

The unit sensitivity evaluation concluded that all three units are moderately sensitive. Concerning floral elements, the development may be considered favourably; however, mitigation measures, should be strongly enforced with particular emphasis on protected flora and SCCs.

8.5. Faunal overview:

This section provides a brief overview of mammals observed and those believed to occur based on habitat availability and the revisions of similar ecological studies conducted in the area. The receiving environment within and around the Wonderpan solar facility broadly presents two major habitats. These habitats are all shaped by the area's natural occurring vegetation and non-biotic elements such as watercourses and distinct geological features.

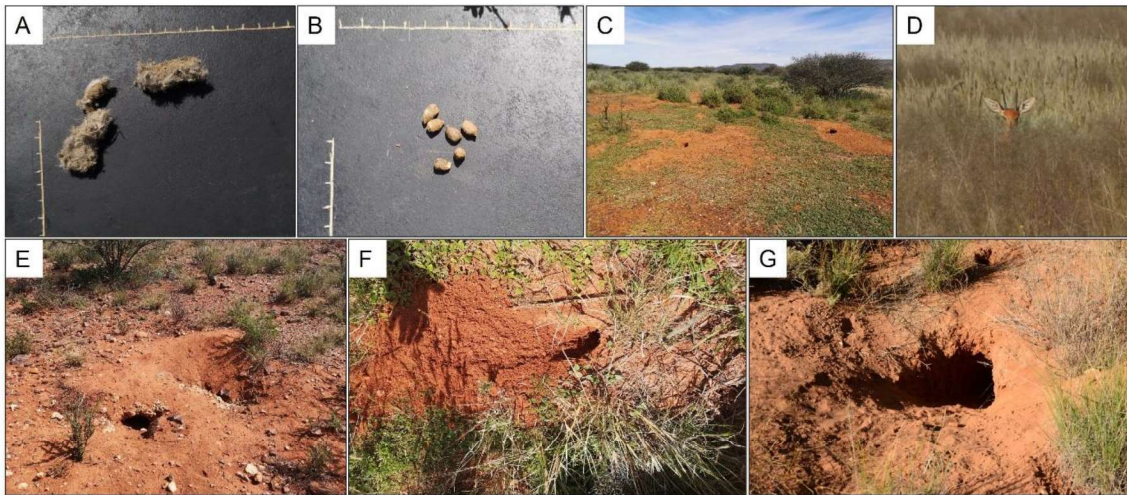


Figure 11 Photographic evidence and observations of mammal activity. (A) Felid scat primarily consists of hairs (likely small mammals). From the size and contents, it likely belongs to *Felis lybica*. (B) Droppings from a small antelope, likely (*Raphicerus campestris*). (C and E) Burrow entrances from *Xerus inauris*. (D) Steenbok photographed on a nearby farm. (F) Shallow excavations exposing plant roots. (G) Aardvark excavation photographed on a nearby farm.

The receiving environment primarily features a semi-closed shrubland habitat flanked by a dense shrub thicket supported by a small tributary of the Karabeelooop (western boundary). Observations of natural occurring mammals in and around the proposed development area are listed in (Table 16). It's important to highlight that some mammals observed during the field survey are provided with provincial protection. As such, all species classified under Schedule 1 and 2 may not be hunted, imported, exported, transported, kept, possessed, bred or traded without acquiring the relevant permit from the provincial department of environmental affairs. None of the observed species are listed as being of conservation concern (Child et al., 2016). Near threatened and or threatened listed mammals for the QDS 2922DD is also listed in Table 16.

Table 16 Mammal species identified on site. The mode of observation is also indicated in this table. Possible species occurrence through the revision of relevant ecological investigation of the area are

also indicated. Schedule 1: Specially protected animals, Schedule 2: Protected animals, Schedule 4: Damage causing animals.

Family	Species	Common name	Observation type
Macroscelididae	<i>Macroscelides proboscideus</i> (Sch 2)	Round-eared sengi	Observed
Sciuridae	<i>Xerus inauris</i> (Sch 2)	South African ground squirrel	Observed + den observation
Viverridae	<i>Genetta genetta</i> (Sch 2)	Common genet	Observed + roadkill
Pedetidae	<i>Pedetes capensis</i> (Sch 2)	South African spring hare	Dung
Herpestidae	<i>Cynictis penicillate</i> (Sch 2)	Yellow mongoose	Observed
Bovidae	<i>Tragelaphus strepsiceros</i> (Sch 2)	Greater kudu	Observed + spoor + dung
Orycteropodidae	<i>Orycteropus afer</i> (Sch 1)	Aardvark	Burrow observed
Bovidae	<i>Raphicerus campestris</i>	Steenbok	Observed
Felidae	<i>Cf. Felis lybica</i> (Sch 1)	African wild cat	Dung
Canidae	<i>Otocyon megalotis</i> (Sch 1)	Bat-eared fox	literature study
Canidae	<i>Canis mesomelas</i> (Sch 4)	Black-backed jackal	literature study + local observations
Hyaenidae	<i>Hyaena brunnea</i> (Sch 1)	Brown hyaena	Literature study
Felidae	<i>Felis nigripes</i> (Sch 1)	Small spotted cat	Literature study
Felidae	<i>Caracal caracal</i> (Sch 4)	Caracal	Literature study

The study area featured ample evidence to suggest a relatively healthy mammalian community (Figure 11). This statement is supported by the presence of several mid-trophic predators, indicative of a healthy communal prey base. Mammal species of conservation concern are listed in (Table 17). Occurrence rationale is based on each species' specific habitat requirements, prey base availability, and literature review of similar studies in the area.

Before conducting the survey, the DFFE screening tool was consulted for any sensitive species' occurrence. SANBI was consulted in reference to particularly sensitive species. A thorough desktop study was initiated, which investigated the following critical species information:

- Broad scaled distributional patterns
- Specific behavioural traits which will aid identification
- Species-specific habitat requirements
- Food preferences

The DFFE screening tool output indicated the possible occurrence of one bird species. The discussion of avifaunal elements falls outside the scope concerned with this report and should be addressed by a relevant specialist.

Table 17 Mammal SCCs that possibly occur within the area. These species were identified based on a revision of relevant literature, the [Virtual Museum's mammal map](#) and [Inaturalist](#) observations.

Species	Habitat and prey base	Rationale
<i>Parahyaena brunnea</i> (NT)	Widespread across southern Africa and found in various habitats: semi-desert, open scrub, and open woodland savannah. Primarily scavenges and supplements its diet with fruits, insects, bird eggs and occasionally hunts small mammals.	Habitat matches its requirement and may occur in the area; however unlikely directly in the Wonderpan solar facility due to fox-proof fencing. This species typically has a vast home range and, if affected, will likely migrate over to the surrounding open areas.
<i>Felis nigripes</i> (VU)	An obligate carnivore. It is a specialist of open, short grass areas with an abundance of small rodents and ground roosting birds. It inhabits dry, open savannah, grasslands and Karoo semi-desert with sparse shrub and tree cover.	Due to the dense shrub cover of the Wonderpan solar facility, it is considered unlikely that this species will utilise this area for hunting. Habitat along the transmission line matches this species requirement; however, the disturbance will be restricted to pole placement and, therefore, considered insignificant.
<i>Panthera pardus</i> (VU)	The Leopard has a wide habitat tolerance, including woodland, grassland savannah and mountain habitats, but also occurs widely in coastal scrub, shrubland and semidesert. Densely wooded and rocky areas are preferred as choice habitat types. Leopards also have highly varied diets, including more than 90 species in sub-Saharan Africa, ranging from arthropods to large antelope up to the size of adult male Eland.	Occurrence probability is difficult to determine as this species has an extensive home range and typically shies away from anthropogenic disturbances. This species is not solely dependent on a specific prey species and will likely migrate to the open spaces once development starts. Impacts on the local leopard population are therefore considered insignificant.

9. Anticipated impacts:

Direct impacts caused by the development of the proposed solar plant will result in the transformation of approximately 133 ha of naturally functioning karoo ecosystem. Direct impacts associated with the proposed 132kV transmission line are primarily restricted to the specific placement of pylons and the small service road running along its path. The following section provides a breakdown of the impacts imposed on the receiving environment due to the development and operation of the proposed solar facility.

Table 18 Summary of anticipated impacts associated with the proposed development. It's important to note that this table is not all inclusive, but merely provides perspective concerning the types of activities which contribute to the deterioration of concerned ecological aspects.

Concerned aspect	Activities directly contributing to the concerned aspect	Secondary activities which may contribute to the concerned aspect
Habitat loss	<ul style="list-style-type: none"> • Physical clearance of vegetation • Internal and access/ service roads • Habitat fragmentation leading to edge effects • Trampling • Accidental events such as fire 	<ul style="list-style-type: none"> • Introduction of alien and invasive species • Soil compaction reducing re-establishment success • Soil erosion
Loss of indigenous floral and faunal diversity	<ul style="list-style-type: none"> • Physical clearance of vegetation • Trampling • Habitat fragmentation • Accidental events such as fire, oil spills etc • Unlawful harvesting/ collecting of plants • Unlawful hunting/ poaching of animals • Road mortalities • Electrification (fencing) 	<ul style="list-style-type: none"> • Accidental introduction of alien and invasive species • Light pollution • Noise pollution (construction phase)
Loss of floral and faunal species of conservation concern	<ul style="list-style-type: none"> • Trampling • Clearance of vegetation • Habitat fragmentation • Poaching, unlawful hunting and gathering of plants and animals • Accidental road mortalities 	<ul style="list-style-type: none"> • Thinning of local genetic diversity • Interruption of lifecycle patterns due to noise and light pollution.

Concerned terrestrial ecological aspects:

Habitat loss and fragmentation is the leading cause of the global biodiversity crisis. The removal of crucial environmental units will lead to the destabilisation of the entire ecosystem and eventually ecological breakdown.

The receiving environment's overall landscape is not considered unique regarding habitat type and broadscale vegetation structure. To some extent, the site's alignment within an ESA zone promotes a conservative approach to land use change; however, considering the landscape is not unique, other open areas with a similar composition and vegetation structure in the immediate area may provide the same supporting role.

The impacts associated with habitat loss are evaluated to be of moderate significance since solar developments typically result in the total clearing of an area's vegetation. Low-intensity developmental practices are necessary and should form a critical part of

the Environmental Management Plan. The efficient implementation of the proposed mitigation measures will significantly lower the impact significance on habitat loss.

Table 19 The anticipated impact on habitat loss for fauna and flora during the construction phase. Post mitigation significance is also indicated.

Construction phase			
Concerned aspect:	Impact characteristic	Pre mitigation score	Post mitigation score
Habitat loss	Geographical extend	1	1
	Probability	4	3
	Duration	4	3
	Reversibility	3	2
	Cumulative impacts	2	1
	Intensity	3	2
	TOTAL	42	20
Significance rating		Moderate	Low
<p>Recommended mitigating:</p> <ul style="list-style-type: none"> • Removal of indigenous flora should be kept at a minimum. • Disturbance related activities may only occur in the demarked area. • Vehicle movement should strictly be kept on designated dirt roads. • Hunting/ trapping of fauna is strictly prohibited. • Post-development open areas should be revegetated and kept free of exotic plant species. • Vehicles may only move within the demarcated space of the development area. • Any other relevant recommendations listed in this report should be implemented. 			

Indigenous vegetation has a far greater conservation value compared to exotic species. Indigenous species have adapted to the surrounding environment and have established many stable networks of energy transfer. The removal of indigenous species disrupts this balance which has formed over many years.

Some alien and invasive species were recorded within the study area; however, their occurrences were restricted. The receiving environment's structure and species composition are primarily natural, with little signs of significant habitat disturbance. Therefore, the solar development will result in the largescale removal of indigenous vegetation and loss of local floral diversity. Faunal elements will likely migrate to lesser disturbed spaces (broadly available in the area). Due to this, the anticipated impact on this aspect is considered moderate. Mitigation is necessary and would be easily achieved.

Table 20 The anticipated impact on the loss of indigenous floral and faunal diversity. The impacts were calculated for both the construction and operational phase. Post mitigation significance is also indicated.

Construction phase			
Concerned aspect:	Impact characteristic	Pre mitigation score	Post mitigation score
Loss of indigenous floral and faunal diversity	Geographical extend	1	1
	Probability	4	3
	Duration	4	3
	Reversibility	3	2
	Cumulative impacts	2	1
	Intensity	3	2
	TOTAL	42	20
Significance rating		Moderate	Low
General mitigation: <ul style="list-style-type: none"> • Development may only occur within the clearly demarked area. • Development in areas of high sensitivity should be avoided. • Post-development open areas should be revegetated and kept free of exotic plant species. • Monitoring for the emergence of exotic species should be conducted. • An alien invasive species management plan must be drafted if the need for such management emerges. • Indigenous species should be prioritised for landscaping. • Vehicle movement should remain within the authorised boundary. • No disturbance related activity may occur within watercourses • A comprehensive fire management plan must be adhered too. • No unnecessary destruction or removal of vegetation are allowed. • During the first few weeks of construction, fencing should be adapted to allow wildlife to migrate to other open spaces. • Small movement corridors within fencing should be considered. • Wildlife elements such as nests and burrows should carefully be inspected, and animals responsibly removed by a relevant specialist. • No hunting, trapping, or killing of fauna is allowed. • Any other relevant recommendations listed in this report should be implemented. 			
Operational phase			
Concerned aspect:	Impact characteristic	Pre mitigation	Post mitigation
Loss of indigenous floral	Geographical extend	2	1
	Probability	3	2
	Duration	4	4

and faunal diversity	Reversibility	4	3
	Cumulative impacts	3	2
	Intensity	2	2
	TOTAL	32	24
Significance rating		Low	Low
<p>General mitigation:</p> <ul style="list-style-type: none"> • The solar site should be adequately fenced off. • Ensure that all cables and connections are insulated to reduce the likelihood of accidental animal electrification • Electric fencing near the ground should not be live to prevent the electrification of small mammals. • Monthly inspections and recordings of all mortalities around the perimeter fence should be conducted (only applicable for electrified fencing). Mortalities should be recorded and be reported to the on-site environmental representative. • High intensity spotlights should be minimised as far as possible. • Light pollution should be minimised by directing spotlights towards the solar farm's interior. • No trapping, hunting, or killing of fauna should be allowed. • Small movement corridors in fencing should be monitored for blockages. 			

The loss of rare, threatened and or protected species should always invoke a conservative approach regarding land use management. These species have been declared as species of conservation concern due to various population declining factors such as urban expansion, the loss of species-specific symbiotic relationships, innate small population sizes, habitat loss, etc. The further loss of these species should be prevented at all costs.

The possible occurrence of floral and faunal SCC was thoroughly assessed on a range of occurrence criteria (Chapters 8.4 and 8.5). The solar development will affect numerous provincially protected flora and two SCC (one confirmed and one possibly occurring). Solar developments result in the removal of an entire area's vegetation and, consequently, the loss of SCCs, which distribution might be restricted. The observed SCC (*Hoodia gordonii*) was prevalent on-site and recorded far outside the development boundary. Thus, it is considered that *H. gordonii*'s population is fairly healthy in this region. Transplant permit applications for all provincially protected flora must be submitted to the Northern Cape Department: Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARDLR).

Boscia albitrunca, a nationally protected tree listed as a species of least conservation concern, is also prevalent on site. DFFE removal permits are necessary for the selective removal of this species.

An impact significance score of 48 is calculated for the loss of floral species of conservation concern. It is important to note that this impact significance score is

calculated at the high threshold range for the moderate rating. Any deviations from the proposed plan might have considerable impacts on this score. Mitigation measures are required to lower the overall impact significance.

The faunal overview concluded that the likelihood of occurrence for mammal SCC is low in the Wonderpan solar facility. These species might occur within the more open habitat along the transmission line; however, the impacts generated by the power line is considered insignificant. Mitigation measures remain important concerning this aspect.

Table 21 The anticipated impact on the loss of floral and faunal SCC. The impacts were calculated for both the construction and operational phase. Post mitigation significance is also indicated.

Construction phase			
Concerned aspect:	Impact characteristic	Pre mitigation	Post mitigation
Loss of floral species of conservation concern	Geographical extend	2	1
	Probability	4	2
	Duration	4	2
	Reversibility	3	2
	Cumulative impacts	3	2
	Intensity	3	2
	TOTAL	48	18
Significance rating		Moderate	Very low
Loss of faunal species of special conservation concern	Geographical extend	1	1
	Probability	3	2
	Duration	3	3
	Reversibility	3	2
	Cumulative impacts	2	1
	Intensity	2	1
	TOTAL	24	9
Significance rating		Low	Very low
General mitigation: <ul style="list-style-type: none"> Protected plant species should be demarked prior to construction activities. Removal permits from the relevant permit authorising authority must be obtained for all provincially and nationally protected flora. All species that may easily transplant should be relocated to undisturbed open spaces within the general area. A pre-construction walkthrough of the facility to located SCCs for relocation is strongly recommended. 			

- A formal relocation management plan should be drafted and implemented prior to construction.
- All construction staff should be informed on species of special conservation concern. A relevant specialist should be notified when any of the mentioned SCC are observed during construction.
- All disturbance related activities must be restricted to the authorised development boundary.
- No illegal harvesting of plant material is allowed.
- No trapping, hunting, or killing of fauna should be permitted.
- Any other relevant recommendations listed in this report should be implemented

Operational phase

Concerned aspect:	Impact characteristic	Pre mitigation	Post mitigation
Loss of floral species of conservation concern	Geographical extend	2	1
	Probability	3	2
	Duration	3	3
	Reversibility	4	4
	Cumulative impacts	2	1
	Intensity	3	2
	TOTAL	42	22
Significance rating		Moderate	Low
Loss of faunal species of special conservation concern	Geographical extend	1	1
	Probability	3	2
	Duration	3	3
	Reversibility	4	4
	Cumulative impacts	2	1
	Intensity	2	1
	TOTAL	26	11
Significance rating		Low	Very low
General mitigation:			
<ul style="list-style-type: none"> • Notice boards containing pictures of floral and faunal SCC should remain on site. • Staff should immediately inform the on site environmental representative and a relevant specialist if any such species were observed. • Vehicle movement should strictly be contained on designated roads. No off roading must be allowed. • Movement corridors in fencing should be monitored on a monthly basis. • Any other relevant recommendations listed in this report should be implemented 			

The anticipated environmental impact evaluation indicated that the proposed solar development's construction phase will have an overall moderate impact on the receiving environment. The anticipated environmental impact generated through the facility's operational phase was calculated at the higher threshold of the low impact category. Any deviation from the proposed development plan may significantly influence this score. The developer and the appointed contractor should remain mindful of low-impact developmental practices. The recommended mitigation measures should be strongly enforced.

Table 22 Overall anticipated environmental impact pre- and post-mitigation.

Concerned aspect	Score prior to mitigation	Rating prior to mitigation	Score post mitigation	Rating prior to mitigation
Construction phase				
Habitat loss	42	Moderate	20	Low
Loss of indigenous floral and faunal diversity	42	Moderate	20	Low
loss of floral species of conservation concern	48	Moderate	18	Very low
Loss of faunal species of conservation concern	24	Low	9	Very low
Overall impact:	39		17	
Significance rating:	Moderate		Very low	
Operational phase				
Loss of indigenous floral and faunal diversity	32	Low	24	Low
loss of floral species of conservation concern	42	Moderate	22	Low
Loss of faunal species of conservation concern	26	Low	11	Very low
Overall impact:	33		19	
Significance rating:	Low		Very low	

Cumulative impacts of solar developments in the region:

The cumulative impacts of renewable energy developments should always be compared to similar developments in the region. This is especially important considering the nature of solar developments typically results in large-scale clearings of the environment.

Renewable energy projects, whether planned, authorised or have already been developed, are featured in Figure 13 below. The South African Renewable Energy EIA Application Database (REEA, 2021) indicates six other solar developments within a

30 km radius around the proposed Wonderpan site. Provided the mentioned solar projects, including the Wonderpan solar site, are all developed, 2967 ha ⁷will be transformed, making up 1.05% area of the 30 km radius zone. Therefore, the cumulative impact of habitat loss generated by renewable energy production is considered to be low.

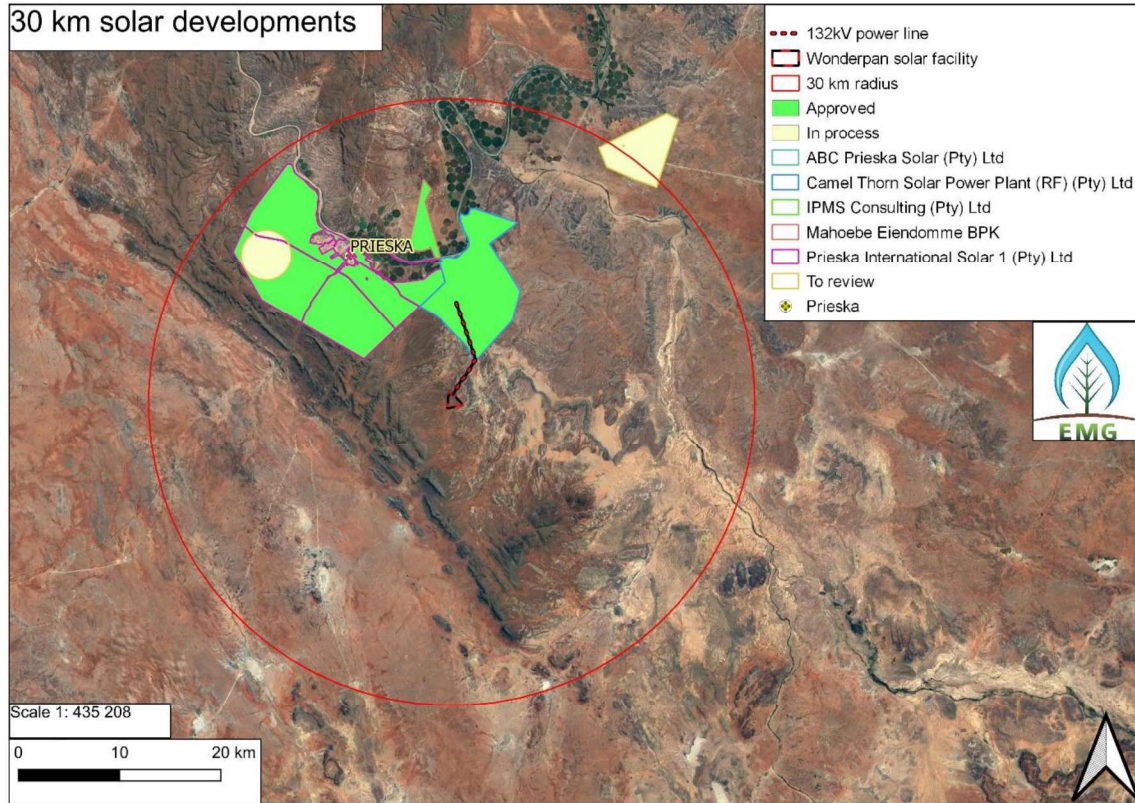


Figure 12 Map indicating renewable energy developments within a 30 km radius around the proposed Wonderpan solar site.

10. Recommendations:

- Hunting, capturing and trapping of fauna must be prohibited.
- Care should be taken to not unnecessarily clear or destroy indigenous vegetation.
- Drip trays should be placed under stationary construction vehicles.
- Vehicle movement should be restricted to the authorised site boundary.
- Excavated topsoil should be kept clean of exotic vegetation.
- Fauna that is trapped in trenches should be relocated by a qualified individual.
- A designated construction waste/debris area should be placed on site and located as far as possible sensitive habitats.

⁷ Area calculations were made assuming solar energy production potential over land area required of 2 ha per MW. The mentioned solar projects have combined energy production potential of 1417 MW.

- Waste should be removed from site on a regular basis and not allowed to pile up as to start polluting the environment.
- All construction-related waste/material should be appropriately disposed of after the construction has ceased.
- A comprehensive fire management plan should be implemented, preventing any fire outbreaks.
- Notice boards should be erected informing construction workers on floral and faunal species of conservation concern. A relevant specialist should be notified when any of these species are observed during the construction phase.
- No protected fauna or flora may be harmed without the necessary permits.
- A preconstruction walkthrough with a qualified botanist should be conducted to identify the exact localities of floral SCC. These species should be demarcated and left undisturbed until a flora harvesting, and relocation permit is obtained.
- A relocation plan should be drafted, and its execution be supervised by a qualified botanist.
- The relocation plan should be executed prior to construction.
- All other mitigations mentioned in the impact assessment section should be implemented.

11. Discussion and conclusion:

The Wonderpan solar facility's specific floral composition and vegetation structure is not a good representation of the Bushmanland Arid Grassland in which it is mapped (SANBI, 2006-2018); Rather, the overall shrubland associated vegetation, features strong associations with the Northern Upper Karoo, which dominates the area immediately north of the site. The receiving environment featured little evidence of significant habitat transformation, and the vegetation is considered natural for the NKu 3.

The DFFE screening tool highlighted the possible occurrence of two floral SCC, *Tridentea virescens* and Sensitive species 144. None of these species were observed within the proposed study, and the likelihood of occurrence for Sensitive species 144 was evaluated to be low. The only exception was *Tridentea virescens*, which was not recorded, but due to its specific habitat requirements underneath shrubs and the challenge of traversing the site, a medium probability of occurrence was assigned. Refer to appendix 4 (Pictures 11 and 12) for *Tridentea virescens* illustrations.

Several provincially protected flora and one plant species of conservation concern (*Hoodia gordonii*) were recorded on site (Table 15). A literature study also revealed the possible occurrence of another floral SCC (*H. officinalis*); however, this species was not recorded on site. The Unit sensitivity analysis concluded that all VUs should be regarded as moderately sensitive units (Table 13). Mitigation measures, especially concerning the possible occurrence and known observations of floral SCCs should be strongly enforced and overseen by a suitable specialist.

The overall anticipated environmental impact evaluation has indicated that the development will generate a moderate and low environmental impact for the construction and operational phases respectively (Table 22). A moderate environmental impact is primarily attributed to the clearing nature of solar developments. PV solar developments usually result in clearing an entire area's vegetation and consequently habitat for flora and fauna. It's important to emphasise that the impact generated through the facility's operational phase was calculated at the higher threshold of the low impact category. Any deviation from the proposed development plan may significantly influence this score. The developer and the appointed contractor should remain mindful of low-impact developmental practices. The recommended mitigation measures should be strongly enforced. The possible occurrence of several provincially protected flora and possibly two flora SCCs significantly contributed to the anticipated impact scores. Development may still be favourably considered, but only if all mitigation measures are followed.

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13. Appendices:

13.1. Appendix 1: Impact assessment evaluation form

Table 23 description of the rating system used to evaluate the possible impacts concerned with the proposed development.

Geographical extent: This describes the spatial reach an impact might have.		
Score		
1	Site specific	The impacts will only affect the specific site.
2	Local	The impacts will affect the local area or district.
3	Provincial	The impacts will be recognised across most of the province.
4	International/ national	Will affect the entire country or other countries.
Probability: This describes the probability that a specific environmental impact will occur.		
1	Unlikely	Less than 25% chance of occurrence.
2	Possible	Between 25-50% chance of occurrence.
3	Most likely	50-75% chance of occurrence.
4	Definite	Greater than 75% chance of occurrence.
Duration: This describes the amount of time an environment will be affected by the impact.		
1	Short term	The impact will disappear very quickly, either through mitigation or through natural processes. The impact should have disappeared within 1 year.
2	Medium term	The impact will endure for a short while after the construction processes and will be mitigated by either human intervention or natural processes. The impact should have disappeared between 2-10 years.
3	Long term	The impact will persist through the construction phase and disappear by either human intervention or natural processes in 10-30 years.
4	Permanent	Mitigation either by man or natural processes is highly unlikely. The impact will have permanently affected the environment.
Reversibility: Describes the potential of an impact to be entirely reversed after development.		
1	Entirely reversible	The impact is entirely reversible and can be achieved with minor mitigation measures.

2	Possibly reversable	The impact might be reversible. Suitable mitigation measures will increase the chances of reversibility and should be considered.
3	Barely reversible	It is unlikely that the impact will be reversed. Extreme mitigation measures might increase the chances of successful reversibility.
4	Irreversible	The impact is irreversible. No mitigation measures can reverse the effects on the environment.
Cumulative impacts: Describes the cumulative impacts of the proposed development, i.t.o. the development process and all activities emanating from the operation of the facility.		
1	Very low cumulative impact	The impact will result in no or minimal cumulative effects.
2	Low cumulative impact	The impact will result in an overall low cumulative effect.
3	Moderate cumulative impact	The cumulative impacts will have moderate levels of impact.
4	High cumulative impact	The cumulative impact will result in high to very high environmental effects.
Intensity: Describes the severity of the impact on the environment		
1	Low	The impact's effect on the system will be hardly noticeable, if at all. Rehabilitation measures have to be in place if required.
2	Medium	The impact will have a recognisable effect on the environment. However, system functionality will still be present with negligible effects on ecosystem integrity. Rehabilitation measures have to be in place.
3	High	The impact will severely affect ecosystem integrity and function. Rehabilitation will be costly, and extreme mitigation measures have to be in place.
4	Very high	The impact will result in the entire ecological breakdown of the system or components thereof. Rehabilitation will be costly with minimal chances of success. Extreme mitigation measures must be in place.

13.2. Appendix 2: Impact significance on the environment

13.2.1. Appendix 2A: Impact significance evaluation:

Impact significance describes the overall environmental impact resulting from the cumulation of impact characteristics. Significance gives a judgement of the effect a development will have on the environment. Significance is calculated as the total score for each criterion (geographical extend + probability + duration + reversibility + cumulative impacts) multiplied by the intensity. A greater significance score results in an overall greater environmental impact and should be avoided or allowed with extreme mitigation measures in place. A lower significance score results in an overall lesser environmental impact and may be allowed with very little or no mitigation measures needed.

Table 24 impact significance evaluation form

Score	Impact significance rating	Description
5-19	Very low	Impact significance is of a very low order. Development is acceptable
20-34	Low	Impact significance is of a low order, and development is acceptable.
35-49	Moderate	The impact will be recognisable and may pose a problem to the development.
50-64	High	The impact is substantial and will significantly affect the environment. Development is unacceptable.
65-80	Very high	The impact is of the highest possible order and will cause irrefutable damage to the environment. Development unacceptable.

13.3. Appendix 3: Species list

13.3.1. Appendix 3A: Plant species

Provincially protected species are coloured **orange** and SCCs are listed in **red**.

Table 25 Plant species logged during the field survey. The various protection schedules (Sch) of plants under the Northern Cape Nature Conservation Act (Act no 9 of 2009) are also indicated. Schedule 1: Specially protected plants, Schedule 2: Protected plants. Trees protected under the National Forests Act (Act no 84 of 1998) are indicated with the abbreviation NFA.

Family	Species	Growth form	Invasive category
Acanthaceae	<i>Justicia incana</i>	Dwarf shrub	
	<i>Acanthopsis hoffmannseggiana</i>	Forb	
	<i>Barleria rigida</i>	Forb	
Aizoaceae	<i>Trianthema triquetrum (Sch 2)</i>	Creeping succulent	
	<i>Aizoon africanum (Sch 2)</i>	Dwarf shrub	
	<i>Aizoon crystallinum (Sch 2)</i>	Dwarf shrub	
	<i>Drosanthemum hispidum (Sch 2)</i>	Succulent	
	<i>Tetragonia arbuscula (Sch 2)</i>	Succulent shrub	
Amaranthaceae	<i>Alternanthera pungens</i>	Creeping forb	Exotic
	<i>Hermbstaedtia fleckii</i>	Forb	
	<i>Caroxylon aphyllum</i>	Shrub	
Amaryllidaceae	<i>Ammocharis coranica (Sch 2)</i>	Geophyte	
	<i>Nerine laticoma (Sch 2)</i>	Geophyte	
Anacardiaceae	<i>Searsia lancea</i>	Tree	
Apocynaceae	<i>Hoodia gordonii (Sch 1)</i>	Succulent	
Asparagaceae	<i>Eriospermum cf. corymbosum</i>	Geophyte	
	<i>Ledebouria apertiflora</i>	Geophyte	
	<i>Asparagus suaveolens</i>	Shrub	
	<i>Agave americana</i>	Succulent	Exotic
Asteraceae	<i>Eriocephalus cf. ericoides</i>	Dwarf shrub	
	<i>Pentzia globosa</i>	Dwarf shrub	
	<i>Felicia muricata</i>	Forb	
	<i>Geigeria filifolia</i>	Forb	
	<i>Kleinia longifolia</i>	Succulent	
Bignoniaceae	<i>Rhigozum trichotomum</i>	Shrub	
Boraginaceae	<i>Ehretia rigida</i>	Shrub	
Cactaceae	<i>Opuntia ficus-indica</i>	Succulent	Exotic - 1b
	<i>Tephrocactus articulatus</i>	Succulent	Exotic - 1b
Capparaceae	<i>Boscia albitrunca (Sch 2) (NFA)</i>	Tree	
Euphorbiaceae	<i>Euphorbia mauritanica (Sch 2)</i>	Succulent	
Fabaceae	<i>Senegalia mellifera subsp. detinens</i>	Shrub	
	<i>Prosopis glandulosa</i>	Tree	Exotic
	<i>Vachellia karroo</i>	Tree	

Gisekiaceae	<i>Gisekia africana</i>	Creeping forb	
Iridaceae	<i>Moraea polystachya (Sch 2)</i>	Geophyte	
Kewaceae	<i>Kewa salsoloides</i>	Succulent	
Malvaceae	<i>Pavonia burchellii</i>	Forb	
Nyctaginaceae	<i>Phaeoptilum spinosum</i>	Shrub	
Oxalidaceae	<i>Oxalis haedulipes (Sch 2)</i>	Geophyte	
	<i>Oxalis lawsonii (Sch 2)</i>	Geophyte	
	<i>Oxalis obliquifolia (Sch 2)</i>	Geophyte	
Papaveraceae	<i>Argemone ochroleuca</i>	Forb	Exotic - 1b
Poaceae	<i>Aristida adscensionis</i>	Graminoid	
	<i>Aristida congesta subsp. congesta</i>	Graminoid	
	<i>Aristida diffusa</i>	Graminoid	
	<i>Cenchrus ciliaris</i>	Graminoid	
	<i>Chloris virgata</i>	Graminoid	
	<i>Digitaria eriantha</i>	Graminoid	
	<i>Enneapogon desvauxii</i>	Graminoid	
	<i>Enneapogon chencerooides</i>	Graminoid	
	<i>Eragrostis bicolor</i>	Graminoid	
	<i>Eragrostis biflora</i>	Graminoid	
	<i>Eragrostis echinocloidea</i>	Graminoid	
	<i>Eragrostis lehmanniana</i>	Graminoid	
	<i>Eragrostis rotifer</i>	Graminoid	
	<i>Eragrostis trichophora</i>	Graminoid	
	<i>Fingerhuthia africana</i>	Graminoid	
	<i>Melinis repens</i>	Graminoid	
	<i>Oropetium capense</i>	Graminoid	
	<i>Panicum coloratum</i>	Graminoid	
	<i>Schmidtia kalahariensis</i>	Graminoid	
	<i>Setaria verticillata</i>	Graminoid	
<i>Sporobolus cf. ludwigii</i>	Graminoid		
<i>Sporobolus ioclados</i>	Graminoid		
<i>Stipagrostis ciliata</i>	Graminoid		
<i>Tragus berteronianus</i>	Graminoid		
Rhamnaceae	<i>Ziziphus mucronata</i>	Shrub	
Scrophulariaceae	<i>Aptosimum lineare</i>	Forb	
	<i>Aptosimum spinescens</i>	Forb	
Solanaceae	<i>Datura ferox</i>	Forb	Exotic
	<i>Solanum giftbergense</i>	Forb	
	<i>Lycium bosciifolium</i>	Shrub	
	<i>Lycium cinerium</i>	Shrub	
Asphodelaceae	<i>Bulbine cf. abyssinica (Sch 2)</i>	Geophyte	
	<i>Aloe claviflora (Sch 2)</i>	Succulent	
Zygophyllaceae	<i>Tribulus terrestris</i>	Creeping forb	
	<i>Tetraena simplex</i>	Creeping succulent	

13.3.2. Appendix 3B: Important taxa within each respective vegetation type

Important plant taxa associated with the Bushmanland Arid Grassland

Growth form	Species	
Geophytic Herb	<i>Moraea venenata</i>	
Graminoid	<i>Aristida adscensionis</i>	<i>Schmidtia kalahariensis</i>
	<i>Aristida congesta</i>	<i>Setaria verticillata</i>
	<i>Cenchrus ciliaris</i>	<i>Sporobolus nervosus</i>
	<i>Enneapogon desvauxii</i>	<i>Stipagrostis brevifolia</i>
	<i>Enneapogon scaber</i>	<i>Stipagrostis ciliata</i>
	<i>Eragrostis annulata</i>	<i>Stipagrostis obtusa</i>
	<i>Eragrostis nindensis</i>	<i>Stipagrostis uniplumis</i>
	<i>Eragrostis porosa</i>	<i>Tragus berteronianus</i>
	<i>Eragrostis procumbens</i>	<i>Tragus racemosus</i>
	<i>Panicum lanipes</i>	
Herb	<i>Acanthopsis hoffmannseggiana</i>	<i>Lotononis oligocephala</i>
	<i>Barleria lichtensteiniana</i>	<i>Lotononis platycarpa</i>
	<i>Aizoon canariense</i>	<i>Sesamum capense</i>
	<i>Amaranthus praetermissus</i>	<i>Nemesia maxii</i>
	<i>Dicoma capensis</i>	<i>Vahlia capensis</i>
	<i>Chamaesyce inaequilatera</i>	<i>Tribulus pterophorus</i>
	<i>Indigastrum argyraeum</i>	<i>Tribulus terrestris</i>
Low Shrub	<i>Barleria rigida</i>	<i>Pteronia sordida</i>
	<i>Blepharis mitrata</i>	<i>Rosenia humilis</i>
	<i>Monechma incanum</i>	<i>Senecio niveus</i>
	<i>Monechma spartioides</i>	<i>Hermannia spinosa</i>
	<i>Aizoon asbestinum</i>	<i>Limeum aethiopicum</i>
	<i>Aizoon schellenbergii</i>	<i>Phaeoptilum spinosum</i>
	<i>Tetragonia arbuscula</i>	<i>Lophiocarpus polystachyus</i>
	<i>Sericocoma avolans</i>	<i>Polygala seminuda</i>
	<i>Berkheya annectens</i>	<i>Talinum arnotii</i>
	<i>Eriocephalus ambiguus</i>	<i>Aptosimum elongatum</i>
	<i>Eriocephalus spinescens</i>	<i>Aptosimum lineare</i>
	<i>Pentzia pinnatisecta</i>	<i>Aptosimum marlothii</i>
	<i>Pentzia spinescens</i>	<i>Aptosimum spinescens</i>
<i>Pteronia leucoclada</i>	<i>Solanum capense</i>	

	<i>Pteronia mucronata</i>	<i>Zygophyllum microphyllum</i>
Small Tree	<i>Boscia foetida</i> subsp. <i>foetida</i>	<i>Acacia mellifera</i> subsp. <i>detinens</i>
Succulent Herb	<i>Trianthema parvifolia</i>	<i>Kleinia longiflora</i>
	<i>Tridentea dwequensis</i>	<i>Salsola glabrescens</i>
	<i>Gisekia pharnacioides</i>	<i>Salsola tuberculata</i>
	<i>Psilocaulon coriarium</i>	<i>Dinteranthus pole-evansii</i>
	<i>Larryleachia dinteri</i>	<i>Ruschia kenhardtensis</i>
	<i>Larryleachia marlothii</i>	<i>Lycium bosciifolium</i>
Tall Shrub	<i>Rhigozum trichotomum</i>	<i>Parkinsonia africana</i>
	<i>Cadaba aphylla</i>	<i>Lycium cinereum</i>

Important plant taxa associated with the northern upper karoo

Growth form	Species	
Geophytic herb	<i>Moraea pallida</i>	
Graminoid	<i>Aristida adscensionis</i>	<i>Fingerhuthia africana</i>
	<i>Aristida congesta</i>	<i>Heteropogon contortus</i>
	<i>Aristida diffusa</i>	<i>Sporobolus fimbriatus</i>
	<i>Enneapogon desvauxii</i>	<i>Stipagrostis ciliata</i>
	<i>Eragrostis bicolor</i>	<i>Stipagrostis obtusa</i>
	<i>Eragrostis lehmanniana</i>	<i>Themeda triandra</i>
	<i>Eragrostis obtusa</i>	<i>Tragus berteronianus</i>
	<i>Eragrostis porosa</i>	<i>Tragus koelerioides</i>
	<i>Eragrostis truncata</i>	<i>Tragus racemosus</i>
Herb	<i>Chamaesyce inaequilatera</i>	<i>Lessertia pauciflora</i>
	<i>Convolvulus boedeckerianus</i>	<i>Manulea deserticola</i>
	<i>Convolvulus sagittatus</i>	<i>Radyera urens</i>
	<i>Dicoma capensis</i>	<i>Sesamum capense</i>
	<i>Gazania krebsiana</i>	<i>Sutera pinnatifida</i>
	<i>Hermannia comosa</i>	<i>Tribulus terrestris</i>
	<i>Indigofera alternans</i>	<i>Vahlia capensis</i>
Low shrub	<i>Amphiglossa triflora</i>	<i>Melolobium candicans</i>
	<i>Aptosimum marlothii</i>	<i>Microloma armatum</i>
	<i>Aptosimum spinescens</i>	<i>Osteospermum leptolobum</i>
	<i>Asparagus glaucus</i>	<i>Osteospermum spinescens</i>
	<i>Atriplex spongiosa</i>	<i>Pegolettia retrofracta</i>
	<i>Barleria rigida</i>	<i>Pentzia calcarea</i>

	<i>Berkheya annectens</i>	<i>Pentzia globosa</i>
	<i>Chrysocoma ciliata</i>	<i>Pentzia incana</i>
	<i>Eriocephalus ericoides</i> subsp. <i>ericoides</i>	<i>Pentzia lanata</i>
	<i>Eriocephalus glandulosus</i>	<i>Pentzia spinescens</i>
	<i>Eriocephalus spinescens</i>	<i>Phyllanthus maderaspatensis</i>
	<i>Euryops asparagoides</i>	<i>Plinthus karooicus</i>
	<i>Felicia muricata</i>	<i>Pteronia glauca</i>
	<i>Galenia exigua</i>	<i>Pteronia sordida</i>
	<i>Gnidia polycephala</i>	<i>Rosenia humilis</i>
	<i>Helichrysum lucilioides</i>	<i>Selago geniculata</i>
	<i>Hermannia spinosa</i>	<i>Selago saxatilis</i>
	<i>Leucas capensis</i>	<i>Tetragonia arbuscula</i>
	<i>Limeum aethiopicum</i>	<i>Zygophyllum lichtensteinianum</i>
Semiparasitic shrub	<i>Thesium hystrix</i>	
Small tree	<i>Acacia mellifera</i> subsp. <i>detinens</i>	<i>Boscia albitrunca</i>
Succulent herb	<i>Psilocaulon coriarium</i>	
Succulent shrub	<i>Hertia pallens</i>	<i>Salsola rabieana</i>
	<i>Lithops hookeri</i>	<i>Salsola tuberculata</i>
	<i>Salsola calluna</i>	<i>Stomatium pluridens</i>
	<i>Salsola glabrescens</i>	<i>Zygophyllum flexuosum</i>
Tall shrub	<i>Gymnosporia szyszylowiczii</i> subsp. <i>namibiensis</i>	<i>Lycium oxycarpum</i>
	<i>Lycium cinereum</i>	<i>Lycium schizocalyx</i>
	<i>Lycium horridum</i>	<i>Rhigozum trichotomum</i>

13.4. Appendix 4: Pictures



Photo 1: *Oxalis haedulipes*



Photo 2: *Hoodia gordonii*



Photo 3: *Boscia albitrunca*



Photo 4: *Nerine laticoma* and *Ammocharis coranica*



Photo 5: *Oxalis lawsonii*



Photo 6: *Tephrocactus articulatus* a serious category 1b invader.



Photo 7: *Aloe claviflora* growing inside a juvenile *Boscia albitrunca*



Photo 8: *Euphorbia fusca* taken by van Rensburg (2022)



Photo 9: *Hoodia officinalis* captured by van Rensburg (2022)



Photo 10: *Titanopsis calcareae* taken by van Rensburg (2022)



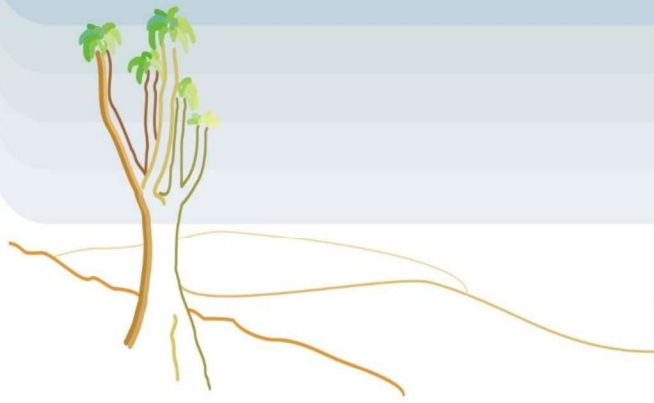
Photo 11: Herbarium specimen of *Tridentea virescens*.



Photo 12: *Tridentea gemmiflora*, a succulent with somewhat similar characteristics to *Tridentea virescens* (left). Picture sourced from Lucstrydom @ <https://www.inaturalist.org/observations/108356376>



Appendix D2
Aquatic ecological report



DPR
Ecologists & Environmental Services

Freshwater Ecological Assessment for a proposed solar development (extent of 134 hectares) for the Wonderpan solar facility located near Prieska, Northern Cape Province.

May 2022

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