DECLARATION OF INDEPENDENCE

I, Chris van Rooyen as duly authorised representative of Chris van Rooyen Consulting, and working under the supervision of and in association with Albert Froneman (SACNASP Zoological Science Registration number 400177/09) as stipulated by the Natural Scientific Professions Act 27 of 2003, hereby confirm my independence (as well as that of Chris van Rooyen Consulting) as a specialist and declare that neither I nor Chris van Rooyen Consulting have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which SiVEST was appointed as environmental assessment practitioner in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), other than fair remuneration for worked performed, specifically in connection with the Environmental Impact Assessment for the proposed 75 Megawatt Helena Photovoltaic Facility 2 and associated transmission Line near Copperton, Northern Cape.

Full Name: Chris van Rooyen
Title / Position: Director

EXECUTIVE SUMMARY

The proposed project will encompass the installation of a solar PV field and associated components near Copperton in the Northern Cape Province, in order to generate electricity that is to be fed into the Eskom grid at the Kronos Main Transmission Station (MTS). The facility will have a maximum export capacity of 75MW. The proposed development area is approximately 430 ha. The voltage of the connection lines from the solar PV energy facility substation to the grid is likely to be 132kV.

The proposed site is situated approximately 9km south of the town of Copperton, in the Northern Cape Province. The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The vegetation on the site itself consists mostly of shrubs scattered between bare patches of sand and gravel.

An estimated 121 species could potentially occur in the study area. Of these, 10 are South African Red Data species, 18 are southern African endemics and 29 are near-endemics. This means that 8.2% of the species that could potentially occur in the study area are Red Data species, and 38.8% are southern African endemics of near-endemics. Overall, the study area potentially contains a total of 47 endemics and near-endemics, which is 28% of the 167 southern African endemics and near-endemics (Hockey et al. 2005).

The potential impact on avifauna associated with the proposed development is as follows:

- Temporary displacement due to disturbance associated with the construction of the solar plant and associated infrastructure;
- Collisions with the solar panels;
- Permanent displacement due to habitat transformation; and
- Collisions with the associated power lines resulting in mortality.

The negative impacts of the proposed Helena PV solar facility on local priority avifauna will range from low to high, depending on the type of impact.

In the case of the PV plant and associated infrastructure, the displacement impact due to disturbance during construction is rated as high to start with, and will remain as such after application of mitigation measures. In the case of habitat transformation during operation, the displacement impact is medium – negative and will remain as such after the application of mitigation measures. The impact of direct mortality due to collisions with the solar panels is likely to be low. The displacement impact associated with the construction of the on-site substation will be low, but should not be viewed in isolation, but rather as part of the overall displacement impact associated with the PV plant.

The proposed 132kV circuit grid connection will have a medium negative collision impact on avifauna during operation which should be reduced to low-negative through the application of anti-collision mitigation measures. The impact of displacement caused by the construction of

the power line will be medium negative, but it could be reduced to low if the Martial Eagle nest on the Hydra-Kronos 400kV line next to Kronos MTS could be re-located.

The cumulative impacts of the facility on priority avifauna will range from major to minor on a local scale, and minor to insignificant on a regional scale.

1 INTRODUCTION

The proposed project will encompass the installation of a solar PV field and associated components near Copperton in the Northern Cape Province, in order to generate electricity that is to be fed into the Eskom grid. The facility will have a maximum export capacity of 75MW. The proposed development area is approximately 270 ha, however it is envisaged that the 75MW energy facility layout will only require approximately 250 ha. The voltage of the connection lines from the solar PV energy facility substation to the grid is likely to be 132kV.

1.1 Project Description

This proposed PV energy facility forms one of three PV energy facilities with a 75MW export capacity that BioTherm are proposing to develop on Portion 3 of the farm Klipgats Pan No 117 (Figure 1). In order to accommodate the Department of Energy's (DoE) competitive bidding process for procuring renewable energy from Independent Power Producers in South Africa, each PV energy facility will be developed under a separate Special Purpose Vehicle (SPV) and therefore each requires a separate Environmental Authorisation. However, the possibility to allow shared associated infrastructure will be considered.

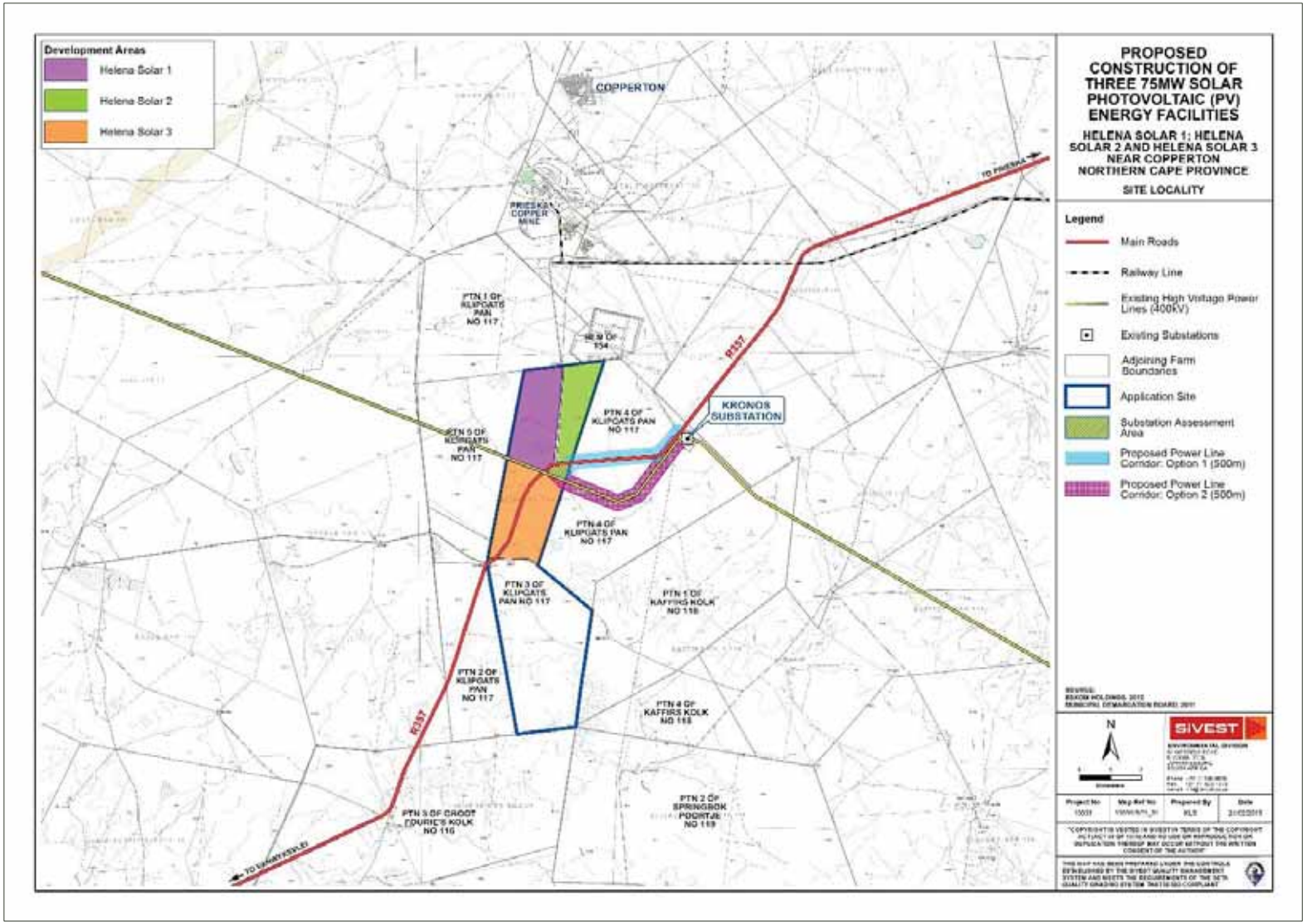

Figure 1: Proposed solar PV energy facility study area (Source: Sivest)

The key technical details and infrastructure required is presented in the table below (**Error! Not a valid bookmark self-reference.**).

Table 1: Helena Solar 1 phase summary

Phase Name	**DEA Reference**	**Farm name and area**	**Technical details and infrastructure necessary for each phase**
Helena Solar 1	14/12/16/3/3/2/765	Portion 3 of Klipgats Pan No 117 (PV site) and Portion 4 of Klipgats Pan No 117 (power lines) PV Site Area: 427.56 ha	▪ Approximately 300 000 **solar PV panels** with a total export capacity of 75MW; ▪ Panels will be either **fixed axis mounting or single axis tracking solutions**, and will be either crystalline silicon or thin film technology; ▪ Onsite **switching station**, with the transformers for voltage step up from medium voltage to high voltage; ▪ The panels will be connected in strings to inverters, approximately **43 inverter stations** will be required throughout the site. Inverter stations will house 2 x 1MW inverters and 1 x 2MVA transformers; ▪ DC power from the panels will be converted into AC power in the inverters and the voltage will be stepped up to 22-33kV (medium voltage) in the transformers. ▪ The **22-33kV cables** will be run underground in the facility to a common point before being fed to the **onsite substation** where the voltage will typically be stepped up to 132kV. ▪ Grid connection is to the Kronos Main Transmission Station (MTS). A **power line** with a voltage of 132kV is proposed and will run from the onsite substation to the Kronos substation. The distance will be about 4km. The final grid connection voltage will be below 275kV. ▪ A **laydown area** for the temporary storage of materials during the construction activities; ▪ **Access roads and internal roads**; ▪ Construction of a **car park and fencing** around the project; and ▪ **Administration, control and warehouse buildings**

1.2 Solar Field

Solar PV panels are usually arranged in rows or 'arrays' consisting of a number of PV panels. The area required for the PV panel arrays will likely need to be entirely cleared or graded. Where tall vegetation is present, this vegetation will be removed from the PV array area.

Approximately 300 000 solar PV panels will be required per project for a total export capacity of 75MW. Support structures will be either fixed axis mounting or single axis tracking solutions and the modules will be either crystalline silicon or thin film technology. The solar PV panels are variable in size, and are affected by advances in technology between project inception and project realisation. The actual size of the PV panels to be used will be determined in the final design stages of the project. The PV panels are mounted onto metal frames which are usually aluminium. Rammed or screw pile foundations are commonly used to support the panel arrays (Figure 2).

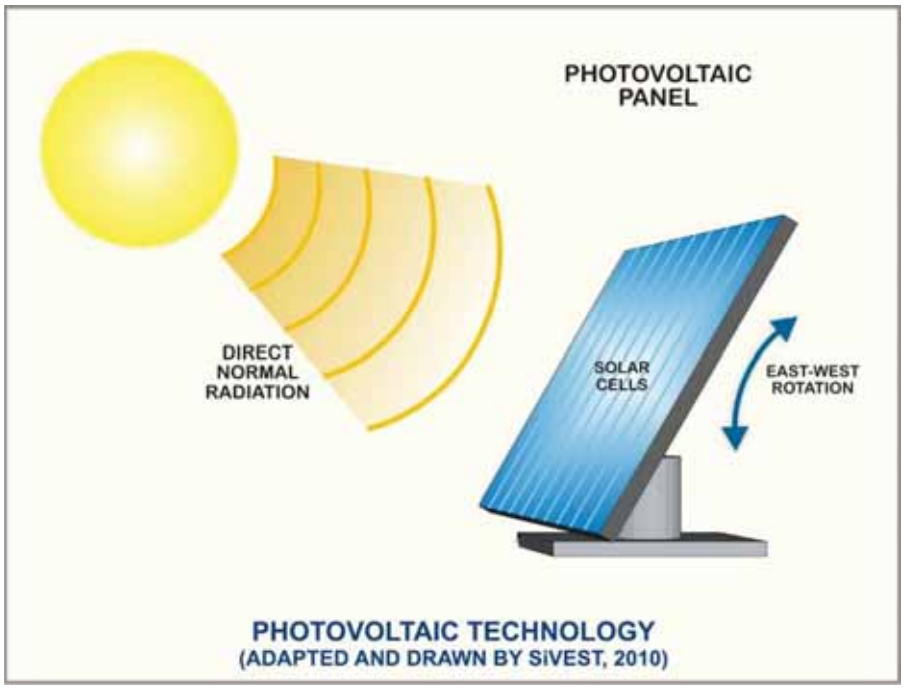

Figure 2: Example of a Photovoltaic Panel with tracking capability.

1.3 Associated Infrastructure

1.3.1 Electrical Infrastructure

The solar PV panel arrays are connected to each other in strings, which are in turn connected to inverters. For a 75MW size facility, typically 2MW inverter stations which are containerised stations housing 2x1MW inverters and 1x2MVA transformers will be used; therefore approximately 43 inverter stations will be required throughout the site for the proposed solar PV energy facility (Figure 3). DC power from the panels will be converted into AC power in the

inverters and the voltage will be stepped up to 22-33kV (medium voltage) in the transformers. The 22-33kV cables will be run underground in the facility to a common point before being fed to the onsite substation and switching station where the voltage will typically be stepped up to 132kV. A Power line with a voltage of up to 132kV will run from the onsite substation to the existing Kronos MTS. The distance will be about 5km.

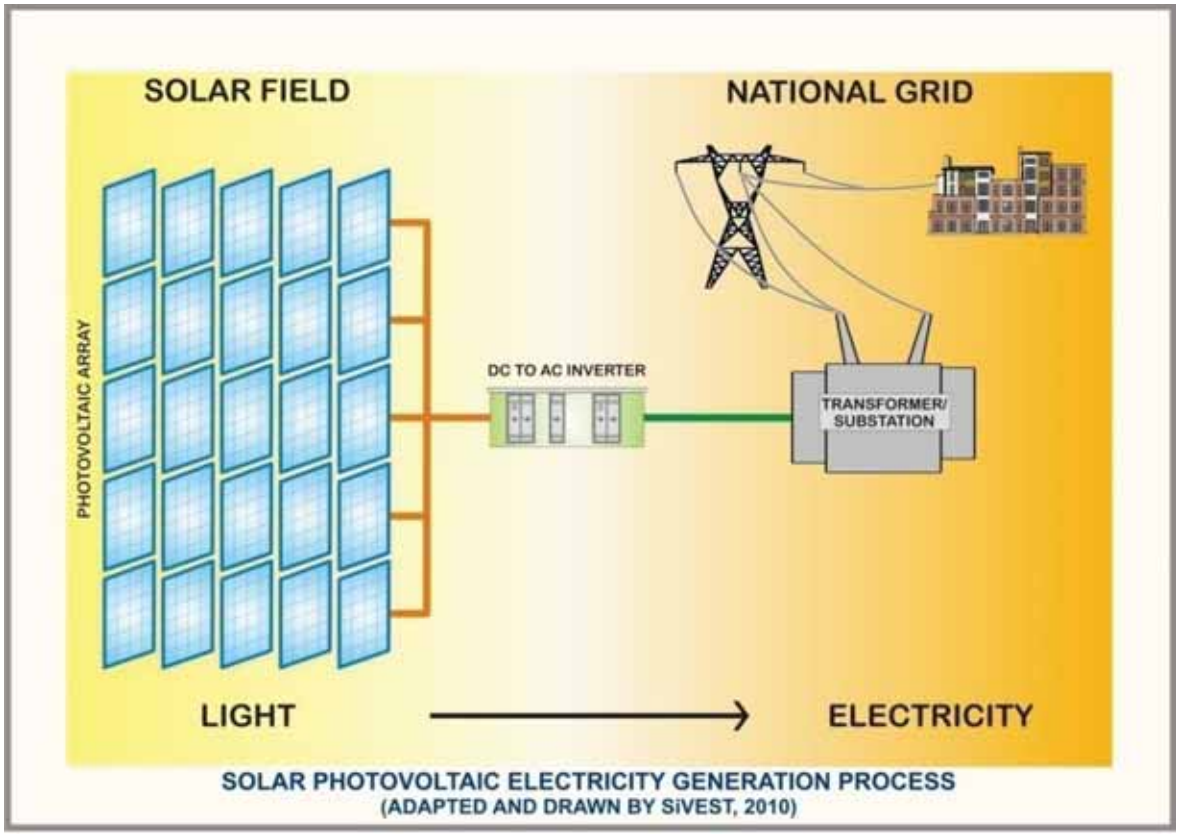

Figure 3: PV process

1.3.2 Buildings

The solar field will require onsite buildings which will be used in the daily operation of the plant and includes an administration building (office). The buildings will likely be single storey buildings which will be required to accommodate the following:

- Control room
- Workshop
- High Voltage (HV) switchgear
- Mess Room
- Toilets
- Warehouse for storage

1.3.3 Construction Lay-down Area

A general construction lay-down area will be required for the construction phase of the proposed solar PV energy facility. The size of this area is yet to be determined, but 3 to 5 hectares is likely.

1.3.4 Other Associated Infrastructure

Other associated infrastructure includes the following:

- Access roads and internal roads;
- A car park; and
- Fencing around the project.

1.4 Alternatives

Due to the limited space available as well as the constraints of the sensitive areas, no alternative PV panel layouts were identified. It was felt that it would be environmentally preferable to assess one viable panel layout rather than two panel layouts that are not technically or environmentally viable. Other design or layout alternatives have been identified. Two alternative site locations for the substation were also proposed, as well as two alternative route corridors for the proposed power line. Additionally, two road and cabling layout alternatives were identified. Based on the scoping phase specialist findings the substation assessment area was eliminated as an appropriate area for the proposed substation as most of this site was found to be potentially sensitive by the specialists. As such, two alternative substation sites that cover an area of 3 ha each were proposed to be assessed in the EIA phase. Should the other two PV projects that are being proposed by BioTherm on the same farm also be granted EAs and be awarded preferred bidder status by the DoE the possibility of sharing the substation site to reduce the environmental impact will be considered.

The layout for the proposed Helena Solar 2 PV facility is presented in 4.

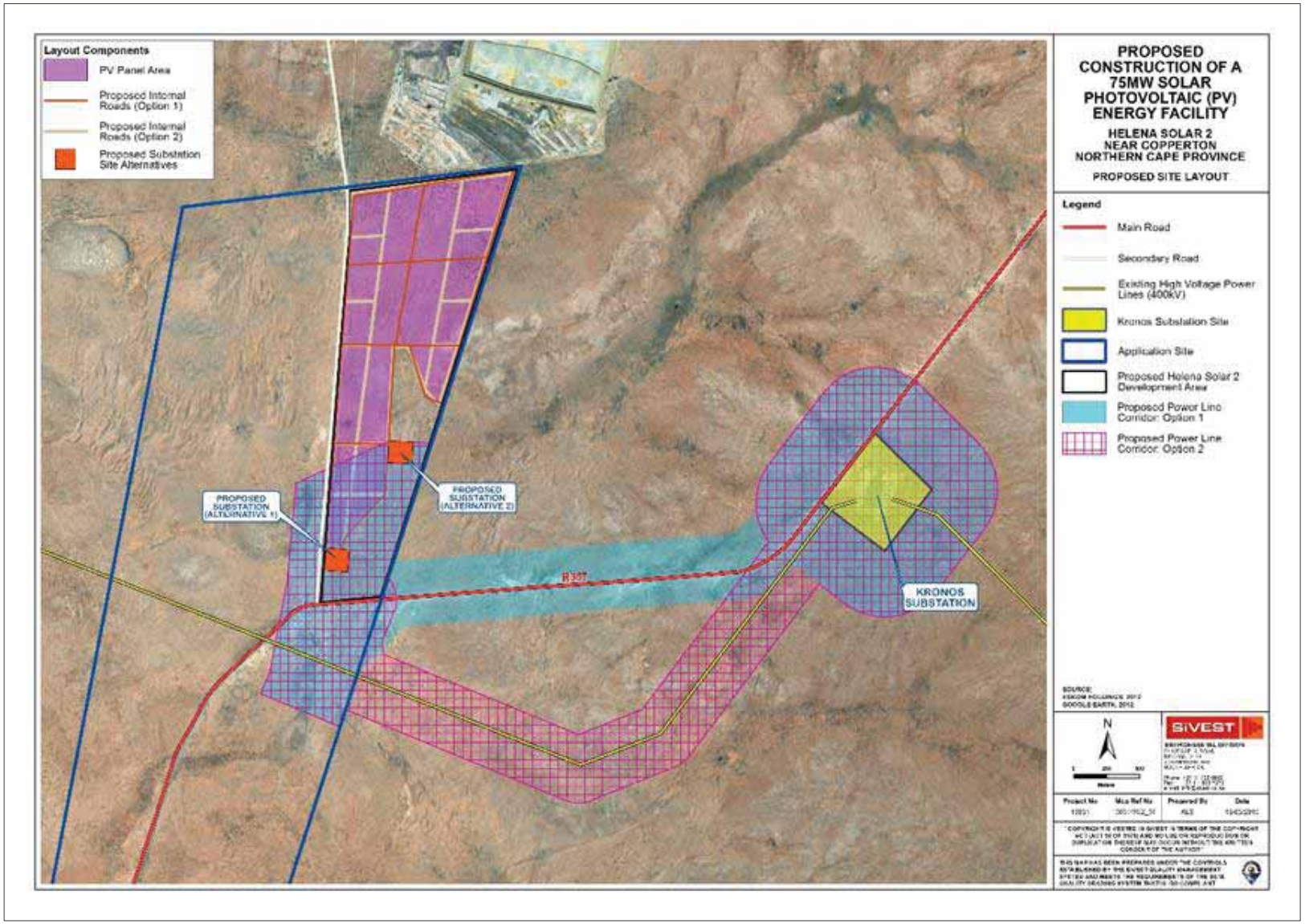

Figure 4: **Proposed Layout Alternatives (Source: SiVEST)**

1.5 Terms of Reference

The terms of reference for this impact assessment report are as follows:

- Describe the affected environment from an avifaunal perspective;
- Discuss gaps in baseline data and other limitations;
- List and describe the expected impacts associated with the PV facility and associated infrastructure;
- List and describe the expected impacts associated with the proposed transmission line;
- Assess and evaluate the potential impacts; and
- Recommend mitigation measures to reduce the impact of the expected impacts.

1.6 Outline of Methodology and Information Reviewed

The following information sources were consulted in order to conduct this study:

- Bird distribution data of the South African Bird Atlas 2 (SABAP 2) was obtained from the Animal Demography Unit of the University of Cape Town, as a means to ascertain which species occurs within the broader area i.e. within a block consisting of nine pentad grid cells within which the proposed solar facilities are situated. The nine pentad grid cells are the following: 2955_2210, 2955_2215, 2955_2220, 3000_2210, 3000_2215, 3000_2220, 3005_2210, 3005_2215 and 3005_2220 (see Figure 5). A pentad grid cell covers 5 minutes of latitude by 5 minutes of longitude (5'× 5'). Each pentad is approximately 8 × 7.6 km. From 2007 to date, a total of 26 full protocol cards (i.e. 26 surveys lasting a minimum of two hours each) have been completed for this area.
- The national threatened status of all priority species was determined with the use of the most recent edition of the Red Data Book of Birds of South Africa (Taylor 2014), and the latest authoritative summary of southern African bird biology (Hockey *et al.* 2005).
- The global threatened status of all priority species was determined by consulting the latest (2014.3) IUCN Red List of Threatened Species (http://www.iucnredlist.org/).
- A classification of the vegetation types in the study area was obtained from the Atlas of Southern African Birds 1 (SABAP1) and the National Vegetation Map compiled by the South African National Biodiversity Institute (Mucina & Rutherford 2006).
- The Important Bird Areas of Southern Africa (Barnes 1998; http://www.birdlife.org.za/conservation/important-bird-areas) was consulted for information on relevant Important Bird Areas (IBAs).
- Satellite imagery from Google Earth was used in order to view the broader development area on a landscape level and to help identify bird habitat on the ground.
- Mr. Gerrie Rudolph, landowner at the development site, was interviewed with regard to birds occurring on the property as well as agricultural practices in the district.

- Information on the micro habitat level was obtained through a site visit by the author from 13 – 17 July 2015 (in the dry season), which included field surveys and bird counts. The survey area included the proposed PV locations and associated infrastructure, transmission lines and access roads (see Appendix 1).
- The results of surveys conducted in similar habitat approximately 12km from the site in the period 26 – 30 January 2015 were also consulted to give an indication of the species diversity in the wet season.
- An intensive internet search was conducted to source information on the impacts of solar facilities on avifauna.

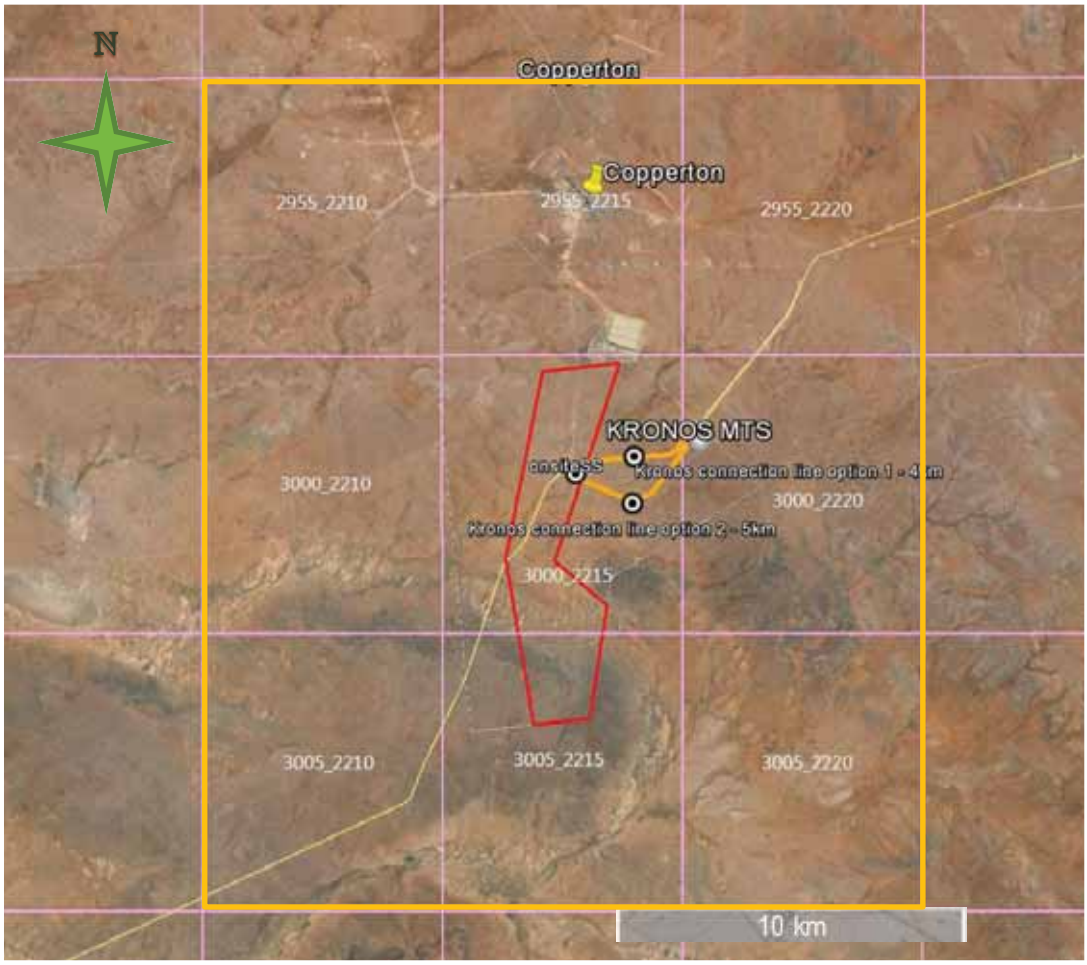

Figure 5: The nine pentads within which the proposed PV facility and associated infrastructure is located.

1.7 Assumptions and Limitations

This study made the basic assumption that the sources of information used are reliable. However, the following must be noted:

- The focus of the study is primarily on the potential impacts on Red Data species, endemics and near-endemics (hereafter called priority species).

- The impact of solar installations on avifauna is a new field of study, with only one scientific study published to date (McCrary *et al*. 1986). Strong reliance was therefore placed on expert opinion and data from existing monitoring programmes at solar facilities in the USA which have recently (2013 - 2015) commenced with avifaunal monitoring. The pre-cautionary principle was applied throughout as the full extent of impacts on avifauna at solar facilities is not presently known.
- The assessment of impacts is based on the baseline environment as it currently exists in the study area. Future changes in the baseline environment are not taken into account. This aspect is dealt with under the section dealing with cumulative impacts.

2 LEGISLATIVE CONTEXT

There is no specific legislation pertaining specifically to the impact of solar facilities on avifauna. There are best practice guidelines available which were compiled by Birdlife South Africa in 2012 (Smit 2012), which was followed in the compilation of this report. Efforts are currently (August 2015) underway to comprehensively revise these guidelines, however these new guidelines are still in draft form and have not been released as yet.

3 BASELINE ASSESSMENT

3.1 Helena Solar 2 and associated infrastructure[1]

The proposed site is situated approximately 9km south of the town of Copperton, in the Northern Cape Province. The habitat in the broader development area is highly homogenous and consists of extensive sandy and gravel plains with low shrub. The vegetation on the site itself consists mostly of shrubs scattered between bare patches of sand and gravel. The dominant vegetation type is Bushmanland Basin Shrubland. Bushmanland This vegetation type consists of dwarf shrubland dominated by a mixture of low, sturdy and spiny (and sometimes also succulent) shrubs (*Rhigozum sp., Salsola sp., Pentzia sp.,* and *Eriocephalus sp.*), 'white' grasses (*Stipagrostis sp.*) and in years of high rainfall also abundant annual flowering plants such as species of *Gazania sp.* and *Leysera sp*. (Mucina & Rutherford 2006). The closest Important Bird Area (IBA), the Platberg Karoo Conservancy, is located approximately 160km to the east (Birdlife 2014) and falls outside the zone of influence of this development.

SABAP1 recognises six primary vegetation divisions within South Africa, namely (1) Fynbos (2) Succulent Karoo (3) Nama Karoo (4) Grassland (5) Savanna and (6) Forest (Harrison *et al.* 1997). The criteria used by the authors to amalgamate botanically defined vegetation units, or to keep them separate were (1) the existence of clear differences in vegetation structure, likely to be relevant to birds, and (2) the results of published community studies on bird/vegetation associations. It is important to note that no new vegetation unit boundaries were created, with use being made only of previously published data. Using this classification system, the natural vegetation in the study area is classified as Nama Karoo.

[1] Associated infrastructure includes buildings, electrical infrastructure, access roads, a car park, fencing and administrative buildings (see Table 1).

Nama Karoo as dominated by low shrubs and grasses; peak rainfall occurs in summer from December to May. Average daily temperatures range between 35°C in January and 18°C in July (http://www.worldweatheronline.com/Copperton-weather-averages/Northern-Cape/ZA.aspx). Trees, e.g. *Acacia karroo* are mainly restricted to ephemeral watercourses, but in the proposed development area, due to the extreme aridity (average annual precipitation of only 147mm in 12 years from 2000 – 2012 - http://www.worldweatheronline.com) the ephemeral watercourses are devoid of trees. In comparison with the Succulent Karoo, the Nama Karoo has higher proportions of grass and tree cover. The two Karoo vegetation types support a particularly high diversity of bird species endemic to Southern Africa, particularly in the family *Alaudidae* (Larks). Its avifauna typically comprises ground-dwelling species of open habitats. Because rainfall in the Nama Karoo falls mainly in summer, while peak rainfall in the Succulent Karoo occurs mainly in winter, it provides opportunities for birds to migrate between the Succulent and Nama Karoo, to exploit the enhanced conditions associated with rainfall. Many typical karroid species are nomads, able to use resources that are patchy in time and space (Barnes 1998).

Figure 6 below is a sample of the typical habitat at the Helena Solar 2 site.

Figure 6: Bushmanland Basin Shrubland, the dominant habitat at the proposed Helena Solar 2 site.

The existing Aries-Kronos 400kV transmission line runs in an east-west direction approximately 500m to the south of the development area, which acts as an important perching substrate for raptors (see Figure 7). The site also contains a borehole with surface water in the form of a water reservoir and a water trough (see Figure 8), which could potentially attract a variety of avifauna which uses it for bathing and drinking.

Figure 7: The existing Aries-Kronos 400kV transmission line which runs approximately 500m south of the proposed development site.

Figure 8: A borehole and water reservoir at the development site

3.2 Proposed Powerline Corridor Option 1

The habitat within the proposed transmission line corridor is also Bushmanland Basin Shrubland (see habitat description under 3.1 above). The proposed alignment runs in an easterly direction from

the PV site along the R357 dirt road to Kronos MTS, for a total length of approximately 4.5km. In general, the corridor does not contain any distinguishing features from an avifaunal perspective, except a two borrow pits that may attract waterbirds and raptors sporadically when filled with water. The one distinguishing feature of the corridor is a Martial Eagle nest site on the Hydra-Kronos 400 kV line that was initially recorded in the early 2000s in surveys of large raptors nesting on Eskom's transmission network in the Karoo (Jenkins *et al.* 2013). The presence of the nest was re-confirmed in 2013, with a pair of adults in attendance at a nest on tower 519 (30º 01.579 S, 22º 20.675 E) in May 2013, and feeding a small chick in August of the same year. This chick was successfully fledged by November, and at least one adult was present in the area, with the nest showing signs of preparation for the upcoming breeding season, in March 2014 (Jenkins & Du Plessis 2014). The nest was inspected during the site visit in June 2015, but the birds were not observed, which is an indication that the nest may not be active this year. At the time of the site visit, there was extensive activity at the Kronos MTS with continuous movements of trucks and pedestrians, which may account for the absence of the eagles at this specific nest site.

3.3 Proposed Powerline Corridor Option 2

The habitat within the proposed transmission line corridor is also Bushmanland Basin Shrubland (see habitat description under 3.1 above). The proposed alignment runs in an easterly direction to Kronos MTS, adjacent to the existing Aries-Kronos 400kV transmission line (see Figure 7), for approximately 5km. The existing transmission line was inspected for any potential large eagle nesting activity from the development site to the Kronos MTS, but no indications of any nesting activity was recorded. The closest recorded Martial Eagle nest site on the Aries – Kronos 400kV line is situated at tower 392 (Jenkins *et. al* 2013), which is approximately 15km to the west and outside the immediate impact zone of this development footprint. The presence of a Martial Eagle nest site on the Hydra-Kronos 400 kV at Kronos MTS has already been discussed under 3.2 above and is also relevant to this corridor option.

4 AVIFAUNA IN THE STUDY AREA

An estimated 121 species could potentially occur in the study area. Of these, 10 are South African Red Data species, 18 are southern African endemics and 29 are near-endemics. This means that 8.2% of the species that could potentially occur in the study area are Red Data species, and 38.8% are southern African endemics of near-endemics. Southern Africa contains 13 avifaunal endemic regions, namely Western Arid, Woodland, Evergreen Forest, Grassland, Montane, Rocky slopes and cliffs, Fynbos, Marine and Inland Waters (MacLean 1999). Of these regions, Western Arid, where the study area is located, contains the highest number of endemics. Overall, the study area potentially contains a total of 47 endemics and near-endemics, which is 28% of the 167 southern African endemics and near-endemics (Hockey *et al.* 2005).

See Appendix 2 for a list of species potentially occurring in the study area. The SABAP2 reporting rate refers to the combined reporting rate in the 9 pentads surrounding and including the development site.

Potential impacts on priority species are listed in Table 1 below.