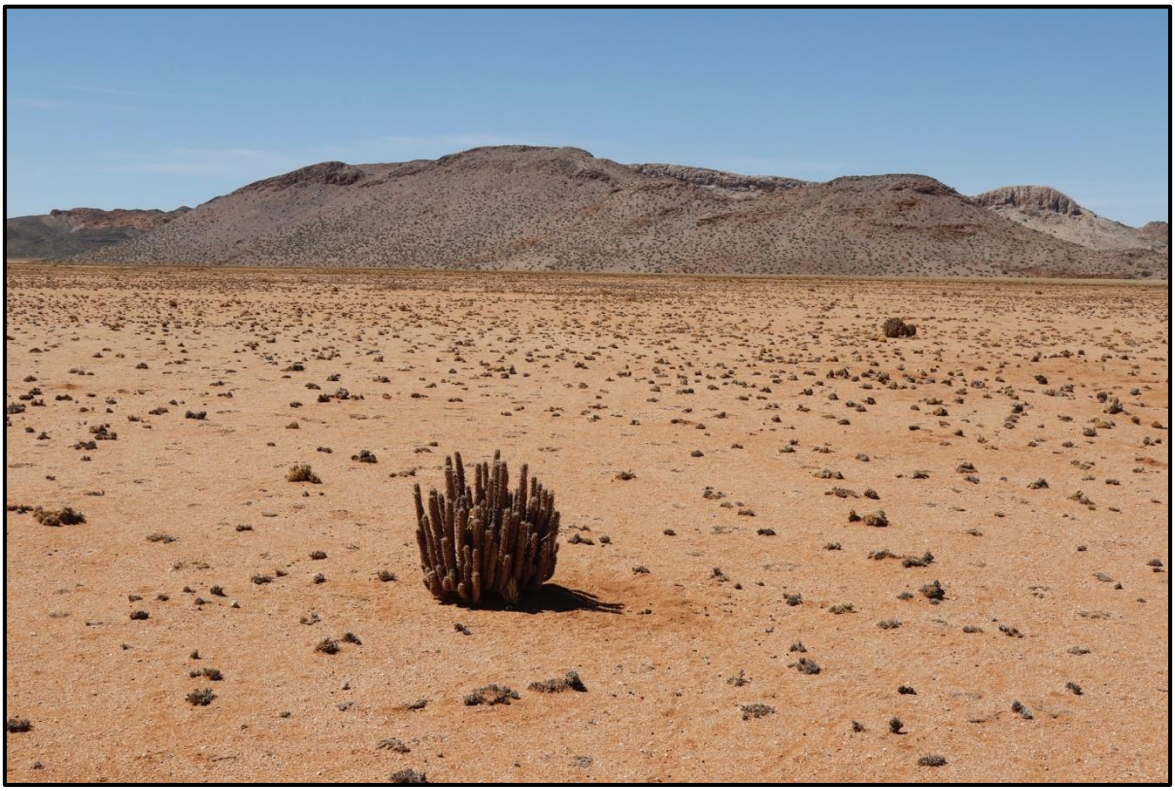
Botanical Impact Assessment
for the proposed
Veld PV South solar facility, near Aggeneys
Northern Cape Province



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Aurecon South Africa (Pty) Ltd

August 2019

National Legislation and Regulations governing this report

This is a 'specialist report' and is compiled in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended, and the Environmental Impact Assessment Regulations, 2014.

Appointment of Specialist

David J. McDonald of Bergwind Botanical Surveys & Tours CC was appointed by Aurecon South Africa (Pty) Ltd ("Aurecon") to provide specialist botanical consulting services for the assessment of the area of the proposed Veld PV South solar facility, Northern Cape Province.

Details of Specialist

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Expertise

Dr David J. McDonald:

- Qualifications: BSc. Hons. (Botany), MSc (Botany) and PhD (Botany)
- Botanical ecologist with over 35 years' experience in the field of Vegetation Science.
- Founded Bergwind Botanical Surveys & Tours CC in 2006
- Has conducted over 300 specialist botanical / ecological studies.
- Has published numerous scientific papers and attended numerous conferences both nationally and internationally (details available on request)

Curriculum Vitae – Appendix 2

Independence

The views expressed in the document are the objective, independent views of Dr McDonald and the study was carried out under the aegis of, Bergwind Botanical Surveys and Tours CC. Neither Dr McDonald nor Bergwind Botanical Surveys and Tours CC have any business, personal, financial or other interest in the proposed development apart from fair remuneration for the work performed.

Conditions relating to this report

The content of this report is based on the author's best scientific and professional knowledge as well as available information. Bergwind Botanical Surveys & Tours CC, its staff and appointed associates, reserve the right to modify the report in any way deemed fit should new, relevant or previously unavailable or undisclosed information become known to the author from on-going research or further work in this field, or pertaining to this investigation

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of the report which are supplied for the purposes of inclusion as part of other reports, including main reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must refer to this report. If these form part of a main report relating to this investigation or report, this report must be included in its entirety as an appendix or separate section to the main report.

Declaration of independence:

I David Jury McDonald, as the appointed Specialist hereby declare/affirm the correctness of the information provided or to be provided as part of the application, and that I:

- in terms of the general requirement to be independent:
  - other than fair remuneration for work performed in terms of this application, have no business, financial, personal or other interest in the development proposal or application and that there are no circumstances that may compromise my objectivity; or
  - am independent, but another specialist (the "Review Specialist") that meets the general requirements set out in Regulation 13 has been appointed to review my work (Note: a declaration by the review specialist must be submitted);
- in terms of the remainder of the general requirements for a specialist, have throughout this EIA process met all of the requirements;
- have disclosed to the applicant, the EAP, the Review EAP (if applicable), the Department and I&APs all material information that has or may have the potential to influence the decision of the Department or the objectivity of any report, plan or document prepared or to be prepared as part of the application; and
- am aware that a false declaration is an offence in terms of Regulation 48 of the EIA Regulations, 2014 (as amended).

Signature of the specialist:

Bergwind Botanical Surveys & Tours CC

Name of company:

14 August 2019

Date:

CONTENTS

1. Background and Brief

Bergwind Botanical Surveys & Tours CC was appointed by Aurecon to undertake a botanical study (scoping and botanical impact assessment) for a proposed solar installation known as the Namaqua 300 MW Combined Solar focusing on two farms – (1) Veld PV North on Farm Naroep (Remainder of Farm 45) (dealt with in a separate report) and (2) Veld PV South on Farm Haramoep (Remainder of Farm 53) – the focus of this report. The area of interest is approximately 20 km north-west of Aggeneys, in the Khai-ma Local Municipality, Namaqua District Municipality, Northern Cape Province. The proponent proposes to develop three solar farms that would consist of one concentrated solar power facility (CSP) and two photovoltaic (PV) energy facilities with associated infrastructure. These farms would have a maximum generation capacity of up to 150 MW for the CSP and 75 MW each for the PV with a combined generation capacity of up to 300 MW. The development has been designed with the intention that the solar farms would make up a consolidated development, known as 'the proposed Namakwa 300 MW Combined Solar Technology Facility', and would utilise shared infrastructure where possible to minimise their overall footprint and associated impacts. However, each project is assessed as a standalone project so that each could be constructed under its own approvals, should this be required.

The principles, guidelines and recommendations of CapeNature [Western Cape] (although the study is in the Norther Cape Province), the requirements of the Department of Environment and Nature Conservation (DENC) and the Botanical Society of South Africa for proactive assessment of the biodiversity of proposed development sites are followed (Brownlie 2005).

The report focuses on Veld PV South project that would cover 300 ha and would include the following components:

- Numerous arrays of PV solar panels;
- Internal access roads;
- An operations and maintenance building;
- A temporary laydown area;
- An on-site substation, including switching yard;
- Internal cabling laid underground when feasible;
- Site access mostly via existing road (widened to 6 m); and
- A loop in loop out line would be built between the facility and an existing 132 kV transmission line to the west, approximately 150 m in length.

2. Terms of Reference: Scoping

- Conduct a field evaluation of the target area of the proposed 'Veld PV South'.
- Indicate any constraints, based on the botanical condition of the study area, that would influence the proposed project, either positively or negatively.
- Provide a baseline and impact assessment to evaluate the impacts of the proposed project on any natural vegetation.
- Note any 'red flags' and sensitive plants species (protected trees; threatened species).

- Assess the 'No Go' condition and the direct and cumulative impacts of the proposed project.
- Recommend mitigation measures that should be implemented to compensate for any negative direct impacts.

Note: The report presented here has remained partly unchanged from the scoping report so as to include all the background and investigative work that went into the Scoping Phase.

3. Terms of Reference: EIA

- Assess the impact of the proposed layout of the VELD PV South installation.
- A road exists from the N14 to the vicinity of the proposed Veld PV South Installation: Assess the impact of the access road from the 'N14 Connector Road' to the PV area.
- Assess the impact of the power lines in the vicinity of VELD PV South.
- Assess the impact of the 132 kV evacuation power line to Aggeneys that would service both VELD PV North and VELD PV South.

4. General Study Area: Veld PV South

4.1 Locality

The general locality is in the Khai-Ma Local Municipality, Namaqua District Municipality, Northern Cape Province north west of Aggeneys and in the area between Pella in the east and Goodhouse in the west. (Figures 1 & 2). The study area falls within the region colloquially known as Bushmanland and is at the interface between the Nama Karoo and Desert biomes (Rutherford *et al.* 2006 in Mucina & Rutherford, 2006). The proposed 'Veld PV South' solar power installation would be on the farm Haramoep 53/RE (Figures 2 & 3). Figures 4 & 5 show the target area (study area) for 'Veld PV South' with the sample track and waypoints.

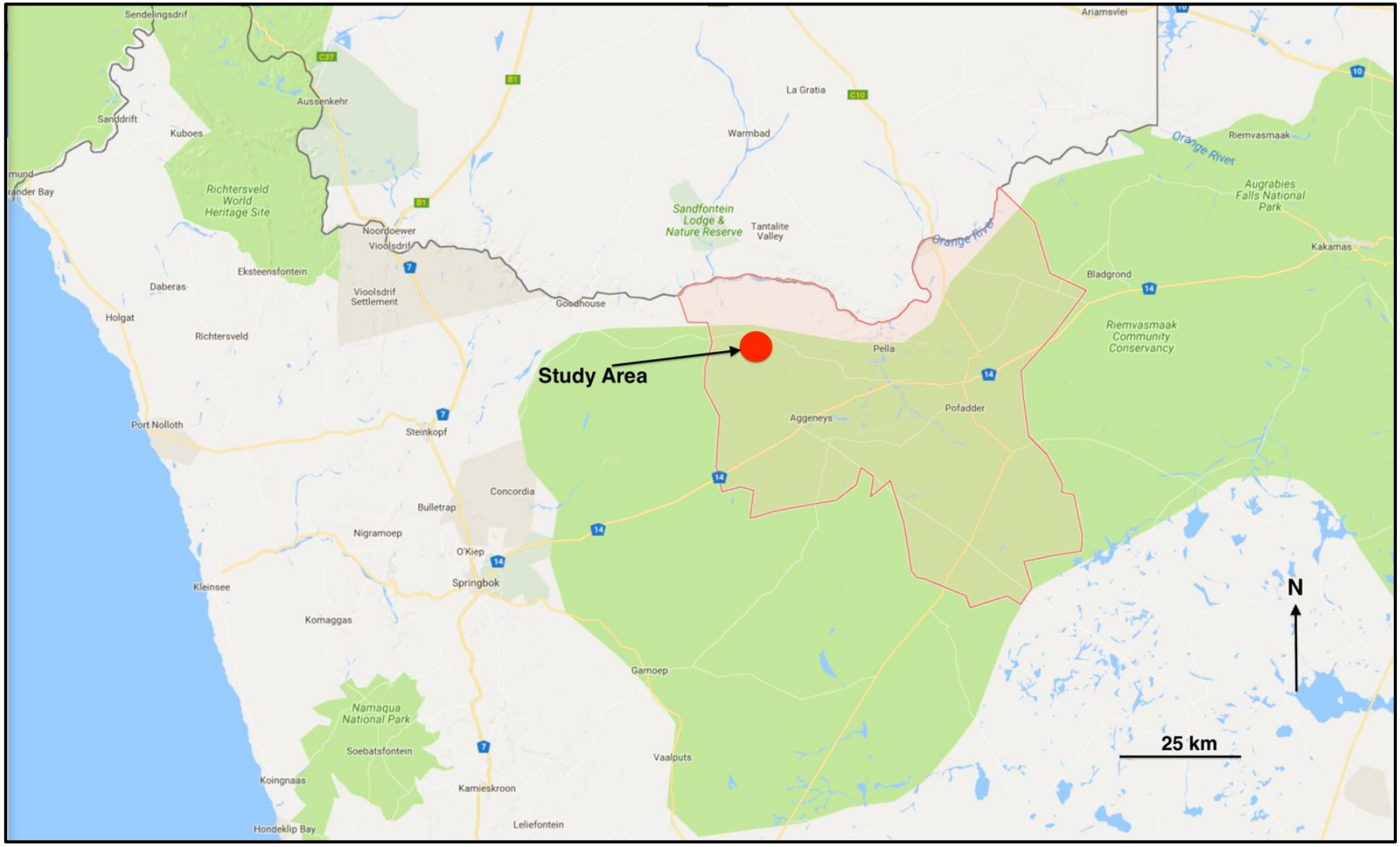

Figure 1. General locality of the study area north-west of Aggeneys the Khai Ma Local Municipality, Namaqua District Municipality Northern Cape Province.

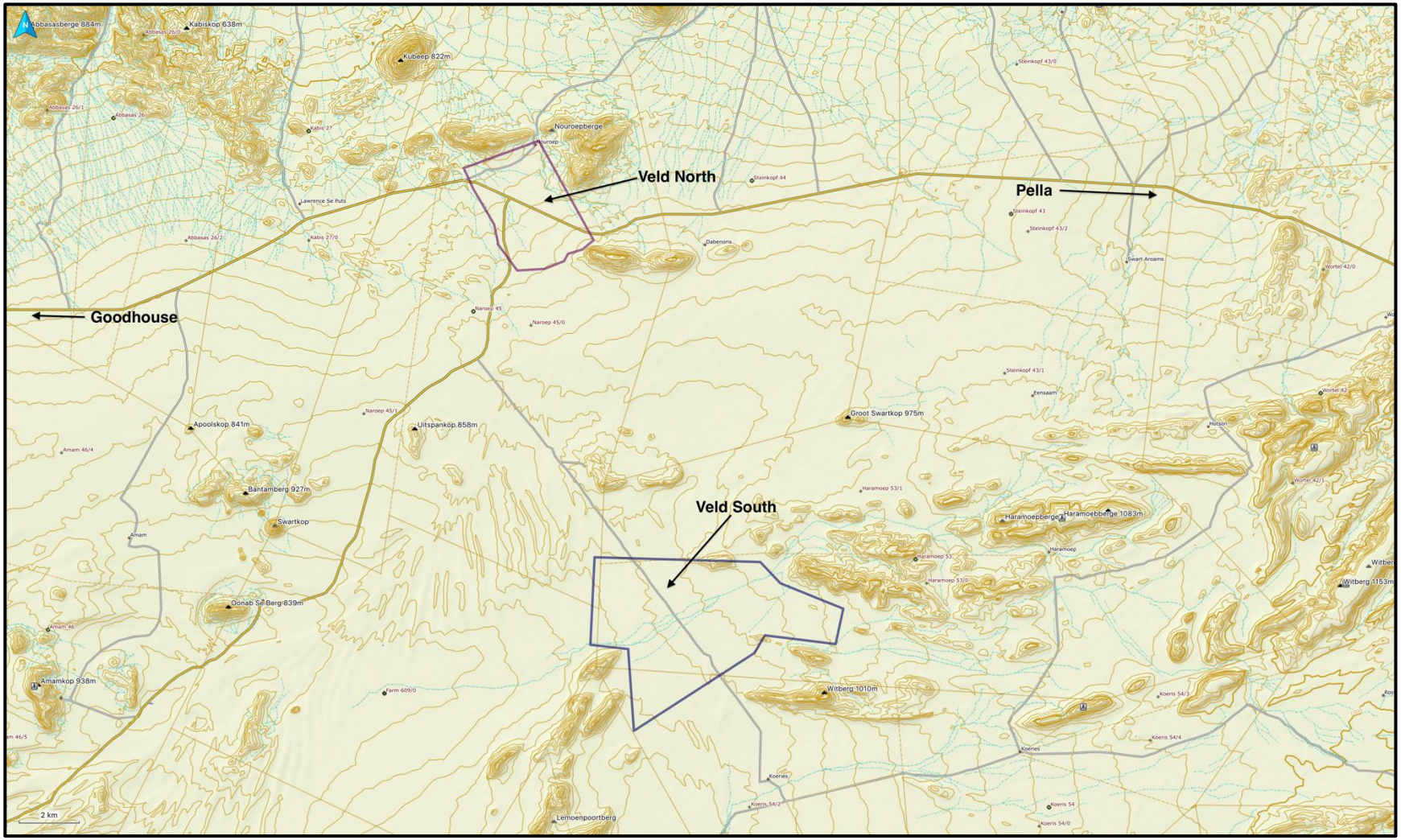

Figure 2. Topographic map showing the location of the greater Veld North PV and Veld South PV areas on the farms Naroep and Haramoep in the Khai Ma Local Municipality, Northern Cape Province.

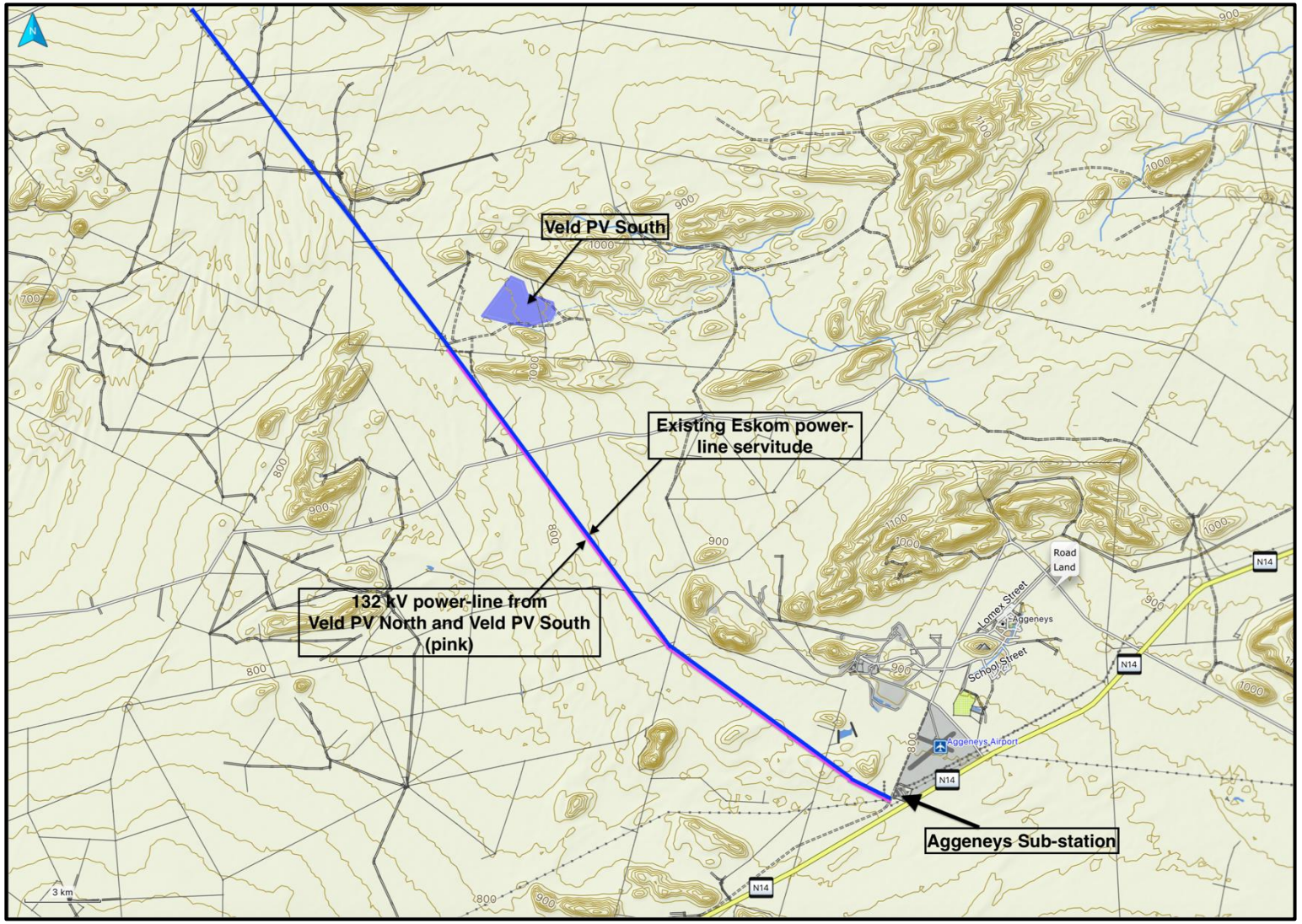

Figure 3. Topographical map showing the location of Veld PV South on the farm Haramoep RE/53 with the proximity of the Eskom power-line servitude to Aggeneys Sub-station.

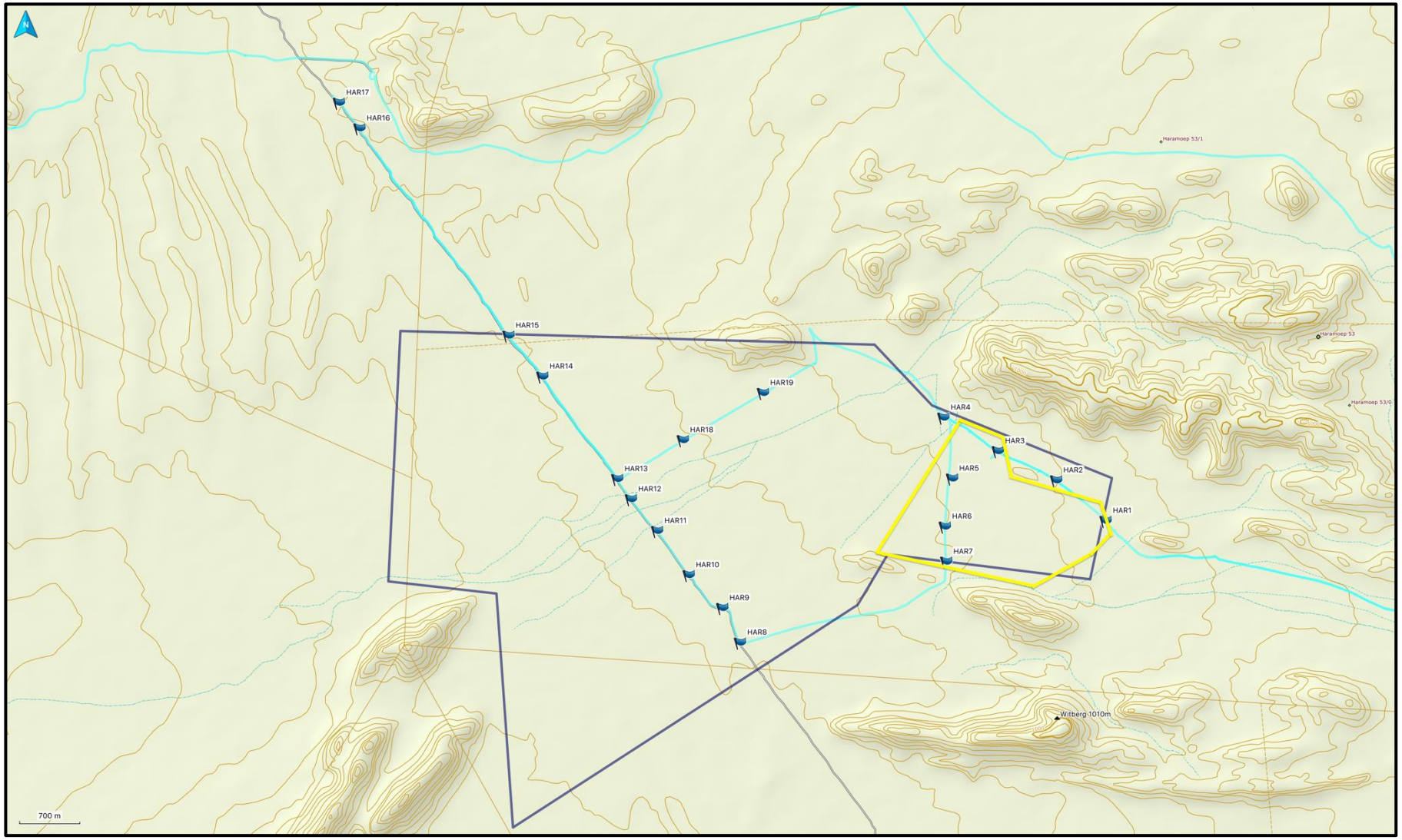

Figure 4. Detailed topography of the greater Veld PV South study area (dark blue boundary) with the subsidiary Veld PV South 'focus area' with yellow boundary. The light blue line is the 'sample track' with waypoints represented by blue flag icons HAR#.

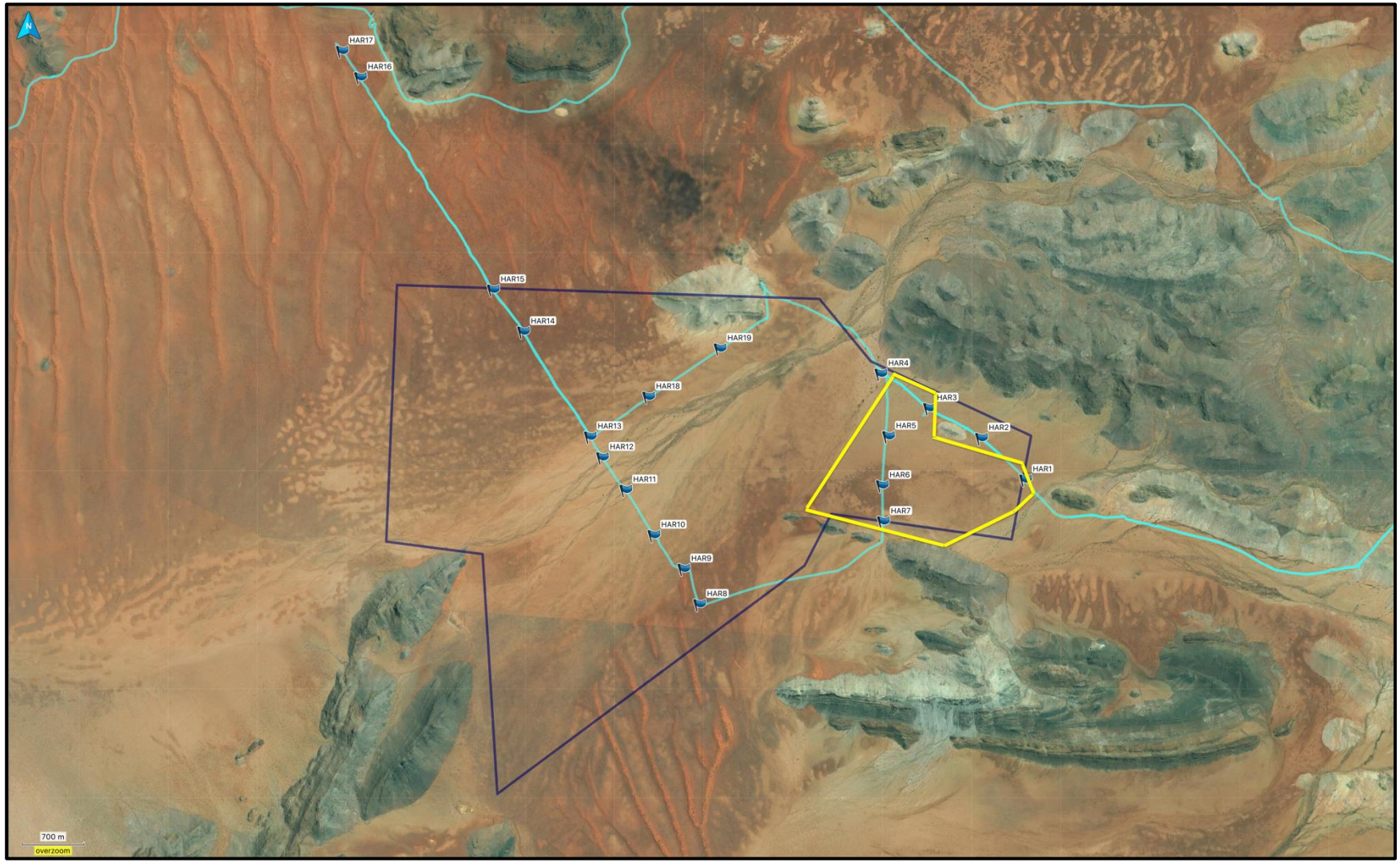

Figure 5. Aerial image (Garmin 'Birdseye' image) showing the greater Veld PV South study area (dark blue boundary) with the subsidiary Veld PV South 'focus area' with yellow boundary. The light blue line is the 'sample track' with waypoints represented by blue flag icons HAR#.

4.2 Topography, Geology and Soils

The geology of the study area is complex due to the underlying granitic-gneissic rocks of the Namaqualand Metamorphic Complex (Namaqua-Natal Province: Cornell *et al*. 2006). These rocks are exposed on the numerous hills surrounding the study area but the main area of focus is a relatively flat plain (with shallow drainage southwards) where the red-yellow apedal, freely drained, sandy soils overly gneissic granite forming a pedisediment i.e. a veneer of sandy-gravel material overlying bedrock.

The land-type over the greater part of the Veld PV South general study area is Ae99 and in the east Ae43 (no dunes present) (Figures 6 & 10). Land-type Af20 has recent sand dunes overlying calcrete and gneissic granite (Figures 7 & 10) and land-type Ic150 displays rock with little or no soil (Figures 8 & 10). The Veld PV South 'focus area' is located exclusively in land-type Ae43 (Figures 9 & 10).

Figure 6. Relatively flat peneplain with red sandy mantle over granitic-gneissic rocks.

Figure 7. Dunes of recent wind-blown sand found in the south of the greater Veld PV South study area. The main grass species is *Centropodia glauca* (Gha grass)

Figure 8. An exposed quartz inselberg surrounded by flat peneplain. This inselberg is immediately north of the Veld PV South 'focus area'.

Figure 9. The relatively flat, sparsely vegetated peneplain where the Veld PV South installation would be located, as seen from the quartz inselberg immediately north of the site.

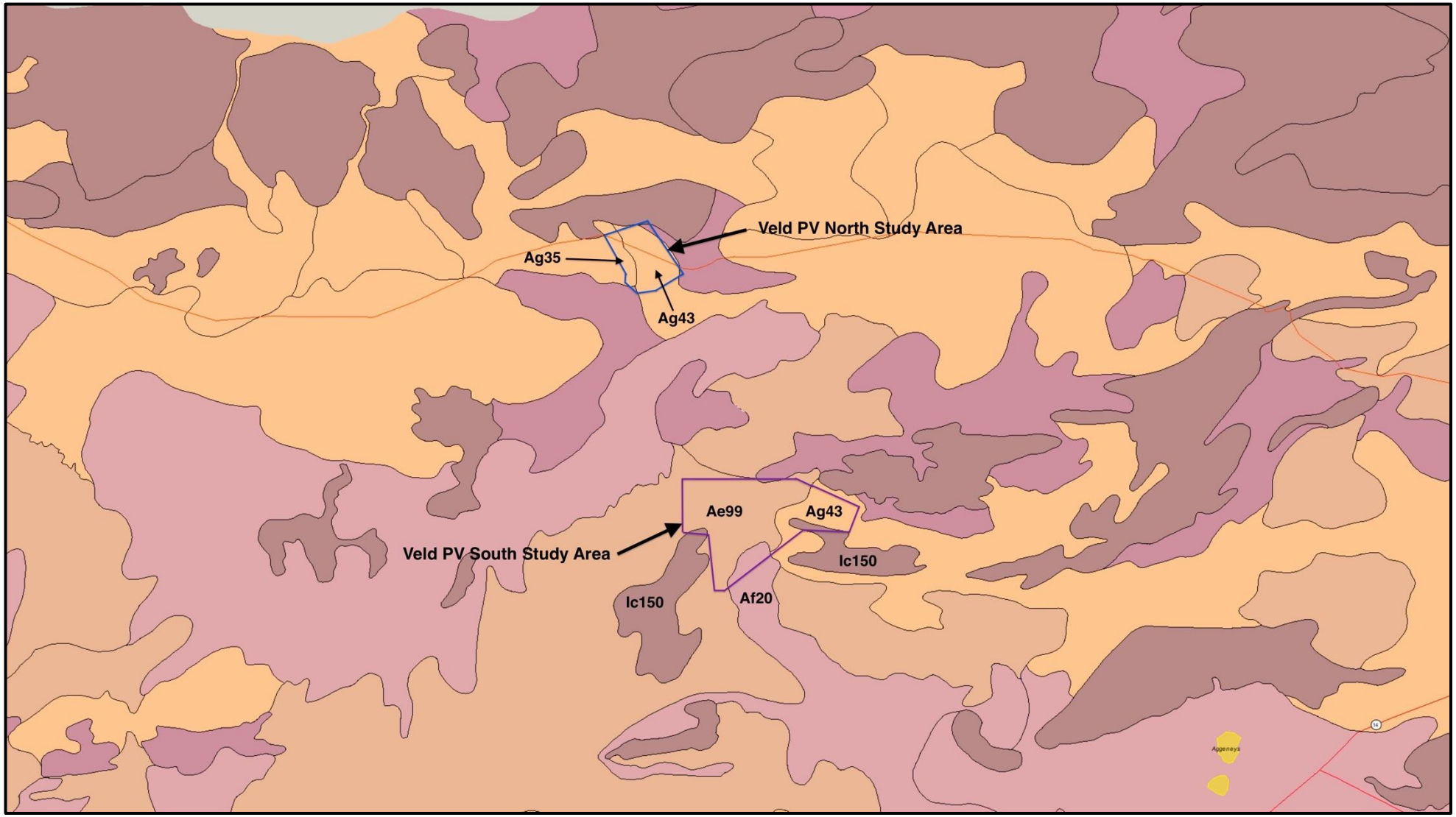

Figure 10. Land type map (Land Survey Staff, 1972—2006) for the Veld PV South as well as Veld PV North study areas.

4.3 Climate

Bushmanland falls within the summer to autumn rainfall zone of the Northern Cape Province. It experiences highly unpredictable rainfall that can vary between 50 to 200 mm per annum. Rain normally falls as scattered thunder showers when tropical thunderstorm activity extends southwards over the Kalahari. It is not uncommon for a heavy shower to occur in one place and for a nearby area to be completely missed, remaining dry. The pattern of average rainfall for Aggeneys, the closest major town to the study area, shows the typical low annual rainfall values with the highest recorded rainfall in March and April (15 mm) and the lowest of only a few millimetres in the winter months (Figure 11).

Summer daytime temperatures can reach above 40 °C (range 20 – 40+ °C) but average from 26 -- 29 °C for November to March, the hottest months. The dry winters are mild to cold. Winter daytime temperatures can reach 25 °C but at night frost can occur and temperatures can average below 0 °C (-3.3 °C) (Mucina *et al.* 2006) (Figure 12). Three vegetation types are found in the study area as described below. The climate diagram for Bushmanland Arid Grassland (Figure 12) mirrors the climate for Aggeneys as depicted in Figure 7. The upland areas with Bushmanland Inselberg Shrubland and Aggeneys Gravel Vygieveld have lower rainfall than the plains in the study area but slightly less mean annual potential evaporation. Mean annual temperatures are also marginally lower (Figure 13). The latter two vegetation types would not be affected by the proposed renewable energy infrastructure in the Veld PV South focus area.

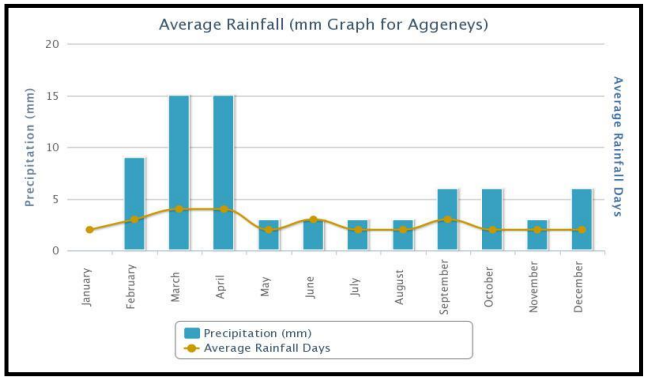

Figure 11. Rainfall for Aggeneys, the main town near to the study area.

(Source: http://www.worldweatheronline.com/Aggeneys-weather-averages/Northern-Cape/ZA.aspx)

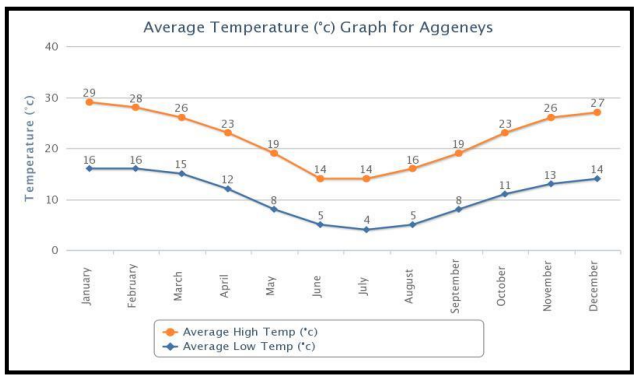

Figure 12. Temperatures for Aggeneys, the main town near the study area.

(Source: http://www.worldweatheronline.com/Aggeneys-weather-averages/Northern-Cape/ZA.aspx)

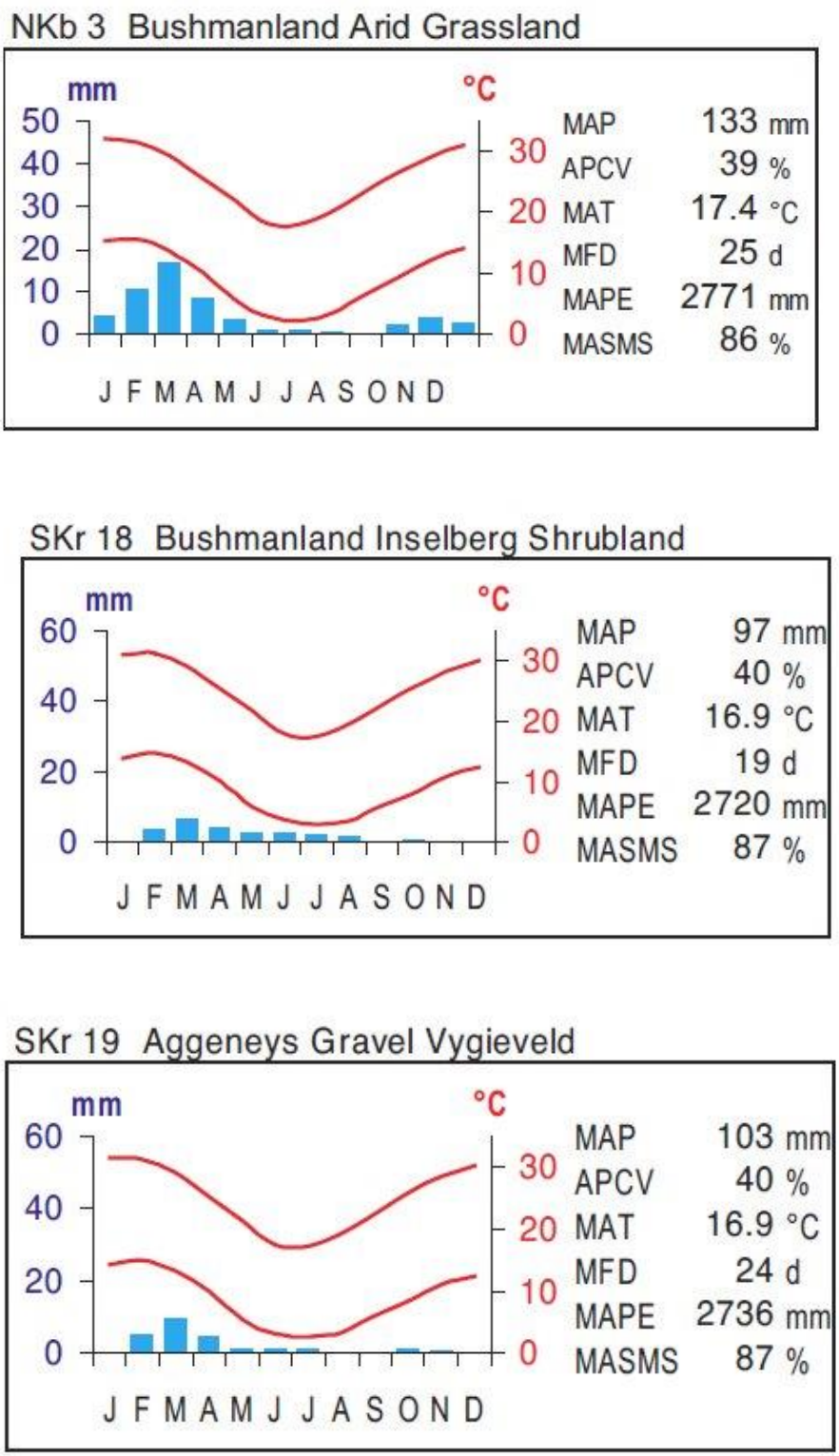

Figure 13. Climate diagrams for Bushmanland Arid Grassland, Bushmanland Inselberg Shrubland and Aggeneys Gravel Vygieveld (from Mucina *et al.,* 2006) showing MAP – Mean Annual Precipitation; ACPV = Annual Precipitation Coefficient of Variance; MAT = Mean Annual Temperature; MFD = Mean Frost Days; MAPE = Mean Annual Potential Evaporation; MASMA = Mean Annual Soil Moisture Stress.

5. Veld PV South – 'Focus Area'

The Veld PV South 'focus area' is a sub-area within the greater 'south' study area. This area is also referred to as a 'power Block'. It is located towards the east of the originally identified and generally investigated greater 'south' study area and covers 300 ha. It would be accessed by a farm road from the east. The 'focus area' is on a wide-open relatively flat plain (peneplain) covered with yellow to red sandy soil and sparse vegetation (described below). The proposed layout of the PV installation with associated sub-station is given in Figure 14.

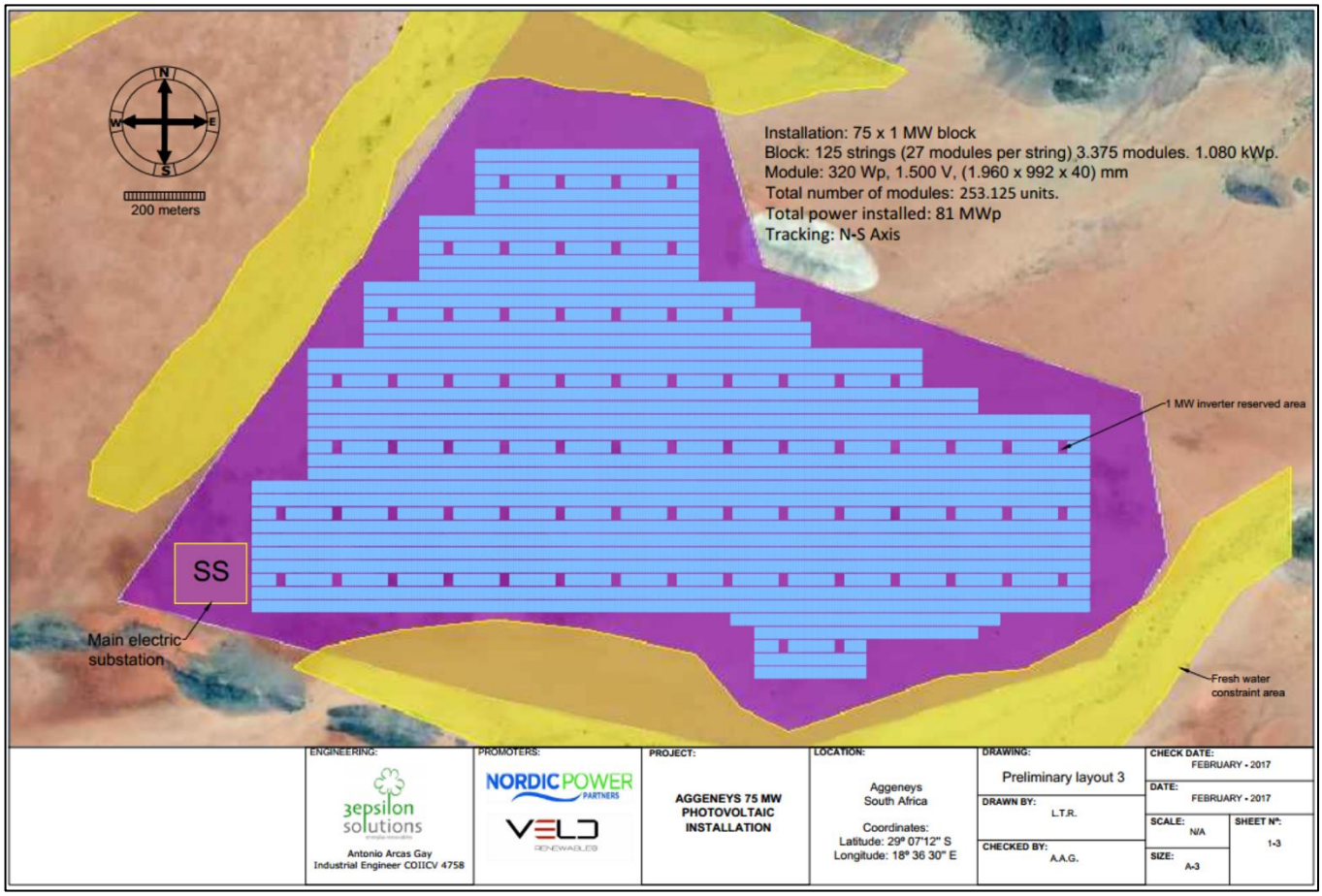

Figure 14. Layout of proposed 75 MW PV installation at Veld PV South.

6. Methods

6.1 Field Sampling

Field-work for the assessment of the proposed Veld PV South installation was carried out on 15 and 12 November 2016. Contact was made with the landowners and permission obtained to enter their properties. They also volunteered valuable insights into the past history of land-use which directly affects the present-day condition of the vegetation. The survey was carried out mostly from a vehicle. Access roads were driven (Figures 4 & 5) and where necessary short

sorties were made to record the species composition of the vegetation and to obtain photographs.

The method used was a 'rapid-assessment technique' in which site observations and numerous photographs were taken for later 'desk-top' analysis. Seventeen (17) waypoints (Figure 4 & 5) were recorded in the study area. This information was transferred to Google Earth ™ aerial-photo maps as well as Garmin Birdseye imagery and used for the preparation of maps.

No formal phytosociological analysis was conducted. The vegetation is described from the species and photographs recorded at the waypoints. The National Vegetation Map (SANBI, 2012) was used as a base map. The Critical Biodiversity Areas map of the Northern Cape Province (E. Oosthuysen) was also used as an informant for interpreting the potential impacts on the vegetation.

6.2 Limitations and Assumptions

The environment was extremely dry at the time of the site visit and no plants were actively growing. This, however, was not entirely a drawback since the Veld PV South focus area is largely uniform and a meaningful appraisal could be done using personal knowledge of this type of environment from elsewhere e.g. Namies south-east of Aggeneys, that I visited in more favourable climatic circumstances.

7. Botanical evaluation of the study area

7.1 General description

Bushmanland Arid Grassland is the main vegetation type found in the Veld PV South 'focus area' area at Haramoep 53/RE. This vegetation type occurs over a wide expanse in the Northern Cape Province from the Bushmanland Basin in the south to the vicinity of the Orange River in the north and from Prieska in the east to Aggeneys in the west (Mucina *et al.* 2006b; McDonald, 2011; McDonald 2012a & 2012b). It is considered to be Least Threatened (Driver *et al.* 2012; Government Gazette, 2011). In the study area, it is found on sandy, well-drained yellow to red soils. The landscape is prone to sheet-wash at times of heavy rain. Seasonal drainage lines ('leegtes') are found which, in some places, are poorly defined whereas in others they are distinct and well-defined.

7.2 Open Plains Grassland

The Veld PV South focus area is covered with Open Plains Grassland (a sub-unit of Bushmanland Arid Grassland). It is described as semi-desert 'steppe' by Mucina *et al.* (2006b) and is typically dominated by Gha grass (*Centropodia glauca*) and 'white grasses' (*Stipagrostis* spp.) (Figures 15 – 18). This vegetation occurs on shallow red sandy soils. Due to the extremely dry conditions prevailing at the time of the site visit, only a few other plant species apart from the grasses were seen or identified in this vegetation type. The other species recorded are *Euphorbia* cf. *lignosa*

(melkbos), *Hoodia gordonii* (ghaap) (Figure 15) that occurs as scattered multi-stemmed individuals, *Hermannia* sp. and *Rhigozum trichotomum* (driedoring) growing as scattered individuals and not in dense clusters as is often the case.

Hoodia gordonii is a protected plant species in the Northern Cape Province. A permit would therefore be necessary to translocate the plants occurring in the proposed Veld PV South focus area to a nearby suitable area that would not be affected by the proposed PV project (search & rescue).

In addition to the above plant species, *Boscia albitrunca* (shepherd' tree or witgatboom) a small tree (usually of great age), occurs along drainage line and occasionally in open areas (Figure 19). At the Veld PV South focus area this species is found along the southern boundary in the near the lower slopes of the low hills. This species is protected under the National Forests Act 1998 (Act 84 of 1998). Since the trees occur near the southern boundary of the proposed PV installation they could, and ideally should, be avoided. If for some reason any trees of this species must be removed or otherwise affected (e.g. prune a permit for such activity would be required from the Department of Agriculture, Forestry and Fisheries.

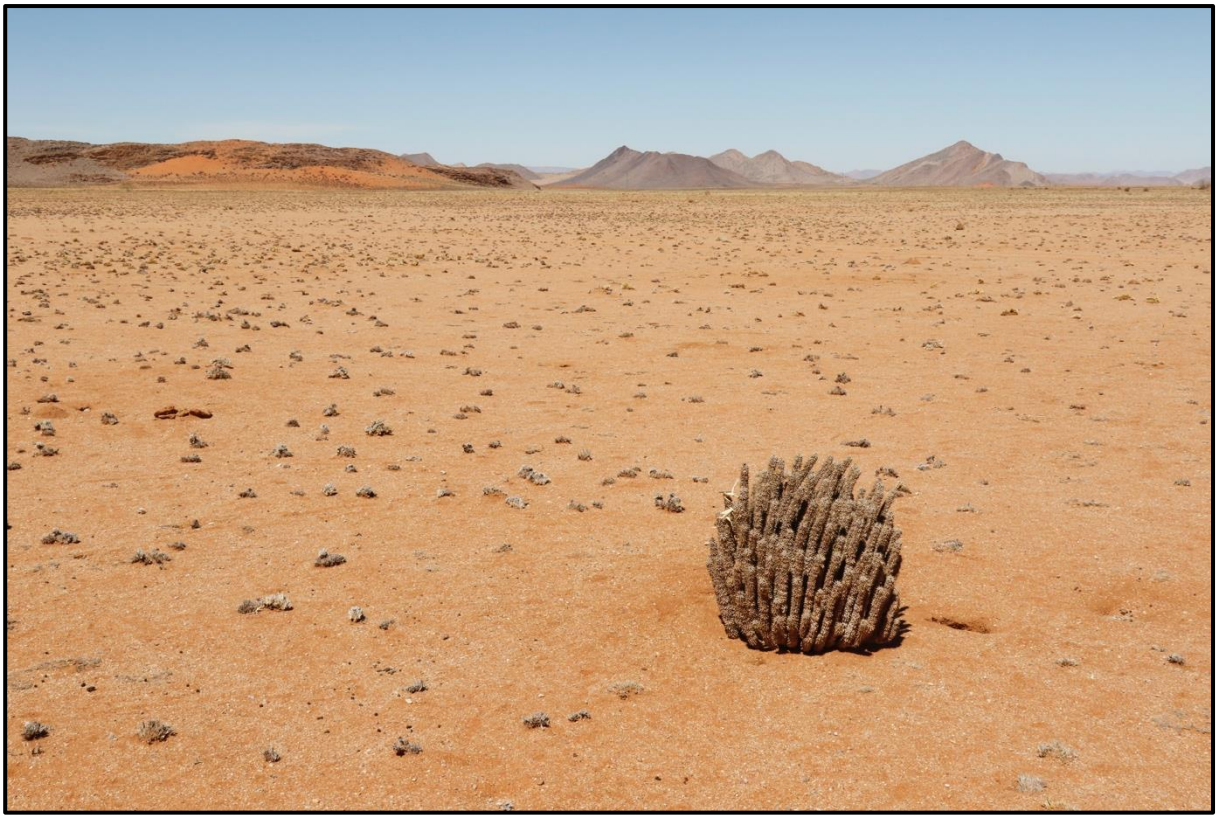

Figure 15. The Veld PV South 'focus area' (view southwards) with *Hoodia gordonii* in the foreground. The dry grass tufts are of *Stipagrostis* spp. (probably *Stipagrostis obtusa*). The grass tufts are heavily grazed and affected by drought.

Figure 16. View north-westwards over the Veld PV South 'focus area' looking towards the quartz inselberg immediately north of the site.

Figure 17. The southern part of the Veld PV South 'focus area' with a strong stand of gha grass (*Centropodia glauca*).

Figure 18. Inselbergs immediately south of the Veld PV South 'focus area'. In the mid-ground right and at the rocky ridge below the higher inselberg are small trees of *Boscia albitrunca*.

Figure 19. An example of an old specimen of *Boscia albitrunca* (shepherd's tree; witgatboom)

7.3 Invasive Alien Plants

No alien invasive plant species were found in the Veld South PV focus area but *Prosopis glandulosa* var. *torreyana* (honey mesquite) is found at Farm Haramoep RE/53 (Figure 20). Caution is therefore advised since disturbance due to construction can introduce and spread this species which would be undesirable.

Figure 20. Invasive honey mesquite (*Prosopis glandulosa* var. *torreyana*) along the entrance road to farm Haramoep RE/53.

8. Conservation Status and Vegetation Sensitivity

Desmet & Marsh (2008) mapped the Critical Biodiversity Areas (CBAs) for the Namaqua District Municipality Biodiversity Sector Plan. Their work has subsequently been extended to the entire Northern Cape Province and shapefiles for the relevant map that covers the Veld PV South focus area was obtained (E. Oosthuysen pers. comm.) The map designates the Veld PV South 'focus area' as falling within a Critical Biodiversity Area 2 (CBA2 – Figure 21). The definition and parameters of CBA2 according to Desmet & Marsh (2008) are given in Appendix 1. CBA2 includes important areas that have endangered vegetation types, important habitat types and threatened species. The Veld PV South 'focus area' has none of these attributes except for *Hoodia gordonii* and marginally *Boscia albitrunca*. The rationale for assigning this area to CBA2 is not clear and no documentation is currently available that explains this designation. Based on field observations I believe that the Veld PV South area should be assigned Ecological Support Area (ESA) status which still points to its ecological value but does not assign a 'critical' status to the area.

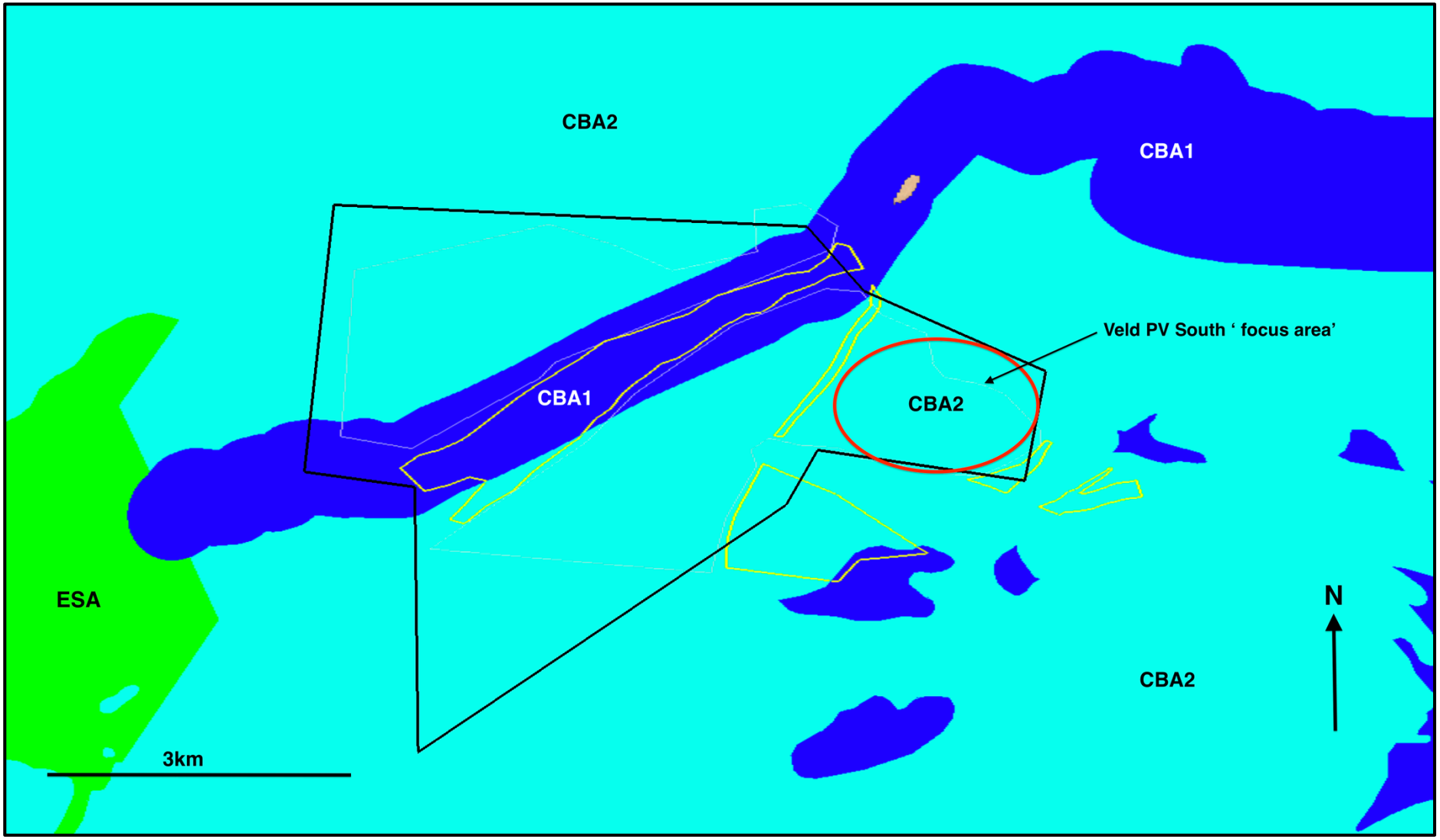

Figure 21. Critical Biodiversity Areas map for the greater Veld PV South study area with the Veld PV South 'focus area' (red oval) located in CBA2.

9. Constraints and Opportunities

The vegetation found in the Veld PV South 'focus area' has very low botanical sensitivity. The Bushmanland Arid Grassland is uniform through the area and has a sparse cover of shrubs. Apart from *Hoodia gordonii*, no succulents such as any *Aloe* spp. are found. Despite the classification of the Veld PV South 'focus area' being classified as CBA2, it is my view that, from a botanical perspective, this area is ideal for the construction of a solar PV installation since it has very low plant species richness as well as not harbouring any species of conservation concern (Red List species).

10. Impact Assessment

10.1 The 'No Go Alternative

In the case of the 'No Go' alternative, the proposed Veld PV South would not be constructed and the *status quo* would persist where current farming practices would continue. The impact of the 'No Go' alternative would be **Very Low negative** (Table 1).

10.2 Direct Impacts of the construction of the Veld PV South Power Block with respect to location

The direct impact of the PV installation in the Veld PV South area would result in removal of mainly grassy vegetation but also a few shrubs and notably a few plants of *Hoodia gordonii*. The conservation status of *Hoodia gordonii* is DDD which means 'data deficient'. Very few of these plants were noted in the 'south' study area and the possible influence on their population status would be negligible.

Once the 'south' general study area had been surveyed, a suitable area was selected for the construction of the Veld PV South Power Block. The result is that there is only one 'alternative' since other areas were screened out during the scoping phase.

Table 1. Assessment of impacts of the proposed Veld PV South – location considerations

LOCATION ALTERNATIVE	Alternative 1
Short description	The proposed Veld PV South Power Block will be located in an area of low biodiversity and very low botanical sensitivity.
Description of alternative specific attributes	No alternative site has been identified since other sites were screened out during the scoping exercise.

List of negative impacts	N/A	Removal of sparse Bushmanland Arid Grassland vegetation.
List of positive impacts	No positive impacts	N/A
List of potential mitigations	N/A	Search and rescue of *Hoodia gordonii*
Nature	Positive	Negative
Duration	N/A	Long-term
Extent	N/A	Local
Magnitude	N/A	Low
Probability	N/A	High
Confidence	N/A	High
Reversibility	N/A	High
Resource irreplaceability	N/A	Low
Mitigatability	N/A	Medium
Significance	N/A	Very Low negative (without mitigation)
Ranked preference (from 1-2)	2	
Motivation for preferred alternative	The Veld PV South Power Block would be built in an area where the habitat is not sensitive and similar habitat occurs way beyond the limits of the power block site. Negative impacts on biodiversity, and more specifically vegetation will be very low.	

10.3 Direct Impacts of the construction of the Veld PV South solar farm with respect to type of technology used.

The type of technology used for the Veld PV South solar farm would have little to no bearing on the vegetation since the entire footprint of the site would be disturbed. Since there is no alternative site proposed, only one footprint has been evaluated and the overall impact would be **Low negative** both prior to and after mitigation (Table 2) for whichever technology is applied.

Table 2. Assessment of impacts of the proposed Veld PV South: Technology alternatives

TECHNOLOGY ALTERNATIVE	Alternative A1	Alternative A2
Short description	Fixed axis PV in the area designated as Veld PV South. In terms of impacts on botanical attributes of the site it is the foot print that is of importance since virtually all vegetation within the footprint would be removed or at least disturbed in some way.	Single axis tracking PV in the area designated as Veld PV South. In terms of impacts on botanical attributes of the site it is the foot print that is of importance since virtually all vegetation within the footprint would be removed or at least disturbed in some way.

Description of alternative specific attributes	The type of PV technology used would have little bearing on the vegetation found in the Veld PV South 'focus area' since the disturbance impacts would be mainly during the construction phase and they would then continue but to a lesser extent in the operational phase.		The type of PV technology used would have little bearing on the vegetation found in the Veld PV South 'focus area' since the disturbance impacts would be mainly during the construction phase and they would then continue but to a lesser extent in the operational phase.	
List of negative impacts	N/A	Removal of sparse Bushmanland Arid Grassland vegetation.	N/A	Removal of sparse Bushmanland Arid Grassland vegetation.
List of positive impacts	No positive impacts	N/A	No positive impacts	N/A
List of potential mitigations	N/A	Search and rescue of *Hoodia gordonii*	N/A	Search and rescue of *Hoodia gordonii*
Assessment				
Nature	Positive	Negative	Positive	Negative
Duration	N/A	Long-term	N/A	Long-term
Extent	N/A	Local	N/A	Local
Magnitude	N/A	Low	N/A	Low
Probability	N/A	High	N/A	High
Confidence	N/A	High	N/A	High
Reversibility	N/A	High	N/A	High
Resource irreplaceability	N/A	Low	N/A	Low
Mitigatability	N/A	Medium	N/A	Medium
Significance	N/A	Very Low negative (without mitigation)	N/A	Very Low Negative (without mitigation)
Conclusion				
Ranked preference (from 1-2)	2		1	
Motivation for preferred alternative	Both technology alternatives would have similar negative impacts on the vegetation of the Veld PV South 'focus area'. The only reason for selecting Alternative 2 above Alternative 1 is that there could be marginally less disturbance of the vegetation. However, the difference in the probable disturbance is difficult to predict.			

10.4 Cumulative impacts

Cumulative impacts are anticipated to be **Very Low negative** since Bushmanland Arid Grassland occurs over wide expanses in the Northern Cape Province and is not rich in plant species. There would be very low irreplaceability of resources due to the construction and operation of the Veld PV South Power Block despite other renewable energy projects in similar ecosystems elsewhere.

10.5 Indirect Impacts

No indirect impacts have been identified.

11. Discussion

A broader area than just the Veld PV South 'focus area' was investigated during field-work and compared with areas, for example, that are near seasonal drainage lines, the area selected for the Veld PV South Power Block is much more desirable from a botanical perspective since it avoids sensitive habitat. The wide-open peneplain has a single vegetation type, Bushmanland Arid Grassland, that is widespread and has low botanical sensitivity. Scattered individuals of *Hoodia gordonii* occur within the proposed footprint and they should be removed prior to construction and relocated to suitable habitat that would not be disturbed in future (A permit would be required for this purpose).

The technology used for the solar farm is immaterial as far as the vegetation is concerned. Conceivably the vegetation of the entire footprint would be disturbed, whether the Alternative 1 (fixed axis PV) or Alternative 2 (single axis tracking PV), is used. Therefore, there would be no meaningful difference in impacts on the vegetation resulting from the different technologies. There may, however, be some small advantage in using single axis tracking PV and that is the reason the technology is preferred above fixed axis PV (Table 1).

12. Conclusions & Recommendations

- A single vegetation type occurs in the Veld PV South Power Block area namely, Bushmanland Arid Grassland. This vegetation type is not endangered in any way and is therefore considered to be Least Threatened.
- The vegetation on the site has low sensitivity and given that and other attributes of the site the impact on the vegetation and habitat would be **Low negative** (pre- and post-mitigation).
- There is no part of the main Veld PV South that has any 'red flags' except for the requirement to relocate plants *Hoodia gordonii*. In addition, along the southern boundary of the site, care should be taken to avoid impact on trees of *Boscia albitrunca*. This should be possible because the trees are mostly within the area excluded due to freshwater ecological constraints. However, if disturbance of any *Boscia albitrunca* trees is unavoidable, a permit for disturbance or removal of such trees would be required from the Department of Environment, Forestry and Fisheries (DEFF).
- No alien invasive plants were recorded in the Veld PV South 'focus area' but exotic mesquite (*Prosopis glandulosa* var. *torreyana*) was noted in the greater Veld PV South study area. Care should be taken during the construction and operational phases to not introduce this invasive species into the PV area.
- All the infrastructure listed in the 'Background and Brief' section was considered in the assessment of impacts. This infrastructure would be contained within the site except for the loop-in, loop out power line. The latter would have negligible further impact than what has been described.
- The development of the proposed Veld PV South is supported from a botanical viewpoint as long as the mitigation measure of relocating *Hoodia gordonii* is carried out. In general I consider this site to be ideal for the proposed renewable energy infrastructure due to the low negative impact it would have on the vegetation and habitat.

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Report submitted: 14 August 2019

Appendix 1: CBA Classification for the Northern Cape Province (from Desmet & Marsh 2008)

Land use category	Biodiversity criteria	Land Management objectives	Recommended appropriate land use[1]

PA: Protected Areas	• Protected areas (PA's) are recognised entities in the Protected Areas Act and include South African National Parks, Northern Cape Provincial Nature Reserves and Municipal Reserves
	• Conservation areas (CA's) are not recognised in the Protected areas Act (e.g. conservancies, private nature reserves)
		• Natural landscapes to be managed to maintain in a natural state with limited or no biodiversity loss.	• Conservation landscape where biodiversity conservation is a primary management objective
			• Protected Areas:
			  • PA's to be managed as such with a management plan, a designated management authority, appropriate management resources such as budget and staff
			  • Private land preferably to be designated in some way e.g. Stewardship Agreements with audited management plan
			• Livestock:
			  • Preferably no livestock grazing. Grazing by indigenous ungulates permitted
			• Tourism:
			  • Suitable for tourism development subject to EIA and provided impact area does not fall into the CBA1 category
			• Other:
			  • Strictly no mining, agricultural or urban development. Hard development is permitted within protected areas subject to an EIA and impact area does not fall within a CBA1 area.
			  • Suitable for scientific research, religious ceremonies, environmental education.
			• Priority areas for restoration and rehabilitation

Land use category	Biodiversity criteria	Land Management objectives	Recommended appropriate land use[1]

CBA 1: Irreplaceable Sites
 	
Any area that is irreplaceable in terms of meeting biodiversity pattern targets. i.e. if these areas are not retained in a natural state then conservation targets will not be met.
 	
These are core biodiversity areas either with the highest biodiversity value (species richness, endemism, unique habitats, etc.) or areas that have been so transformed to other land-uses (mining and croplands) that all of what remains is required to meet conservation targets
 	
The most important areas for biodiversity conservation in the municipality
	Terrestrial CBA's:
	• Critical Vegetation Types: Ecosystem Status - Critically Endangered Ecosystems
	• Critical Terrestrial Habitats: Experts Areas
	• Irreplaceable Sites: Bokkeveld CAPE Fine-Scale Plan
	• Critical sites for species
	
	Aquatic CBA's:
	• Critical Aquatic Habitats (fine-scale assessment): Bokkeveld critical wetlands and rivers
	• Critical Aquatic Habitats (fine-scale assessment): Lower Orange River Experts Areas
	• Critical Aquatic Habitats (fine-scale assessment): Kamiesberg wetland study
		• Natural landscapes to be managed to maintain in a natural state with no biodiversity loss.	• Conservation landscape with potentially multiple uses where biodiversity conservation is one of the primary management objectives
			• Protected Areas:
			  • Suitable and a priority for statutory protected area development
			  • Private land preferably to be designated in some way e.g. Stewardship Agreements with audited management plan
			• Livestock:
			  • No permanent livestock grazing. Seasonal grazing permissible
			  • Strictly no kraals, stock posts or artificial water points
			  • Maintain stock within recommended stocking rates
			  • Adopt and implement the Grazing Management Guidelines developed for the NDM
			• Tourism:
			  • No large-scale or intensive tourism development or construction of permanent tourism infrastructure
			  • Suitable for low impact recreation tourism subject to an EIA
			• Other activities:
			  • Strictly no mining, agricultural or urban development
			  • Suitable for scientific research
			• No biodiversity offsets possible for developments that result in the transformation of natural habitat (e.g. cropping and mining) irrespective of anticipated restoration success.

Land use category	Biodiversity criteria	Land Management objectives	Recommended appropriate land use[1]
			• Priority areas restoration and rehabilitation

CBA 2: Important Areas
 	
Other areas know to be of high biodiversity value.
 	
Important areas for ecological processes and climate change adaptation.
	Terrestrial CBA's:
	• Critical Vegetation Types: Ecosystem Status - Endangered and Vulnerable Ecosystems
	• Important Terrestrial Habitats: Quartz Patches
	• Important Terrestrial Habitats: South-facing Slopes
	• Important Terrestrial Habitats: Kloofs
	• Important Terrestrial Habitats: Riverine Rabbit
	• Important Terrestrial Habitats: Experts Areas
	
	Aquatic CBA's:
	• Important Aquatic Habitats (fine-scale assessment): Lower Orange River Experts Areas
	• Important Aquatic Habitats (fine-scale assessment): Kamiesberg wetland study
		• To be managed to maintain near natural landscapes with some loss in ecosystem integrity and functioning	• Multi-use landscapes where biodiversity conservation is a preferred but not the only land use activity
			• Biodiversity compatible land uses strongly encouraged and industries encouraged to adopt and implement industry accepted biodiversity management plans
			• Protected Areas:
			  • Suitable and a priority for statutory protected area development
			  • Private land preferably to be designated in some way e.g. Stewardship Agreements with audited management plan
			• Livestock:
			  • Stock farming permissible
			  • Adopt and implement the Grazing Management Guidelines developed for the NDM
			• Tourism:
			  • No large-scale or intensive tourism development or construction of permanent tourism infrastructure
			  • Suitable for low impact recreation tourism and construction of temporary infrastructure subject to an EIA
			• Other:
			  • Suitable for scientific research, religious ceremonies, environmental education.
			  • Restrict further expansion of surface-mining, cropping agricultural and urban development – i.e. avoid further loss of natural habitat and where possible utilise

Land use category	Biodiversity criteria	Land Management objectives	Recommended appropriate land use[1]
			existing transformed or degraded areas for hard developments • Biodiversity offsets required where development impacts on land management objective

ESA: Ecological Support Areas (Processes)
 	
Areas meeting ecological process targets or achieving biodiversity persistence objectives.
 	
Areas not explicitly targeted for biodiversity pattern or process, but that support key resources (e.g. water) or features in the landscape whose basic structure and ecological function require protection such as large areas with no permanent human structures (roads housing etc), away from stock posts for maintaining large-scale ecological processes such as free-ranging wildlife
	• Biodiversity Corridors
	• Richtersveld springs
	• Kamiesberg wetland buffer areas
	• Bokkeveld critical wetland and river buffers
	• Wilderness areas (not included)
		• To be managed to maintain near natural landscapes with minimal loss in ecosystem integrity and functioning
		• Spatially explicit corridors must be managed to maintain function and structure, especially for aquatic systems.
		• To be managed to maintain near natural landscapes with minimal loss in ecosystem integrity and functioning
		• Buffers to be managed to limit transformation with particular emphasis on maintaining ecological process that require large areas.
			• Multi-use landscapes where land-use management focuses on maintaining connectivity within the natural landscape
			• Biodiversity compatible land uses strongly encouraged and industries encouraged to adopt and implement industry accepted biodiversity management plans
			• Protected Areas:
			  • Priority areas for the promotion of stewardship
			• Livestock:
			  • Stock farming permissible
			  • Adopt and implement the Grazing Management Guidelines developed for the NDM
			• Tourism:
			  • Suitable for tourism development
			• Other:
			  • Suitable for scientific research, religious ceremonies, environmental education.
			  • Where possible restrict further expansion of surface-mining, cropping agricultural and urban development – i.e. avoid further loss of natural habitat and where possible utilise existing transformed or degraded areas for hard developments.
			  • Biodiversity offsets required where development impacts on land management objective

Land use category	Biodiversity criteria	Land Management objectives	Recommended appropriate land use[1]
ONA: Other Natural Areas All remaining natural areas containing Vulnerable and Least Threatened Vegetation	• All remaining natural vegetation	• Functional landscapes: manage land to maintain basic ecosystem processes despite expecting significant loss in natural vegetation cover • Biodiversity maintained in critical patches and ecosystem corridors • Management guidelines are dependent on specific features such as vegetation type status and special species or habitats. These are often protected by specific legislation such as that relating to the maintenance of riparian buffers.	• Production landscapes where land-use management focuses on maintaining connectivity within the natural landscape • Biodiversity compatible land uses strongly encouraged and industries encouraged to adopt and implement industry accepted biodiversity management plans • Livestock production should adopt and implement "Grazing Guidelines" developed for the NDM • Development of extensive tourism facilities (e.g. visitor's centre's, villages) • Transformation by mining, agricultural or urban development conditionally allowed subject to EIA • Developments do not necessarily require biodiversity offsets

Appendix 2: Curriculum Vitae

Dr David Jury McDonald Pr.Sci.Nat.

Name of Company: Bergwind Botanical Surveys & Tours CC. (Independent consultant)

Work and Home Address: 14 A Thomson Road, Claremont, 7708

Tel: (021) 671-4056 **Mobile:** 082-8764051 **Fax:** 086-517-3806

E-mail: dave@bergwind.co.za

Website: www.bergwind.co.za

Profession: Botanist / Vegetation Ecologist / Consultant / Tour Guide

Date of Birth: 7 August 1956

Employment history:

- 19 years with National Botanical Institute (now SA National Biodiversity Institute) as researcher in vegetation ecology.
- Five years as Deputy Director / Director Botanical & Communication Programmes of the Botanical Society of South Africa
- Thirteen years as private independent Botanical Specialist consultant (Bergwind Botanical Surveys & Tours CC)

Nationality: South African (ID No. 560807 5018 080)
Languages: English (home language) – speak, read and write
Afrikaans – speak, read and write

Membership in Professional Societies:

- South Africa Association of Botanists
- International Association for Impact Assessment (SA)
- South African Council for Natural Scientific Professions (**Ecological Science, Registration No. 400094/06**)
- Field Guides Association of Southern Africa

Key Qualifications:

- Qualified with a M. Sc. (1983) in Botany and a PhD in Botany (Vegetation Ecology) (1995) at the University of Cape Town.
- Research in Cape fynbos ecosystems and more specifically mountain ecosystems.
- From 1995 to 2000 managed the Vegetation Map of South Africa Project (National Botanical Institute)

- Conducted botanical survey work for AfriDev Consultants for the Mohale and Katse Dam projects in Lesotho from 1995 to 2002. A large component of this work was the analysis of data collected by teams of botanists.
- **Director: Botanical & Communication Programmes** of the Botanical Society of South Africa (2000—2005), responsible for communications and publications; involved with conservation advocacy particularly with respect to impacts of development on centres of plant endemism.
- Further tasks involved the day-to-day management of a large non-profit environmental organisation.
- **Independent botanical consultant** (2005 – to present) over 300 projects have been completed related to environmental impact assessments in the Western, Southern and Northern Cape, Karoo and Lesotho. A list of reports (or selected reports for scrutiny) is available on request.

Higher Education

Degrees obtained
and major subjects passed:

B.Sc. (1977), University of Natal, Pietermaritzburg
Botany III
Entomology II (Third year course)

B.Sc. Hons. (1978) University of Natal, Pietermaritzburg
Botany (Ecology /Physiology)

M.Sc. - (Botany), University of Cape Town, 1983.
Thesis title: 'The vegetation of Swartboschkloof, Jonkershoek, Cape Province'.

PhD (Botany), University of Cape Town, 1995.
Thesis title: 'Phytogeography endemism and diversity of the fynbos of the southern Langeberg'.

Certificate of Tourism: Guiding (Culture: Local)
Level : 4 Code: TGC7 (Registered Tour Guide: WC 2969).

Employment Record :

January 2006 – present: Independent specialist botanical consultant and tour guide in own company: **Bergwind Botanical Surveys & Tours CC**
August 2000 - 2005 : Deputy Director, later Director Botanical & Communication Programmes, Botanical Society of South Africa
January 1981 – July 2000 : Research Scientist (Vegetation Ecology) at National Botanical Institute
January 1979—Dec 1980 : National Military Service

Further information is available on my company website: www.bergwind.co.za

Appendix 3: Botanical Assessment Content Requirements of Specialist Reports, as prescribed by Appendix 6 of GN R326.

Regulation	Content as required by NEMA	Specialist Report Section/Annexure Reference
1 (1) (a)	Details of- (i) The specialist who prepared the report; and	Cover & Page 2
	(ii) The expertise of that specialist to compile a specialist report, including a CV.	Page 2 & Appendix 2
1 (1) (b)	A declaration that the specialist is independent in a form as may be specified by the competent authority.	Pages 3 & 4
1 (1) (c)	An indication of the scope of, and purpose for which, the report is prepared.	Pages 6 -- 12
1 (1)(cA)	An indication of the quality and age of base data used for the specialist report.	Page 18
1 (1)(cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change.	N/A
1 (1) (d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Page 18
1 (1) (e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used.	Page 194
1 (1) (f)	Details of an assessment of the specifically identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives.	Pages 25--27
1 (1) (g)	An identification of any areas to be avoided, including buffers.	N/A

Regulation	Content as required by NEMA	Specialist Report Section/Annexure Reference
1 (1) (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.	Pages 9—12,15,18,24
1 (1) (i)	A description of any assumptions made and any uncertainties or gaps in knowledge.	N/A
1 (1) (j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities.	Pages 19--23
1 (1) (k)	Any mitigation measures for inclusion in the EMPr.	Page 25
1 (1) (l)	Any conditions for inclusion in the environmental authorisation.	Pages 25--28
1 (1) (m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation	N/A
1 (1) (n)	A reasoned opinion- (i) whether the proposed activity, activities or portions thereof should be authorised; and	N/A
	(iA) regarding the acceptability of the proposed activity or activities; and	N/A
	(ii) If the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan	N/A
1 (1) (o)	A description of any consultation process that was undertaken during the course of preparing the specialist report	N/A
1 (1) (p)	A summary and copies of any comments received during any consultation process and where applicable, all responses thereto	N/A

Regulation	Content as required by NEMA	Specialist Report Section/Annexure Reference
1 (1) (q)	Any other information requested by the competent authority	N/A