PROPOSED 1 GW UPINGTON SOLAR PARK:

FAUNA & FLORA SPECIALIST SCOPING REPORT FOR IMPACT ASSESSMENT

PRODUCED FOR LIDWALA CONSULTING ENGINEERS

BY

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JANUARY 2014

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DECLARATION OF CONSULTANTS' INDEPENDENCE

- I Simon Todd, 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, 2010 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, 2010 and any specific environmental management Act;
- am fully aware of and meet the responsibilities in terms of NEMA, the Environmental Impact Assessment Regulations, 2010 (specifically in terms of regulation 17 of GN No. R. 543) and any specific environmental management Act, and that failure to comply with these requirements may constitute and result in disqualification;
- 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 71 of GN No. R. 543.

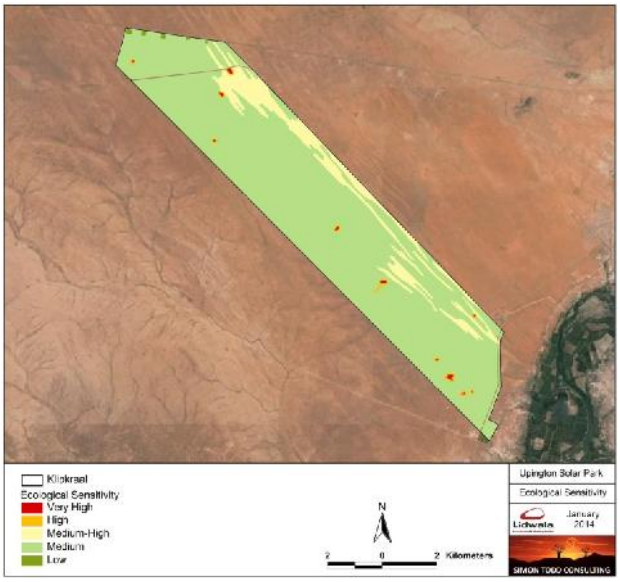
Note: The terms of reference must be attached.

Simon Todd Pr.Sci.Nat 400425/11.
January 2014

EXECUTIVE SUMMARY

CEF (Soc) Ltd is proposing to develop a 1 GW Upington Solar Park. The proposed development area is on the farm Klipkraal 451 located 10 km west of Upington in the Northern Cape.

The development is currently in the Feasibility & Scoping phase and this scoping report details the ecological features of the proposed site and provides a preliminary assessment of the ecological sensitivity of the site and identifies the likely impacts that may be associated with the development. A site visit and desktop review of the available ecological information for the area was conducted in order to identify and characterize the ecological features of the site and develop a draft ecological sensitivity map for the site, which is depicted below.



Two vegetation types, Gordonia Duneveld and Kalahari Karroid Shrubland, occur within the Klip Kraal site. Both of these have been little impacted by transformation and neither is of conservation concern. However, in reality a more complex mosaic of different vegetation types and plant communities is present at the site. Of these, the linear dunes within the Gordonia Duneveld vegetation type are identified as being vulnerable to disturbance. The current proposed layouts would require the levelling of the dunes which is considered an irreversible impact. In addition to the dunes a number of relatively small rock pans were identified at the site, many of which contained water at the time of the site visit and which contained a variety of frogs and temporary water crustaceans. Although the pans occupy a very small proportion of the site, they are ecologically significant and represent foci of faunal activity. In the long-term it would be important to maintain the connectivity of the pans with the surrounding landscape. However, as this may not be possible for all pans, the priority pans at the site should be identified and targeted for incorporation into ecological corridors or natural areas within the development. While the loss of some of the smaller pans may be acceptable, the loss of all the pans at the site would be considered a significant negative impact.

While there are few Red Data-Listed plant species at the site, there are a number of protected species present at the site which includes the majority of the dominant tree species. It is likely that hundreds of individuals would be affected. An estimate of the

number of individuals that would be affected by the development will be made during the fieldwork for the EIA phase.

There are likely to be several listed fauna utilising the site, but these are widespread species and the development would not be likely to generate a significant impact on the populations of these species given their low density within this arid environment. Cumulative impacts are however a concern given the extent of the current development and the abundance of other renewable energy developments in the area. It is recommended that the potential for the development of at least one ecological corridor or 'green belt' be investigated as a possibility to reduce the potential impact of the development on the connectivity of the landscape.

Based on the results of this study, three main areas of concern or impact were identified which should receive consideration before the EIA phase of the development, are as follows:

- The abundance of listed tree species within the site is likely to be relatively high and as there is little scope for avoidance, it is likely that a large proportion of the trees present would be impacted by the development. Depending on the exact number of trees that would be impacted, DAFF and provincial authorities may want to engage the developer with regards to the implementation of offset measures to compensate for the loss of the protected trees.
- The dunes at the site cannot be developed in their current state and it is likely that they would need to be levelled as part of the development. This is seen to constitute an irreversible impact as it is not likely that the dunes could be reformed when the facility is decommissioned. This will generate a large amount of loose sand at the site and it is likely that a long-term dust suppression and wind erosion management strategy would need to be developed to deal with this problem, should these areas be developed.
- There are a number of small rocks pans present at the site. Not all the pans are of equal significance and those pans identified as most ecologically significant should be targeted for incorporation into corridors or green areas within the development.
- While the concentration of development within the current site can be viewed in a positive light as it reduces the overall footprint that would be required if the same output was obtained from a number of separate sites, it does increase the likelihood and significance of some impacts. In particular, there is little space between the different elements of the development and this would increase the potential disruption of landscape connectivity for fauna. It is recommended that the potential for the development of at least one ecological corridor or 'green belt' be investigated as a possibility to reduce the potential impact of the development on the connectivity of the landscape.

While the above impacts are highlighted as significant issues for the development, there do not appear to be any immediately obvious fatal flaws associated with the site that would prevent the development from proceeding. In terms of the three technical options that have been developed, there do not appear to be any highly preferred options. All three options would generate a similar extent of transformation and hence a similar level of impact. This is also likely to be true of any future layouts developed for the facility, as it is the footprint itself rather than the type of solar technology that is the determining factor in terms of ecological impact. Future layouts which can accommodate the presence of a corridor or 'green belt' should be considered and would be preferable to the development of the site without cognisance of sensitive ecological habitats and landscape processes.

1 INTRODUCTION

The CEF (SOC) Ltd. is proposing to develop the 1 GW Upington Solar Park. The proposed development area is on the farm Klipkraal 451 located 10 km west of Upington in the Northern Cape.

In terms of the EIA Regulations published in terms of Section 24(5) of the National Environmental Management Act (NEMA, Act No. 107 of 1998), the development requires authorisation from the National Department of Environmental Affairs (DEA) before it can proceed. Lidwala Consulting Engineers is conducting the EIA process and has appointed Simon Todd Consulting to provide a specialist fauna and flora Scoping Study of the development site as part of the EIA process.

The purpose of the Ecological Scoping Report is to describe and detail the ecological features of the proposed site; provide a preliminary assessment of the ecological sensitivity of the site and identify the likely impacts that may be associated with the development. A desktop review of the available ecological information for the area is conducted in order to identify and characterize the ecological features of the site. This information is used to derive a draft ecological sensitivity map that presents the apparent ecological constraints and opportunities for development at the site, which can then be verified and refined during the EIA. The information and sensitivity map presented here provides an ecological baseline that can be used in the planning phase of the development to ensure that the potential negative ecological impacts associated with the development can be minimized. Furthermore, the study defines the terms of reference for the EIA phase of the project and outlines a plan of study for the EIA which will follow the Scoping Study.

1.1 SCOPE OF STUDY

The specific terms of reference for the scoping study includes the following:

- a description of the environment that may be affected by the activity and the manner in which the environment may be affected by the proposed project;
- a description and evaluation of potential environmental issues and potential impacts (including direct, indirect and cumulative impacts) that have been identified;
- Direct, indirect and cumulative impacts of the identified issues are evaluated within the Scoping Report in terms of the following criteria:
    - the nature, which includes a description of what causes the effect, what will be affected and how it will be affected;
    - the extent, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international;

- a statement regarding the potential significance of the identified issues based on the evaluation of the issue/impacts;
- Identification of potentially significant impacts to be assessed within the EIA phase and the details of the methodology to be adopted in assessing these impacts. This should be detailed enough to include within the Plan of Study for EIA and include a description of the proposed method of assessing the potential environmental impacts associated with the project

1.2 ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989 as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005). The approach and methodology to be used are detailed in Annex 1, while the data sources relied upon by the study are detailed in Annex 2.

1.3 RELEVANT ASPECTS OF THE DEVELOPMENT

The proposed development site is located on Klip Kraal Farm 451, which is situated within the jurisdiction of the Khara Hais local Municipality in the Northern Cape Province. The development would comprise a mix of different generating technologies, with a total planned generation capacity of 1 GW. This would be made up of a mix of CSP, CPV and PV generating capacity with associated infrastructure including, power transmission infrastructure, access roads, water and sewerage reticulation systems, management and maintenance buildings etc. The details of three options considered for the assessment are described in Annex 3.

It is however important to note that in terms of the current assessment, the actual type of technology that is ultimately used is not likely to greatly alter the severity of impact associated with the development. Rather, the impact would be related largely to the footprint of the development rather than the type of technology used as all forms will likely require that the site is cleared and levelled at construction. Furthermore, in order to achieve the 1 GW desired output the proposed site would need to be fully developed. Option 1 is illustrated below as an example of the likely extent of the development within the site. Although there may be small differences in the total footprint associated with each option, these are not considered significant in the context of the total extent of transformation that would be associated with the development. The layout of the development has however not been finalised and would be informed by this and the other specialist studies.

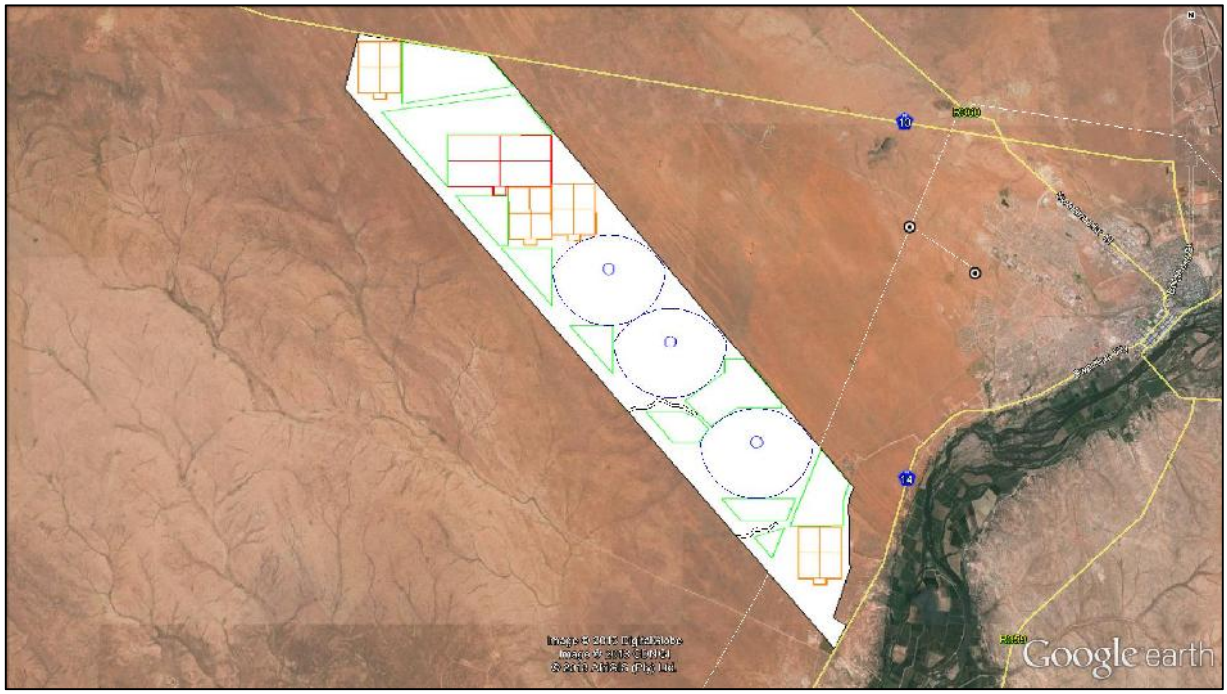


Figure 1. The layout of the proposed Option 1 at Klip Kraal, with 100MW central receiver CSP units illustrated in blue, 125 and 50 MW parabolic trough units in red and orange and PV areas in green. Although three different layouts have been produced, they are not considered alternatives chosen at this stage for the proposed Solar Park, but are used to gauge the likely nature and extent of the development.

1.4 LIMITATIONS & ASSUMPTIONS

The current study consists of a desktop study as well as a site visit and as such significant features have been checked and validated in the field. The site visit was particularly important in identifying and evaluating the pans at the site which have not been mapped by the NFEPA or other database. The site visit was also important in confirming the presence and abundance of protected species at the site, which is not usually possible from a desktop study alone. As the site has been visited and the ecological patterns present validated in the field, this represents a significant advantage over a desktop study alone and eliminates a large proportion of the uncertainty associated with the study.

In order to counter the likelihood that the area has not been well sampled in the past and in order ensure a conservative approach, the species lists derived from the literature for the site were obtained from an area significantly larger than the study area and are likely to include a much wider array of species than actually occur at the site. This is a cautious and conservative approach which takes the study limitations into account.

2 DESCRIPTION OF THE AFFECTED ENVIRONMENT- BASELINE

2.1 BROAD-SCALE VEGETATION PATTERNS

According to the national vegetation map (Mucina & Rutherford 2006), there are two vegetation types within the boundaries of the site, and a few others which are common in the area, but which do not occur within the site (Figure 2). In terms of the conservation status of the various vegetation types of the area, only Lower Gariep Alluvial Vegetation is of concern and is listed as Endangered. This vegetation type is however associated with the alluvium along the Orange River and would not be impacted by the current development which is some distance from the river itself. Furthermore, within the study area the majority of the Lower Gariep Alluvial Vegetation has been transformed by intensive agriculture, which along with alien plant invasion, form the major threats to this vegetation type.

Table 1. Vegetation types that occur within or near the Upington Solar Park site with their basic conservation statics and status according to the National List of Threatened Ecosystems (2011) and Mucina & Rutherford (2006). Note that only Kalahari Karroid Shrubland and Gordonia Duneveld occur within the site.

Name	Extent km^2	Remaining	Conservation Target	Protected	Status
Kalahari Karroid Shrubland	**8284**	**99.2%**	**21%**	**0.1%**	**Least threatened**
Gordonia Duneveld	**36772**	**99.8%**	**16%**	**14.2%**	**Least threatened**
Lower Gariep Alluvial Vegetation	752	50.3%	31%	5.8%	Endangered
Lower Gariep Broken Veld	4538	99.5%	21%	3.9%	Least threatened
Bushmanland Arid Grassland	45479	99.4%	21%	0.4%	Least threatened

Within the area affected by the proposed development, two vegetation types are mapped, namely Kalahari Karroid Shrubland and Gordonia Duneveld. Both Kalahari Karroid Shrubland and Gordonia Duneveld are classified as Least Threatened and have been little impacted by transformation and more than 99% of their original extent is still intact (Table 1). Kalahari Karroid Shrubland is considered Hardly Protected within formal conservation areas, while Gordonia Duneveld is Moderately Protected. Mucina & Rutherford (2006), list 6 endemic species for Bushmanland Arid Grassland, while no vegetation-type endemic species are known from either Kalahari Karroid Shrubland or Gordonia Duneveld. The biogeographically important and endemic species known from these vegetation types tend to be widespread within the vegetation type itself and local-level impacts are not likely to be of significance for any of these vegetation types or species concerned. Gordonia Duneveld

is widely distributed and is among the most extensive vegetation types in South Africa while Kalahari Karroid Shrubland is less extensive, but represents a transitional vegetation type between the northern Nama Karoo and Kalahari (Savannah) vegetation types.

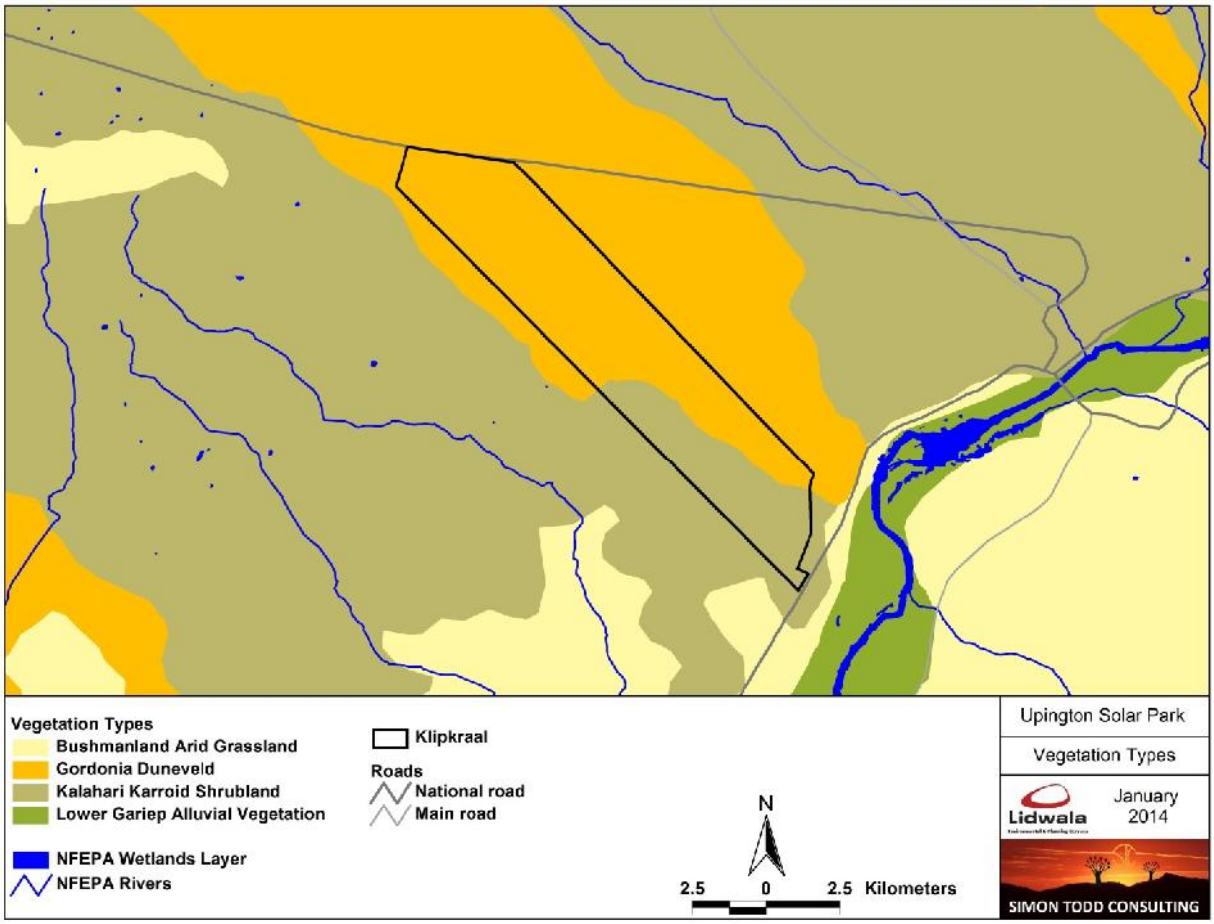


Figure 2. Broad-scale overview of the vegetation in and around the Upington Solar Park. The vegetation map is an extract of the national vegetation map as produced by Mucina & Rutherford (2006), and also includes rivers and wetlands delineated by the National Freshwater Ecosystem Priority Areas assessment (Nel et al. 2011).

2.2 VEGETATION COMPOSITION

In this section a brief description of each vegetation or habitat type which is present within the study area is described along with any other pertinent characteristics and species of conservation concern that may be associated with each vegetation type. A map of the various habitats described is provided at the end of the section in Figure 6.

Although the habitat map present here is farm more detailed and representative than the Vegmap, it is important to recognise that vegetation communities frequently grade into one another and in many instances lines draw between communities are arbitrary. In addition, some communities such as the Kalahari Karroid Shrubland and Sandy Plains described here form a fine-scale mosaic that is basically impossible to map due to their fine-scale variation and the presence of a full spectrum of gradation from one type to the other. Nevertheless, the typical forms of each are described below.

Kalahari Karroid Shrubland

Species commonly observed within the areas of Kalahari Karroid Shrubland include shrubs such as *Leucosphaera bainesii*, *Hermannia spinosa*, *Monoechma genistifoilium*, *Salsola rabieana*, *Aptosimum albomarginatum*, *A.spinecens*, *Kleinia longiflora*, *Limeum argute-carinatum*, *Phyllanthus maderaspatensis*, *Zygophyllum dregeanum* and grasses such as *Stipagrostis anomala*, *S.ciliata*, *S.uniplumis*, *S.hochstetteriana* and *Schmidtia kalariensis*. The proportion of shrubs in this vegetation type is usually related to soil depth and texture, with the proportion of grass increasing as the soils become deeper or more sandy. As such there are likely to be many parts of the site which are transitional with Gordonia Duneveld or even contain elements of Bushmanland Arid Grassland. The southern part of the site is likely to be mosaic of these different elements related to fine-scale changes in soil depth and landscape position. Within this vegetation unit, species of conservation concern that are often present include *Adenium oleifolium*, *Aloe claviflora* and *Hoodia gordonii*. *Aloe claviflora* and *Adenium oleifolium* can be confirmed present, and *Boophone disticha* was also observed during the site visit, but no *Hoodia gordonii* was observed. The protected species confirmed present are widespread and have healthy populations outside of the development area and any impact on these species would not compromise the local or regional populations of these species in a significant manner. Trees are less abundant within this vegetation type and large tracts of the site on this vegetation type are more or less devoid of trees, with only the occasional individual of the provincially protected species *Boscia foetida* present.

Figure 3. An area of shallow soils on calcrete dominated by low shrubs such as *Monechma genistifolium*, *Eriocephalus ambiguous* and *Pentzia spinescens*. The transition to deeper soils and more grassy vegetation can be seen in the background.

Gordonia Duneveld

Although the majority of the site is classified as Gordonia Duneveld, this vegetation type consists of several different habitats. The most obvious of which are the dunes and the inter-dune areas. The dunes and areas of deep sand are usually dominated by species such as *Crotalaria orientalis*, *Stipagrostis amabilis*, *Centropodia glauca*, *Acacia haematoxylon* and various forbs. The interdune slacks are usually dominated by grasses or *Rhigozum trichotomum* depending on the substrate conditions as well as the history of land use. Other common species associated with the areas of Gordonia Duneveld include trees such as *Parkinsonia africana*, *Boscia foetida*, *Boscia albitrunca* and *Acacia erioloba*, shrubs such as *Phaeoptilum spinosum*, *Rhigozum trichotomum*, and *Lycium bosciifolium*, grasses such as *Stipagrostis ciliata*, *S.uniplumis*, *S.amabilis*, *Schmidtia kalahariensis*, and forbs such as *Senna italica*, *Tribulis pterophorus*, *Hermannia tomentosa* and *Requienia sphaerosperma*. Species of conservation concern associated with this habitat include the nationally protected trees *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca*. The density of these trees at the site does is not particularly high, however the extent of the development is relatively large and the total number of affected individuals is likely to number several hundred trees. Where large numbers of protected trees are impacted by development, DAFF and the provincial authorities may request that a conservation offset be implemented. In such an agreement, a similar area to that affected by the development is placed under more formal conservation through contract or similar legally binding process. In the current context, this may be difficult as the majority of the site will be used for the development and the offset would need to come from off the site. In some instances a financial compensation may take the place of the offset.

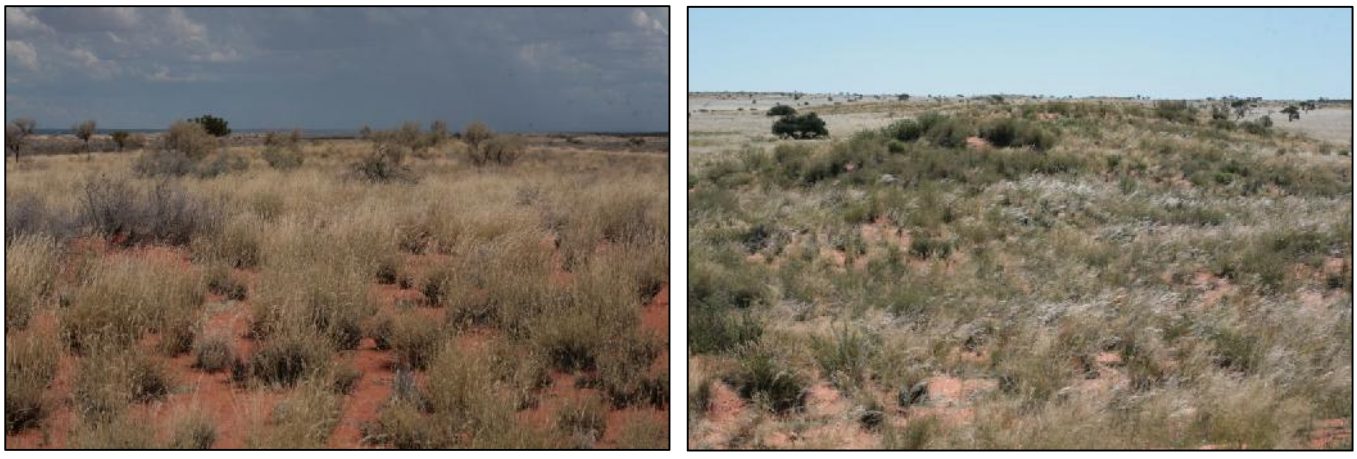


Figure 4. Gordonia Duneveld, left near the northern boundary of the site near the N10 and right towards the southern extent of the site. In the left image the dune crest can be seen with *Centropodia glauca* the dominant grass and *Acacia haematoxylon* in the distance. In the right image, the dunes are dominated by *Stipagrostis amabilis*, *Stipagrostis uniplumis*, *Crotalaria spartioides* and *Lycium hirsutum*, while in the distance between the dunes some individuals of *Boscia albitrunca* are also visible.

Drainage Lines

There are no well-developed drainage lines within the site, which can be ascribed to the sandy substrate and low slope which allows for a high infiltration rate and very little runoff. Although some small drainage lines have been mapped within the study area by the Surveyor General these cannot be confirmed present based on the site visit. A single small drainage line running into one of the small pans can be confirmed present. Based on the site visit, the drainage lines mapped on the 1:50 000 topographic sheets for the area are not apparent in the vegetation on the ground and therefore are not considered sensitive and at least from a vegetation perspective do not need to be avoided.

Pans

Although there are no pans mapped within the study area by the NFEPA (2011), satellite imagery and ground-truthing during the site visit revealed that a number of relatively small pans are present within the site. It is likely that these have not been picked up by the NFEPA as these are rock pans which do not generate a characteristic signature as with clay pans. Most of these pans had water present during the site visit and had a variety of fauna associated with them. Karoo Toads as well as a number of different temporary water crustaceans such as Tadpole Shrimps, Fairy Shrimps and Clam Shrimps were observed breeding in the pans. The pans were also foci of animal activity and despite their distance from the Orange River a number of water-associated mammals including Cape Clawless Otter and Water Mongoose were observed to be using these areas. Due to their ecological significance, the pans are considered sensitive and as such rock pans are a rare feature in the landscape, their loss would be a significant potential impact associated with the development. Not all of the pans are however considered equally significant and some of the larger pans or those which hold water on a more regular basis are identified as being priorities for conservation. The large pan which lies to the southeast of the Eskom Gordonia-Oasis 132kV line is identified as the most important pan at the site. This pan consists of several pools each with different characteristics and faunal assemblages.

Figure 5. The large pan which occurs near the Eskom 132kV line which traverses the site. The pan consists of a small basin with exposed bedrock and a number of small pools with associated wetland fauna and flora.

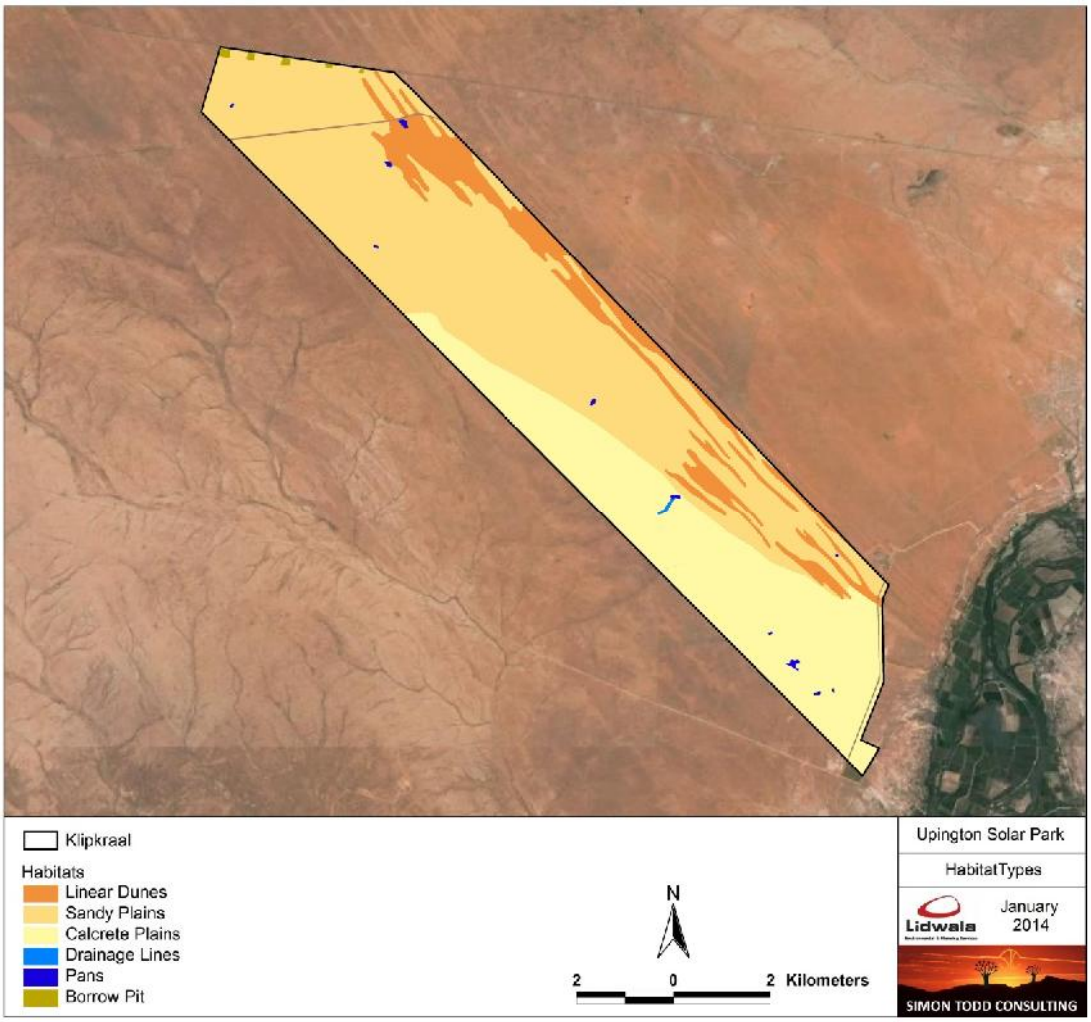


Figure 6. Habitat map of the Klip Kraal site. The vegetation of the site is characterised by a transition from shallow soils on calcrete in the south to deeper sands and dune systems in the north. Numerous small pans are also scattered across the site.

2.3 Listed and Protected Plant Species

According to the SANBI SIBIS database, 286 indigenous plant species have been recorded from the quarter degree squares 2820 BD, DB and 2821 AC and CA. Probably only about half of this number would occur within the site. The list includes 7 species of conservation concern as listed below in Table 2. Of those on the list only *Acacia erioloba* can be confirmed present, but *Harpagophytum procumbens* and *Boophone disticha* were also observed to be present at the site. Apart from the red-data listed species, there are also additional species present which are either protected under the National Forests Act such as *Boscia albitrunca* and *Acacia haematoxylon* or protected under the Northern Cape Nature

Conservation Act of 2009, which includes *Boscia foetida*, all *Mesembryanthemaceae*, , all species within the *Euphorbiaceae*. *Oxalidaceae*, *Iridaceae*, all species within the genera *Nemesia* and *Jamesbrittenia*. As already mentioned DAFF and DENC may request that an offset be implemented if large numbers of protected species are impacted by the development. Such an impact is likely to stem from an impact to *Acacia erioloba*, *Acacia haematoxylon* and *Boscia albitrunca* which are relatively abundant at the site and it is possible that several hundred individuals of these species may be impacted.

Table 2. Listed species which may occur within the Upington Solar Park site, including their IUCN status and the likelihood that they occur at the site.

Family	Species	IUCN Status	Likelihood
ASPHODELACEAE	*Aloe dichotoma*	VU	Low
MESEMBRYANTHEMACEAE	*Dinteranthus wilmotianus*	NT	Low
AMARYLLIDACEAE	*Crinum bulbispermum*	Declining	Low
FABACEAE	*Acacia erioloba*	Declining	Confirmed
APOCYNACEAE	*Hoodia gordonii*	DDD	High
ASTERACEAE	*Felicia deserti*	DDD	High
ASTERACEAE	*Senecio glutinarius*	DDT	Low

2.4 Critical Biodiversity Areas & Broad-Scale Processes

No fine-scale conservation planning has been conducted for the region and as a result, no Critical Biodiversity Areas have been defined for the study area. In terms of other broad-scale planning processes, the site does not fall within a National Protected Areas Expansion Strategy Focus Area (NPAES), indicating that the area has not been identified as an area of exceptional biodiversity or of significance for the long-term maintenance of broad-scale ecological processes and climate change buffering within the region. The development would however contribute to cumulative impacts in the area, which are becoming increasingly large given the concentration of renewable energy facilities in the immediate area (Figure 6). This includes the Abengoa Khi Solar One CSP facility under construction southwest of the site, an approved CSP facility on Van Roois Vley northwest of the site as well as several other proposed solar energy facilities still in process. The concentration of development within the area will increase the fragmentation of the landscape and impact landscape connectivity.

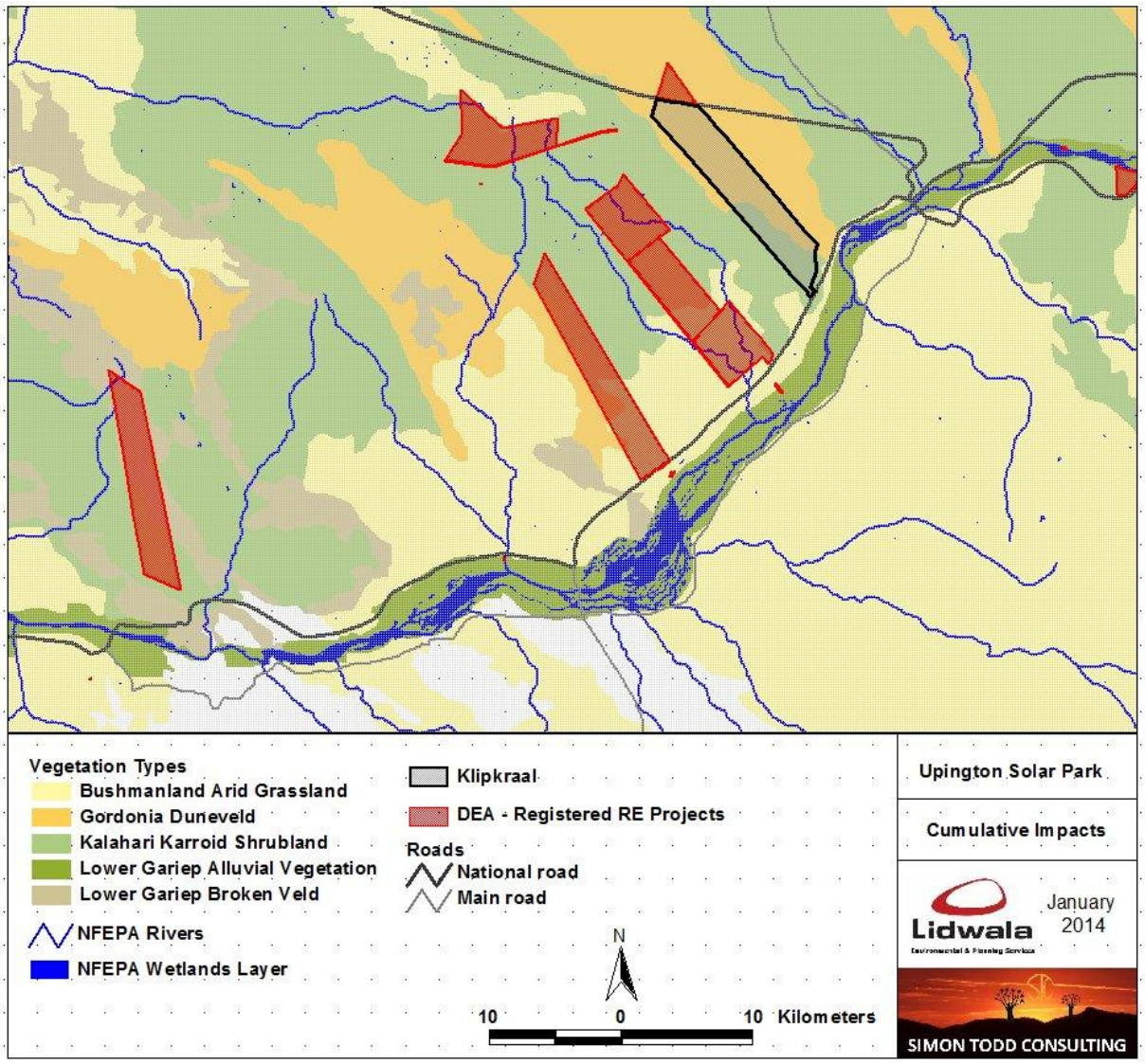


Figure 6. Map of the DEA-registered projects in the vicinity of the Klip Kraal site, as at December 2012.

2.5 FAUNAL COMMUNITIES

Mammals

The site falls within the distribution range of 46 terrestrial mammals, indicating that the mammalian diversity at the site is of moderate potential. The site is however relatively homogenous in terms of the variety of habitats present and the overall mammalian diversity at the site is likely to be significantly lower than the richness of the broader area. Of particular relevance is the lack of rocky hills or outcrops at the site which would preclude a variety of species from the site.

Three listed terrestrial mammals may occur at the site, the Honey Badger *Mellivora capensis* (Endangered), Brown Hyaena *Hyaena brunnea* (Near Threatened) and Black-footed cat *Felis nigripes* (Vulnerable). While it is possible that all three listed species occur at the site, it is least likely that the Brown Hyaena *Hyaena brunnea* is present as this species is often purposely or inadvertently persecuted within farming areas. As these species have a wide national distribution, the development would not create a significant extent of habitat loss for these species.

The site lies within the distribution range of 6 bat species, indicating that the richness of bats at the site is probably quite low. Bat activity is probably focused along the Orange River, where there is ample food as well as an abundance of natural and artificial shelter. The lack of wetlands and large drainage lines away from the Orange River suggests that bat activity patterns within the site are likely to be low. Any pans present would also be areas that would attract bats when they had water, but few such areas have been identified at the site.

Overall there do not appear to be any highly significant issues regarding mammals and the development of the site. In general, the major impact associated with the development of the site for mammals would be habitat loss and the disruption of the broad-scale connectivity of the landscape.

Reptiles

According to the SARCA database, 39 reptile species are known from the area suggesting that the reptile diversity within the site is likely to be moderate to low. As there are no significant rocky outcrops at the site, only species associated with sandy substrates or trees are likely to be present. Species observed in the vicinity include the Namaqua Mountain Gecko *Pachydactylus montanus*, Spotted Sand Lizard *Pedioplanis lineoocellata* and Spotted Desert Lizard *Meroles suborbitalis*, but a relatively wide variety of reptile species can be expected to occur at the site including various skinks, agamas and barking geckos. No RDB-listed reptile species are known from the area and there do not appear to be any broad habitats at the site which would be of high significance for reptiles. As with mammals, the development is likely to result in local habitat loss for reptiles but as there are no listed or range-restricted reptiles that are likely to occur at the site the impacts are not likely to be of broader significance.

Amphibians

The site lies within the distribution range of 10 amphibian species. The only listed species which may occur at the site is the Giant Bullfrog *Pyxicephalus adspersus* which is listed as Near Threatened. This species is however associated with pans and as there are no pans

within the site that would provide suitable breeding habitat for this species, it is unlikely that it occurs at the site. Due to the aridity of the site and the lack of natural perennial water sources at the site amphibian abundance at the site is likely to be low. As a result impacts on amphibians are likely to be local in extent and of low significance.

Avifauna

According to the SABAP 1 and 2 data sets, 190 bird species are known from the broad area surrounding the site. This includes 7 IUCN listed species (Table 3), all of which except for the Black Stork are likely to occur at the site. During the site visit, several Kori Bustard were observed at the site as well as a pair of Secretary Birds, which are listed as Near Threatened and have not been recorded by SABAP within the area before. Most larger birds within arid areas are nomadic and make large movements according to rainfall or seasonal drivers of food availability and as such, these species are not likely to be at the site on a permanent basis but would use the site during favourable conditions such as was the case during the site visit.

Apart from the listed species which may occur at the site, a number of large Sociable Weaver nests were observed within the site. These are considered significant as apart from the large number of birds living in the nests, there is a lot of other biodiversity associated with the nests as they are used by other birds as nesting sites and also attract a variety of predators. The nests are usually within large trees, mostly *Acacia erioloba*, which also attract a lot of fauna which like Tree Rats make use of the trees as habitat or are attracted to the shade or the pods produced by the trees. While there are a relatively large number of *Acacia erioloba* trees present at the site, most are relatively young and large specimens with Weaver nests are not that common and are considered point sensitivities.

Although the habitat loss resulting from the construction of the facility is the most obvious avifauna-related impact, power lines may generate a more significant long-term cumulative impact as slow breeding species are often affected and without mitigation, the impact persists for the lifetime of the power line. All of the listed species are susceptible to some degree to either or both electrocution or collision from power-line infrastructure. Larger raptors are susceptible to both collision and electrocution, while storks and bustards are all vulnerable to collision with power lines. This is a significant source of impact for these species. Therefore, the grid connection options which minimise the length of new power lines are preferable. The large amount of development at the site is likely to make the area less attractive to larger raptors, storks and bustards and therefore it is power line infrastructure which leaves the site which is of primary concern regarding likely avifaunal impacts.

It is also important to note that CSP developments with a central receiver can also generate avifaunal impacts when birds fly through hotspots caused by the reflectors. Long-term

preconstruction monitoring is usually a DEA requirement for CSP developments with a tower, but may not be required for parabolic trough systems.

Table 3. Listed bird species known to occur in the vicinity of the proposed Upington Solar Park site, according to the SABAP 1 and 2 databases, and their risk of collision with or electrocution from power line infrastructure.

Species	Common Name	Status	Collision	Electrocution
Falco biarmicus	Lanner Falcon	NT	High	Moderate
Falco naumanni	Lesser Kestrel	VU	High	Moderate
Ciconia nigra	Black Stork	NT	High	
Falco peregrinus	Peregrine Falcon	NT	High	Moderate
Ardeotis kori	Kori Bustard	VU	High	
Neotis ludwigii	Ludwig's Bustard	VU	High	
Polemaetus bellicosus	Martial Eagle	VU	Moderate	High

2.6 SITE SENSITIVITY ASSESSMENT

The sensitivity map for the proposed Upington Solar Park site is illustrated below in Figure 7. The majority of the site consists of arid grassland or grassy shrubland on calcrete or sandy plains considered to be of moderate sensitivity. The dunes are considered to be of moderate to high sensitivity due to their greater susceptibility to disturbance-related impacts. Since most types of solar energy development require flat or relatively flat ground, the dunes within the development areas will need to be levelled in order to accommodate the development. This will clearly generate a large amount of irreversible disturbance at the site. Furthermore, it is not likely that the dunes can be developed in their current state in any case as large amounts of disturbance in the dune ecosystem would mobilise the dunes, which would clearly have unacceptable impacts on the generating infrastructure. If the dunes were to be levelled, this would amount to a significant impact that has a very low probability of being effectively restored after the facility is decommissioned.

The pans are identified as the main sensitive feature of the site. Although these constitute only a small proportion of the site they are ecologically significant and represent foci of faunal activity at the site. In the long-term it would be important to maintain the connectivity of the pans with the surrounding landscape. However, as this may not be possible for all pans, the priority pans at the site should be identified and targeted for incorporation into ecological corridors or natural areas within the development. While the loss of some of the smaller pans may be acceptable, the loss of all the pans at the site would be considered a significant negative impact.

Apart from the pans and dunes, the presence of a relatively high density of protected tree species across the site is likely to represent a significant source of impact from the development at the site. Development of the flat calcrete and sandy plains would generate the least ecological impact, but it does not seem possible to restrict the development to these areas in the face of maintaining the 1 GW desired output of the facility. Due to the large proportion of the site that would need to be developed, the opportunities for mitigating the impacts on protected species through avoidance is limited and the loss of a large proportion of the trees from the site would be a likely consequence of the development.

In terms of fauna, the pans are identified as foci of animal activity at the site, but given their small size they do not function independently of the surrounding landscape and potential impacts on the pans should be placed within this context. The loss of several thousand hectares of currently intact habitat would result in significant habitat loss for fauna at a local scale and relatively large numbers of smaller fauna are likely to be displaced by the development. However, as there are no localised species which occur at the site, the significance of the habitat loss would be manifested largely at the local level. Of broader potential significance would be the disruption of landscape connectivity for fauna, particularly in an east-west direction. As the development would occupy the majority of the site, the opportunities for fauna to move through the area would be low and under the current layouts, there do not appear to be any functional ecological corridors which would contribute towards mitigating this impact.

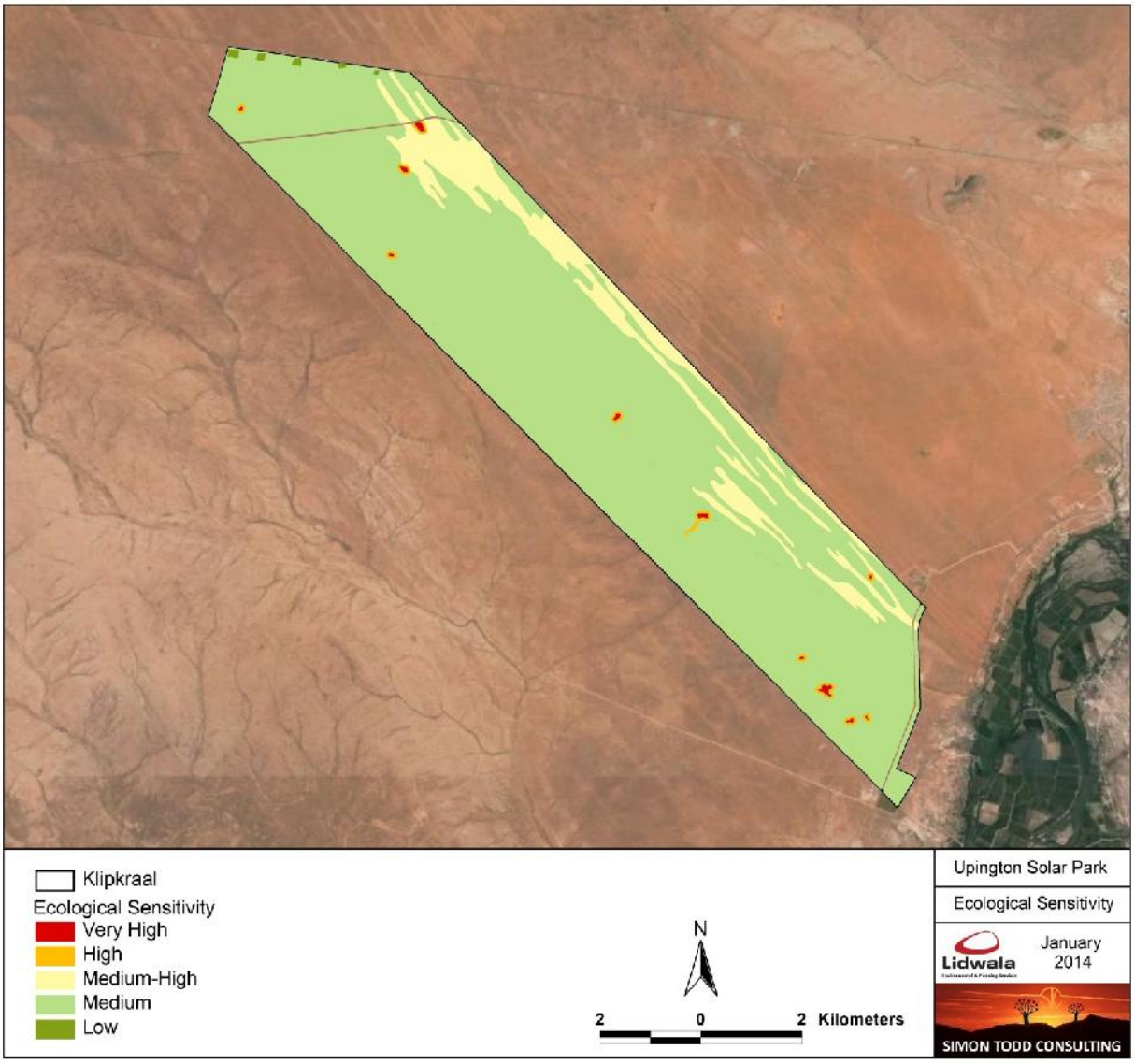


Figure 7. Draft ecological sensitivity map of the proposed Upington Solar Park site. The main sensitive feature of the site is the pans which are scattered across the site, but comprise a small overall proportion of the study area.

3 IDENTIFICATION & NATURE OF IMPACTS

The development of the Upington Solar Park is likely to result in a variety of impacts, associated largely with the disturbance, loss and transformation of intact vegetation and faunal habitat to hard infrastructure such as CSP and PV arrays, roads, operations buildings etc. The following impacts are identified as the major impacts that are likely to be associated with the development and which will be assessed during the EIA phase of the

development, for the preconstruction, construction and operational phases of the development.

Impacts on vegetation and protected plant species

It is confirmed that several protected plant species occur within the site and under the current project description there is a certainty that many individuals of these would be affected by the development. Depending on the number and identity of the affected species, impacts on such species are likely to be of moderate significance. There is little that can be done to mitigate this impact and it would be an inevitable consequence of the development.

Soil erosion and associated degradation of ecosystems

The large amount of disturbance created during construction will leave the site vulnerable to soil erosion, especially in the areas of dunes. While the generally low slope at the site will to some extent reduce the likely severity of this impact, mobilisation of the loose sand by wind is highly likely if measures are not taken to stabilise the surface after construction. In addition, the large amount of hardened surface created by the development will generate significant amounts of runoff during occasional storm events and this will also pose a potential erosion hazard to those areas receiving the runoff.

Direct Faunal impacts

Construction and operational phase noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna would move away from the area as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some mammals or reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Avifaunal Impacts

Large raptors and many larger bird species such as cranes and bustards are vulnerable to collisions with or electrocution from power line infrastructure. This can be a particular problem if the power line lies within the movement or migration pathway of the birds. As many of these species are long-lived slow-breeding species, collisions with power lines can be a major source of mortality for such species and may threaten the viability of local or regional populations. Insulating electrical components and fitting bird flight diverters can provide some mitigation against such impacts and is recommended as standard practice for new power line infrastructure.

Impacts on Broad-Scale Ecological Processes and Loss of Landscape Connectivity

As there are several other renewable energy developments in the area, the development of the site will contribute towards cumulative impacts, particularly the loss of landscape connectivity. The site is likely to be fenced and the cleared parts of the site are also likely to be hostile to many smaller fauna which will prevent or impede their movement across the landscape. The significance of this impact will need to be evaluated at the landscape level with consideration of the location and configuration of the other developments in the area. It is however recommended that the potential for the establishment of an ecological corridor across the site be investigated as a potential mitigation measure to reduce the impact on landscape connectivity. Any such corridors should be a minimum of 100m wide in order to be ecologically effective.

Reduced ability to meet conservation obligations & targets

The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets. The receiving vegetation types in the study area are classified as Least Threatened and they are extensive vegetation types that are still more than 99% intact. The development of the site would result in the loss of up 5000ha of intact habitat which on its own is not considered highly significant, but as there is an array of other developments in the area, the possibility for significant cumulative impact on the affected vegetation types or on more localised plant communities is a potential concern.

3.2 POTENTIAL SIGNIFICANCE OF IMPACTS

A preliminary assessment of the likely extent and significance of each impact identified above is made below for the facility itself including directly associated infrastructure and for the grid connection. The assessment approach and significance criteria that will be used for the assessment in the EIA phase are detailed in Annex 4.

3.2.1 Generating and Associated Infrastructure

The likely significance of the impacts associated with the solar energy component of the development are described below. This includes the CSP or PV areas and associated infrastructure such as the on-site substation, access roads, lay-down areas and management buildings, but not the grid connection, which will be assessed separately.

Impacts on vegetation and listed plant species

Nature: Site preparation and construction will result in a lot of disturbance which would impact indigenous vegetation and listed and protected species as well. For some species translocation may be a viable option, but this will not be a viable option for most of the protected woody species.

Extent: The total extent of the development is relatively high and the facility would result in a concentrated local impact of up to several thousand hectares.

Potential Significance: The significance of this impact would depend on the number and identity of protected species within the final development footprint, but as there is little scope for mitigation through avoidance, it is likely that a significant proportion of individuals on the site would be lost. While this would clearly generate a high local impact, the overall significance of this impact is likely to be moderate on account of the wide distribution and abundance of the protected species.

Soil erosion leading to ecological degradation

Nature: Disturbance at the site during construction would leave the site vulnerable to wind and water erosion. Large amounts of sand leaving the site through wind erosion could impact adjacent areas as the mobilised sand would smother vegetation and generate additional erosion problems. In addition, the area received occasional intense thunder storms during the summer and the large amount of hardened infrastructure associated with the development would generate large amounts of runoff that would need to be managed in order to limit erosion.

Extent: The extent of this impact would most likely be restricted to the site and the areas receiving the runoff or windblown sand.

Potential Significance: The site is fairly flat and so the risk of water erosion is likely to be fairly low and manageable with mitigation. The level of disturbance created during construction of the development is however likely to be high, especially in the areas with dunes and post-construction management will be required to manage dust and wind erosion. With mitigation the significance of this impact is likely to be low to moderate.

Direct Faunal Impacts

Nature: Increased levels of noise, pollution, disturbance and human presence will be detrimental to fauna. Sensitive and shy fauna are likely to move away from the area during the construction phase as a result of the noise and human activities present. Some mammals and reptiles such as tortoises would be vulnerable to illegal collection or poaching during the construction phase as a result of the large number of construction personnel that are likely to be present.

Extent: The extent of the impact would be largely restricted to the local area.

Potential Significance: Disturbance during the construction is likely to be high as a result of disturbance, noise and human presence. However, during the operational phase impacts are likely to be of relatively low significance, given the low activity levels which will occur at this time.

Impacts on Broad-Scale Ecological Processes and Loss of Landscape Connectivity

Nature: The development of the site will contribute towards the cumulative disruption of landscape connectivity as it will represent a hostile environment to many species which will be prevented from passing through the area.

Extent: The extent of the impact would be restricted to the local region.

Potential Significance: This impact is likely to be of moderate significance given the intact nature of the broader landscape and the lack of locally endemic fauna.

Reduced ability to meet conservation obligations & targets

Nature: The loss of unprotected vegetation types on a cumulative basis from the broad area may impact the countries' ability to meet its conservation targets.

Extent: The extent of this impact is likely to be restricted to the local region.

Potential Significance: The receiving vegetation types in the study area are classified as Least Threatened and they are extensive vegetation types that are still more than 99% intact. Therefore the loss of these vegetation types from the development area is not likely to be highly significant. However, at a more local level the habitats and plant communities present within the site may not be widely available in the area and the development would potentially have a more significant impact on such localised plant communities is a potential concern. There is little evidence to suggest at this point that the site is unique and this impact is likely to be relatively low significance.

3.2.2 Grid Connection

The likely significance of the impacts associated with the grid connection required for the development are described below.

Impacts on vegetation and listed plant species

Nature: Some listed plant species are likely to occur along the chosen power line route and may be impacted by disturbance during the construction of the power line.

Extent: The footprint of the power line is likely to be low and in addition it is likely that most listed species can be avoided through micrositing of the pylons.

Potential Significance: The significance of this impact is likely to be low as avoidance measures would be able to reduce the majority of negative impact associated with the power lines.

Avifaunal Impacts

Nature: The power line is likely to generate collision or electrocution mortalities of susceptible avifauna. Although this impact may be low at any one time, this is a long term cumulative impact that may be a major source of mortality for some species.

Extent: The extent of this impact would be largely local in nature although it is important to recognise that the affected bird species move widely in response to the availability of food and nesting requirements.

Potential Significance: This impact would be of low significance, provided that suitable mitigation to reduce collisions and electrocution are implemented and given the likely low length of the required power line.

3.3 No-Go Alternative

The no-go alternative would maintain the status quo with the site being used for extensive livestock production. Under appropriate management, this is a long-term sustainable activity and while there are some impacts associated with extensive livestock production, it has the advantage of maintaining the vegetation in a near-natural condition. As such, the majority of fauna are still able to use the site and most ecological processes are able to continue. The development of the site will certainly have an impact on the ecological value of the areas within the development footprint and biodiversity will be significantly lower than under the current situation. In addition, the development may also impact some broad-scale ecological processes which are little impacted under the current land-use.

4 PROPOSED ACTIVITIES FOR THE EIA PHASE

The current study is based largely on a desktop assessment and additional fieldwork during the EIA phase will be an important activity required to validate and refine the findings of this report. This will include the following studies and activities:

- Ground-truth and refine the ecological sensitivity map of the site. Particular attention will be paid to the presence of sensitive features within the site, such as unique edaphic environments or habitats of particular significance for fauna. Although the pans have already been ground-truthed, the priority pans will be identified and possible options for ecological corridors identified.
- Better characterise the vegetation and plant communities present at the site. The SA vegetation map only provides a coarse picture of the vegetation present and on-site surveys will be conducted to generate a species list for the site as well as identify and where necessary map different plant communities present at the site if they are associated with different sensitivity classes.
- Identify and map the presence of any unique and special habitats at the site such as gravel patches, rock fields and other localised habitats.
- Locate, identify and map the location of significant populations of species of conservation concern. Some species of concern may be widespread and others localised and the distribution of such species will be established during the site visit. Of particular importance will be obtaining an estimate of the density of protected tree species at the site such as *Acacia erioloba*, *A.haematoxylon* and *Boscia ablitrunca*.
- Evaluate the likely presence of listed faunal species at the site such as the Giant Bullfrog, and identify associated habitats that should be avoided to prevent impact to such species.
- Evaluate, based on the site attributes, what the most applicable mitigation measures to reduce the impact of the development on the site would be and if there are any areas where specific precautions or mitigation measures should be implemented.
- Assess the impacts identified above in light of the site-specific findings and the final layout to be provided by the developer.

5 CONCLUSION & RECOMMENDATIONS

According to the national vegetation map two vegetation types, Gordonia Duneveld and Kalahari Karroid Shrubland, occur within the Klip Kraal site. Both of these have been little impacted by transformation and neither is of conservation concern. However, the national vegetation map represents a very coarse picture of the vegetation in the area and the actual vegetation at the site consists of a more complex mosaic of different vegetation types and plant communities. The proposed layouts provided to date, would require the levelling of the dunes at the site which is considered an irreversible impact. A number of small pans were identified at the site and while these occupy a very small proportion of the site, they are disproportionately important and represent foci of fauna activity. The loss of all the pans would represent a significant negative impact associated with the development and it

is recommended that the priority pans should be identified and incorporated into corridors or other 'green belt' features within the development.

While there are few threatened species at the site, there are a number of protected species present at the site, including the majority of the dominant tree species. Although an estimate of the number of individuals of such species that would be lost has not been made at this point, it is likely to number at least hundreds of individuals. An estimate of the number of individuals that would be affected by the development will be made during the fieldwork for the EIA phase.

While there are likely to be some listed fauna utilising the site, these are widespread species and the development would not be likely to generate a significant impact on the populations of these species. Cumulative impacts are however certainly a concern given the extent of the current development and the abundance of other renewable energy developments in the area. However in the context of an arid, largely intact landscape, development within concentrated nodes is preferable to scattered development and as such, the high density of the current development and the proximity to other renewable energy developments is seen as a positive factor.

The following issues are identified as the major potential impacts associated with the development that should receive consideration as part of the feasibility study and where appropriate or possible accommodated within the design and planning features of the development before the EIA phase:

- The abundance of listed tree species within the site is likely to be relatively high and as there is little scope for avoidance, it is likely that a large proportion of the trees present would be impacted by the development. The affected species are relatively common and widespread and the development would however not compromise the overall viability of the populations of these species. Nevertheless, depending on the exact number of trees that would be impacted, DAFF and provincial authorities have a policy regarding the number of individuals of protected species that can be impacted by a development without triggering additional off-site mitigation measures. Consequently, if this threshold is exceeded then the authorities may want to engage the developer with regards to the implementation of offset measures to compensate for the loss of the protected trees.
- The pans at the site are identified as important ecological features of the area and were confirmed to provide habitat for a variety of associated organisms and represent foci of animal activity at the site. The loss of some of the smaller pans may be acceptable, however the loss of all the pans at the site would constitute a significant negative ecological impact. The pans cannot operate in isolation from the surrounding landscape and as such, the priority pans such as that along the Eskom

Gordonia-Oasis 132kV line which traverses the site should be identified and incorporated into corridors for faunal movement where possible.

- The dunes at the site cannot be developed in their current state as they are too steep and loose and in order to achieve the full desired output of the development, they would need to be levelled. This would constitute an irreversible impact as it is not likely that the dunes could be reformed when the facility is decommissioned. Apart from the direct impact of the loss of the dunes, this will generate a large amount of loose sand at the site and a long-term dust suppression and wind erosion management strategy will need to be developed to deal with this problem if the dunes were to be levelled or removed. It may also be difficult to establish a cover of vegetation in these areas as the underlying sand will be very sterile and some other physical protective measures may be required.
- While the concentration of development within the current site can be viewed in a positive light as it reduces the overall footprint that would be required if the same output was obtained from a number of separate sites, it does increase the likelihood and significance of some impacts. In particular, there is little space between the different elements of the development and this would increase the potential disruption of landscape connectivity for fauna. The property is nearly 20 km long and under the layouts provided the majority of this would be developed with little opportunity for fauna to pass between the developed areas. As such, the potential disruption of landscape connectivity is high. In order to reduce this impact, one or more corridors across the width of the site could be implemented as part of the design features of the site. Although this would require at least 30ha of space for a 100m wide corridor, the placement of the corridor between elements of the development could reduce the direct loss to the development to around 15ha, which seems an acceptable loss within the broader scale and context of the site. Therefore, it is recommended that this be incorporated into the design features of the development.

In terms of the different proposed options that have developed at the scoping stage, there are no clearly preferred options as the overall footprint of the different options is similar. Although there is some difference in the technology mix among the options, how this might relate to differences in ecological impact remains to be clarified. The primary question is whether or not there are any differences in the amount of vegetation that needs to be cleared for each technology type. As this point, there does not appear to be any information to suggest that any one solar technology requires less vegetation clearing than another, so it must be assumed that all technology options are equal in this regard. In the EIA phase, options which can accommodate the presence of a corridor or 'green belt' should be considered and would be preferable to the development of the site without cognisance of sensitive ecological habitats and landscape processes.

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7 ANNEXES

ANNEX 1. ASSESSMENT APPROACH & PHILOSOPHY

The assessment will be conducted according to the EIA Regulations, published by the Department of Environmental Affairs and Tourism (April 1998) in terms of the Environmental Conservation Act No. 73 of 1989 as well as within the best-practice guidelines and principles for biodiversity assessment as outlined by Brownlie (2005) and De Villiers et al. (2005).

This includes adherence to the following broad principles:

- That a precautionary and risk-averse approach be adopted towards projects which may result in substantial detrimental impacts on biodiversity and ecosystems, especially the irreversible loss of habitat and ecological functioning in threatened ecosystems or designated sensitive areas: i.e. Critical Biodiversity Areas (as identified by systematic conservation plans, Biodiversity Sector Plans or Bioregional Plans) and Freshwater Ecosystem Priority Areas.

- Demonstrate how the proponent intends complying with the principles contained in section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended (NEMA), which, amongst other things, indicates that environmental management should.

    - In order of priority aim to: avoid, minimise or remedy disturbance of ecosystems and loss of biodiversity;
    - Avoid degradation of the environment;
    - Avoid jeopardising ecosystem integrity;
    - Pursue the best practicable environmental option by means of integrated environmental management;
    - Protect the environment as the people's common heritage;
    - Control and minimise environmental damage; and
    - Pay specific attention to management and planning procedures pertaining to sensitive, vulnerable, highly dynamic or stressed ecosystems.

These principles serve as guidelines for all decision-making concerning matters that may affect the environment. As such, it is incumbent upon the proponent to show how proposed activities would comply with these principles and thereby contribute towards the achievement of sustainable development as defined by the NEMA.

In order to adhere to the above principles and best-practice guidelines, the following

approach forms the basis for the study approach and assessment philosophy:
The study will include data searches, desktop studies, site walkovers / field survey of the property and baseline data collection, describing:

- A description of the broad ecological characteristics of the site and its surrounds in terms of any mapped spatial components of ecological processes and/or patchiness, patch size, relative isolation of patches, connectivity, corridors, disturbance regimes, ecotones, buffering, viability, etc.

In terms of **pattern**, the following will be identified or described:

Community and ecosystem level

- The main vegetation type, its aerial extent and interaction with neighbouring types, soils or topography;
- Threatened or vulnerable ecosystems (*cf. SA vegetation map/National Spatial Biodiversity Assessment, fine-scale systematic conservation plans, etc*).

Species level

- Red Data Book species (giving location if possible using GPS)
- The viability of an estimated population size of the RDB species that are present (include the degree of confidence in prediction based on availability of information and specialist knowledge, i.e. High=70-100% confident, Medium 40-70% confident, low 0-40% confident)
- The likelihood of other RDB species, or species of conservation concern, occurring in the vicinity (include degree of confidence).

Fauna

- Describe and assess the terrestrial fauna present in the area that will be affected by the proposed development.
- Conduct a faunal assessment that can be integrated into the ecological study.
- Describe the existing impacts of current land use as they affect the fauna.
- Clarify species of special concern (SSC) and that are known to be:
    - endemic to the region;
    - that are considered to be of conservational concern;
    - that are in commercial trade (CITES listed species);
    - or, are of cultural significance.
- Provide monitoring requirements as input into the Environmental Management Plan (EMP) for faunal related issues.

Other pattern issues

- Any significant landscape features or rare or important vegetation associations such as seasonal wetlands, alluvium, seeps, quartz patches or salt marshes in the vicinity.

- The extent of alien plant cover of the site, and whether the infestation is the result of prior soil disturbance such as ploughing or quarrying (alien cover resulting from disturbance is generally more difficult to restore than infestation of undisturbed sites).
- The condition of the site in terms of current or previous land uses.

In terms of **process**, the following will be identified or described:

- The key ecological "drivers" of ecosystems on the site and in the vicinity, such as fire.
- Any mapped spatial component of an ecological process that may occur at the site or in its vicinity (i.e. *corridors* such as watercourses, upland-lowland gradients, migration routes, coastal linkages or inland-trending dunes, and *vegetation boundaries* such as edaphic interfaces, upland-lowland interfaces or biome boundaries)
- Any possible changes in key processes, e.g. increased fire frequency or drainage/artificial recharge of aquatic systems.
- Furthermore, any further studies that may be required during or after the EIA process will be outlined.
- All relevant legislation, permits and standards that would apply to the development will be identified.
- The opportunities and constraints for development will be described and shown graphically on an aerial photograph, satellite image or map delineated at an appropriate level of spatial accuracy.

ANNEX 2. DATA SOURCING AND REVIEW

Data sources from the literature consulted and used where necessary in the study includes the following:

Vegetation:

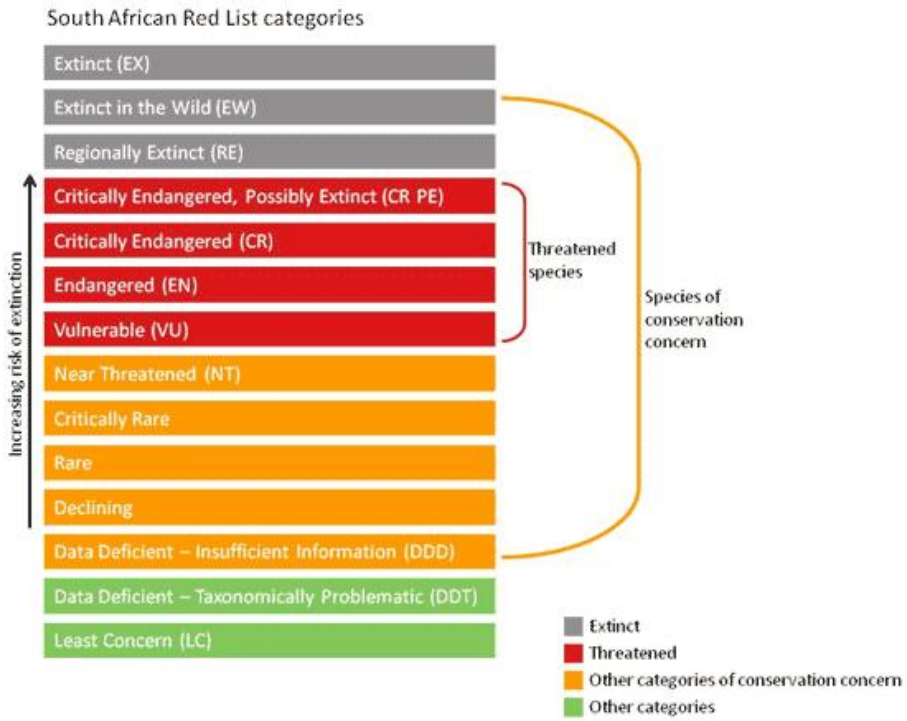
- Vegetation types and their conservation status were extracted from the South African National Vegetation Map (Mucina and Rutherford 2006) as well as the National List of Threatened Ecosystems (2011), where relevant.
- No Critical Biodiversity Areas (CBA) mapping or systematic conservation planning has been conducted for the area with the result that no detailed conservation priority area information is available for the area.
- Information on plant and animal species recorded for the Quarter Degree Square (QDS) 2821 AC and 2821 CA was extracted from the SABIF/SIBIS database hosted by SANBI. This is a considerably larger area than the study area, but this is necessary to ensure a conservative approach as well as counter the fact that the site itself has probably not been well sampled in the past.
- The IUCN conservation status of the species in the list was also extracted from the database and is based on the Threatened Species Programme, Red List of South African Plants (2013).
- Freshwater and wetland information was extracted from the National Freshwater Ecosystem Priority Areas assessment, NFEPA (Nel et al. 2011).
- Important catchments and protected areas expansion areas were extracted from the National Protected Areas Expansion Strategy 2008 (NPAES).

Fauna

- Lists of mammals, reptiles and amphibians which are likely to occur at the site were derived based on distribution records from the literature and various spatial databases (SANBI's SIBIS and BGIS databases).
- Literature consulted includes Branch (1988) and Alexander and Marais (2007) for reptiles, Du Preez and Carruthers (2009) for amphibians, Friedmann and Daly (2004) and Skinner and Chimimba (2005) for mammals.
- Apart from the literature sources, additional information on reptiles were extracted from the SARCA web portal, hosted by the ADU, http://vmus.adu.org.za
- The faunal species lists provided are based on species which are known to occur in the broad geographical area, as well as a preliminary assessment of the availability and quality of suitable habitat at the site.
- The conservation status of each species is also listed, based on the IUCN Red List Categories and Criteria version 3.1 (2013) (See Figure below) and where species have not been assessed under these criteria, the CITES status is reported where

possible. These lists are adequate for mammals and amphibians, the majority of which have been assessed, however the majority of reptiles have not been assessed and therefore, it is not adequate to assess the potential impact of the development on reptiles, based on those with a listed conservation status alone. In order to address this shortcoming, the distribution of reptiles was also taken into account such that any narrow endemics or species with highly specialized habitat requirements occurring at the site were noted.

In addition to the above, an ecological study has been conducted for the site as part of a feasibility study and the data contained in the report is used where appropriate. Of particular relevance is a vegetation analysis with the definition of various plant communities for the site, which is information that cannot be otherwise obtained from the general literature for the site. In addition, the consultant has worked on several sites in the immediate vicinity of the current development and this information is used where relevant and appropriate. Sensitivity Mapping & Assessment



Schematic representation of the South African Red List categories. Taken from http://redlist.sanbi.org/redcat.php

Sensitivity Mapping

A draft ecological sensitivity map of the site was produced by integrating the available ecological and biodiversity information available in the literature and various spatial databases as described above. As a starting point, mapped sensitive features such as wetlands, drainage lines and water bodies were collated and buffered where appropriate to comply with legislative requirements or ecological considerations. Additional sensitive areas where then identified from the satellite imagery of the site and delineated. All the different layers created were then merged to create a single coverage. Features that were specifically captured in the sensitivity map include drainage features, wetlands and dams, as well as rocky outcrops and steep slopes. The ecological sensitivity of the different units identified in the mapping procedure was rated according to the following scale:

- **Low** – Units with a low sensitivity where there is likely to be a negligible impact on ecological processes and terrestrial biodiversity. This category is reserved specifically for areas where the natural vegetation has already been transformed, usually for intensive agricultural purposes such as cropping. Most types of development can proceed within these areas with little ecological impact. Due to the large amount of transformation that has occurred in the area, this is the dominant sensitivity category within the study area.
- **Medium**- Areas of natural or previously transformed land where the impacts are likely to be largely local and the risk of secondary impact such as erosion low. Development within these areas can proceed with relatively little ecological impact provided that appropriate mitigation measures are taken.
- **High** – Areas of natural or transformed land where a high impact is anticipated due to the high biodiversity value, sensitivity or important ecological role of the area. Development within these areas is undesirable and should only proceed with caution as it may not be possible to mitigate all impacts appropriately.
- **Very High** – Critical and unique habitats that serve as habitat for rare/endangered species or perform critical ecological roles. These areas are essentially no-go areas from a developmental perspective and should be avoided as much as possible.
- In some situations, areas where also categorized between the above categories, such as Medium-High, where an area appeared to be of intermediate sensitivity with respect to the two defining categories.

ANNEX 3. RELEVANT ASPECTS OF THE DEVELOPMENT

The development will consist of the following:

- The proposed park would comprise a mix of different generating technologies with a total planned generation capacity of 1 GW.
- This would be made up of a mix of CSP and PV generating capacity with associated infrastructure including the following:
- Power transmission infrastructure including
    - Up to 5 x 132kV overhead power lines
    - One or more on-site substations, which would then connect via overhead power line to the proposed ESKOM MTS substation, the final location of which has yet to be decided.
- Site access roads with the primary access likely to be paved and currently proposed to run along the western boundary of the site. The road would be 7m wide and 18km long and there would also be additional 5m wide secondary gravel roads
- Up to 5 2000m^3 water reservoirs with rising main and gravity reticulation system.
- Sewerage reticulation system.
- A variety of buildings including workshop, offices and a solar technology demonstration area.
- Three different layouts have been currently proposed, which vary in the mix of generation technologies used. These are as follows:
    - Option 1 consists of 3 x 100MW central receiver CSP plants, 1 x 125MW and 4 x 50 MW parabolic trough plants and the remaining deficit for the 1 GWoutput coming from PV occupying about 1400ha of the site.
    - Option 2 aims to maximize the amount of CSP with storage that can fit onto the site, to allow the most generation during peak hours. Similar to option 1, it also only considers CSP options with storage and the remaining available land is filled in with PV to allow for a total of 1 GW installed capacity. In order to fit the most CSP, there is not as much variety in technologies, with the majority of the park being made up of 125 MW parabolic trough plants as these fit the best within the shape of the park and the remaining 800ha filled with PV.
    - Option 3 is aimed at coming up with a technology mix that is likely to have the lowest cost, both in terms of up front capital expenditure and overall financial return. As such, there is a larger focus on PV technology with 2600ha of PV, a 100MW central receiver CSP with storage and 100MW central receiver with no storage and 2 x 50MW parabolic trough plants with storage.

ANNEX 4. ASSESSMENT & SIGNIFICANCE CRITERIA

In order to identify potential impacts (both positive and negative) it is important that the nature of the proposed activity is well understood so that the impacts associated with the activity can be understood. The process of identification and assessment of impacts includes the following:

- Determine the current environmental conditions in sufficient detail so that there is a baseline against which impacts can be identified and measured.
- Determine future changes to the environment that will occur if the activity does not proceed.
- An understanding of the activity in sufficient detail to understand its consequences; and
- The identification of significant impacts which are likely to occur if the activity is undertaken.

As per DEA *Guideline 5: Assessment of Alternatives and Impacts* the following methodology is applied to the predication and assessment of impacts. Potential impacts are rated in terms of direct, indirect and cumulative impacts:

- **Direct impacts** are impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity. These impacts are usually associated with the construction, operation or maintenance of an activity and are generally obvious and quantifiable.

- **Indirect impacts** of an activity are indirect or induced changes that may occur as a result of the activity. These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken or which occur at a different place as a result of the activity.

- **Cumulative impacts** are impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities. Cumulative impacts can occur from the collective impacts of individual minor actions over a period of time and can include both direct and indirect impacts.

- **Spatial extent** – The size of the area that will be affected by the impact:

    - Site specific
    - Local (<2 km from site)
    - Regional (within 30 km of site)
    - National.

- **Intensity** –The anticipated severity of the impact:

    - High (severe alteration of natural systems, patterns or processes)

- Medium (notable alteration of natural systems, patterns or processes)
- Low (negligible alteration of natural systems, patterns or processes).

- **Duration –The timeframe during which the impact will be experienced:**

  - Temporary (less than 1 year)
  - Short term (1 to 6 years)
  - Medium term (6 to 15 years)
  - Long term (the impact will cease after the operational life of the activity)
  - Permanent (mitigation will not occur in such a way or in such a time span that the impact can be considered transient).

Using the criteria above, the impacts are further assessed in terms of the following:

Probability –The probability of the impact occurring:

- Improbable (little or no chance of occurring)
- Probable (<50% chance of occurring)
- Highly probable (50 – 90% chance of occurring)
- Definite (>90% chance of occurring).

Significance – Will the impact cause a notable alteration of the environment?

- Low to very low (the impact may result in minor alterations of the environment and can be easily avoided by implementing appropriate mitigation measures, and will not have an influence on decision-making)
- Medium (the impact will result in moderate alteration of the environment and can be reduced or avoided by implementing the appropriate mitigation measures, and will only have an influence on the decision-making if not mitigated)
- High (the impacts will result in major alteration to the environment even with the implementation on the appropriate mitigation measures and will have an influence on decision-making).

Status - Whether the impact on the overall environment will be:

- positive - environment overall will benefit from the impact
- negative - environment overall will be adversely affected by the impact
- neutral - environment overall not be affected.

Confidence – The degree of confidence in predictions based on available information and specialist knowledge:

- Low
- Medium
- High

Management Actions and Monitoring of the Impacts (EMP):

- Where negative impacts are identified, mitigatory measures will be identified to avoid or reduce negative impacts. Where no mitigatory measures are possible this will be stated
- Where positive impacts are identified, augmentation measures will be identified to potentially enhance positive impacts
- Quantifiable standards for measuring and monitoring mitigatory measures and enhancements will be set. This will include a programme for monitoring and reviewing the recommendations to ensure their ongoing effectiveness.

Cumulative Impact

Consideration is given to the extent of any accumulative impact that may occur due to the proposed development. Such impacts are evaluated with an assessment of similar developments already in the environment. Such impacts will be either positive or negative, and will be graded as being of negligible, low, medium or high impact.