Faunal Survey:
Smaug giganteus
(Giant girdled lizards)

Khauta Solar PV facility near Welkom in the Free State Province

Prepared for:

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1. Declaration of independence

I, Roy de Kock as duly authorised representative of Blue Leaf Environmental (Pty) Ltd, hereby confirm my independence (as well as that of BlueLeaf) as a specialist and declare that neither I nor BlueLeaf have any interest, be it business, financial, personal or other, in any proposed activity, application or appeal in respect of which Enviroworks 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 proposed new Khauta Solar PV Facility near Welkom in the Free State Province. I further declare that I am confident in the results of the studies undertaken and conclusions drawn because of it – as is described in this report.

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Full Name: Roy de Kock

Title / Position: Ecologist
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2. Expertise of specialist

Roy has over 15 years' experience in environmental consulting and specialist services in the Eastern Cape. Various projects throughout South Africa as well as Africa at larges has also been undertaken. Projects include baseline studies, impact assessments and compliance auditing for various large-scale projects including numerous wind farms, roads (National and Provincial), and infrastructure development projects. Roy has also conducted numerous specialist studies including but not limited to Ecological and Botanical assessments, Biodiversity studies, Plant and Animal Search and Rescue, Fauna and Flora permits, Aquatic Assessments, Agricultural and Soil Assessments and Environmental and Venomous animals training workshops.

Roy holds a BSc Honours in Geology and an MSc in Botany from the Nelson Mandela University in Port Elizabeth. He is currently busy with his PhD (Doctorate degree) in Botany and Soil Science. He has over 15 years' experience in the environmental consulting focussing on Ecological and Agricultural Assessments, Geological and Geotechnical analysis, Environmental Management Plans, mining applications and various environmental impact studies.

Roy is a registered as a professional natural scientist (Pri.Sci.Nat.) with SACNASP (Registration nr: 400216/16).

Mr Mark Marshall assisted in this study. Mark is a renowned reptile specialist with over 21 years of experience in studying, relocating, and rehabilitating various reptile species in South Africa. Mark owns a reptile rehabilitation centrum in Port Elizabeth which has successfully managed the rehabilitation and release of thousands of reptile species over the last 15 years. Mark is also one of the few specialists that has kept and successfully bred with sungazers in captivity.

3. Introduction

The sungazer (*Smaug giganteus*, syn. *Cordylus giganteus*), also known as the giant girdled lizard, giant dragon lizard, or giant zonure (Moton; 2014) is the largest species of the Cordylidae, a family of lizards from sub-Saharan Africa (Branch; 1998). This threatened species is endemic to Highveld grasslands in the interior of South Africa (Branch; 1998). In 2011, it was assigned to the new genus *Smaug*, along with seven other species previously belonging to the genus *Cordylus,* based on a comprehensive molecular phylogeny of the Cordylidae (Stanley *et al*; 2011).

S. giganteus or sungazers is the largest of the girdled lizards. It is brown in colour on the upper surface; merging to straw/yellow colouring along the side of the body and yellow underneath. They have four very large, spiny scales on the back of the head. Along the body the dorsal (back) scales are larger than the lateral (side) scales, which are smaller but still spiny. The tail has whorls of large, very spiny scales, decreasing in size from the base to the tip. Juveniles are generally similar to adults but with patches of orange-brown on the body.

Figure 3.1: Photo image of a sungazer (Source: Endangered Wildlife Trust; EWT)

The species is known as the sungazers because of its distinctive thermoregulatory behaviour of elevating the anterior parts of the body by extending its fore limbs, usually near the entrance of its burrow as if looking at the sun.

Sungazers, unlike other girdled lizards which live on rocks, make shallow burrows in open grassland. They are diurnal (active during the day) and are often seen basking on the ground near the burrow or, less often, on a termite mound. They live in colonies and dig burrows into the sandy loamy soils of *Themeda* (red grass/rooigras) grassland in South Africa. They hibernate (dormant state like sleep) during the winter and are rarely seen at all between May and mid-August.

Sungazers only reproduce every other year, and only produce one or two offspring. They are viviparous meaning they give birth to live young. The population is thought to be in decline due to habitat destruction through the conversion of grassland to farmland (maize, sunflower, and other crop farming), illegal collecting for the pet trade, as well as collection for the muti (traditional medicine) industry. Conversion/transformation (especially ploughing) of native grassland is the biggest threat to the species. It has been recorded that sungazers do not seem to return to previously ploughed land.

The sungazer is endemic (only found in one country or geographic area) to South Africa. It is found in the highland grasslands of the north-eastern Free State as well as a small population in southwestern Mpumalanga province (Figure 3.2). The population status is unknown but thought to be declining. Globally and nationally the Giant Girdled Lizard is classified as Vulnerable (IUCN Red List).

The main reason for their small distribution is that they are extremely habitat specific. They are only found in high lying grassland areas dominated by *red grass* on sandy loams soils that are not too wet. Grasses must be kept short (20-30cm in height) by grazers to allow the sungazers to spot natural predators while waiting just outside their borrows for prey. They feed on small insects like grasshoppers and bugs. Juveniles feed on ants mostly.

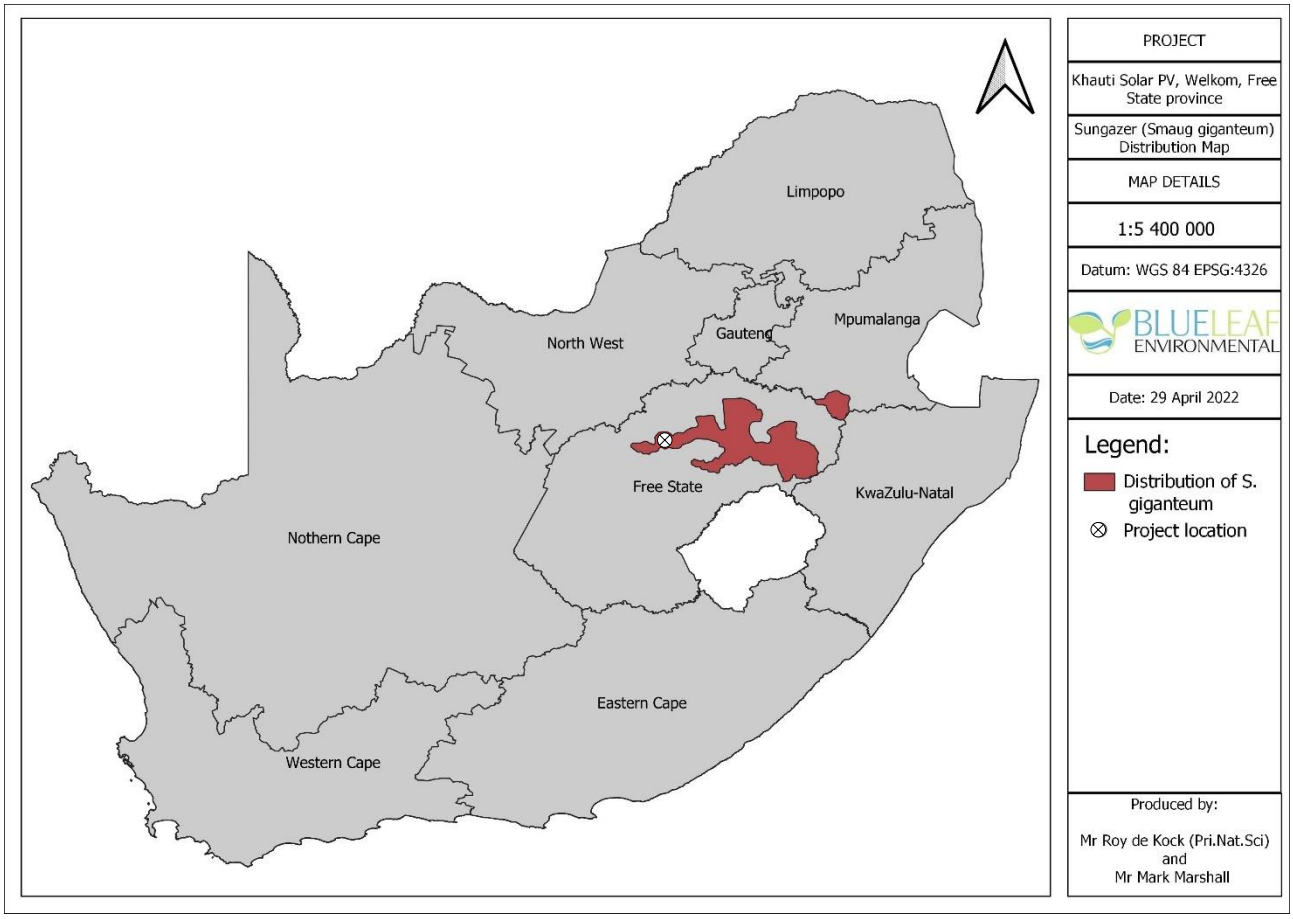


Figure 3.2: Distribution map for *S. giganteum* (Source: Parusnath *et al*; 2017)

The proposed new Khauti Solar PV facility will be located just north of Kimberley and within the westernmost distribution of *S. giganteus (Figure 3.2)*.

Blue Leaf Environmental (Pty) Ltd (BLE) has therefore been appointed by Enviroworks on behalf of the developer to:

1. Identify the distribution of *S. giganteus* colonies within the study site.
2. Identify suitable habitats.
3. Confirming known sites of occurrences.

4. Methodologies

A site visit was conducted between the 30th of April and 1 May 2022 to map the study sites for *S. giganteus* occurrences.

4.1 Study area

The study area was demarcated by Enviroworks and consist of three portions, each within a different landowner's land parcel (Figure 4.1). These land parcels were numbered Portions 1, 2 and 3 for easy reference.

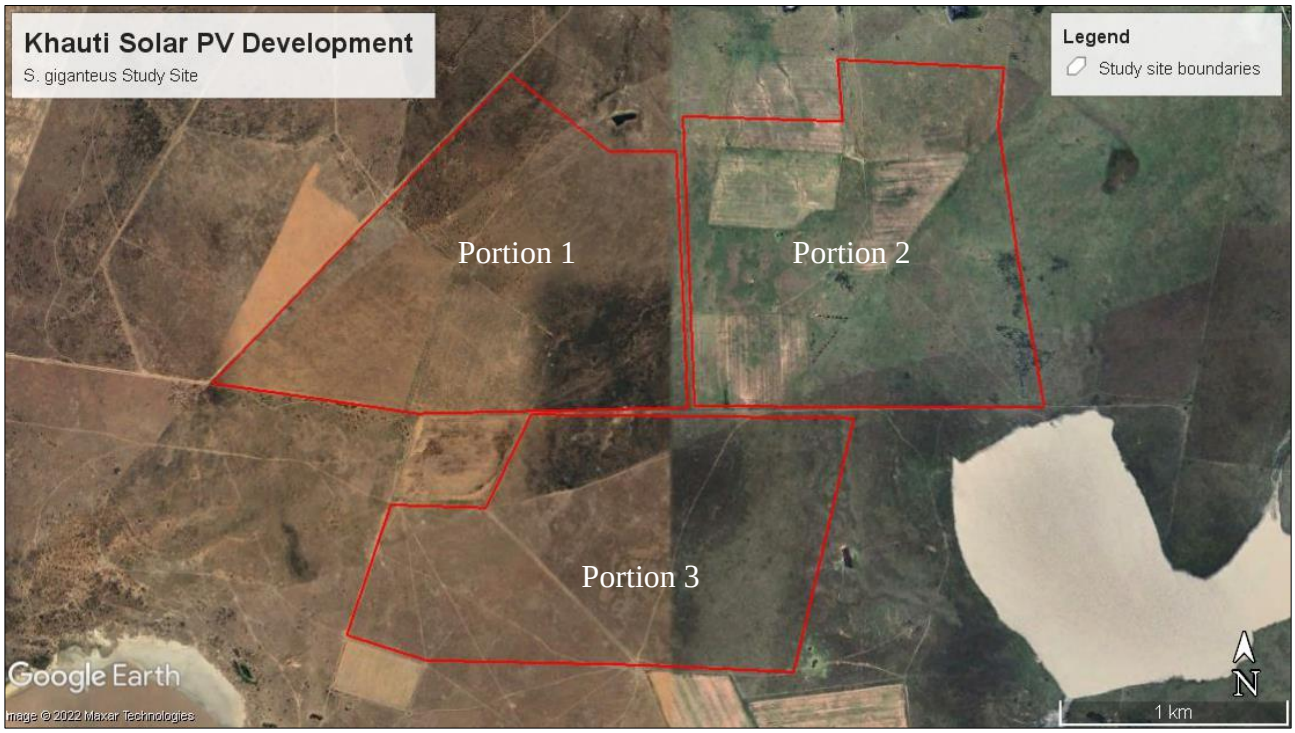


Figure 4.1: Khauti Solar PV study site

Where possible, areas immediately surrounding each land parcel were also investigated.

4.2 Sampling protocol

Each land portion was investigated separately. The entire site was divided into linear lines approx. 50m apart, either north to south or east to west. These lines were then walked while all observations related to sungazers were recorded.

Suitable habitats were identified based on the following criteria:

- If there were evidence of recent ploughing (within the last 10 years) the area was excluded.
- Areas covered by *Themeda* grasses (red grass) were included.
- Areas where compacted sandy loam soils occur with little to no rocks were included.
- Short grasses (less that 30-40 cm in length) were included.
- Wet soils were excluded.

Occurrence of live specimens and burrows were mapped separately from suitable habitats.

Two areas within the study site were identified through literature as high potential occurrence (CBA1 areas as per the FS Critical Biodiversity Map; Figure 4.2).

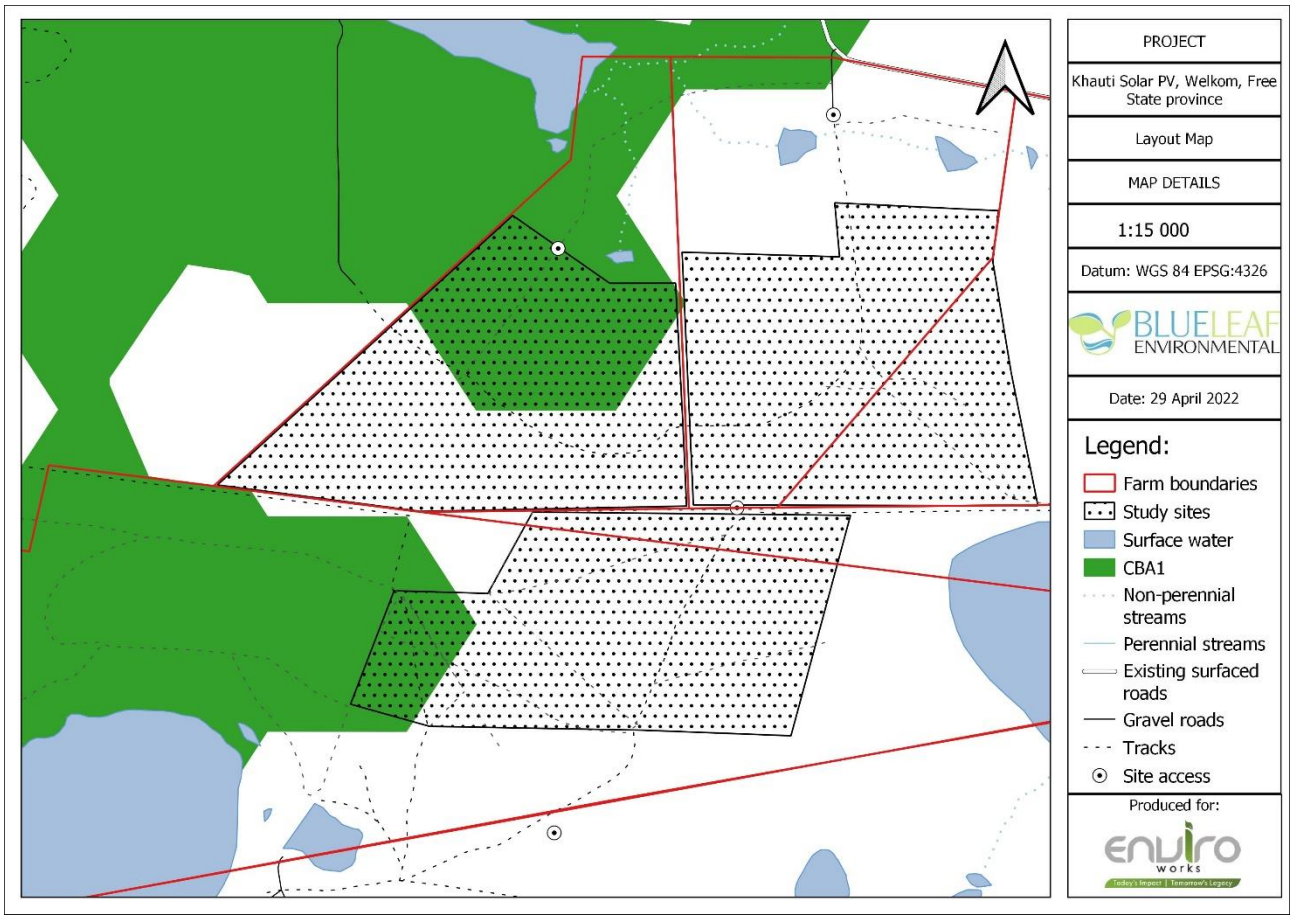


Figure 4.2: Critical biodiversity map of the study area and surrounding environments.

The one was the northern section of land parcel 1, located between the northern boundary and the dense clump of trees in the central parts of the farm just north of an old cropland (Figure 4.3).

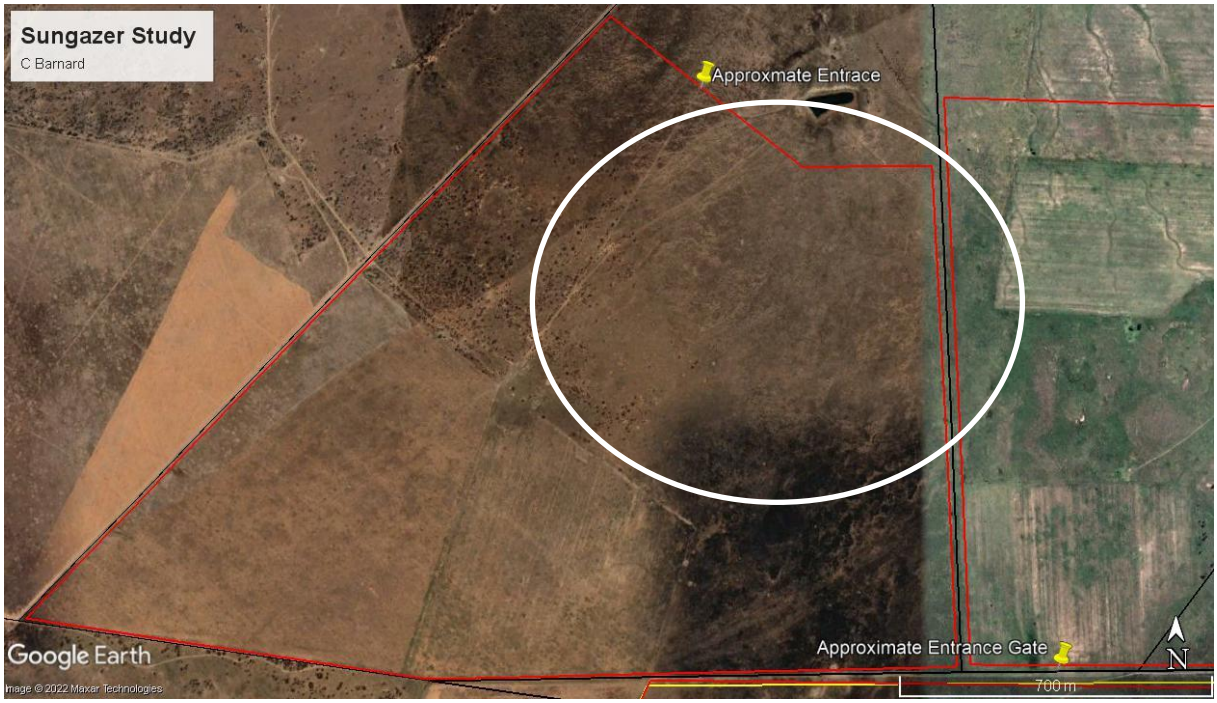


Figure 4.3: High potential sungazer habitat 1 on land parcel 1

A second high potential occurrence area was identified along the western boundary of land parcel 3 (Figure 4.4).

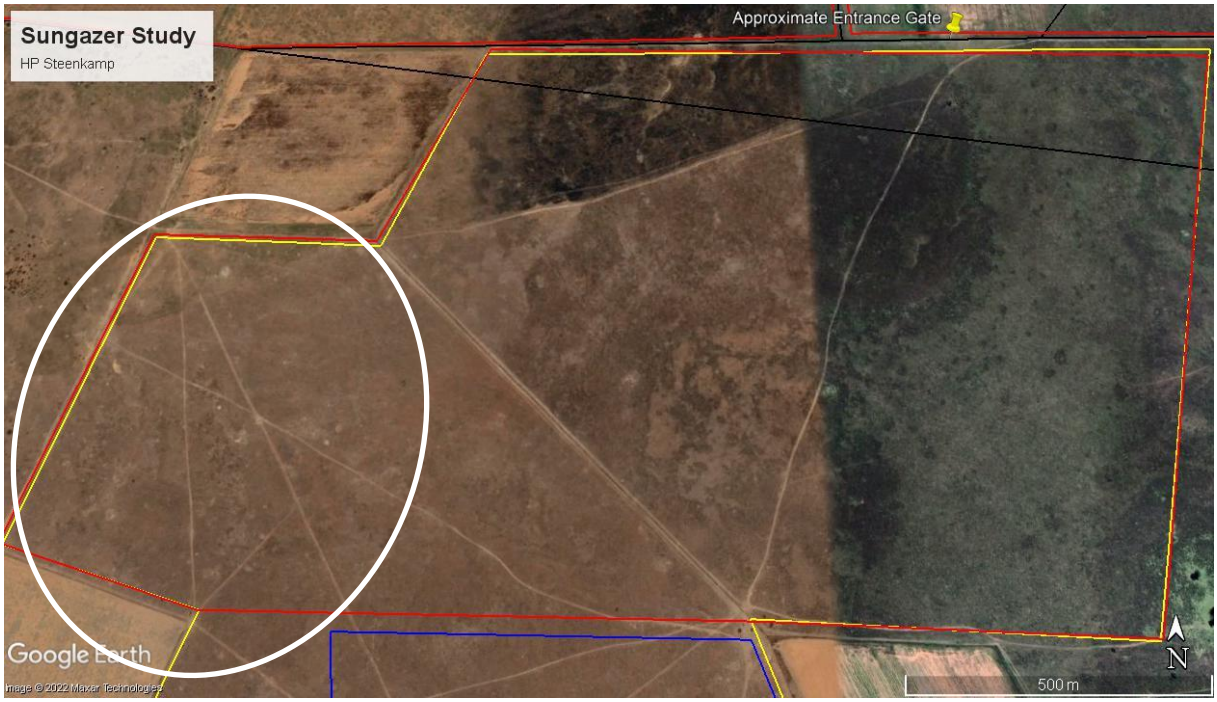


Figure 4.4: High potential sungazer habitat 2 on land parcel 3

Both these areas were surveyed in detail and all findings were recorded.

4.3 Limitations

Sungazers are not very active between May and August (the "cold months"). It also rained the week before the site visit and maximum daily temperatures during the site visit rarely exceeded 20°C. It was therefore assumed that sungazer activities will be limited on site and therefore the study focussed more on finding active burrows that live specimens.

The landowners and farm workers were also interviewed, and historic observation points were noted and visited.

5. Study outcome

Below is a discussion of each of the 3 land parcels investigated during the site visit:

5.2 Land parcel 1

Land parcel 1 did not contain any visible sungazer habitats. Grasses throughout the site were very tall (1m and higher) with no grazing occurring on site. There were small patches of shorter grasses (not *Themeda*) interspersed between the taller grasses (*Themeda*) that may have been suitable habitats, but they were searched, and no burrows, specimens, or traces (tracks and scales) were found. The area identified as high potential sungazer habitat 1 was intensively searched with no results. As a result, this area was still identified as a potential habitat but with no occurrence (See section 5.5 below).

Grasses are taller than 1m:	High potential sungazer habitat 1:
	
Dominantly tall red grass intersperse with small patches of shorter grasses:	
	

5.3 Land parcel 2

Suitable habitats were observed and mapped with no occurrence of any specimens. A single burrow was found at (GPS coordinate: S 27° 52.844'; E 26° 52.173') but the burrow was old with no recent proof of occupation.

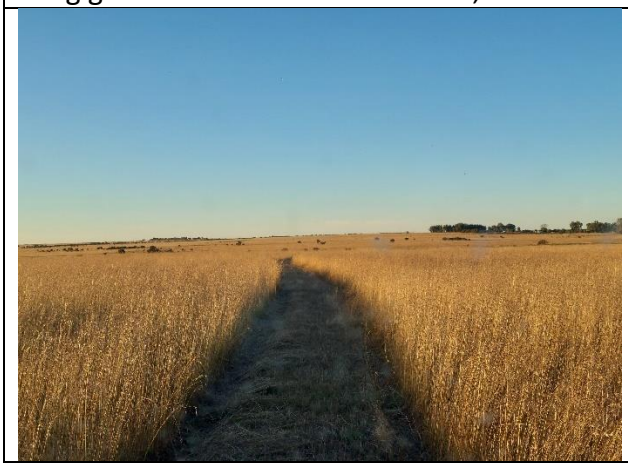
Single sungazer hole on land parcel 2:

Suitable habitats but no specimens of burrows:

5.4 Land parcel 3

As with land parcel 2, suitable habitats were observed and mapped in land parcel 3. No burrows and no live specimens were found within the study site, but 2 areas were mapped outside the study site containing active burrows. Sungazers were not noted in these areas but, because of the cold day, were probably hiding inside their burrows. The landowner and various farmworkers however confirmed observing live specimens in these 2 areas.

Long grasses occur in various areas, but 3 areas were considered as suitable habitats:



5.5 Habitat mapping

Based on all the above-mentioned evidence, a map was created of the study site (Figure 5.1). The map shows the extend of all suitable habitats within the study site as well as all burrows and live specimen found within and surrounding the study site. Please note that no live specimens were found and are therefore not mapped on Figure 5.1 below. Two suitable habitats were also identified outside the project boundary. The identification of these 2 sites were based on:

1. Sites located outside the project areas.
2. Identifying existing communities with active burrows.
3. Mapping suitable habitats surrounding active burrows.

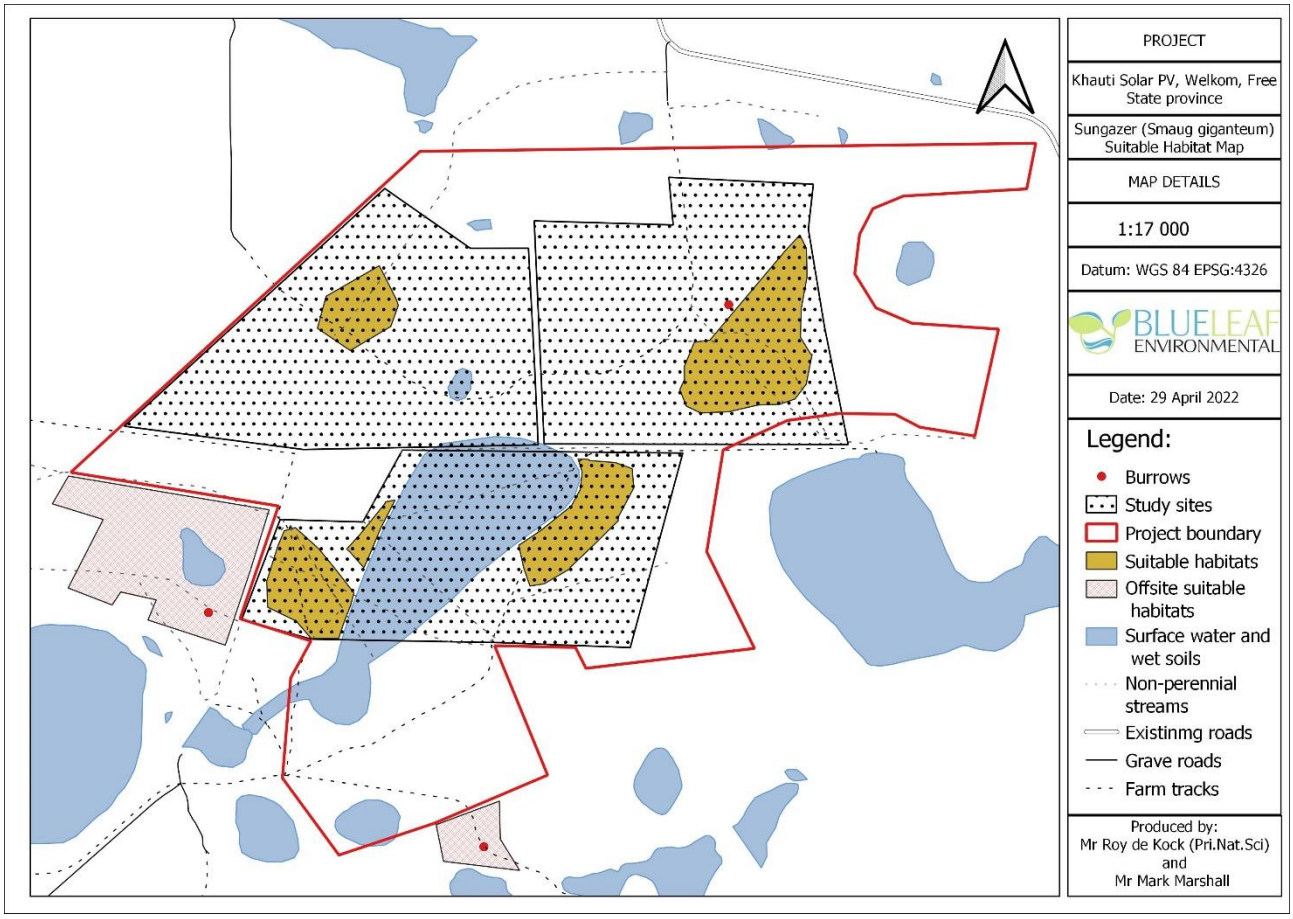


Figure 5.1: Sungazer habitat and location map within and surrounding the Khauti Solar PV study site

These 2 areas (offsite suitable habitats) should be considered as offset communities. Both areas are located outside the development footprint and therefore will not be impacted during construction. Both areas also contain existing communities located within active burrows.

6. Conclusion

Below is a summary of the findings:
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6.1 Summary

Even though most of the study site conformed to most of the habitat requirements listed in section 4.2, most grasslands were too long (more that 20-30 cm high) to be considered suitable sungazer habitats with some minor areas waterlogged. The map in Figure 5.1 shows areas where suitable habitats do occur but with no live specimen of burrow occurrence. One unused burrow was found on land parcel 2 (GPS coordinate: S 27° 52.844'; E 26° 52.173') but the burrow was old and unused.

Sungazers are opportunistic hunters sitting in one place near the entrance of their burrows waiting for small prey like bugs and other insects to venture close while at the same time needing to look out for natural predators, so they do not prefer long grasses. Multi grass layers of different ages, older than 1 year, and approx. 1m tall were observed on land parcel 1 so the chances of sungazers occurring on the property is extremely low. A small area in between trees contained small open patches of short grasses between longer grasses but with no burrows. This small patch aligns with the Free State CBA1 map indicating that sungazers may have occurred historically here (called High potential sungazer habitat 1 in this report). No evidence of sungazere or even old burrows were found.

Land parcel 2 had a suitable habitat in its eastern section while land parcel 3 was the most promising section with large suitable habitat parcels throughout the site. However, no specimens or burrows were found. Land parcel 3 also had a high potential sungazer area (called High potential sungazer habitat 2) on its western boundary. Habitats were suitable, but no specimens or burrows were found.

The 2 offsite suitable habitats (Figure 5.12) should be considered as offset communities. Both areas are located outside the development footprint and therefore will not be impacted during construction. Both areas also contain existing communities located within active burrows.

6.1 Recommendations

Based on the abovementioned findings, the following recommendations are made and must be implemented during all phases of the proposed new Khauti Solar PV development:

- Other than the two No-Go sites identified outside the study area, there are no exclusion sites within the study site.
- All suitable habits (as per Figure 5.1) must undergo a micro-siting exercise to confirm the absence of burrows before commencement of any construction related activity onsite. If any are found, they should be relocated.
- The Solar PV site must be monitored regularly (possibly monthly) throughout its operational life for sungazer occurrence and distribution.
- The 2 offsite suitable habitats should be considered as offset communities. The approximate extend of their suitable habitat areas area indicated in Figure 5.

Even though numerous areas within the study site were identified as suitable sungazer habitats, no live specimens and no burrows were found. Development of the proposed Khauti Solar PV facility may proceed provided all conditions mentioned in this report is included into the site EMPr and adhered to.

It is the opinion of the specialists that these sungazers may even return during operations of the proposed new Solar PV facility. All solar panels will be mounted on aboveground steel frames lifting these panels off the ground surface. This means that the ground footprint of the Solar PV facility will be relatively small. The Developer will also have to keep the grass underneath these panels short, creating potential safe habitats for sungazers. The only negative factor will be the panels blocking the sun underneath them, but habitats will be suitable, especially around the PV cluster fringes where more sunlight reaches the ground. It may be a good option to conduct academic studies on this occurrence.

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