CBA. Furthermore, a botanist or suitably qualified ECO must be appointed during the construction phase of the project.

CONTENTS

INTRODUCTION

Renewable energy takes many forms, including biomass, geothermal, hydropower, wind and solar. Of these, solar may be the most promising: it can be used to generate electricity or to heat water, has little visual impact, and scales well from residential to industrial levels. Solar is the fastest growing energy source in the world. It offers a limitless supply of clean, safe, renewable energy for heat and power. And it's becoming ever more affordable, more efficient, and more reliable.

According to various experts (www.thesolarfuture.co.za), building solar plants is in many ways more financially viable and sustainable than erecting coal fired power stations. When a coal power plant has reached its life span, usually after 40 years depending on the technology, it must be demolished and rebuild (at a huge price tag). When panels of a solar plant reach their lifespan, you only need to replace the panels. Replacing panels is becoming cheaper and better in what they do as the technology is continuously improving. South Africa has abundant coal reserves, but its reserves of solar power are even greater, and unlike coal, solar power is inflation-proof and doesn't lead to large scale destruction of landscapes or the pollution of precious water. In addition South Africa is the world's best solar energy location after the Sahara and Australia.

The advantages of Solar and other renewable power sources are clear: greater independence from imported fossil fuels, a cleaner environment, diversity of power sources, relief from the volatility of energy prices, more jobs and greater domestic economic development. All over the world, solar energy systems have reduced the need to build more carbon-spewing fossil-fuelled power plants. They are critical weapons in the battle against global warming. As the cost of solar technologies has come down, solar is moving into the mainstream and growing worldwide at 40-50% annually (www.wikepedia.org).

In 2011, the International Energy Agency said that "the development of affordable, inexhaustible and clean solar energy technologies will have huge longer-term benefits. It will increase countries' energy security through reliance on an indigenous, inexhaustible and mostly import-independent resource, enhance sustainability, reduce pollution, lower the costs of mitigating climate change, and keep fossil fuel prices lower than otherwise. These advantages are global.

Keren Energy Holdings is proposing the establishment of a 10 MW concentrated photovoltaic solar energy facility on the Remaining extent Duinen Rdr Farm 258, Vanrhynsdorp, (Western Cape Province, Matzikama Local Municipality). The facility will be established on an area of approximately 20 ha portion of the Farm, located just north of Maskamsig (Vanrhynsdorp). The purpose of the proposed facility is to sell electricity to Eskom as part of the Renewable Energy Independent Power Producers Procurement Programme. This programme has been introduced by the Department of Energy to promote the development of renewable power generation facilities.

TERMS OF REFERENCE

EnviroAfrica (Pty) Ltd was appointed by Keren Energy Holdings as the independent Environmental Assessment Practitioner (EAP) to undertake the Scoping/Environmental Impact Assessment (EIA) Process for the proposed development. PB Consult was appointed by EnviroAfrica to conduct a Biodiversity Assessment of the proposed development area.

PB Consult was appointed within the following terms of reference:

- Evaluate the general location of the proposed site and make recommendations on a specific location for the 20
- The study must consider short- to long-term implications of impacts on biodiversity and highlight irreversible impacts or irreplaceable loss of species.

INDEPENDENCE & CONDITIONS

PB Consult is an independent consultant to Keren Energy Holdings and has no interest in the activity other than fair remuneration for services rendered. Remunerations for services are not linked to approval by decision making authorities and PB Consult have no interest in secondary or downstream development as a result of the authorization of this proposed project. There are no circumstances that compromise the objectivity of this report. The findings, results, observations and recommendations given in this report are based on the author's best scientific and professional knowledge and available information. PB Consult reserve the right to modify aspects of this report, including the recommendations if new information become available which may have a significant impact on the findings of this report.

DEFINITIONS & ABBREVIATIONS

DEFINITIONS

Environmental Aspect: Any element of any activity, product or services that can interact with the environment.

Environmental Impact: Any change to the environment, whether adverse or beneficial, wholly or partially resulting from any activity, product or services.

No-Go Area(s): Means an area of such (environmental/aesthetical) importance that no person or activity is allowed within a designated boundary surrounding this area.

ABBREVIATIONS

BGIS	Biodiversity Geographical Information System
DEA	Department of Environmental Affairs
DENC	Department of Environment and Nature Conservation (Northern Cape Province)
EAP	Environmental assessment practitioner
EIA	Environmental impact assessment
EMP	Environmental management plan

NEMA	National Environmental Management Act, Act 107 of 1998
NEM: BA	National Environmental Management Biodiversity Act, Act 10 of 2004
NSBA	National Spatial Biodiversity Assessment
SANBI	South African National Biodiversity Institute
SKEP	Succulent Karoo Ecosystem Project
WWTW	Wastewater Treatment Works

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PROJECT DESCRIPTION

Keren Energy Holdings is proposing the establishment of a 10 MW concentrated photovoltaic solar energy facility on the Remaining extent Duinen Rdr Farm 258, Vanrhynsdorp, (Western Cape Province, Matzikama Local Municipality). The facility will be established on an area of approximately 20 ha portion of the Farm, located just north of Maskamsig (Vanrhynsdorp).

The proposed facility will utilise Concentrated Photovoltaic (CPV) technology, which aims to concentrate the light from the sun, using Fresnel lenses, onto individual PV cells. This method increases the efficiency of the PV panels as compared to conventional PV technology. An inverter is then used to convert the direct current electricity produced into alternating current for connection into the Eskom grid. A single solar generator produces approximately 66kV. In order to produce 10 MW, the proposed facility will require a number of generators arranged in multiples/arrays. The CPV panels will be elevated (2 m above ground) by a support structure, and will be able to track the path of the sun during the day for maximum efficiency. Approximately 1.8 ha is required per installed MW. A 10 MW capacity facility will thus require a development footprint of approximately 20 ha (including associated infrastructure – ancillary infrastructure). Each panel will be approximately 22 m wide by 12.5 m high. When the panels are tracking vertically the structure will have a maximum height of approximately 15 m.

The site can be accessed from Vanrhynsdorp, taking the Maskamsig road north onto the existing secondary road leading north towards the Farm De Duinen. However, additional temporary access roads will have to be established on site. Site preparation will include clearance of vegetation at the footprint of the following infrastructure:

- Support structures (approximately 148 units are proposed) (excavations of 1 m^2 by 5 m deep)
- Switchgear
- Inverters
- Workshops
- Trenches for the underground cabling

The activities may require the stripping of topsoil, which will need to be stockpiled, backfilled and/or spread on site. All in all, the proposed facility can be likened to light agriculture, with the exception that natural vegetation will be allowed to remain on all the non-disturbed areas. All surfaces not used for the facility and associated infrastructure will remain natural.

DESCRIPTION OF ENVIRONMENT

The aim of this description is to put the study area in perspective with regards to all probable significant biodiversity features which might be encountered within the study area. The study area has been taken as the proposed site and its immediate surroundings. During the desktop study any significant biodiversity features associated with the larger surroundings was identified, and were taken into account. The desktop portion of the study also informs as to the biodiversity status of such features as classified in the National Spatial Biodiversity Assessment (2004) as well as in the recent National list of ecosystems that are threatened and in need of protection (GN 1002, December 2011), promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. In addition the Biodiversity Sector plan for Saldanha Bay, Bergrivier, Cederberg and Matzikama Municipalities (2010) was also taken into account, especially with regard to Critical Biodiversity Areas (CBA's), species and special habitats.

LOCATION & LAYOUT

Vanrhynsdorp is situated Western Cape Province (Matzikama Local Municipality), just north of Klawer, next to the N7. The proposed Vanrhynsdorp Solar Site will be located on the Remaining extent Duinen Rdr Farm 258, Vanrhynsdorp. The facility will be established on an area of approximately 20 ha, on a portion of the Farm, located just north of Maskamsig (Vanrhynsdorp).

Figure 1: The general location of the proposed Vanrhynsdorp Keren Energy Solar Facility

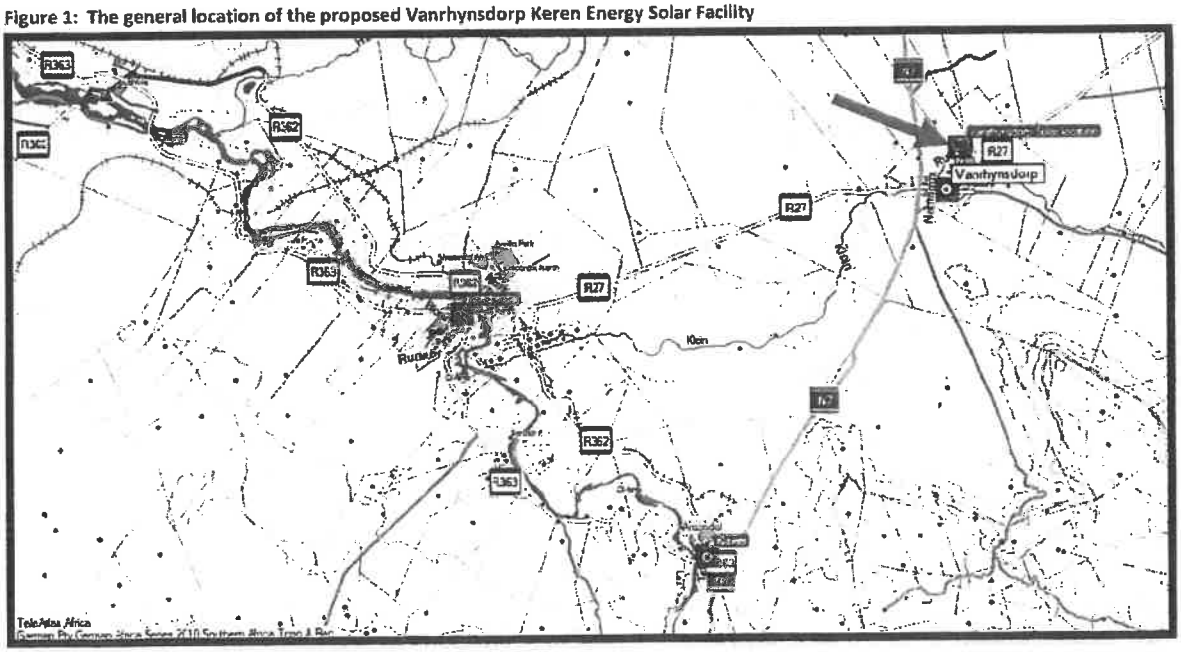


Figure 2 indicates the proposed final site location. However, the visual impact assessment suggested a new site location somewhat west of the proposed site location (Refer to Figure 3). The biodiversity assessment for both site locations is expected to be the same. Please note that this biodiversity assessment was done for the proposed site location and all reference to the "site", refer to the location described in Figure 2 and Table 1.

Figure 2: Google image showing the proposed solar site location (approximately 20 ha)

Figure 3: Alternative site location on recommendation from the visual impact assessment

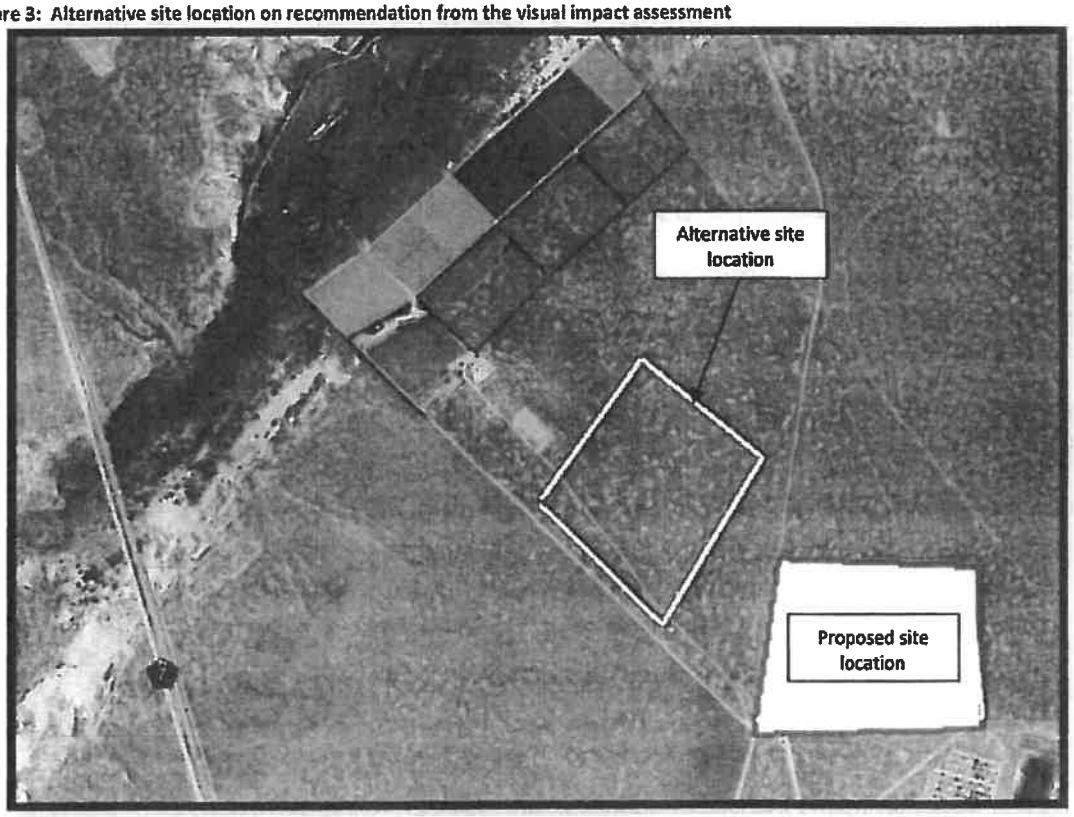


Table 1: GPS coordinates describing the boundaries of the final proposed solar site location (WGS 84 format)

DESCRIPTION	LATITUDE AND LONGITUDE	ALTITUDE
North-west corner	S31 35 12.5 E18 44 50.3	145 m
North-east corner	S31 35 15.9 E18 45 11.3	147 m
South-east corner	S31 35 30.1 E18 45 09.0	151 m
South-west corner	S31 35 27.2 E18 44 44.9	147 m

METHODS

Various desktop studies were conducted, coupled by a physical site visit at the end of January 2012 and further desktop studies. The timing of the site visit was reasonable in that essentially all perennial plants were identifiable, but the bulb and annual flowers was not recognisable and the possibility remains that a number of species may have been missed. However, the author is confident that a fairly good understanding of the biodiversity status in the area was obtained.

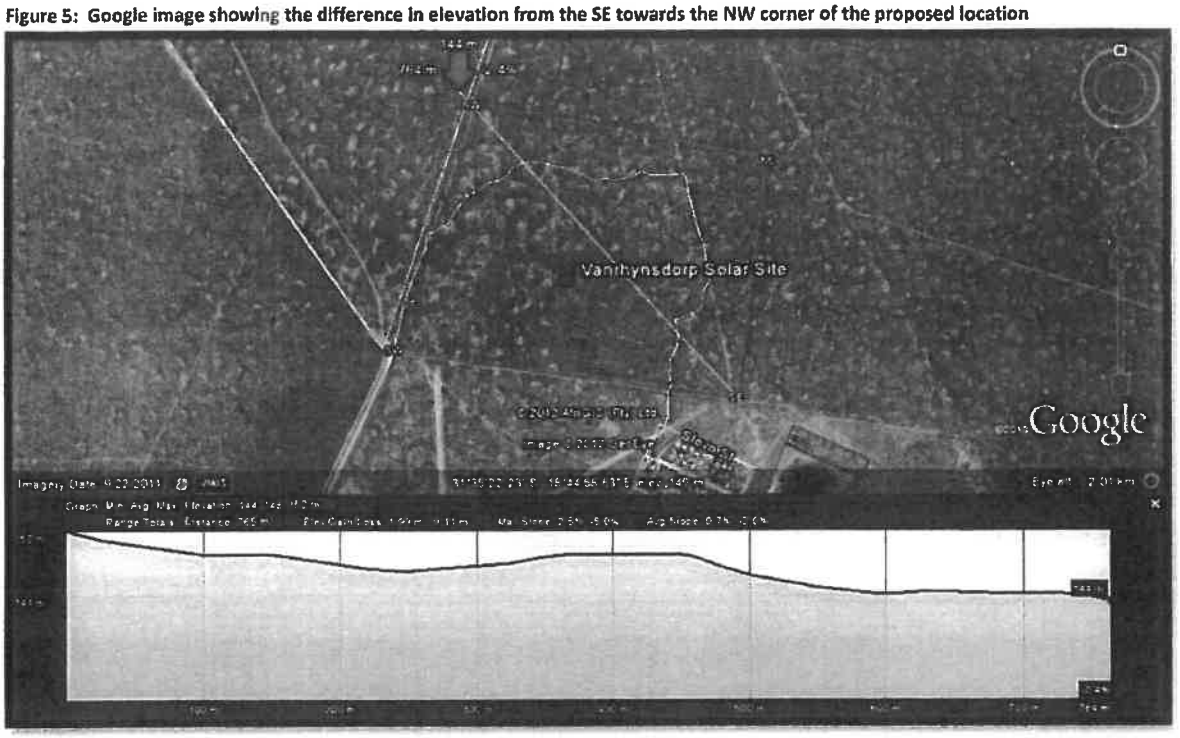
The survey was conducted by walking through the site (Refer to Figure 4) and examining, marking and photographing any area of interest. Confidence in the findings is high. During the site visit the author endeavoured to identify and locate all significant biodiversity features, including rivers, streams or wetlands, special plant species and or specific soil conditions which might indicate special botanical features (e.g. rocky outcrops or silcrete patches).

Figure 4: A Google image showing the route (yellow line) that was walked as well as special features encountered

TOPOGRAPHY

The solar site is located on an almost level area on a slightly undulating landscape, just north-west of Maskamsig (Vanrhynsdorp), approximately 3 km north of town. Elevation data in Table 1 and Figure 5, shows that the site slopes very slightly from the south-east towards the north-west (in the direction of the Droë River, which is located approximately 2 km north-west of the proposed location). Elevation varies from 151 m (south-east corner) towards the north-west at 145 m with an average slope of 0.7% and an elevation loss of approximately 9 m. No wetlands even drainage lines were observed on site.

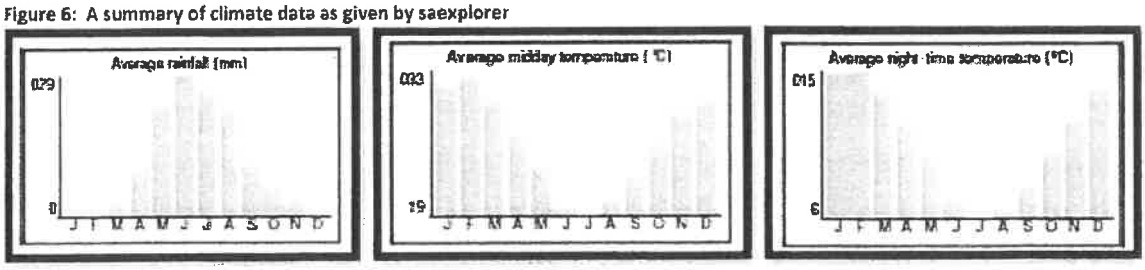
Figure 5: Google image showing the difference in elevation from the SE towards the NW corner of the proposed location



CLIMATE

All regions with a rainfall of less than 400 mm per year are regarded as arid. Vanrhynsdorp normally receives about 133 mm of rain per year and because it receives most of its rainfall during winter it has a Mediterranean climate. It receives the lowest rainfall (0 mm) in January and February and the highest (29 mm) in June. The monthly distribution of average daily maximum temperatures (centre chart below) shows that the average midday temperatures for Vanrhynsdorp range from 19.3°C in July to 32.3°C in February. The region is the coldest during July when the temperature drops to 5.9°C on average during the night (www.saexplorer.co.za).

Figure 6: A summary of climate data as given by saexplorer

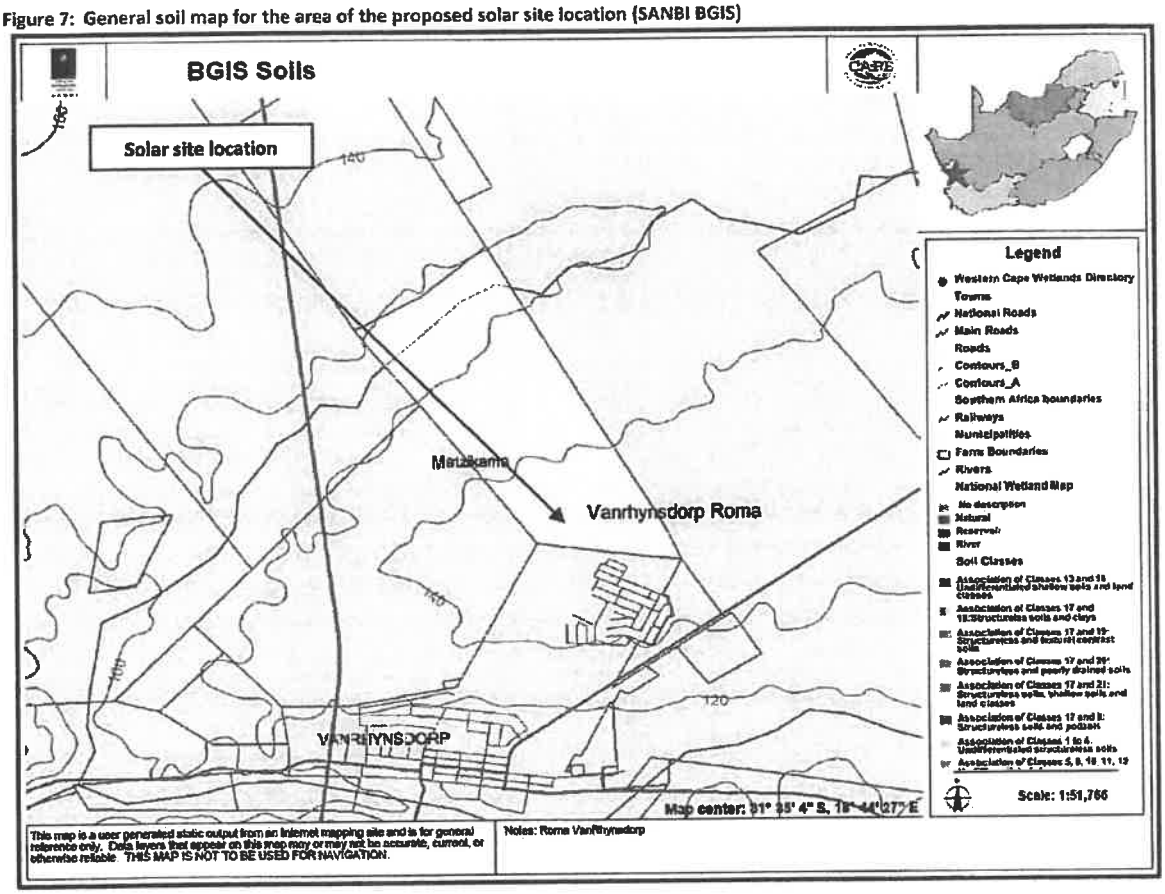


GEOLOGY & SOILS

According to Mucina and Rutherford (2006) and the SANBI Biodiversity Geographical Information System, the greater part of this area is underlain by schist's, phyllite and sandstones of the Gariep Supergroup, which

outcrop when they are not covered by recent superficial deposits of alluvium and duripan crusts (calcrete). Soils are described as soils with minimal development usually shallow on hard weathered rock, with intermitted diverse soils (lime generally present in part or most of the landscape). Soils are generally sandy-loamy, slightly acid to alkaline, with high skeletal content. More than half of the area is classified as Ag land type, followed by Fc land type, with Db and Ae land types only of minor importance. The soils (Refer to Figure 7) show minimal development, usually shallow on hard weathered rock with or without intermittent diverse soils, with lime generally present (Mucina & Rutherford, 2006).

Figure 7: General soil map for the area of the proposed solar site location (SANBI BGIS)



No special soils or geology features (e.g. quartz patches or broken veld), which could support special botanical features, were observed during the site visit (or are expected).

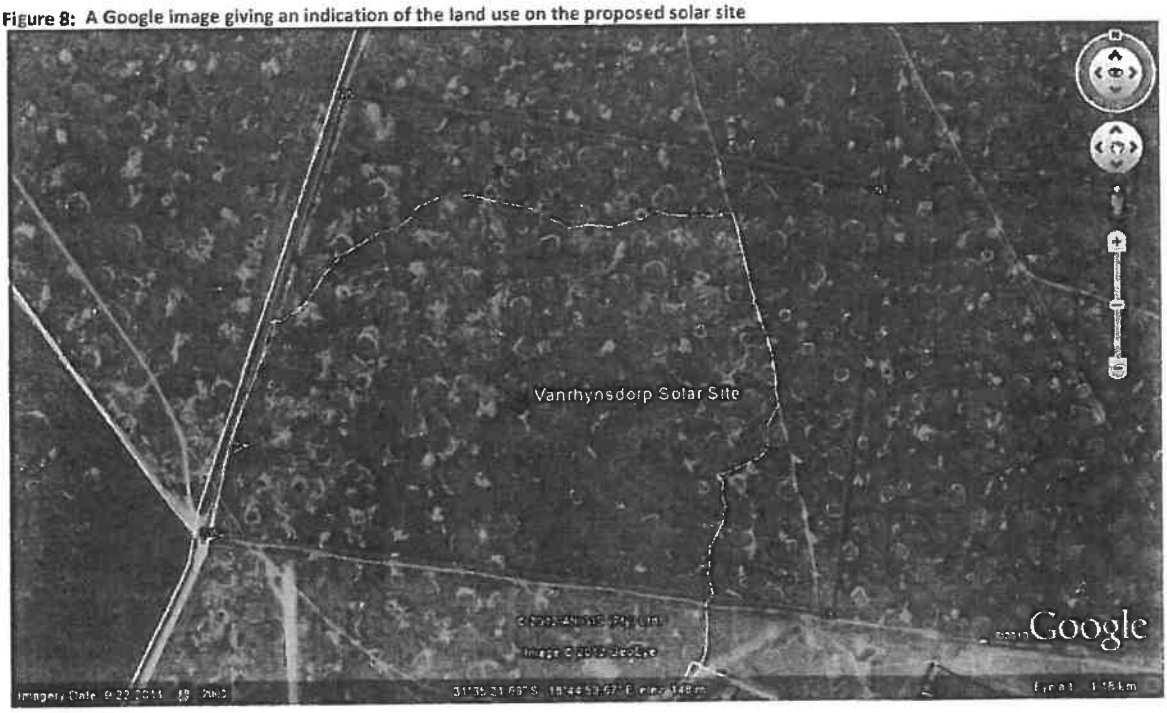
LANDUSE AND COVER

The study area is located on an almost level area in a slightly undulating landscape, just north of Vanrhynsdorp and south-east of the Droë River. The property zoned as agriculture and used for stock grazing. Smaller game species is still expected in the larger area (refer to Figure 8).

Vanrhynsdorp is situated at the outskirts of the immense, semi-desert Nama-Karoo with its vegetation of succulents and semi-arid climate. It has a prominent tourism sector and socio-economic development is supported by this industry. Due to the availability of land, it has been reported that industrial land near

Vanrhynsdorp is intended for power generation, manufacturing, industrial plants, distribution hubs, or major infrastructural facilities. Such developments require sizeable capital investment and often generate consequential economic growth in terms of labour and peripheral industries. The proposed project site is located in geographical proximity of the town. The main land use of the study area is grazing, and there is transmission lines located on the property. Natural vegetation forms an open low shrub layer, dominated by *Salsola* over a shorter grassy/shrub layer. Occasional individuals of the invasive alien tree, *Prosopis,* were encountered. No intensive agriculture or any other form of development was observed (footpaths criss-cross most of the site).

Figure 8: A Google image giving an indication of the land use on the proposed solar site



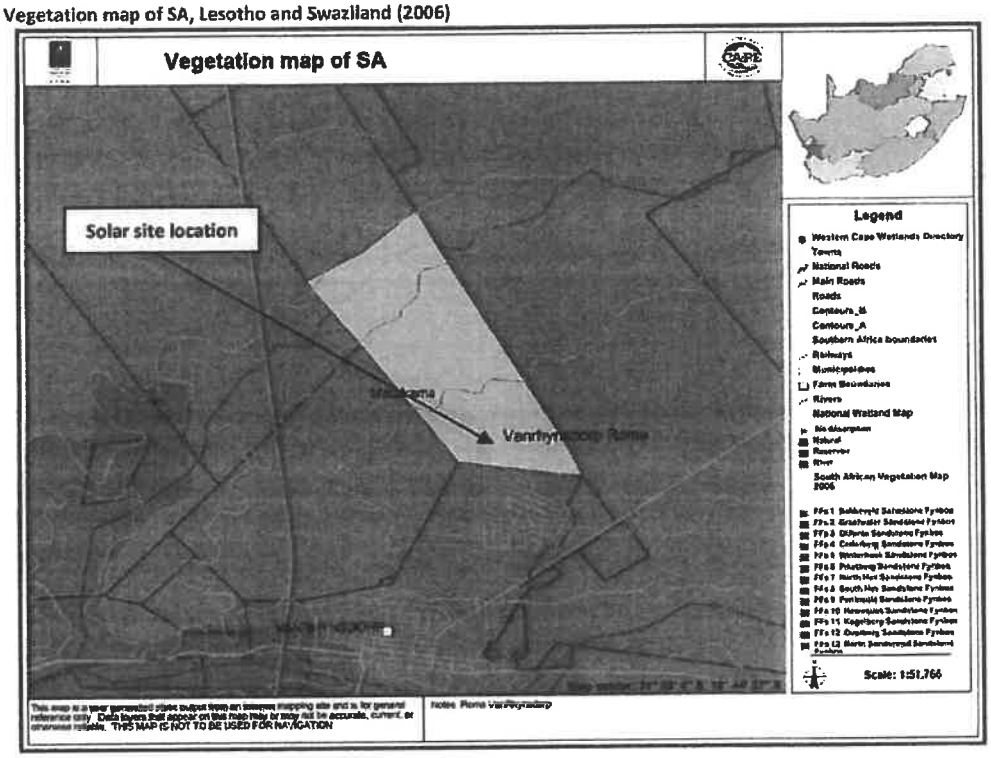
VEGETATION TYPES

In accordance with the 2006 Vegetation map of South Africa, Lesotho and Swaziland (Mucina & Rutherford, 2006) only one broad vegetation type is expected in the proposed area and its immediate vicinity, namely Vanrhynsdorp Gannabosveld (Darker brown in Figure 9). The site visit confirmed that only Vanrhynsdorp Gannabosveld is present in the larger study area.

Vanrhynsdorp Gannabosveld was classified as "Vulnerable" during the 2004 National Spatial Biodiversity Assessment (NSBA). At that stage more than 79% of this vegetation still remains in its natural state, but none of this vegetation type is formally protected throughout South Africa. Recently the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011), was promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. According to this National list, **Vanrhynsdorp Gannabosveld, was de-classified from Vulnerable to Least Threatened**.

Mucina & Rutherford (2006) noted that Vanrhynsdorp Gannabosveld is found in the Western Cape in the Namaqualand, southern Knersvlakte between Vredendal and Vanrhynsdorp at the foot of the Matsikamma and Gifberg Mountains as well as northeast of Vanrhynsdorp at altitudes varying from 100 - 300 m.

Figure 9: Vegetation map of SA, Lesotho and Swaziland (2006)

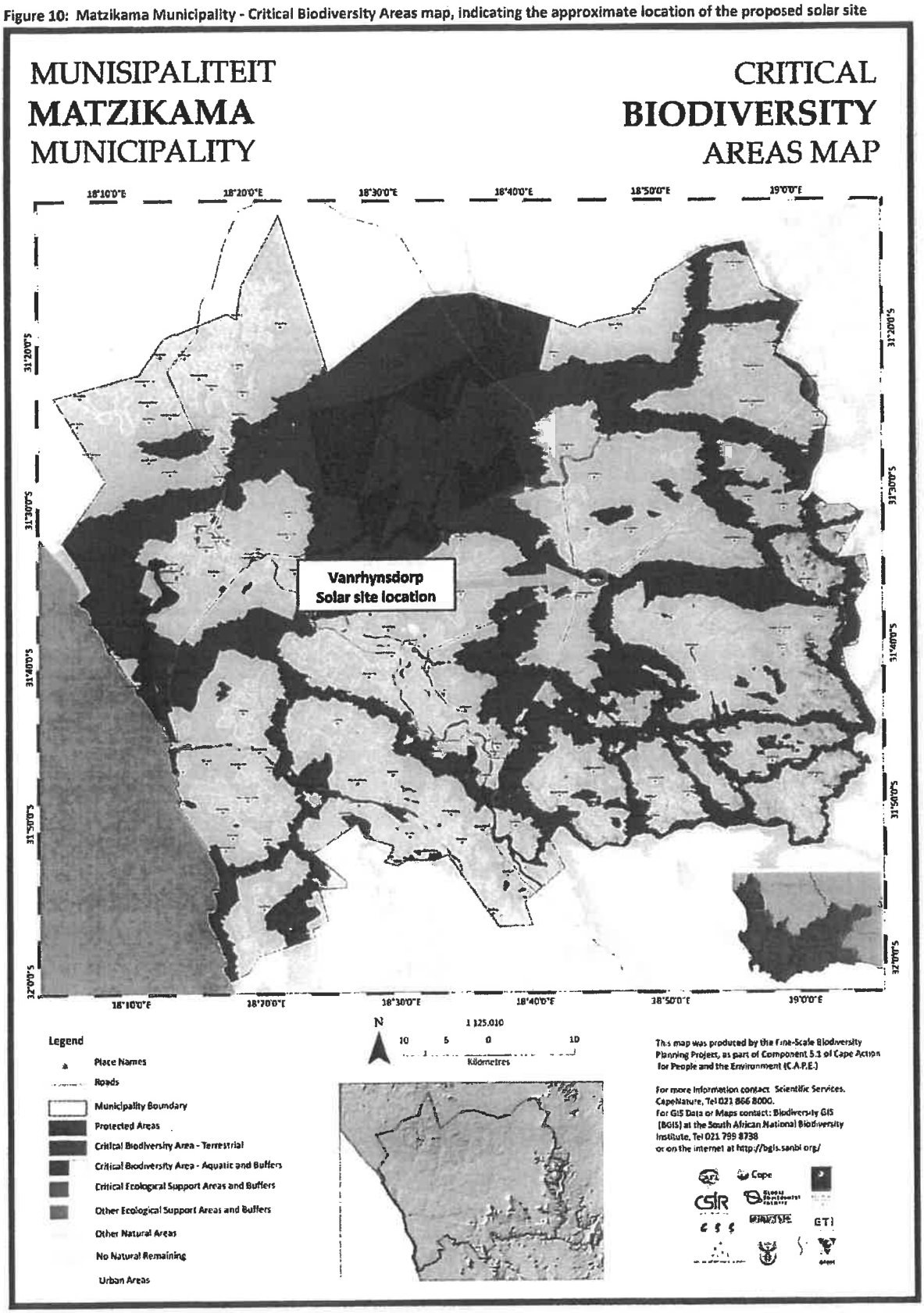


CRITICAL BIODIVERSITY AREA (CBA)

According to the Biodiversity Sector Plan (Maree & Vromans, 2010) for the Matzikama and surrounding Municipalities, Critical Biodiversity Areas (CBA's) are those areas required to meet biodiversity thresholds. They are areas of land or aquatic features (or riparian buffer vegetation alongside CBA aquatic features) which must be safeguarded in their natural state if biodiversity is to persist and ecosystems are to continue functioning. These Critical Biodiversity Areas incorporate: i) areas that need to be safeguarded in order to meet national biodiversity pattern thresholds (target area), ii) areas required to ensure the continued existence and functioning of species and ecosystems (including the delivery of ecosystem services); and/or iii) important locations for biodiversity features or rare species. The CBA network represents the most land-efficient option to achieving all biodiversity targets and terrestrial CBA includes:

- All remaining patches of critically endangered vegetation,
- All known point localities of Species of Special Concern
- Endangered, Vulnerable or Least Threatened vegetation required to meet national thresholds
- Landscape corridors required to meet the predefined thresholds for spatially explicit ecological processes (e.g. upland – lowland corridors, coastal-and-sand movement corridors).

Figure 10: Matzikama Municipality - Critical Biodiversity Areas map, indicating the approximate location of the proposed solar site



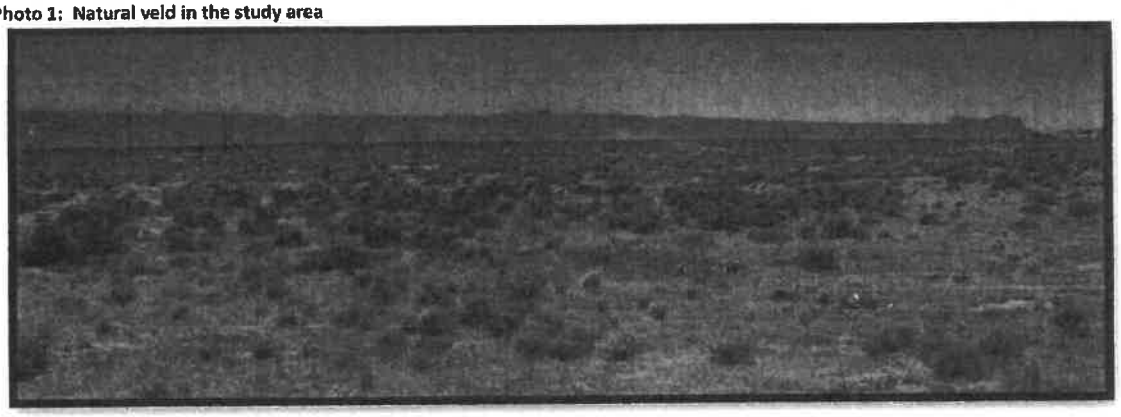
According to the Biodiversity Sector Plan for the Matzikama Municipality (Maree & Vromans, 2010) and the associated Critical Biodiversity Areas map, the proposed Vanrhynsdorp solar site location falls within such a

Critical Biodiversity Area (Refer to Figure 10 above). The objective for the CBA's in the Matzikama Municipality is to maintain all natural land, rehabilitate degraded areas back to natural or near natural and to manage these areas for no further degradation.

VANRHYNSDORP GANNABOSVELD

Vanrhynsdorp Gannabosveld is part of the succulent Karoo Biome and described as occurring mainly on flat or very slightly undulating landscape supporting succulent shrubland dominated by *Salsola*, *Drosanthemum*, *Rushia* and some disturbance indicators such as short lived *Aizoaceae*, including representatives of the genera *Galenia*, *Psilocaulon*, *Caulipsolon* and *Mesembryanthemum* in the southern Knersvlakte and at the foothill of the Matsikamma and Gifberg Mountains (Mucina & Rutherford, 2006). In the south, the shale plains can acquire a grassland appearance through seasonal dominance of *Bromus pectinatus* and *Stipa capensis*.

Photo 1: Natural veld in the study area



Acocks (1953) described this vegetation as Succulent Karoo while Low & Rebelo (1996) described this vegetation as Lowland Succulent Karoo. Photo 1 gives an indication of the vegetation encountered during the site visit.

According to Mucina & Rutherford (2006) important taxa for this vegetation type includes the following:

Succulent shrubs: *Caulipsolon rapaceum, Drosanthemum deciduum, Drosanthemum hispidum, Euphorbia mauritanica, Salsola namibica, Salsola zeyheri, Andromischus sphenophyllus, Antimima dasyphylla, Aridaria brevicarpa, Aridaria noctiflora, Delosperma crassum, Drosanthemum latipetalum, Euphorbia aspericaulis, Lampranthus uniflorus, Manochlamys albicans, Rushia fugitans, Tetragonia hirsuta, Tetragonia sarcophylla, Tylecodon reticulates, Tylecodon ventricosus* and *Zygophyllum cordifolium.*

Low Shrubs: *Galenia fruticosa, Asparagus capensis, Asparagus suaveolens, Chrysocoma longifolia, Eriocephalus microphyllus, Galenia africana, Hermannia cuneifolia, Pteronia paniculata, Selago albida* and *Tripteris sinuata.*

Herbs: *Gazania lichtensteinii, Foveolina dichotoma, Ocosiphon suffruticosum, Tribulus terrestris, Adenogramma glomerata, Amellus microglossus, Arctotis hirsuta, Cotula microglossa, Cromidon corrigioloides, Dimorphotheca sinuata, Felicia namaquana, Felicia tenella, Gazania krebsiana, Groteria*

diffusa, Grielum humifusum, Heliophila pendula, Nestlera biennis, Osteospermum pinnatum, Plantago cafra, Rhynchosidium pumilum and *Tripteris microcarpa.*

Geophytic Herbs: *Babiana minuta, Babiana sambucina, Cyanella orchidiformis, Dipcadi crispum, Lapeirousia exilis, Massonia echinata, Moraea galaxia, Moraea miniata, Oxalis annae, Oxalis compressa, Oxalis pes-caprae, Oxalis purpurea, Sparaxis galeata, Strumaria unguiculata, Trachyandra falcate, Trachyandra jacquiniana* and *Trachyandra scabra.*

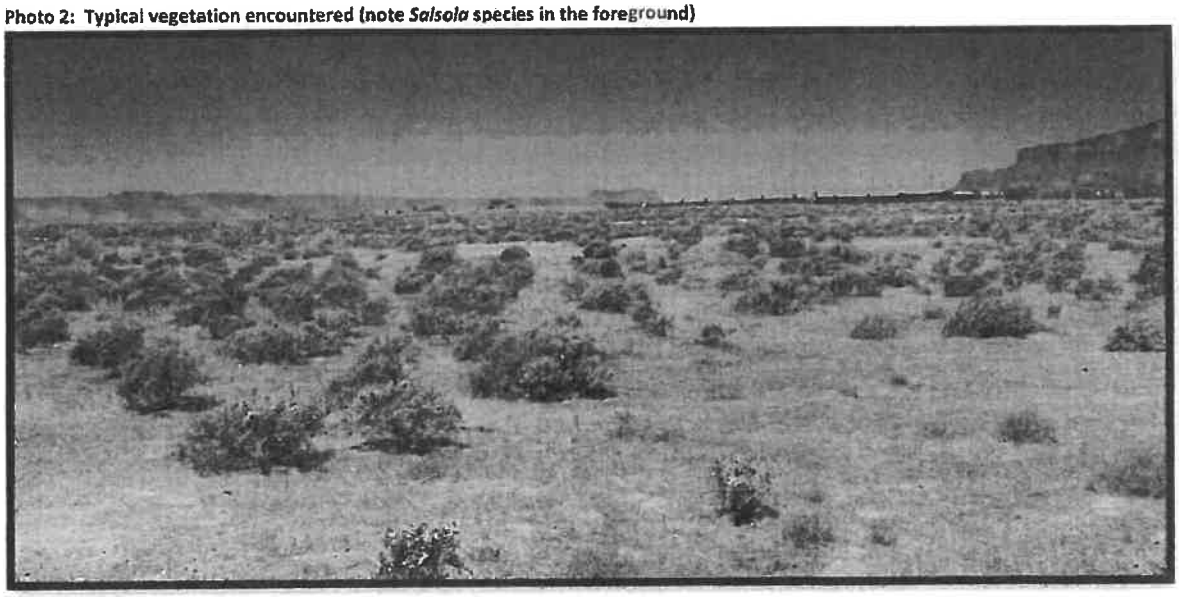
Succulent Herbs: *Psilocaulon junceum, Apatesia helianthoides, Apatesia sabulosa, Phyllobolus nitidus* and *Psilocaulon leptarthron.*

Graminoids: *Stipa capensis, Bromus pectinatus, Ehrharta ramose, Enneapogon argyropa, Karroochloa tenella, Pentaschistis patula, Stipagrostis ciliata, Stipagrostis zeyheri* and *Tribolium pusillum.*

VEGETATION ENCOUNTERED

The vegetation encountered conforms to that of Vanrhynsdorp Gannabosveld and supported an open shrubland with two layers normally present, namely a low shrub layer up to 0.5 m with a grassy/shrub under layer reaching approximately 0.2 m in height) with open patches in between (Photo 2). The alien invader tree, *Prosopis glandulosa*, was also occasionally encountered.

Photo 2: Typical vegetation encountered (note *Salsola* species in the foreground)



This vegetation is strongly influence by winter rainfall and fog and has been compared to a desert harbouring a range of succulent plants beyond compare. It has a bulb flora richer than any other arid region and produces spectacular displays of annual flowers after good rains. In addition the rainfall in the Namaqualand has been described a reliable which serves as a further explanation for its unparalleled diversity of leaf succulents, bulbs and spring flowers. It was clear that the area was at its driest which showed in the lack of species found. The top layer was absolutely dominated by *Salsola* cf. *zeyheri* and *Atriplex cf. lindleyi* with other species like *Aloe*,

Euphorbia mauritanica, Eriocephalus, Pteronia, Limonium sinuatum (exotic garden plant) also present (Refer to Photo 2). Various seed pods and other indicators of geophytes were observed but where not identifiable.

ENDEMIC OR PROTECTED PLANT SPECIES

According to Mucina & Rutherford (2006), various endemic succulent shrub, geophytic herbs and succulent herb species are expected in this vegetation type (Refer to Table 2). However, due to the very dry season, none of the above was identifiable. As a result the study cannot confirm that any of these species are or are not present within the proposed location. It must be noted that the vegetation type is considered "Least Threatened" (Government Notice No 1002, 9 December 2011: National list of Ecosystems that are threatened and in need of protections) and that this classification is based on plant species diversity and turnover as well as habitat transformation. The number of species per broad geographical levels for the Karoo Biome is relative low (Van Rooyen, 1988, *vide* Mucina & Rutherford, 2006). It is therefore very unlikely that any red data species will be confined to this site alone.

The only protected tree that might be expected to overlap with the broader study area (although unlikely) is the quiver tree (*Aloe dichotoma*). None has been observed in the study area.

Table 2: Protected tree species with a geographical distribution that may overlap the broader study area

SPECIES NAME	COMMON NAME	TREE NO.	DISTRIBUTION
Aloe dichotoma	Kokerboom Quiver tree	29	Semi-desert and desert areas usually associated with rocky outcrops.

FAUNA

The farm is zoned agriculture and used for livestock grazing. However, it is expected that the property still supports a number of game species, birds and other fauna. However, viewed in the larger context of the farm, the 20 ha solar facility will not pose a significant loss of grazing and the proposed solar site facility is not expected to have a major impact on regional biodiversity and with mitigating and good environmental control during construction the impact could be minimised.

According to the Biodiversity Sector Plan for the Matzikama Municipality (Maree & Vromans, 2010), the following fauna is to be expected in the larger area which includes the Saldanha Bay, Bergrivier, Cederberg and Matzikama Municipalities.

BIRDS

Several endemic bird species occur in this area, e.g. Barlow's lark (*Certhilauda barlowi*). Other species in the region include the vulnerable black harrier *(Circus maurus),* which has the most restricted range of the world's 13 harrier species, Karoo bustard *(Eupodotis vigorsii),* Ludwig's bustard (*Neotis ludwigii),* Karoo chat *(Cercomela schlegelii),* dune lark *(Certhilauda erythrochlamys),* and dusky sunbird *(Nectarinia fusca).*

Moreover, thousands of sea birds roost on sheltered islands or rest on the beaches along the West Coast. Some of these include the Cape Gannet, Flamingos, African Penguins and Waders (Maree & Vromans, 2010).

MAMMALS

Mammal species that are endemic or near endemic to the area are Van Zyl's Golden Mole (*Cryptochloris zyli*), Cape Dune Molerat (*Batyergus suillus*), Cape Gerbil (*Tatera afra*) and Grant's Golden Mole (*Eremitalpa granti*). Van Zyl's Golden Mole *(Cryptochloris zyli)* belongs to the golden mole family which is comprised of 18 species, all endemic to the African continent. Van Zyl's golden mole differs from the other species in the same genus, in that it is a smaller mole with a total length of approximately 8cm and is darker and browner with a purplish sheen. Very little is known about this Critically Endangered species as it spends most of its life underground in shallow sandy soils of the temperate, Strandveld Succulent Karoo (Maree & Vromans, 2010).

This golden mole is mainly threatened due to habitat loss through overgrazing, crop cultivation, irrigation and mining. Today, there is only one locality known to have the Van Zyl's golden mole, i.e. Compangnies Drift, 16 km inland from Lamberts Bay. Conservation initiatives should aim to conserve this species through the establishing of more Private Conservation areas such as Conservancies and Private Nature Reserves and statutory conservation areas, thereby protecting the golden moles habitat (Maree & Vromans, 2010).

INSECTS

The northern reaches of the West Coast constitute the southern-most tip of an area of endemism for darkling beetles (tenebrionid family, which includes toktokkies). Another group, found almost exclusively in southern Africa, are the monkey beetles which are concentrated in this area. Along with many types of wasps and bees, these beetles pollinate the West Coast's immense range of plant species. Perhaps the most unusual invertebrates found here are the long-tongued flies (*Memestrinidae*), which can have mouthparts up to 50 mm long. The level of richness and endemism in insect species is likely to be similar to the extraordinary richness exhibited by the plant life. Preliminary studies show that more than half of the species in some insect groups are endemic to the area, occurring nowhere else in the world (Maree & Vromans, 2010).

REPTILES

The diversity of reptile species is relatively high in the drier succulent karoo area along the west coast. Seven species of girdled lizards of the genus *Cordylus*, including the armadillo girdled lizard (*Cordylus cataphractus*, VU*)* are endemic to the area. Two endemic tortoise species occur in the area, namely the Namaqualand tent tortoise (*Psammobates tentorius trimeni*) and the Namaqualand speckled padloper (*Homopus signatus signatus*) (Maree & Vromans, 2010).

RIVERS AND WETLANDS

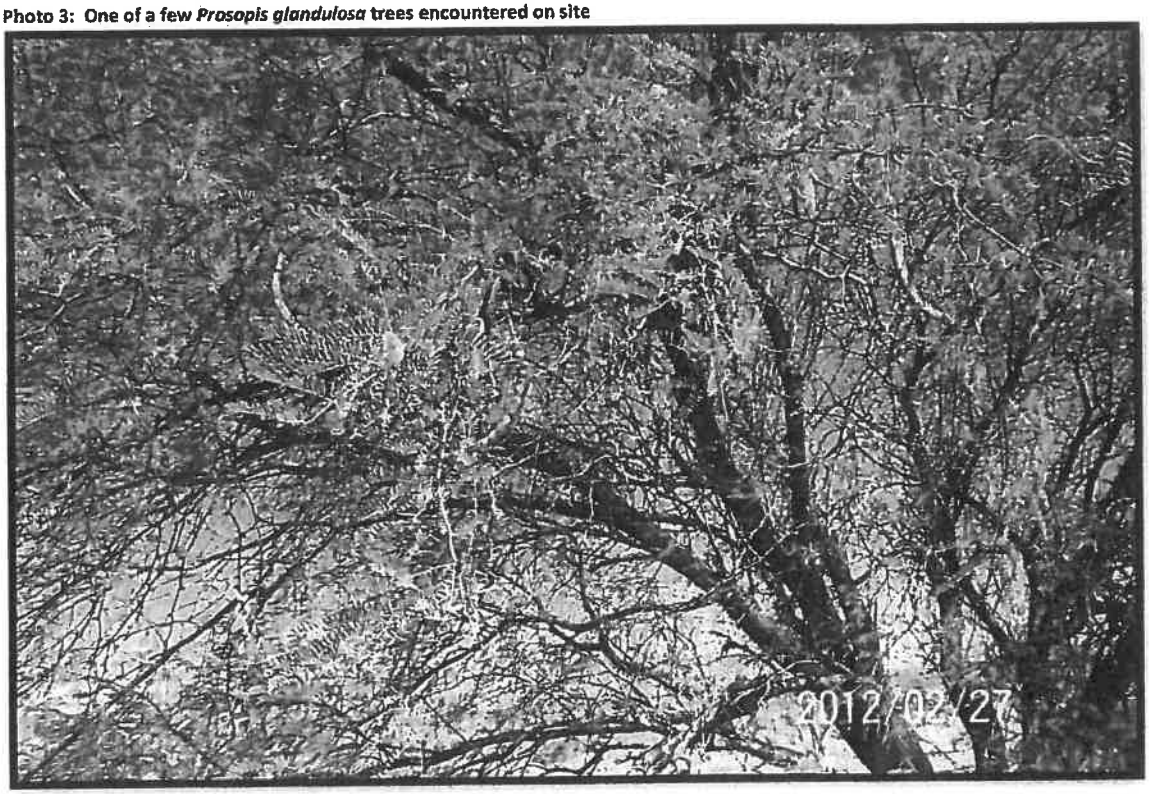
Rivers maintain unique biotic resources and provide critical water supplies to people. South Africa's limited supplies of fresh water and irreplaceable biodiversity are very vulnerable to human mismanagement. Multiple environmental stressors, such as agricultural runoff, pollution and invasive species, threaten rivers that serve the world's population. River corridors are important channels for plant and animal species movement, because they link different valleys and mountain ranges. They are also important as a source of water for human use. Vegetation on riverbanks needs to be maintained in order for rivers themselves to remain healthy, thus the focus is not just on rivers themselves but on riverine corridors.

No rivers, watercourses or even drainage lines were observed on the proposed solar location. However, the Droë River is located approximately two kilometres to the north-west of the proposed location, while the Klein River is to be found approximately 1.8 km to the south of the proposed location.

INVASIVE ALIEN INFESTATION

Most probably because of the aridity of the area, invasive alien rates are generally very low for most of this area and only occasional individuals of *Prosopis glandulosa* (Suidwesdoring) was observed.

Photo 3: One of a few *Prosopis glandulosa* trees encountered on site



SIGNIFICANT BIODIVERSITY FEATURES ENCOUNTERED

The table underneath gives a summary of biodiversity features encountered during the site visit and a short discussion of their possible significance in terms of regional biodiversity targets.

Table 3: Summary of biodiversity features encountered on Erf 1654, Vanrhynsdorp and their possible significance

BIODIVERSITY ASPECT	SHORT DESCRIPTION	SIGNIFICANCE RATING
Geology & soils	The soils are mostly similar throughout the study area.	No special features have been encountered on the final solar location (e.g. true quartz patches, wetland mosaics, isolated mountain peaks).
Land use and cover	Agricultural land	Agricultural land used for grazing.
Vegetation types	Vanrhynsdorp Gannabosveld.	Vanrhynsdorp Gannabosveld is considered "Least threatened". However, the remaining natural veld shows good connectivity with the surrounding areas and falls within an area identified as a **Critical Biodiversity Area** within the Matzikama Municipality.
Endemic or protected plant species	No endemic species was observed, but it is probable that some may be found on the site.	The vegetation type is considered "Least Threatened" and that this classification is based on plant species diversity and turnover as well as habitat transformation. The number of species per broad geographical levels for the Karoo Biome is relative low and it is therefore very unlikely that any red data species will be confined to this site alone.
Fauna	The farm is used for agricultural grazing, although small game species are still expected.	The size and location of the solar facility is not expected to have a significant impact on total grazing or the movement of game species found on the larger area.
Rivers & wetlands	No watercourses or even drainage lines were encountered on the site.	No impact
Invasive alien infestation	A few Prosopis trees were observed.	All alien trees on the site and its immediate surroundings should be removed (with regular follow-up).

In summary, all areas with remaining natural vegetation, especially when these features show good connectivity with the surrounding natural veld (e.g. corridors) should be considered as significant. In this case the proposed location also co-insides with an area identified as a **Critical Biodiversity Area** within the Matzikama Municipality. As such it places extra emphasis on the ecological importance of the area in which the site is to be located. On the other hand, the placement of a 20 ha solar site in this location is not expected to have significant impact on any single biodiversity feature but it may put pressure on regional conservation targets in that it might impede corridor connectivity. The impact on populations of individual species is regarded as low, the impact on sensitive habitats is regarded as low (no sensitive habitats encountered on site), however, due to its CBA status the impact on ecosystem function is regarded as medium to medium-high (impeding corridor movement), cumulative impact on ecology is regarded as medium to medium-high (CBA status) and finally the impact on economic use of the vegetation is regarded as low.

BIODIVERSITY ASSESSMENT

Biological diversity, or biodiversity, refers to the variety of life on Earth. As defined by the United Nations Convention on Biological Diversity, it includes diversity of ecosystems, species and genes, and the ecological processes that supports them. Natural diversity in ecosystems provides essential economic benefits and services to human society—such as food, clothing, shelter, fuel and medicines—as well as ecological, recreational, cultural and aesthetic values, and thus plays an important role in sustainable development. Biodiversity is under threat in many areas of the world. Concern about global biodiversity loss has emerged as a prominent and widespread public issue.

The objective of this study was to evaluate the biological diversity associated with the study area in order to identify significant environmental features which should be avoided during development activities and or to evaluate short and long term impact and possible mitigation actions in context of the proposed development.

As such the report aim to evaluate the biological diversity of the area using the Ecosystem Guidelines for Environmental Assessment (De Villiers *et. al.*, 2005), with emphasis on:

- Significant ecosystems
    - Threatened or protected ecosystems
    - Special habitats
    - Corridors and or conservancy networks
- Significant species
    - Threatened or endangered species
    - Protected species

METHOD USED

During May 2001, Van Schoor published a formula for prioritizing and quantifying potential environmental impacts. This formula has been successfully used in various applications for determining the significance of environmental aspects and their possible impacts, especially in environmental management systems (e.g. ISO 14001 EMS's). By adapting this formula slightly it can also be used successfully to compare/evaluate various environmental scenario's/options with each other using a scoring system of 0-100%, where any value of 15% or less indicate an insignificant environmental impact while any value above 15% constitute ever increasing environmental impact.

Using Van Schoor's formula (adapted for construction with specific regards to environmental constraints and sensitivity) and the information gathered during the site evaluation the possible negative environmental impact of the activity was evaluated.

Underneath follows a short description of Van Schoor's formula. In the formula the following entities and values are used in order to quantify environmental impact.

$S = [(fd + int + sev + ext + loc) \times (leg + gcp + pol + ia + str) \times P]$ (as adapted for construction activities)

Where

S = Significance value

fd = frequency and duration of the impact

int = intensity of the impact

sev = severity of the impact

ext = extent of the impact

loc = sensitivity of locality

leg = compliance with legal requirements

gcp = conformance to good environmental practices

pol = covered by company policy/method statement

ia = impact on interested and affected parties

str = strategy to solve issue

P = probability of occurrence of impact

CRITERIA

The following numerical criteria for the above-mentioned parameters are used in the formula.

fd = frequency and duration of the impact					
low frequency ; low duration	1	medium frequency; low duration	1.5	high frequency ; low duration	2
low frequency; medium duration	1.5	medium frequency ; medium duration	2	high frequency ; medium duration	2.5
low frequency ; high duration	2	medium frequency ; high duration	2.5	high frequency ; high duration	3

int = intensity of the impact					
low probability of species loss; low physical disturbance	1	medium probability of species loss; low physical disturbance	1.5	high probability of species loss; low physical disturbance	2
low probability of species loss; medium physical disturbance	1.5	medium probability of species loss; medium physical disturbance	2	high probability of species loss; medium physical disturbance	2.5
low probability of species loss; high physical disturbance	2	medium probability of species loss; high physical disturbance	2.5	high probability of species loss; high physical disturbance	3

sev = severity of the impact	
changes immediately reversible	1
changes medium/long-term reversible	2
changes not reversible	3

ext = extent of the impact	
locally (on-site)	1
regionally (or natural/critical habitat affected)	2
globally (e.g. critical habitat or species loss)	3

loc = sensitivity of location	
not sensitive	1
moderate (e.g. natural habitat)	2
sensitive (e.g. critical habitat or species)	3

leg = compliance with legal requirements	
compliance	0
non-compliance	1

gcp = good conservation practices	
conformance	0
non-conformance	1

pol = covered by company policy	
covered in policy	0
not covered/no policy	1

ia = impact on interested and affected parties	
not affected	1
partially affected	2
totally affected	3

str = strategy to solve issue	
strategy in place	0
strategy to address issue partially	0.5
no strategy present	1

P = probability of occurrence of impact	
not possible (0% chance))	0
not likely, but possible (1 - 25% chance)	0.25
likely (26 - 50% chance)	0.50
very likely (51 - 75% chance)	0.75
certain (75 - 100% chance)	0.95

EVALUATION OF SIGNIFICANT ECOSYSTEMS

The main drivers in this vegetation type would be soil type and depth and grazing pressure (herbivore), and could largely determine plant community composition and occurrence of rare species. Grazing may be an important factor in regulating competitive interaction between plants. Certain species can act as important "nursery" plants for smaller species and are also important for successional development after disturbance. Tortoises and mammals can be important seed dispersal agents.

THREATENED OR PROTECTED ECOSYSTEMS

The site visit confirmed that the vegetation conforms to Vanrhynsdorp Gannabosveld (Refer to Figure 9). This vegetation type was classified as "Vulnerable" during the 2004 National Spatial Biodiversity Assessment (NSBA). During 2004 more than 79% of this vegetation still remained in its natural state, but none of this vegetation type was formally protected throughout South Africa. However, please note that the *National list of ecosystems that are threatened and in need of protection* (GN 1002, December 2011), was promulgated during 2011 in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004. According to this National list, **Vanrhynsdorp Gannabosveld, has now been de-classified to a status of Least Threatened**.

But, even though it has a status of "Least threatened" the proposed solar site location will be situated within an area that has been identified as a Critical Biodiversity Area (corridor) within the Matzikama Municipal Biodiversity Sector Plan (Maree & Vromans, 2010). Even though the proposed solar site is relatively small (20 ha), its placement within a CBA ensures that the impact on threatened or protected ecosystems must be regarded as medium to medium-high.

Mitigation:

- Consider moving the solar site location out of the CBA corridor.
- If the above is not possible ensure that the final placement takes the ecological process into consideration and will result in the least impact on the CBA corridor (e.g. placing it along the edge of the CBA).
- Good environmental control during the construction must be implemented.

SPECIAL HABITATS

Special Habitats include areas that are rare within the region, or which support Species of Special Concern, as well as ecosystems or ecological processes. They include Listed Threatened Ecosystems in terms of the NEMBA and other habitats protected by legislation, namely wetlands, estuaries and indigenous forests. According to the Biodiversity Sector Plan for the Matzikama and surrounding Municipalities (Maree & Vromans, 2010), the

most prominent Special Habitats occurring within these municipalities include coastal forests, rocky outcrops along the coast, wetland mosaics, inselbergs (isolated mountain peaks) and rocky coastal gorges. None of these (or other) special habitats were observed during the site visit. Furthermore, the vegetation has been classified as "Least threatened". But the proposed solar site location will be situated within an area that has been identified as a Critical Biodiversity Area (corridor) within the Matzikama Municipal Biodiversity Sector Plan (Maree & Vromans, 2010).

Overall the development of the 20 ha Keren Energy solar facility at Vanrhynsdorp is not expected to a have a significant impact on any special habitat (although it will impact on a threatened ecosystem). As a result the impact on special habitats is rated as low.

Mitigation:

- None.

CORRIDORS AND OR CONSERVANCY NETWORKS

Looking at the larger site and its surroundings it shows excellent connectivity with remaining natural veld in almost all directions. Corridors and natural veld networks are still relative unscathed (apart from road networks). However, even though Vanrhynsdorp Gannabosveld has now been de-classified to a status of Least Threatened, the proposed solar site will be located within an area that has been identified as a Critical Biodiversity Area within the Matzikama Municipal Biodiversity Sector Plan (Maree & Vromans, 2010). This area was most probably specifically included into the CBA as a result of its role as a viable east-west connective corridor between large areas of natural veld. Even though the proposed solar site is relatively small (20 ha), its placement within a CBA ensures that the impact on the corridor status must thus be regarded as medium to medium-high.

Mitigation:

- Consider moving the solar site location out of the CBA corridor.
- If the above is not possible ensure that the final placement takes the ecological process into consideration and will result in the least impact on the CBA corridor (e.g. placing it along the edge of the CBA).

EVALUATION OF SIGNIFICANT SPECIES

The site visit was performed at the end of February (2012). At the time of the study the veld in the Vanrhynsdorp area was very dry. As a result none of the herb or bulbs were visible, even succulent herbs was almost absent. However, although not ideal, it was still possible to get a good feel for the vegetation, but it is possible that significant species might have been overlooked.

THREATENED OR ENDANGERED SPECIES

No threatened or endangered species were recorded during the site visit, however, this does not rule out their presence as they may be subject to seasonable rainfall and may not have been observable during the time of the site visit. It must be noted that the vegetation type is considered "Least Threatened" (Mucina & Rutherford, 2006) and that this classification is based on plant species diversity and turnover as well as habitat transformation. The number of species per broad geographical levels for the Karoo Biome is relative low (Van Rooyen, 1988, *vide* Mucina & Rutherford, 2006). It is therefore very unlikely that any red data species will be confined to this site alone.

During the site visit no such species were observed and in the regional context the author is of the opinion that the development of the 20 ha solar facility will not lead to irreversible species loss.

The possibility of such an impact occurring is rated as low.

Mitigation:

- With good environmental control (e.g. footprint minimisation, topsoil removal, storage and re-distribution) and rehabilitation after construction (leaving the remaining area as natural as possible) the possibility of such an impact occurring will become insignificant.

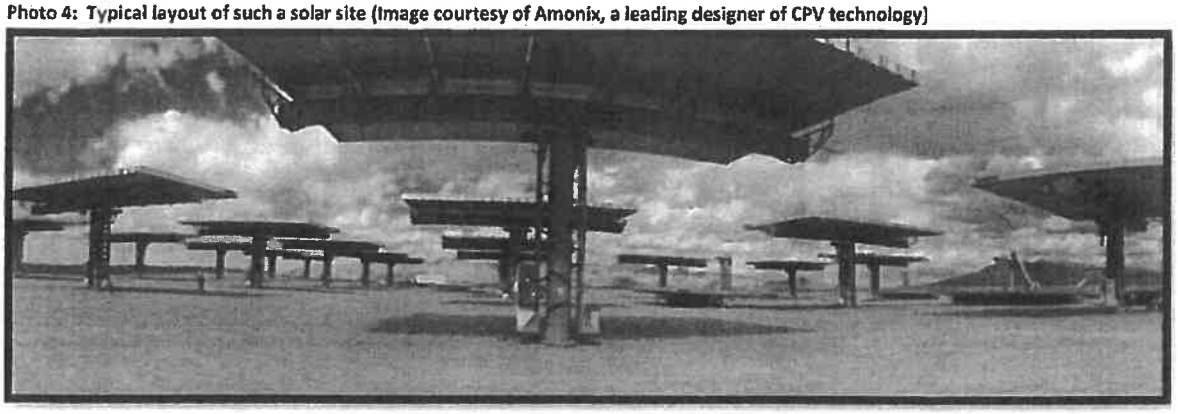
PROTECTED SPECIES

No protected species was observed within the proposed solar site location.

PLACEMENT AND CONSTRUCTION METHOD

A single solar generator produces approximately 66kV. In order to produce 10 MW, the proposed facility will require a number of generators arranged in multiples/arrays. The CPV panels will be elevated (2 m above ground) by a support structure, and will be able to track the path of the sun during the day for maximum efficiency (Refer to Photo 4). Approximately 1.8 ha is required per installed MW. A 10 MW capacity facility will thus require a development footprint of approximately 20 ha (including associated infrastructure – ancillary infrastructure). Each panel will be approximately 22 m wide by 12.5 m high. When the panels are tracking vertically the structure will have a maximum height of approximately 15 m. The excavation needed for each support structures (approximately 148 units are proposed) will be 1 m^2 by 5 m deep. It means that apart from the associated structures, approximately 148 holes of 1 m^2 by 5 m deep will be excavated. Each hole must be at least 22 m from the next.

Photo 4: Typical layout of such a solar site (Image courtesy of Amonix, a leading designer of CPV technology)



The activities will require the stripping of topsoil (for the pylon holes and access roads only, leaving the remainder as natural as possible), which will need to be stockpiled, backfilled and/or spread on site. All in all the proposed facility can be likened to light agriculture, with the exception that natural vegetation can be allowed to remain on all the non-disturbed areas. All surfaces not used for the facility and associated infrastructure can remain natural (the Quantification of environmental impacts was based on the assumption that the footprint will be minimised and that areas not directly impacted by the location of infrastructure would remain almost natural).

DIRECT IMPACTS

As the name suggest, direct impacts refers to those impacts with a direct impact on biodiversity features and in this case were considered for the potentially most significant associated impacts (some of which have already been discussed above).

Direct loss of vegetation type and associated habitat due to construction and operational activities.

- Loss of ecological processes (e.g. migration patterns, pollinators, river function etc.) due to construction and operational activities. (Refer to page 22).
- Loss of local biodiversity and threatened plant species (Refer to page 22)
- Loss of ecosystem connectivity (Refer to page 23)

LOSS OF VEGETATION AND ASSOCIATED HABITAT

One broad vegetation type is expected in the study area, namely Vanrhynsdorp Gannabosveld (Refer to Vegetation encountered on page 14). Vanrhynsdorp Gannabosveld was classified as "Vulnerable" during the 2004 National Spatial Biodiversity Assessment. Within the more recent *"National list of ecosystems that are threatened and in need of protection"* (GN 1002, December 2011), promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004, the status of Vanrhynsdorp Gannabosveld has been de-classified to a status of "Least Threatened". During 2004, more than 79% of this

vegetation type is still found in a relative natural state. Thus the vegetation itself is not considered to belong to a threatened or protected ecosystem. No special habitats were encountered on site (e.g. quartz patches wetland mosaics or isolated mountain peaks), which could sustain significant smaller ecosystems. However, even though Vanrhynsdorp Gannabosveld has now been de-classified to a status of Least Threatened, the proposed solar site will be located within an area that has been identified as a Critical Biodiversity Area within the Matzikama Municipal Biodiversity Sector Plan (Maree & Vromans, 2010). Although it might not lead to significant loss of vegetation it might impact on its role as a viable east-west connective corridor between large areas of natural veld.

Thus, even though the proposed solar site is relatively small (20 ha), its placement within a CBA ensures that the impact on the specific vegetation type must thus be regarded as medium.

Mitigation: The following is some mitigation which will minimise the impact of the solar plant location and operation.

- Consider moving the solar site location out of the CBA corridor.
- If the above is not possible ensure that the final placement takes the ecological process into consideration and will result in the least impact on the CBA corridor (e.g. placing it along the edge of the CBA).
- Only existing access roads should be used for access to the terrain (solar site).
- The internal network of service roads (if needed) must be carefully planned to minimise the impact on the remaining natural veld on the site. The number of roads should be kept to the minimum and should be only two-track/twee spoor roads (if possible). The construction of hard surfaces should be minimised or avoided.
- Access roads and the internal road system must be clearly demarcated and access must be tightly controlled (deviations may not be allowed).
- Indiscriminate clearing of areas must be avoided, only pylon sites and sites where associated infrastructure needs to be placed must be cleared (all remaining areas to remain as natural as possible).
- All topsoil (at all excavation sites) must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.
- Once the construction is completed all further movement must be confined to the access tracks to allow the vegetation to re-establish over the excavated areas.

INDIRECT IMPACTS

Indirect impacts are impacts that are not a direct result of the main activity (construction of the solar facility), but are impacts still associated or resulting from the main activity. Very few indirect impacts are associated

with the establishment of the solar facility (e.g. no water will be used, no waste material or pollution will be produced through the operation of the facility).

The only indirect impact resulting from the construction and use of the facility is a loss of movement from small game and other mammals, since the property will be fenced. However, it is not considered to result in any major or significant impact on the area as a whole.

CUMULATIVE IMPACTS

In order to comprehend the cumulative impact, one has to understand to what extent the proposed activity will contribute to the cumulative loss of this vegetation type and other biodiversity features on a regional basis. Vanrhynsdorp Gannabosveld was classified as "Vulnerable", during the 2004 National Spatial Biodiversity Assessment. However, the more recent *"National list of ecosystems that are threatened and in need of protection"* (GN 1002, December 2011), promulgated in terms of the National Environmental Management Biodiversity Act (NEM: BA), Act 10 of 2004, de-classified the vegetation status to "Least Threatened". More than 79% of this vegetation type is still found in a relatively natural state. Thus the vegetation itself is not considered to belong to a threatened or protected ecosystem. No special habitats were encountered on site, which could sustain significant smaller ecosystems.

However, even though Vanrhynsdorp Gannabosveld has now been de-classified to a status of Least Threatened, the proposed solar site will be located within an area that has been identified as a Critical Biodiversity Area within the Matzikama Municipal Biodiversity Sector Plan (Maree & Vromans, 2010). Although it might not lead to significant loss of vegetation it might impact on its role as a viable east-west connective corridor between large areas of natural veld.

Thus the impact on the regional status of this vegetation type and associated biodiversity features would be classified as medium. However, apart from possible significant corridor function loss, no irreversible species-loss, habitat-loss or associated impact can be foreseen from locating and operating the solar facility on the final proposed solar site.

THE NO-GO OPTION

During the impact assessment only the final proposed site (as described in Figure 2 and Table 1 is discussed. From the above, the "No-Go alternative" does signify biodiversity gain in that the integrity of an important ecological corridor (identified as a CBA within the Matzikama Municipal Biodiversity Sector Plan) will be protected and maintained. It will also sustain the Biodiversity Sector Plan objectives for the Municipality which states that CBA's must be managed with the objective to maintain all natural land, rehabilitate degraded areas back to natural or near natural and to manage these areas to prevent further degradation.

The site visit and desktop studies described and evaluated in this document led to the conclusion that the "No-Go" alternative may result in significant gain in regional conservation targets (not through the conservation of significant vegetation, rare & endangered species or special habitats, but through corridor conservation).

On the other hand the pressure on Eskom facilities, most of which are currently still dependant on fossil fuel electricity generation, will remain. Solar power is seemingly a much cleaner, biodiversity friendly, and more sustainable long term option for electricity production. The socio-economical gain for the area could also be significant.

QUANTIFICATION OF ENVIRONMENTAL IMPACTS

Taking all of the above discussions into account and using Van Schoor's formula for impact quantification, impacts of the following can be quantified as follows:

Please note that the Quantification of environmental impacts was based on the assumption that the footprint will be minimised and that areas not directly impacted by the location of infrastructure could remain almost natural.

NO DEVELOPMENT

The no development scenario can only take regional biodiversity into account. The site visit and desktop studies described and evaluated in this document led to the conclusion that the "No-Go" alternative may result in significant gain in regional conservation targets (not through the conservation of significant vegetation, rare & endangered species or special habitats, but through corridor conservation) **and it should be considered to move the proposed final site location out of the CBA**. On the other hand, national biodiversity (and even possibly global diversity) may show significant gain over time, if for instance fossil burning electricity generation could be reduced and or replaced by cleaner energy production methods. Although solar energy is presently not seen as a viable stand-alone technology for electricity production it will lighten the pressure on the fossil burning facilities of Eskom and in so doing will add to a more sustainable way of electricity production.

DEVELOPMENT WITHOUT MITIGATION

The purpose of this scenario is to illustrate, using Van Schoor's formula, the loss should development be allowed without any mitigation measures. It is assumed that the 20 ha will be totally developed into hard surfaces, but still in context of the regional importance of the biodiversity associated with the area.

$S = [(fd + int + sev + ext + loc) \times (leg + gcp + pol + ia + str) \times P]$ (as adapted)

$S = [(3 + 2 + 2 + 1 + 3) \times (1 + 1 + 1 + 1 + 1) \times 0.95] =$ **52 %**

In the above any value of 15% or less indicates an insignificant environmental impact, while any value above 15% constitutes ever increasing environmental impact.

DEVELOPMENT WITH MITIGATION

The purpose of this scenario is to illustrate, using Van Schoor's formula, the environmental gain should development be allowed with all proposed mitigation measures implemented. It is assumed that the 20 ha will be developed, but that all areas not directly impacted by infrastructure placement will remain as natural as possible.

$S = [(fd + int + sev + ext + loc) \times (leg + gcp + pol + ia + str) \times P]$ (as adapted)

$S = [(3 + 2 + 2 + 1 + 3) \times (0 + 1 + 0 + 1 + 0) \times 0.95] =$ **20 %**

In the above any value of 15% or less indicates an insignificant environmental impact, while any value above 15% constitutes ever increasing environmental impact.

RECOMMENDATIONS & IMPACT MINIMIZATION

The site visit and desktop studies described and evaluated in this document led to the conclusion that the "No-Go" alternative may result in significant gain in regional conservation targets (not through the conservation of significant vegetation, rare & endangered species or special habitats, but through corridor conservation) **and it should be considered to move the proposed final site location out of the CBA**.

It was also clear that the specific site location cannot be rejected on the grounds of:

- the significance of the specific vegetation type (which are classified as Least Threatened),
- nor due to the impact on populations of individual species (regarded as low),
- nor due to the conservation of rare & endangered species (considered not be to be significantly impacted),
- nor for the protection of protected species (of which none was encountered),
- nor due to the impact on special or sensitive habitats (none encountered).

Thus, although the placement of the solar site location is not expected to have significant impact on any single biodiversity feature, it is expected to put **pressure on regional conservation targets** (possible impediment of corridor connectivity) due to its CBA status

On the other hand, national biodiversity (and even possibly global diversity) will show significant gain over time, if for instance fossil burning electricity generation could be reduced and or replaced by cleaner energy production methods. Although solar energy is presently not seen as a viable stand-alone technology for electricity production it will lighten the pressure on the fossil burning facilities (and the need for building more) of Eskom and in so doing will add to a more sustainable way of electricity production.

Finally, when quantifying the development options, the Van Schoor's formula for impact quantification still shows a significant difference between development **without** and development **with** mitigation.

With the available information at the author's disposal it is recommended that the possibility of locating the proposed site out of the CBA must be investigated (Refer to Figure 11). If not possible, all mitigation measures described in this document is implemented and the site should be located to minimise the impact on the CBA. Furthermore, a botanist or suitably qualified ECO must be appointed during the construction phase of the project.

IMPACT MINIMIZATION

GENERAL

- All construction must be done in accordance with an approved construction and operational phase Environmental Management Plan (EMP), which must be developed by a suitably experienced Environmental Assessment Practitioner.
- A suitably qualified Environmental Control Officer must be appointed to monitor the construction phase of the solar plant in terms of the EMP and the Biodiversity study recommendations as well as any other conditions which might be required by the Department of Environmental Affairs.
- An integrated waste management system must be implemented during the construction phase.
- All rubble and rubbish (if applicable) must be collected and removed from the site to a suitable registered waste disposal site.
- All alien vegetation should be removed from the larger property.
- Adequate measures must be implemented to ensure against erosion.

SITE SPECIFIC

- **Consider moving the solar site location out of the CBA corridor (Refer to Figure 11, next page).**
- If the above is not possible ensure that the final placement takes the ecological process into consideration and will result in the least impact on the CBA corridor (e.g. placing it along the edge of the CBA).
- A botanist or suitably experienced ECO must be appointed to oversee the initial layout of the construction site, with the aim to minimise the impact on the CBA.
- Only existing access roads should be used for access to the terrain (solar site).
- The internal network of service roads (if needed) must be carefully planned to minimise the impact on the remaining natural veld on the site. The number of roads should be kept to the minimum and should be only two-track/ twee-spoor roads (if possible). If possible the construction of any hard surfaces should be minimised or avoided.
- During construction access roads and the internal road system must be clearly demarcated and access must be tightly controlled (deviations must not be allowed).
- Indiscriminate clearing of areas must be avoided, only pylon sites and sites where associated infrastructure needs to be placed may be cleared (all remaining areas to remain as natural as possible).
- All topsoil (the top 15-20 cm at all excavation sites), must be removed and stored separately for re-use for rehabilitation purposes. The topsoil and vegetation should be replaced over the disturbed soil to provide a source of seed and a seed bed to encourage re-growth of the species removed during construction.

- Once the construction is completed all further movement must be confined to the approved access and maintenance tracks to allow the vegetation to re-establish over the excavated areas.

Figure 11: A possible alternative which will not impact on the CBA (locate within the yellow rectangle) might be the following