Upilanga PV1

Northern Cape Province

Final Basic Assessment Report

DEA Ref:.14/12/16/3/3/1/2218

December 2020

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PROJECT DETAILS

Title	:	Basic Assessment Process: Final Basic Assessment Report for Upilanga PV1, a solar PV facility and associated infrastructure proposed on a site near Upington and within the Upington Renewable Energy Development Zone (REDZ), in the Northern Cape Province.
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Client	:	Emvelo Capital Projects (Pty) Ltd
Report Revision	:	Final Basic Assessment Report for Authority Decision making
Date	:	December 2020

When used as a reference this report should be cited as: Savannah Environmental (2020) Final Basic Assessment for Upilanga PV1, Northern Cape Province.

PURPOSE OF THE BA REPORT AND INVITATION TO COMMENT

Emvelo Capital Project (Pty) Ltd, the proponent, proposes the development of a 100MW solar photovoltaic (PV) facility, as well as, associated infrastructure on a study area and development area located near the town of Upington in the Northern Cape Province. The solar PV facility will be known as Upilanga PV1. The study area falls within the jurisdiction of the Dawid Kruiper Municipality and the greater ZF Mgcawu District Municipality, as well as, the Upington Renewable Energy Development Zone (REDZ).

The project development footprint is within the development area that will house the proposed development, and which has been considered fully within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective within this Basic Assessment (BA) Report.

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Upilanga PV1 requires Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA) subject to the completion of a Basic Assessment process, as prescribed in Regulations 21 to 24 of the EIA Regulations, 2014 (GNR 326) and as per GNR 114. The need for EA subject to the completion of Basic Assessment process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 2 (GNR 325) as well as the location of the development area within the Upington REDZ.

The BA Report was available for review from 03 August 2020 to 04 September 2020 at the following location:

» https://www.savannahsa.com/public-documents/energy-generation/upilanga-solar-park/.

Following comments received during the review period, the Basic Assessment Report had been revised to include the following additional information:

» An offset analysis that accounts for the irreversible loss of protected species (refer to Section 7 of this report and Appendix D1 for the full offset analysis report).
» A revised Environmental Management Programme (EMPr) to include the outcomes (objectives) and actions to implement the offset analysis (refer to Appendix K).

The Revised Basic Assessment Report was made available for a 30-day review and comment period in accordance with Regulation 19(1) (b) of the EIA Regulations, 2014 (as amended) from **Wednesday 11 November 2020 to Friday, 11 December 2020**. The availability of the Revised Basic Assessment Report for the 30-day comment and review period was advertised in the Gemsbok Newspaper on **Wednesday, 11 November 2020.** The Revised Basic Assessment Report was made available for download from Savannah Environmental's website: https://www.savannahsa.com/public-documents/energy-generation/upilanga-solar-park/ .

Changes to this final basic assessment report have been underlined for ease of reference.

EXECUTIVE SUMMARY

Emvelo Capital Project (Pty) Ltd, the proponent, proposes the development of a 100MW solar photovoltaic (PV) facility, as well as, associated infrastructure on a study area and development area located near the town of Upington in the Northern Cape Province. The solar PV facility will be known as Upilanga PV1. The study area falls within the jurisdiction of the Dawid Kruiper Municipality and the greater ZF Mgcawu District Municipality, as well as, the Upington Renewable Energy Development Zone (REDZ).

A development area of 350ha has been identified within the study area by the proponent for the development of Upilanga PV1 and associated infrastructure, which has been fully considered within this BA process and assessed in terms of its suitability from an environmental and social perspective within this BA Report.

The development area is regarded as being of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities. Upilanga PV1 will have a contracted capacity of up to 100MW and will include specific infrastructure, namely:

- Solar PV panels with a maximum height of 5m utilising Single axis tracking; Fixed axis tracking; Dual axis tracking or Fixed Tilt mounting structures made of galvanised steel and aluminium.
- Grid alternatives using underground cables to connect to the on-site substations at authorised site and 1.4 and authorised grid connection to the Ilanga substation.
- A step-up facility (transformer) to step up the electricity current from 11kV/22kV/33kVto 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
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- An access road to the development area no more than 6m wide.
- Internal access roads within the PV panel array area with a maximum width of 4m.
- Perimeter security fencing around the development area.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Three grid connection alternatives have been assessed within this Basic Assessment process:

1) On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 33kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref: 14/12/16/3/3/2/299) to the existing Ilanga substation.
2) An onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation).
3) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

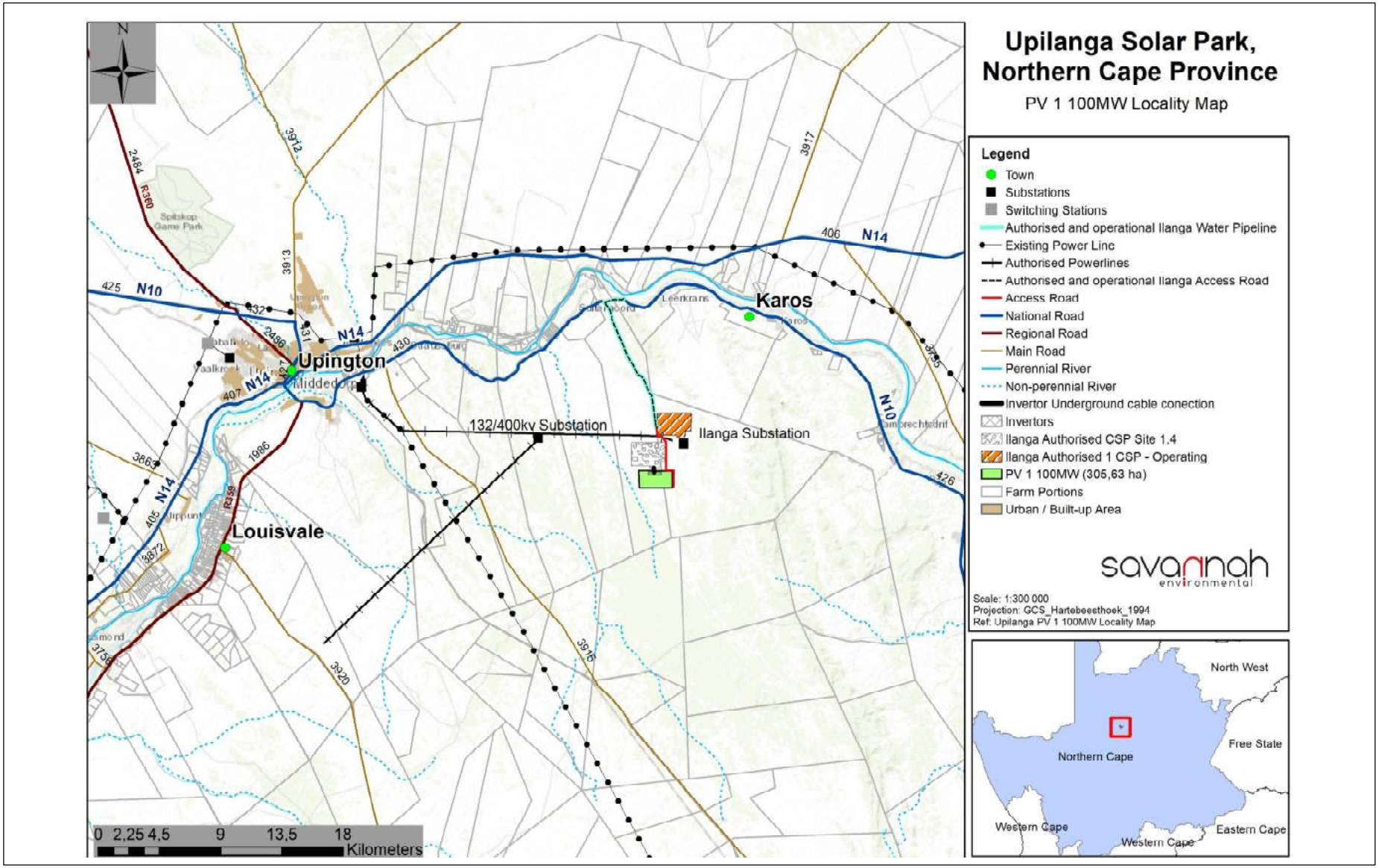

Figure 0.1: Locality map illustrating the location of the study area and development area under investigation for the development of Upilanga PV1

Emvelo Capital Projects (Pty) Ltd has confirmed that the development area is suitable for the development of a solar energy facility from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability, site-specific characteristics such as topography and accessibility, the location within the Upington REDZ, as well as the proximity of the area to authorised and constructed solar energy facilities, i.e. the operational Ilanga CSP One facility and authorised CSP sites 1.3 and 1.4.

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists.

The potential environmental impacts associated with Upilanga PV1 identified and assessed through the BA process include:

» Impacts on ecology, flora and fauna.
» Impacts on avifauna.
» Impacts on aquatic resources.
» Impacts to soils, land types and agricultural potential.
» Impacts on heritage resources, including archaeology and palaeontology.
» Visual impacts on the landscape as a result of the facility.
» Positive and negative social impacts.

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. Some mitigation measures have already been considered and implemented through the micro-siting of the solar PV facility development footprint, such as the avoidance of the major drainage features located within the development area of Upilanga PV1. The abundance of protected tree species, especially *Boscia albitrunca*, within the development footprint is relatively high and as many as 3000 individuals of this species would be lost to the development. An offset analysis for this species has been undertaken to investigate the need and quantum of the offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities. It is the intention of the developer to investigate a land offset of up to 30 000ha within the Upilanga Solar Park to create a conservation area. This is to be discussed and agreed with the Department of Forestry (part of DEFF) and implemented once the project is developed.

The potential environmental impacts associated with Upilanga PV1 identified and assessed through the BA process include:

» Impacts on ecology, flora and fauna.
» Impacts on avifauna.
» Impacts on aquatic resources.
» Impacts to soils, land types and agricultural potential.
» Impacts on heritage resources, including archaeology and palaeontology.
» Visual impacts on the landscape as a result of the facility.
» Positive and negative social impacts.

Impacts on Ecology

The field assessment as well as a desktop review of the available ecological information for the area revealed that the vegetation of the development area consists of Kalahari Karroid Shrubland with some Bushmanland Arid Grassland on deeper soils across the site.

In terms of sensitive features, the vegetation of the development area is considered generally moderate to low sensitivity with few plant species of concern present. There is a relatively high density of the protected tree species *Boscia albitrunca* within the development footprint and as many as 3000 individuals would be impacted. An offset analysis for this species has been conducted to investigate the need and quantum of the offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities (Appendix D1). Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia (Acacia) erioloba* and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. Within the Upilanga PV 1 footprint, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 10 trees/ha with the result that the development would result in the loss of approximately 3000 individuals of this species. This far exceeds the guideline amount of trees that DEFF finds acceptable for loss without an offset. The appropriate offset will therefore be required to be developed and agreed with DEFF and other provincial authorities once the project is selected as a Preferred Bidder project, and prior to construction commencing.

Although there are quartz patches in the area which are home to several local endemics or specialised species such as Lithops, no quartz patches home to such species were observed within the development area.

The majority of the site lies within an area classified as "Other natural areas" and has not been classified as a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA). There are no CBAs in close proximity to the development area, indicating that the establishment of Upilanga PV 1 does not pose a threat to any CBAs or other areas considered to be of significance from a broad-scale conservation planning perspective

In terms of fauna, there are few species of conservation concern that are likely to be present or abundant at the site and the primary impact of the development on fauna would be some habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur as a result of the development. Consequently, the impacts of the development on fauna and flora are considered acceptable and would be of low significance after mitigation.

Offset Analysis

The primary motivations for an offset for the Upilanga Solar Park include the cumulative impact of the development on habitat loss, fragmentation and the loss of individuals of protected tree species. The residual impact associated with each was determined to be moderate and each PV project on its own was not considered sufficient to warrant an offset. Given the scale of development at the site and combined impact on ecological function and biodiversity at the site associated with the implementation of numerous projects proposed as part of the Solar Park, exceptional mitigation beyond standard avoidance and minimising of impacts is warranted. In order to address these concerns, Emvelo Capital Projects (Pty)_ Ltd has indicated that the remaining undeveloped part of the site could potentially be set aside as an offset for

the development. This has been critically evaluated and the offset analysis provides an examination of the potential of the site to be used as an offset to reduce the residual impacts of the development.

The investigation determined the following outcomes and conclusions regarding the site and its potential value and limitations as an offset:

- The majority of the development footprint is within the Bushmanland Arid Grassland vegetation type. This is an extensive vegetation type with few species or features of conservation concern present. Offsetting the development within this vegetation type would not be likely to result in significant biodiversity gains and is not recommended.
- The diversity of habitats at the site is quite high and this is seen as an important feature of the site as such habitat diversity does not often occur in the Kalahari/Bushmanland Bioregion. Of particular importance is the presence of approximately 2000ha of Lower Gariep Broken Veld at the site. This vegetation type is currently Poorly Protected and is likely to remain severely under-protected into the future as a sufficient extent does not fall within any NPAES focus areas.
- Should the site be committed to formal conservation, the contribution of 2000ha of Lower Gariep Broken Veld to conservation would add 0.44% of the existing extent to conservation. Although this is not highly significant at the national level, it is considered locally significant. In addition, it is important to note that many of the specialised species and species of conservation concern of the wider area are associated with the Lower Gariep Broken Veld vegetation type. As such it clear that the biodiversity value of Lower Gariep Broken Veld is greater than that of Bushmanland Arid Grassland on a per-area basis and the two cannot be traded on a 1 to 1 basis.
- The principle of like for like is a critical element of an offset, and in the current situation it could be argued that using Lower Gariep Broken Veld as an offset for the loss of habitat within Bushmanland Arid Grassland violates this principle. This is however not a valid argument, because it is the cumulative impacts on broad scale ecological processes and protected tree species that are the primary drivers of the need for an offset and neither of these are specifically associated with Bushmanland Arid Grassland but rather the ecosystem more generally. As such, the fact that the ecosystem within the development footprint is relatively poor in terms of biodiversity value, is expected given the first two tiers of the mitigation hierarchy which aim to avoid impact on the high value ecosystems of the site. In addition, ecological processes in semi-arid and arid regions operate over large scales and the development can therefore be seen within the context of the surrounding ecosystem and should not be isolated to just the affected vegetation type. Therefore, it is clear that the undeveloped parts of the property represent the best opportunity to offset the impacts of the development on a like for like basis.
- The density of protected trees within the undeveloped area is variable, it is estimated that there would be 2-3 times the number of protected trees outside of the development footprint as compared to those within the proposed footprint. This is considered adequate representation of protected trees within the offset to counter the loss of trees within the footprint.
- The overall conclusion and recommendation regarding the potential of the undeveloped part of the site to act as an offset is that the potential contribution of the site to conservation targets and outcomes is considered to be significant and as such is adequate to offset the moderate residual impacts of the development.
- Given the high development pressure in the Upington area, the area would benefit from a fine-scale conservation plan, which would enhance development planning in the area. This should focus on the distribution of rare and localised habitats with specific associated species such as quartz patches and pans. It should also focus on ensuring that the broad-scale connectivity and functioning of the landscape

is maintained as the impacts of renewable energy development are likely to be most felt by faunal which move extensively about the landscape.

Impacts on Avifauna

A total of 163 bird species have been recorded within the broader study area and surrounds. Eleven (11) are red-listed species, six (6) are listed as near-endemic and a further ten (10) species are biome-restricted. There are no known Important Bird Areas (IBAs) or wetlands of significant avifaunal importance within the vicinity of the broader study area (other than the Orange River located within 12 km to the north).

The broader study and development area consists primarily of Bushmanland Arid Grassland habitat with some components of Kalahari Karroid Shrubland in some areas and likely supports a fairly typical avifaunal assemblage expected for the area. Eleven (11) red data listed species are known to occur within the surrounding environment, of which at least four (4) terrestrial species (Ludwig's Bustard, Karoo Korhaan, Kori Bustard, and Secretarybirds are considered common while others appear to occur less frequently.

Five (5) of the eleven (11) red-listed species are considered most important as they would potentially be impacted the most due to habitat loss and displacement. Species considered to be most important include the Ludwig's Bustard (Endangered), *Secretarybird* (Vulnerable), Karoo Korhaan (Near-threatened) and Kori Bustard (Near-threatened). The White-backed Vulture (Critically Endangered) and Lappet-faced Vulture have been recorded in the wider area but are unlikely to be highly affected by the development and as their presence is likely sporadic during infrequent foraging trips. The Black Stork (Vulnerable) is unlikely to occur due to the absence of suitable habitat, but may occur along the nearby Orange River where more suitable habitat exists. A Black Harrier (Endangered) and breeding pair of Verreaux's Eagle (Vulnerable) have been recorded within the broader study area; however neither species were recorded on either SABAB1 or SABAB2 cards and thus likely have a low frequency of occurrence and only be affected by reduced foraging ground. Use was made of the data from two seasons of monitoring for 2015 and 2016. Each visit included surveys in 1km transects across the site. These transects covered all main habitat types present. Vantage Point observations were also undertaken covering 12 hours in each season as promoted by the draft BARESG guidelines (Jenkins et al. 2015). Previous avifauna monitoring on the site (undertaken by Birds and Bats Unlimited in 2016 over 2 seasons) recorded large Sociable Weaver nests on site. No other sensitive breeding or roosting sites of any red-listed species were recorded. . It is possible that there is a Secretarybird nest within the vicinity of the broader study area. Consequently, a conservative approach has been adopted when assessing the impact of the development on the avifauna.

The proposed development area for the Upilanga PV1 facility is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the broader study area supports a typical bioregional avifaunal assemblage, there are no impacts associated with the development that are considered to be of high residual significance and which cannot be mitigated to an acceptable level. As there are no high residual impacts associated with the development it can be supported from an avifaunal perspective. It is, therefore, the reasoned opinion of the specialists that the Upilanga PV1 development be authorised, subject to a verification site visit and the implementation of the recommended mitigation measures.

Impacts on Aquatic Resources

A variety of wetland types were identified near the study area and included depressions / pans and riverine floodplain, the latter being considered alluvial watercourses in this landscape setting. The study area systems are ephemeral and only carried water for a short week long period in 2014 and in 2019, thus the observed development area systems don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.25 m and 5 m wide were mostly terrestrial. This coupled to the fact that the footprints will largely avoid the mainstem rivers it is anticipated that a detailed hydrological assessment is not required.

The Aquatic Resources Impact Assessment (**Appendix F**) assessed the impact of Upilanga PV1 on aquatic resources and/or features present within the study area and development area for the life-cycle of the project. In summary, the aquatic impact assessment concluded that the proposed layout for the Upilanga PV1 facility would have no detrimental impact on the following:

» Any Very High sensitivity areas identified by the DEA Screening Tool
» Mainstem rivers and Pans that do contain functioning aquatic environments that received a Very High sensitivity rating.

Some impacts (panel areas & road crossings) are located in secondary alluvial water courses and minor drainage lines that were either fragmented or contained no riparian zones, with a Moderate sensitivity.

With the proposed mitigation (proper stormwater management and post construction rehabilitation), the impacts would be Low and acceptable for development, as these areas contained no aquatic habitat, and only functioned as a means to sustain / convey baseflows within the greater catchment. The proposed development would in essence not impact on this as surface runoff, although managed to prevent erosion, would still emanate from the site (when significant rainfall occurs), thus maintain this aspect of the hydrological system observed.

Therefore, based on the results of this report, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be Low. This includes the internal roads proposed that would need to cross some of these systems. This is based on the fact that some of the aquatic features to be affected by the proposed development contain no aquatic habitat and only function as a means to sustain or convey baseflows within the catchment. The development of Upilanga PV1 would not have an impact on this aspect, as surface run-off will emanate from the development footprint (when significant rainfall occurs); therefore, the hydrological system observed within the area will be maintained.

The construction and operation of Upilanga PV1 and the associated infrastructure is supported from an aquatic resources perspective and is considered acceptable subject to the developer obtaining the necessary water use authorisation from the Department of Water and Sanitation.

Impacts on Soil and Agricultural Potential

The very low rainfall and hot conditions in the study area, coupled with the sandy and/or rocky soils, mean that the prevailing agricultural potential is very low. Due to the predominance of very sandy soils, often with a fine grade of sand, the hazard of wind erosion when the topsoil is disturbed may be significant, as these areas are mapped as "highly susceptible".

The Soil and Agricultural Potential Assessment for the proposed Upilanga PV1 (**Appendix G**) has identified and assessed impacts associated with the development of Upilanga PV1. These impacts are expected during the construction and operation phases and include loss of agricultural land and increased soil erosion hazard caused by wind. These impacts will be negative with a permanent to short term-term duration depending on the impact being considered and will have a magnitude of moderate to low. The significance of the impacts is low, following the implementation of the recommended mitigation measures. No impacts of a high significance have been identified.

No fatal flaws have been identified from a soils and agricultural perspective; therefore, all impacts can be mitigated to be within an acceptable level of impact during life cycle of the project. The specialist has indicated that the development of Upilanga PV1 can be authorised and that the development footprint proposed and assessed as part of this BA Report is acceptable from a soils and agricultural potential perspective. This is subject to the implementation of the recommended mitigation measures as provided by the specialist.

Impacts on Heritage (including archaeology and palaeontology)

The Heritage Impact Assessment (**Appendix H**) assessed the impact of Upilanga PV1 on archaeological and palaeontological resources within the study area and development area for the life cycle of the project. It is expected that impacts to heritage resources will occur during the construction phase due to the on-ground disturbance required by the construction activities.

No significant heritage resources or formal and informal graves were identified within the development area for Upilanga PV1. No significant heritage resources were identified within the footprint for the proposed Upilanga 1 100MW Solar PV facility and associated infrastructure. The stone age occurrences identified consist of isolated finds, and low-density ex-situ surface scatters containing predominantly of Middle Stone Age (MSA) material, with a few incidences of Later Stone Age (LSA) lithics. The lithic material identified is of low significance (not conservation-worthy), and even though the resources may be destroyed during construction, the impact is inconsequential. No mitigation is required for archaeological material recorded in the footprint areas of the proposed Upilanga PV1. The significance of the impact on archaeological resources is therefore low, with a long-term duration and a low magnitude. Therefore, the development of Upilanga PV1 will not have a significant negative impact on the heritage resources identified within the development area.

The igneous and metamorphic basement rocks of Precambrian age underlying the entire study area are entirely unfossiliferous. The overlying aeolian sands, calcretes, surface gravels and stream deposits of the Kalahari Group mantling the ancient bedrocks are generally of low to very low palaeontological sensitivity. Low-level impacts on fossil heritage here are probable. However, the probability of significant impacts on palaeontological heritage is considered to be low.

Based on the nature of the heritage resources identified and the lack of any fossils recorded or expected in the area, the significance of the impacts will be low, with the implementation of the recommended mitigation measures. As such, the development of Upilanga PV1 is not associated with any fatal flaws from a heritage, archaeological and palaeontological perspective, and it is for this reason that the project is considered to be acceptable.

Visual Impacts

The proposed 100MW PV Plant is expected to have a very contained core area of visual exposure, generally restricted to a 1 - 3km radius of the site. This is due to the generally constrained height of the PV Plant structures. The core area of visual exposure is entirely restricted to the properties earmarked for the Upilanga Solar Park and there are no potentially sensitive visual receptors located within a 1 - 3km radius of the proposed development.

Potential visual impacts identified within the Visual Impact Assessment (**Appendix I**) include construction activities on in close proximity to the PV plant, visual impacts to observers travelling along the roads and residents at homesteads within 3km-6km of the proposed PV facility, impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility, impact of solar glint and glare as a visual distraction and possible air travel hazard, impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures and potential impact on the sense of place of the region.

The duration of the impacts is expected to be long-term for majority of the visual impacts and with a magnitude ranging from moderate to low. The significance of the impacts will be medium and low with the implementation of mitigation, depending on the impact being considered. No impacts of a high significance are expected to occur. Potential mitigation factors for the 100MW PV Plant include the fact that the facility utilises a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. The development of Upilanga PV1 is therefore considered to be acceptable from a visual perspective.

Social Impacts

The Social Impact Assessment (**Appendix J**) identified that most social impacts associated with the development of Upilanga PV1 will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. The magnitude of the impacts ranges from high to small depending on the impact being considered and the status thereof. Impacts on the social environment are expected during both the construction and operation phases. The construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures.

During the construction phase, negative impacts include, nuisance impacts (including noise and dust); an influx of construction workers and job seekers to the area and a change in population; safety and security impacts; impacts on daily living and movement patterns; and visual and a sense of place impacts. The significance of the negative construction phase impacts will be low with the implementation of the recommended mitigation measures. The positive social impacts associated with the construction phase of Upilanga PV1 include, an economic multiplier effect, and direct and indirect employment and skills development opportunities. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures by the specialist.

Impacts associated with the operation of Upilanga PV1 will be both positive and negative. The negative impacts are related to the change in the sense of place and the loss of agricultural land and overall productivity as a result of the operation of the solar PV facility. The significance of the negative impacts will

be low with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of the facility relate to the development of non-polluting renewable energy infrastructure, a contribution to Local Economic Development (LED) and social upliftment, and the creation of employment and skill development opportunities for the local economy and the country. The significance of the positive impacts will be low and medium with the implementation of the recommended enhancement measures.

Upilanga PV1 is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that Upilanga PV1 can be authorised from a social perspective.

Comparative Assessment of the Grid Connection Alternatives

Three main grid connection alternatives are proposed by the proponent to provide grid evacuation solutions to the Upilanga PV1 development area during the construction, operation and the decommissioning phase of the proposed development. These include the following:

- **Alternative 1 (technically preferred):** consists of an on-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation.

- **Alternative 2:** consists onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation); and

- **Alternative 3:** Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

Alternative 1 is considered to be the preferred technical alternative.

As it is expected that all 3 alternatives would have similar impacts on the environment, as concluded by the specialist studies, there is no preference regarding the power line alternatives. Therefore, the preferred technical alternative, Alternative 1, is supported.

Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The most significant of these will be the contribution towards a reduction in greenhouse gas emissions and consequent assistance with climate change mitigation.

The alignment of renewable energy developments with the IRP and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive.

The social and economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant. However, there is a lack of understanding of the cumulative impacts on other environmental and social receptors such as birds, visual amenity and landscape character of the affected areas largely due to limited information of impacts from existing facilities within the country. This assessment is therefore qualitative.

The assessment of the cumulative impacts was undertaken through the consideration of the Upilanga PV1 impacts in isolation and compared to the cumulative impacts of Upilanga PV1 and other solar facilities including the proposed Upilanga Solar Park (CSP & PV facilities) within a 50km radius from the development area. Cumulative impacts are expected to occur with the development of Upilanga PV1 throughout all phases of the project life cycle and within all areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Upilanga PV1 is to determine whether the cumulative impact will be acceptable within the landscape proposed for the development, and whether the cumulative loss, from an environmental and social perspective, will be acceptable without whole-scale change.

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Upilanga PV1 will be acceptable and the majority are rated as being of low to medium significance with the implementation of appropriate mitigation. On this basis, the following can be concluded considering the Upilanga PV1 Facility:

- There are no impacts associated with the establishment of Upilanga PV1 that cannot be mitigated to a medium or low significance, the impact of the development on the protected tree, *B. albitrunca* has been investigated in terms of the potential for the establishment of an offset to counter the impact on this species (Appendix D1). The proximity of Upilanga PV1 to the existing developments is seen as a positive aspect of the development and overall cumulative impacts associated with the Upilanga PV development are considered acceptable. In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them.
- Low- Medium risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected. In terms of potential losses to landscape connectivity, the development area is not considered to lie within an area that is considered a likely avifaunal movement corridor or along an important ecological gradient, and as such, the overall cumulative impact of the development is considered acceptable.
- Low risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. A number of solar projects have been constructed in the area, creating an existing impact and alteration to the current sense of place.
- The construction of the project will not result in unacceptable loss of or impact to heritage resources.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Upilanga PV1 and other proposed renewable energy facilities in the region are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the Upington REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

Figure 0.2 provides an environmental sensitivity map of the preferred layout for Upilanga PV1.

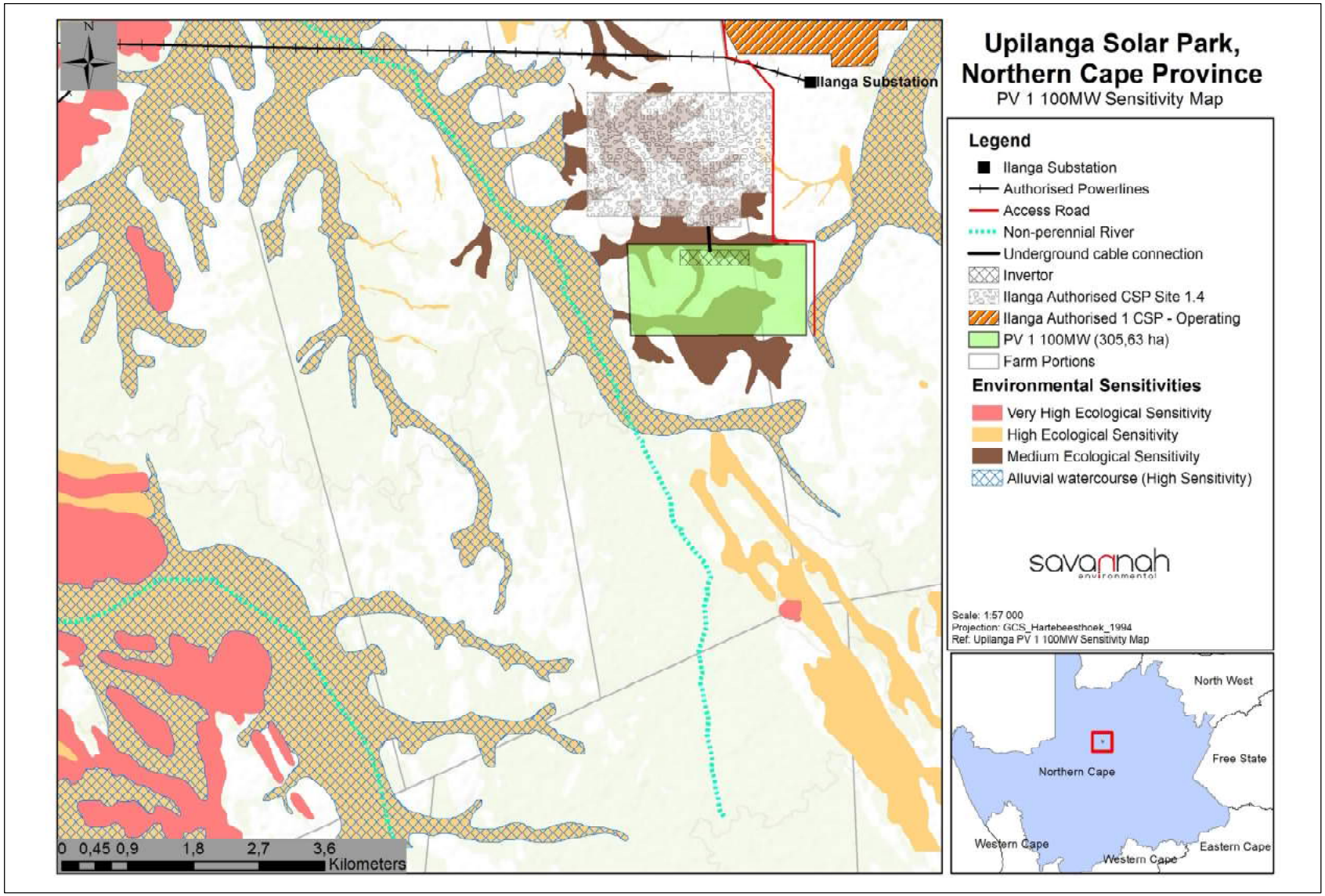

Figure 0.2: Final preferred layout map of the preferred development footprint for Upilanga PV 1, as was assessed as part of the BA process, overlain with the environmental sensitivities (refer to **Appendix O** for A3 maps)

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: 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 (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

i. The land, water and atmosphere of the earth;
ii. Micro-organisms, plant and animal life;
iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to 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 because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Biodiversity Offsets: Conservation measures designed to remedy the residual negative impacts of development on biodiversity and ecological infrastructure, once the first three groups of measures in the mitigation sequence have been adequately and explicitly considered (i.e. to avoid, minimize and rehabilitate/restore impacts).

Photovoltaic effect: Electricity can be generated using photovoltaic solar panels which are comprised of individual photovoltaic cells that absorb solar energy to directly produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods, but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: means— Any substance, whether or not that substance can be reduced, re-used, recycled and recovered-

(a) that is surplus, unwanted, rejected, discarded, abandoned or disposed of;
(b) which the generator has no further use of for the purposes of production;
(c) that must be treated or disposed of; or
(d) that is identified by the Minister by notice in the Gazette.

and includes waste generated by the mining, medical or other sector, but –

(i) a by-product is not considered waste; and
(ii) any portion of waste once re-used, recycled and recovered, ceases to be waste.

ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibels
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DENC	Northern Cape Department of Environment and Nature Conservation
DoE	Department of Energy
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NWA	National Water Act
PM	Post Meridiem; "Afternoon"
SAHRA	South African National Heritage Resources Agency
SWMP	Stormwater Management Plan

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CHAPTER 1: INTRODUCTION

Emvelo Capital Projects (Pty) Ltd, an independent power developer of solar power plants in South Africa, proposes the development of Upilanga PV1, a 100MW photovoltaic (PV) solar energy facility and associated infrastructure on a site located ~28km south-east of the town of Upington in the Northern Cape Province (refer to Figure 1.1). The project and associated infrastructure is proposed within Portion 3 of the Farm Matjesrivier 41 and Lot 944 and will form part of the Upilanga Solar Park. The site falls within the jurisdiction of the Dawid Kruiper and the greater ZF Mgcawu District Municipality.

As the project has the potential to impact on the environment, an Environmental Impact Assessment process is required to be completed in support of an application for Environmental Authorisation prior to the commencement of construction of the project. As the project falls within the Renewable Energy Development Zone (REDZ)[1] 7 (the Upington REDZ), a Basic Assessment (BA) process is applicable as per GNR114 of February 2018. This BA Report describes and assesses this proposed project and consists of the following chapters:

- **Chapter 1** provides background to Upilanga PV1 and the BA process.
- **Chapter 2** outlines strategic regulatory and legal context for energy planning in South Africa and specifically for Upilanga PV1.
- **Chapter 3** provides a description of Scope of the Upilanga PV1, including identified project alternatives.
- **Chapter 4** provides a motivation for the need and desirability of the proposed project.
- **Chapter 5** outlines the approach to undertaking the BA process.
- **Chapter 6** describes the existing biophysical and social environment within and surrounding the broader study and development area.
- **Chapter 7** provides an assessment of the potential issues and impacts associated with the solar PV facility and presents recommendations for the mitigation of significant impacts.
- **Chapter 8** provides an assessment of the potential cumulative impacts.
- **Chapter 9** presents the conclusions and recommendations based on the findings of the BA Report.
- **Chapter 10** provides references used in the compilation of the BA Report

[1] The REDZ are zones identified by the Department of Environmental Affairs (DEA) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities and which have been earmarked for the development of renewable energy facilities within South Africa as per GNR114 of February 2018

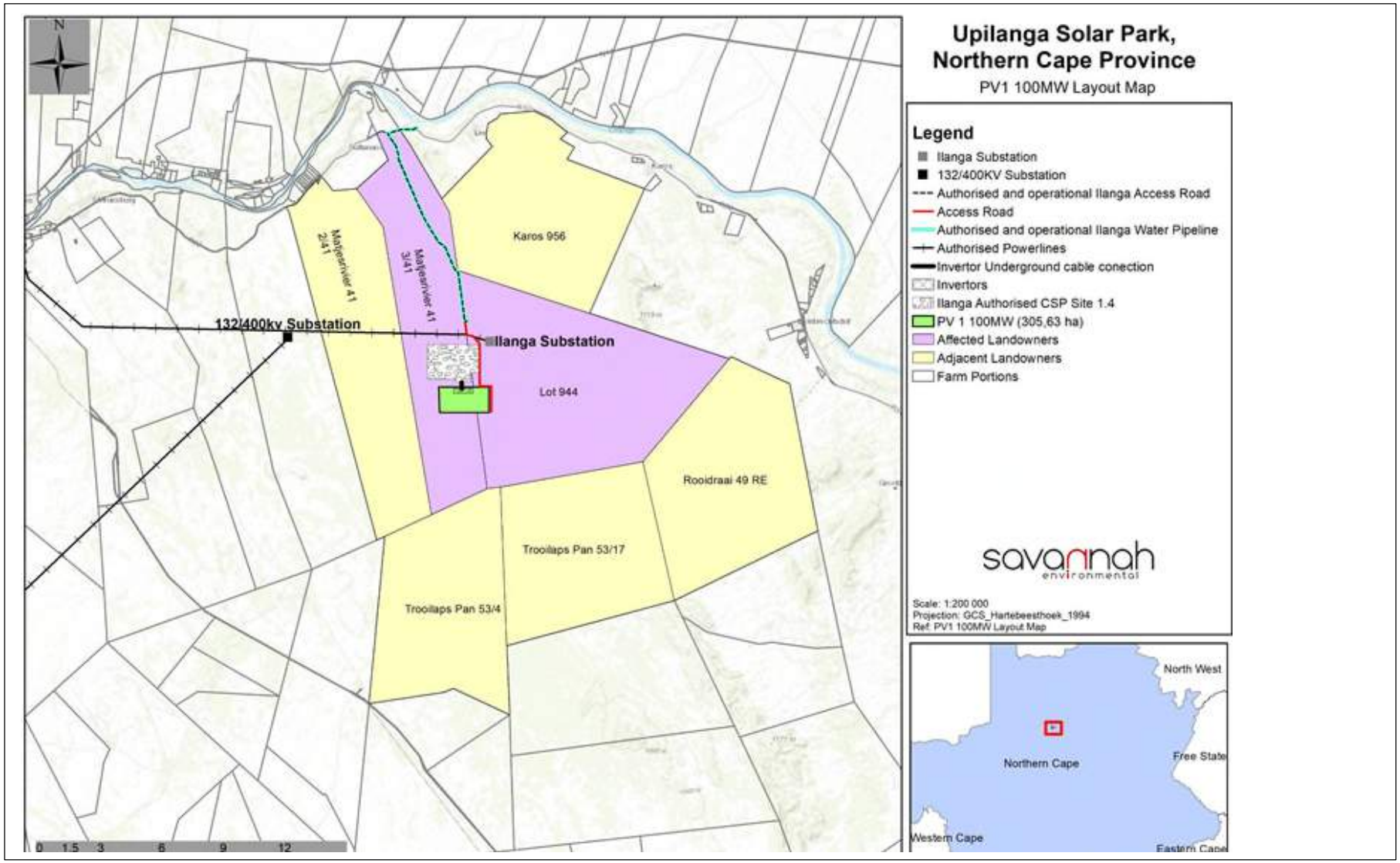


Figure 1.1: Locality map illustrating the Upilanga PV1 development area within the broader study area

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This BA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended) promulgated in terms of Chapter 5 of the National Environmental Management Act (No. 107 of 1998). This Chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
1(a) the details of the EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details and expertise of the EAP who prepared the report is included in section 1.4 and CVs of the project team are included in Appendix A.
(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	A description of the location of Upilanga PV1 is included in **Table 1.1** and **Figure 1.1**. The information provided includes the 21-digit Surveyor General Code of the affected property and the farm name. Information on the relevant province, local and district municipalities, ward and current land zoning is also provided.

1.2. Project Overview

The Integrated Resource Plan (IRP) 2019 developed by the Department of Energy indicates that South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. Renewable energy, including Solar PV, wind and CSP with storage present an opportunity to diversify the energy mix, to produce grid connected or distributed off-grid electricity. In order to achieve this diversified mix and harness the benefits of renewable energy, the IRP 2019 includes an allocation of 6000MW of new capacity to large scale PV, and a further 6000MW allocated to embedded generation.

From a regional perspective, the greater Upington area is considered favourable for the development of commercial solar energy facilities by virtue of the prevailing climatic conditions (as the economic viability of a solar energy facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the affected property, the availability of a direct grid connection (i.e. a point of connection to the national grid) and the availability of land on which the development can take place. The broader study area is designated as a Solar Corridor in terms of the Provincial Spatial Development Framework (PSDF) and is also located within the Upington REDZ and the Northern Grid Corridor.

It is in this context that the Upilanga PV1 project is being proposed. Ultimately, the project is intended to be a part of the renewable energy projects portfolio for South Africa, as contemplated in the Integrated Resource Plan, and Integrated Energy Plan.

The proposed project will have a contracted capacity of up to 100MW AC of electricity, and will make use of PV solar technology for the generation of electricity. A development area[2] of ~306ha is proposed for the Upilanga PV1 facility. The project will comprise the following key infrastructure and components:

[2] The development area is the identified area within the farm Matjesrivier 41 3 and Lot 944 within which the required infrastructure for the Upilanga PV1 solar facility and associated infrastructure will be sited. The facility layout of the infrastructure and the area to be covered by the infrastructure is known as the development footprint.

- Solar PV panels with a maximum height of 5m utilising Single axis tracking; Fixed axis tracking; Dual axis tracking or Fixed Tilt mounting structures made of galvanised steel and aluminium.
- Grid alternatives using underground cables to connect to the on-site substation at authorised site 1.4 and ultimately to the existing the Ilanga substation
- A step-up facility (inverter) to step up the electricity current from 11kV/22kV/33kVto 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
- An access road to the development area no more than 6m wide.
- Internal access roads within the PV panel array area with a maximum width of 4m.
- Perimeter security fencing around the development area.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The table below provides an overview of the Upilanga PV1 facility. The key infrastructure components associated with the development of Upilanga PV1 are described in greater detail within Chapter 3 of this BA Report.

Table 1.1: Overview of the Upilanga PV1 development area

Province	Northern Cape Province
District Municipality	ZF Mgcawu District Municipality
Local Municipality	Dawid Kruiper Local Municipality
Ward number(s)	Ward 14 of Dawid Kruiper Local Municipality
Nearest town(s)	Upington (28km)
Affected property of the development area: Farm name(s), number(s) and portion numbers	Matjesrivier 41 Portion 3 Lot 944 within the Karos Settlement
SG 21 Digit Code (s)	Matjesrivier 41 portion 3: C0360000000000004100003 Lot 944: C0360009000009440000 0
Current zoning of the study area	Agricultural land-use
Site Co-ordinates (corner co-ordinates of PV1)	1) 28°31'9.25"S, 21°30'27.12"E 2) 28°31'8.58"S, 21°31'55.03"E 3) 28°31'47.47"S, 21°31'55.72"E 4) 28°31'47.73"S, 21°30'28.18"E
Grid Connection	Grid Connection Alternatives for Upilanga PV1: 1) On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 33kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation. 2) An onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation). 3) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

Access Road	Access to the study area and development area is proposed via the existing N10 and via the existing unnamed tarred road to the existing Karoshoek CSP One facility. This unnamed road is to be extended by a ±15 km long, ± 6m wide tarred access road to the PV1 site or extended via a gravel access road to the PV1 site.

1.3. Details and Expertise of the Environmental Assessment Practitioner (EAP)

In accordance with Regulation 12 of the 2014 EIA Regulations (GN R326), Emvelo Capital Projects (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd (Savannah Environmental) as the independent environmental consultant to undertake the Basic Assessment and prepare the BA Report for Upilanga PV1 and its associated infrastructure. Neither Savannah Environmental nor any of its specialists are subsidiaries of/or are affiliated to Emvelo Capital Projects (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed solar PV facility.

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned) and is rated as a Level 2 Broad-Based Black Economic Empowerment (B-BBEE) Contributor. The company was established in 2006 with a clear objective to provide services to the infrastructure development sector. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

The Savannah Environmental team has considerable experience in environmental impact assessments and environmental management and has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa, including those associated with electricity generation and transmission.

The Savannah Environmental team comprises:

- **Arlene Singh.** She holds a Bachelor degree in Environmental Science and an Honours degree in Environmental Management and has seven years of experience in the environmental management field. Her key focus is on undertaking environmental impact assessments, public participation, environmental management plans and programmes**.** She is registered as a Candidate Natural Scientist with the South African Council for Natural Scientific Professions (SACNASP) and registered as Environmental Assessment Practitioner with the Environmental Assessment Practitioners Association of South Africa (EAPASA).

- **Jo-Anne Thomas.** She holds a Master of Science Degree in Botany (M.S.c Botany) from the University of the Witwatersrand and is registered as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP) and a registered Environmental Assessment Practitioner (EAP) with the Environmental Assessment Practitioners Association of South Africa (EAPASA) (2019/726). She has over 20 years of experience in the field of environmental assessment and

management, and the management of large environmental assessment and management projects. During this time, she has managed and coordinated a multitude of large-scale infrastructure EIAs and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. She has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPrs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.

» **Nicolene Venter.** She is a Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

Curricula Vitae (CVs) detailing Savannah Environmental team's expertise and relevant experience are provided in **Appendix A**.

CHAPTER 2: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a solar PV facility such as Upilanga PV1 and the associated infrastructure is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable to or have bearing on the proposed project. It also provides information which supports the need and justification for the project, which is further discussed in Chapter 3.

2.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is proposed including- (i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report. (ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	A description of the policy and legislative context within which Upilanga PV1 is proposed is included in section 2.3, 2.4 and 2.5.

2.2. Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Mineral Resources and Energy. The hierarchy of policy and planning documentation that supports the development of renewable energy projects, such as solar energy facilities, is illustrated in **Figure 2.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies and plans that have relevance to the development of Upilanga PV1.

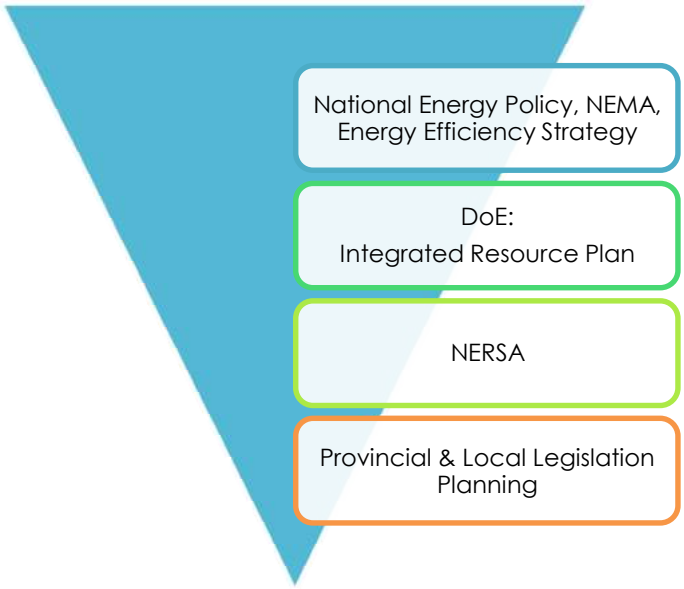


Figure 2.1: Hierarchy of electricity and planning documents

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy developments are multi-sectoral (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a solar energy project and the related statutory environmental assessment process.

At **National Level**, the main regulatory agencies are:

- **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity and, since merging with the Department of Mineral Resources (DMR), is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (No. 28 of 2002) (MPRDA) in terms of Section 53 of the MPRDA. Therefore, in terms of the Act, approval from the Minister is required to ensure that the proposed activities do not sterilise mineral resource that may occur within the broader study area and development area.
- **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- **Department of Environment, Forestry and Fisheries (DEFF):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the 2014 EIA Regulations (GN R326) as amended. DEFF is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the EA for the project under consideration. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).
- **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.

- **Department of Human Settlements , Water and Sanitation (DHSWS):** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).
- **The Department of Agriculture, Rural Development and Land Reform (DARDLD):** This Department is the custodian of South Africa's agricultural resources and is responsible for the formulation and implementation of policies governing the agriculture sector and the initiation, facilitation, coordination and implementation of integrated rural development programmes.

At **Provincial Level**, the main regulatory agencies are:

- **Northern Cape Department of Environment and Nature Conservation (DENC):** This Department is the commenting authority for the BA process for the project and is responsible for issuing of other biodiversity and conservation-related permits.
- **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
- **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manage heritage resources throughout the Northern Cape Province.

At the **Local Level,** the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, both the local and district municipalities play a role. The local municipality includes the **Dawid Kruiper Local Municipality** which form part of the **ZF Mgcawu District Municipality**. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

2.3 National Policy

2.3.1. The National Energy Act (No. 34 of 2008)

The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment in, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities, such as Upilanga PV1.

2.3.2. White Paper on the Energy Policy of South Africa, 1998

The South African Energy Policy, published by the then Department of Minerals and Energy (DME) in December 1998 identifies five key objectives, namely:

- Increasing access to affordable energy services.
- Improving energy sector governance.
- Stimulating economic development.
- Managing energy-related environmental impacts.
- Securing supply through diversity.

In order to meet these objectives and the developmental and socio-economic objectives of South Africa, the country needs to optimally use available energy resources. The South African Government is required to address what can be done to meet these electricity needs both in the short and long-term. The White Paper identifies key objectives for energy supply, such as increasing access to affordable energy services, managing energy-related environmental impacts and securing energy supply through diversifying South Africa's electricity mix.

This policy recognises that renewable energy applications have specific characteristics which need to be considered. The Energy Policy is "*based on the understanding that renewables are energy sources in their own right, and are not limited to small-scale and remote applications, and have significant medium- and long-term commercial potential*." In addition, the National Energy Policy states that "*Renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future*".

The support for the Renewable Energy Policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind, and that renewable applications are, in fact, the least cost energy service in many cases from a fuel resource perspective (i.e. the cost of fuel in generating electricity from such technology), more so when social and environmental costs are taken into account. In spite of this range of resources, the National Energy Policy acknowledges that the development and implementation of renewable energy applications has been neglected in South Africa.

Government policy on renewable energy is therefore concerned with addressing the following challenges:

- Ensuring that economically feasible technologies and applications are implemented.
- Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.
- Addressing constraints on the development of the renewable industry.

2.3.3. White Paper on the Renewable Energy Policy, 2003

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognises the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The position of the White Paper on Renewable Energy is based on the integrated resource planning criterion of:

"Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options."

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. It also informs the public and the international community of the Government's vision, and how the Government intends to achieve these objectives; and informs Government agencies and organs of their roles in achieving the objectives.

South Africa relies heavily on coal to meet its energy needs because it is well-endowed with coal resources in particular. However, South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped. This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include:

» Ensuring that equitable resources are invested in renewable technologies.
» Directing public resources for implementation of renewable energy technologies.
» Introducing suitable fiscal incentives for renewable energy.
» Creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper are considered in six focal areas, namely:

i) Financial instruments.
ii) Legal instruments.
iii) Technology development.
iv) Awareness raising.
v) Capacity building and education.
vi) Market based instruments and regulatory instruments.

The policy supports the investment in renewable energy facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing Greenhouse Gas (GHG) emissions and the promotion of renewable energy sources.

2.3.4. The Electricity Regulation Act (No. 04 of 2006) (ERA)

The Electricity Regulation Act (No. 04 of 2006) as amended by the Electricity Regulation Act (No. 28 of 2007), replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry.

The ERA establishes a national regulatory framework for the electricity supply industry and made NERSA custodian and enforcer of the National Electricity Regulatory Framework. The ERA also provides for licences and registration as the manner in which the generation, transmission, distribution, reticulation, trading, and import and export of electricity is regulated.

2.3.5. The National Development Plan (NDP) 2030

The National Development Plan (NDP) 2030 offers a long-term plan for the country. It defines desired destinations where inequality and unemployment are reduced and poverty is eliminated so that all South

Africans can attain a decent standard of living. Electricity is one of the core elements of a decent standard of living.

While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

» Raising employment through faster economic growth
» Improving the quality of education, skills development and innovation
» Building the capability of the state to play a developmental, transformative role

In terms of the Energy Sector's role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:

» Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation.
» Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households.
» Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change.

In formulating its vision for the energy sector, the NDP took the IRP 2010 as its point of departure. Therefore, although electricity generation from coal is still seen as part of the energy mix within the NDP, the plan sets out steps that aim to ensure that, by 2030, South Africa's energy system looks very different to the current situation: coal will contribute proportionately less to primary-energy needs, while gas and renewable energy resources – especially wind, solar, and imported hydroelectricity – will play a much larger role.

2.3.6. Integrated Energy Plan (IEP), November 2016

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

» To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector.
» To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels).
» To guide investment in and the development of energy infrastructure in South Africa.
» To propose alternative energy strategies which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the IEP was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is

reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

» Objective 1: Ensure security of supply.
» Objective 2: Minimise the cost of energy.
» Objective 3: Promote the creation of jobs and localisation.
» Objective 4: Minimise negative environmental impacts from the energy sector.
» Objective 5: Promote the conservation of water.
» Objective 6: Diversify supply sources and primary sources of energy.
» Objective 7: Promote energy efficiency in the economy.
» Objective 8: Increase access to modern energy.

2.3.7. Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity is a subset of the IEP and constitutes South Africa's National electricity plan. The IRP is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment. The primary objective of the IRP is to determine the long term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.

The promulgated IRP 2010–2030 identified the preferred generation technology required to meet expected demand growth up to 2030. It incorporated government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, reduced water consumption, diversified electricity generation sources, localisation and regional development.

Following the promulgation of the IRP 2010–2030, implementation followed in line with Ministerial Determinations issued under Section 34 of the Electricity Regulation (Act No. 4) of 2006. The Ministerial Determinations give effect to planned infrastructure by facilitating the procurement of the required electricity capacity.

Since the promulgated IRP 2010–2030, the following capacity developments have taken place:

» A total 6 422 MW under the Renewable Energy Independent Power Producers Programme (REIPPP) has been procured, with 3 876 MW operational and made available to the grid.
» IPPs have commissioned 1 005 MW from two Open Cycle Gas Turbine (OCGT) peaking plants.
» Under the Eskom build programme, the following capacity has been commissioned:
  * 1 332 MW of Ingula pumped storage, 1 588 MW of Medupi, 800 MW of Kusile and
  * 100 MW of Sere Wind Farm.
» 18 000MW of new generation capacity has been committed to.

Besides capacity additions, a number of assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South

Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with INDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline.

Following consideration of all these factors, the following Plan was promulgated.

	Coal	Coal (Decommis-sioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas & Diesel	Other (Distributed Generation, CoGen, Biomass, Landfill)
Current Base	37,149		1 860	2,100	2 912	1 474	1 980	300	3 830	499
2019	2,155	-2,373					244	300		Allocation to the extent of the short term capacity and energy gap.
2020	1,433	-557				114	300			
2021	1,433	-1403				300	818			
2022	711	-844			513	400 1,000	1,600			
2023	750	-555				1000	1,600			500
2024			1,860				1,600		1000	500
2025						1000	1,600			500
2026		-1,219					1,600			500
2027	750	-847					1,600		2000	500
2028		-475				1000	1,600			500
2029		-1,694			1575	1000	1,600			500
2030		-1,050		2,500		1000	1,600			500
TOTAL INSTALLED CAPACITY by 2030 (MW)	33,364		1,860	4,600	5,000	8,288	17,742	600	6,380	
% Total Installed Capacity (% of MW)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.4	1.2*	6.3	17.8	0.6	1.3	

Installed Capacity
Committed/Already Contracted Capacity
Capacity Decommissioned
New Additional Capacity
Extension of Koeberg Plant Design Life
Includes Distributed Generation Capacity for own use

- 2030 Coal Installed Capacity is less capacity decommissioned between years 2020 and 2030.
- Koeberg power station rated/installed capacity will revert to 1,926MW (original design capacity) following design life extension work.
- Other/ Distributed generation includes all generation facilities in circumstances in which the facility is operated solely to supply electricity to an end-use customer within the same property with the facility.
- Short term capacity gap is estimated at 2,000MW.

Figure 2.2: IRP 2019 as promulgated in October 2019

This plan provides for the development of 6000MW of new capacity from large scale PV. The Upilanga PV1 project would contribute towards this goal.

2.3.8. New Growth Path (NGP) Framework, 23 November 2010

The purpose of the New Growth Path (NGP) Framework is to provide effective strategies towards accelerated job-creation through the development of an equitable economy and sustained growth. The

target of the NGP is to create 5 million jobs by 2020. With economic growth and employment creation as the key indicators identified in the NGP. The framework seeks to identify key structural changes in the economy that can improve performance in term of labour absorption and the composition and rate of growth.

To achieve this, government will seek to, amongst other things, identify key areas for large-scale employment creation, as a result of changes in conditions in South Africa and globally, and to develop a policy package to facilitate employment creation in these areas.

2.3.9. National Climate Change Bill, 2018

On 08 June 2018 the Minister of Environmental Affairs published the National Climate Change Bill ("the Bill") for public comment. The purpose of the Bill is to build an effective climate change response and ensure the long-term, just transition to a climate resilient and lower carbon economy and society. This will be done within the context of sustainable development for South Africa, and will provide for all matters related to climate change.

The National Climate Change Bills addresses issues related institutional and coordination arrangement across the three spheres of government namely national, provincial and local. It further highlights the need the spheres of government and entities, sectors as well business to respond to challenges of climate change. The bill further address the matters relating to, the national adaptation to impacts of climate change, greenhouse gas emissions and removals, and policy alignment and institutional arrangements. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans. The following objectives are set within the Bill:

a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Upilanga PV1 comprises a renewable energy generation facility and would not result in the generation or release of emissions during its operation.

2.3.10. National Climate Change Response Policy, 2011

South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based

on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.

As an integral part of the policy, a set of near-term priority flagship programmes will be implemented to address the challenges of climate change, one of which includes the Renewable Energy Flagship Programme. This flagship programme includes a scaled-up renewable energy programme, based on the current programme specified in the IRP 2010, and using the evolving South African Renewables Initiative led by the Department of Public Enterprise and Department of Trade and Industry (DTI), as a driver for the deployment of renewable energy technologies. The programme will be informed by enhanced domestic manufacturing potential and the implementation of energy efficiency and renewable energy plans by local government.

The development of Upilanga PV1 is aligned with the Renewable Energy Flagship Programme identified under South Africa's NCCRP and could therefore be argued to be aligned with the country's approach to addressing climate change.

2.3.11. Strategic Integrated Projects (SIPs)

The Presidential Infrastructure Coordinating Committee (PICC) is integrating and phasing investment plans across 18 Strategic Infrastructure Projects (SIPs) which have five core functions: to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development and enabling regional integration. SIP 8 and 9 of the energy SIPs supports the development of the solar energy facility:

- SIP 8: Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010 – 2030) and supports bio-fuel production facilities.
- SIP 9: Electricity generation to support socio-economic development: The proposed Upilanga PV1 is a potential SIP 9 Project as electricity will be generated and social and economic upliftment, development and growth will take place within the surrounding communities. It would become a SIP 9 project if selected as a Preferred Bidder project by the Department of Energy. SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.

Upilanga PV1 could be registered as a SIP project once it is under development. The project would then contribute to the above-mentioned SIPs.

2.4 Provincial Planning and Context

2.4.1. Northern Cape Provincial Spatial Development Framework (PSDF) 2012

The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the Province is to enable sustainability through sustainable development. The Province considers social

and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty.

The PSDF considers the release of greenhouse gas (GHG) emissions created by human activity as the key cause of global warming, which in turn could result in major negative effects and disasters in the short- and medium-term. This effect would increasingly undermine human development gains. Innovative strategies would have to be implemented to reduce the impact of global deterioration.

The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the Province's energy generation capacity by 2020.

The overall energy objective for the Province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the Province through appropriate financial and fiscal instruments.

2.4.2. The Northern Cape Climate Change Response Strategy

The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: "*The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with heightened requirements for effective disaster management*".

Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the NCP's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.

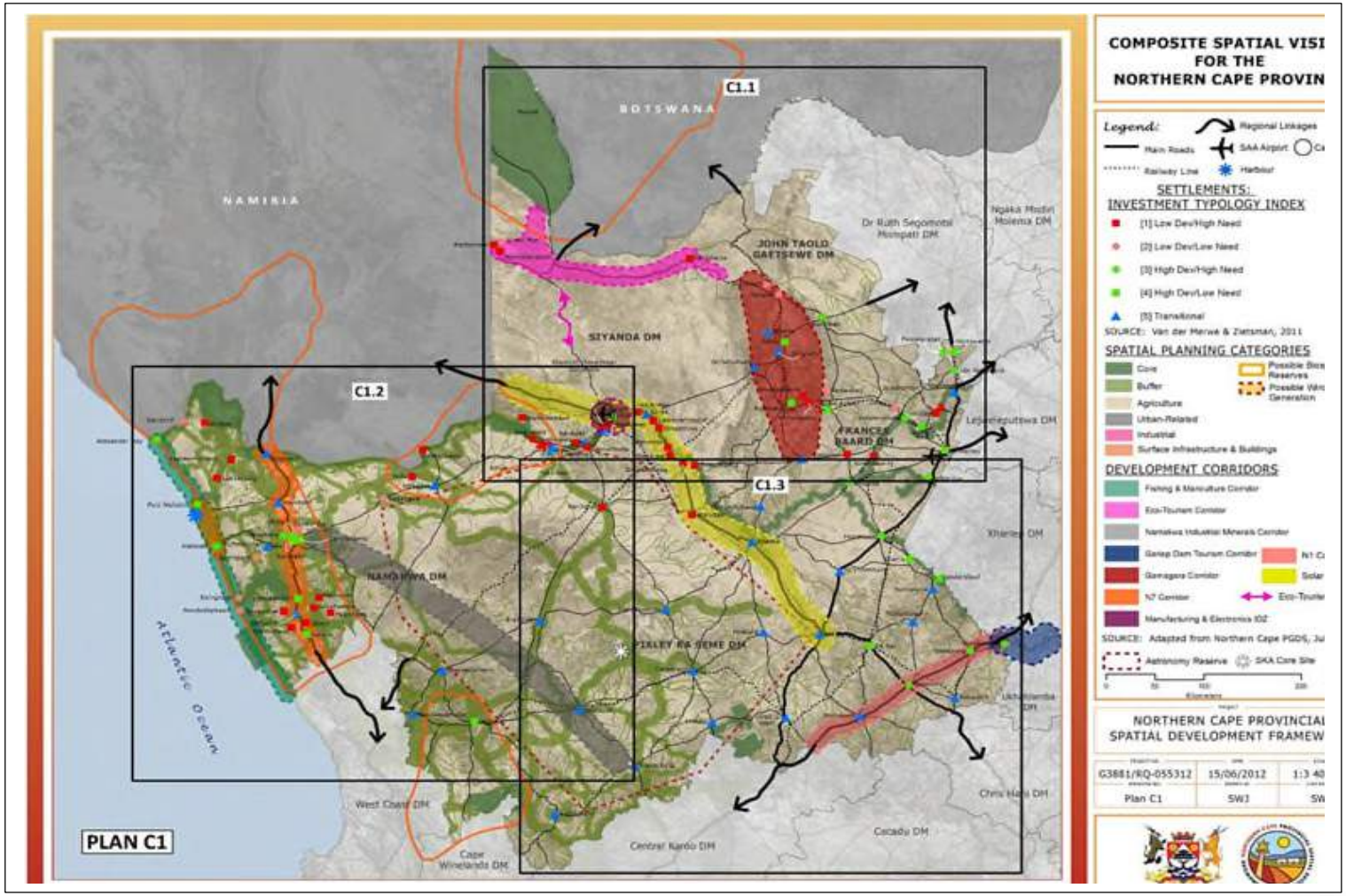


Figure 2.2: Development regions and corridors of the Northern Cape (Source: Northern Cape PSDF 2012). The position of the Upilanga PV1 site is indicated by the red star

The MEC further indicated that the NCP was involved in the processing 7 wind energy facility and 11 solar energy facility EIA applications (March 2011)[3].

The development of Upilanga PV1 will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.

2.5 Local Policy and Planning Context

The local tiers of government within which Upilanga PV1 is located in the Dawid Kruiper Local Municipality within the ZF Mgcawu District Municipality. The development instruments or policies at both the district and local level contain objectives which are in line with the development of Upilanga PV1. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 2.1: Relevant district and local legislation and policies for Upilanga PV1

Relevant policy	Relevance to Upilanga PV1
ZF Mgcawu District Municipality Draft Integrated Development Plan (IDP), 2018/2019 (2017-2022)	The vision of the ZF Mgcawu DM is "Quality support to deliver quality services." The mission of the ZF Mgcawu DM is "Centre of excellence in providing quality basic services through support to local municipalities." The following strategic and development objectives have been identified for the ZF Mgcawu DM: » To monitor and determine the housing backlogs in the district as well as to eradicate sanitation & infrastructure backlogs » To assess and provide targeted support improving institutional capacity and service delivery capabilities of category B-municipalities » To promote environmental health and safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of environmental health services, fire and disaster risks » To promote safety of communities in the ZF Mgcawu District through the proactive prevention, mitigation, identification and management of fire and disaster risks » To Facilitate the Development of Sustainable regional land use, economic, spatial and environmental planning frameworks that will support and guide the development of a diversified, resilient and sustainable district economy » To market, develop and co-ordinate tourism in the ZF Mgcawu District » To assess and monitor the status of infrastructure needs and requirements of B Municipalities » To ensure efficient business operations and to fulfils the assurance statutory requirements of the ZF Mgcawu District Municipality The strategic objective of supporting and guiding the development of a diversified, resilient and sustainable district economy, and the development objectives of creating investment opportunities in sectoral development (i.e. investment activities, Entrepreneurial business support programme), and enabling an environment for business establishment and support initiatives (i.e. Increase the number of businesses, entrepreneurial support) through its local content and local economic development requirements as prescribed under the REIPPP Programme will be supported through the proposed development.

[3] (www.info.gov.za/speech/DynamicAction?pageid=461&sid=22143&tid=45200).

Relevant policy	Relevance to Upilanga PV1
Dawid Kruiper Local Municipality Final Reviewed Integrated Development Plan for 2019/2020 (approved on 30 May 2019)	The LM identified, through the undertaking of a community and stakeholder analysis, key priority issues. Issues relating to energy and electricity have been identified and includes electricity provision to all in need and the upgrading of electricity infrastructure. The LM confirms that it is involved in the national programme for the development of solar power installations in the Upington area. Furthermore, the electricity sector is one of the fastest growing sectors in the municipality and it is considered that the sector must be exploited to ensure the creation of new job opportunities for local people.
Dawid Kruiper All-inclusive Spatial Development Framework Final Report (February 2018)	The IDP (as discussed above) identified the following 8 pillars as being important for development and the Dawid Kruiper Council's envisagement of a self-sustaining ecology with long-term benefit for all inhabitants of Dawid Kruiper: 1. Agriculture 2. Manufacturing and industry 3. Tourism as a sustainable industry 4. Urban development 5. Rural development 6. Social Development 7. Conservation of natural habitats 8. Natural resources According to the Dawid Kruiper LM SDF the area under investigation is located within the C.a.2 Agriculture (Ward 11) Spatial Planning Category (SPC). The implementation of Upilanga PV1 is not considered to be in contrast with the Dawid Kruiper LM SDF and the SPC within which the project is located. In addition, the REIPPP Programme requires preferred bidders to make contributions towards local economic development and social upliftment, to be focused on benefitting local communities within the vicinity of the development area.

2.6 International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of Upilanga PV1 are provided below in **Table 4.4**. Upilanga PV1 is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.4: International policies relevant to Upilanga PV1

Relevant policy	Relevance to the proposed project
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	The Conference of the Parties (COP), established by Article 7 of the UNFCCC, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments and takes decisions to promote the effective implementation of the Convention. The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement is open for signature and subject to ratification, acceptance or approval by States and regional economic integration organisations that are Parties to the Convention

Relevant policy	Relevance to the proposed project
	from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only be sanctioned once it has been ratified by 55 countries, representing at least 55% of emissions. South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. The Agreement was promulgated on 04 November 2016, thirty days after the date on which at least 55 Parties to the Convention, which account for at least 55% of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary. Following COP21, countries met in Katowice, Poland from 2 December to 14 December 2018 for COP24. Countries agreed on various elements from COP21 held in Paris in 2015, which pertained to how governments will measure, report and verify their emission-cutting efforts, which was a key element as it ensured all countries are held to proper standards and will find it difficult to renege from the signed agreements. There was, however, a disagreement amongst countries over carbon credits which are awarded to countries for their emission-cutting efforts and their carbon sinks, such as forests, which absorb carbon. The emission count towards countries' emission-cutting targets. Brazil, which hoped to benefit from its large rainforest cover, insisted on a new form of wording which would allow double counting of credits, undermining the integrity of the system. This issue was put on hold and will be discussed at the COP25, to be held in Santiago de Chile, Chile. Largely absent from the COP24 discussions was the question of how countries will step up their targets on cutting emissions. On current targets, the world is set for 3° of warming from pre-industrial levels, which scientists have said would be disastrous, resulting in droughts, floods, sea level rises and the decline of agricultural productivity. However, in 2019, the United Nations will meet again in Chile to discuss the final elements of the COP21 agreement and begin to work on future emission targets[4]. South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively. The policy provides support for Upilanga PV1 which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.

[4] https://www.theguardian.com/environment/2018/dec/16/what-was-agreed-at-cop24-in-poland-and-why-did-it-take-so-long

Relevant policy	Relevance to the proposed project
The Equator Principles III (June 2013)	The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects (such as Upilanga PV1) and apply globally to all industry sectors. Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of Upilanga PV1. In terms of the EPs, South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines. Upilanga PV1 is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GN R326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.
International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)	The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012. Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standard 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1. Given the nature of Upilanga PV1, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.

CHAPTER 3: PROJECT DESCRIPTION AND ALTERNATIVES

This Chapter provides a description of Upilanga PV1, comprising a solar PV energy facility and associated infrastructure proposed for development. It must be noted that the project description presented in this Chapter is subject to change to some extent based on the outcomes and recommendations of detailed engineering and other technical studies, the findings and recommendations of the BA and supporting specialist studies, and any licencing, permitting, and legislative requirements.

3.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the Basic Assessment Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale.	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale is included in **Figure 3.1**.
(g) a motivation for the preferred site, activity and technology alternative;	A motivation for the preferred development area, activity and technology alternative is included in section 3.2, and 3.2.2.1.
(h)(i) details of all the alternatives considered;	The details of all alternatives considered are included in section 3.2.
(h)(ix) the outcome of the site selection matrix;	The outcome of the site selection process undertaken for the identification of the broader study and development area is included in section 3.3.
(h)(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such.	A motivation for not considering any alternative development locations is included in section 3.2.2.1.
(h) (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	A concluding statement indicating the preferred alternatives, including the preferred location of the activity is included in section 3.2.2.1 and 3.2.2.

3.2. Project Site Description

A broader study area has been identified for the development of Upilanga PV1 which consists of two properties, i.e. Portion 3 of the farm Matjesrivier 41, Lot 944 within the Karos Settlement, approximately 28km south-east of the town of Upington. The broader study area is located within Ward 14 of Dawid Kruiper within the greater ZF Mgcawu District Municipality in the Northern Cape Province. It is within these properties that the development area of ~350ha for Upilanga PV1 and its associated infrastructure has been identified and located. The proposed project site can be accessed via an existing road running south from the N10 national road located to the north of the site up to the existing Ilanga 1 CSP facility. A new portion of road will be required to be constructed from this existing facility to the proposed site. This facility will be connected to the grid via the authorised Upilanga CSP site 1.4 (DEA Ref:.14/12/16/3/3/2/299).

Table 3.1 provides information regarding the proposed project site identified for Upilanga PV1, and also includes information regarding the properties that may be impacted by the grid connection.

Table 3.1: Overview of the project site identified for Upilanga PV1

Province	**Northern Cape Province**
District Municipality	ZF Mgcawu District Municipality
Local Municipality	Dawid Kruiper Local Municipality
Ward number(s)	Ward 14 of Dawid Kruiper Local Municipality
Nearest town(s)	Upington (~28km to the west)
Affected property of the development area: Farm name(s), number(s) and portion numbers	Matjiesrivier 41 portion 3 Lot 944 within the Karos Settlement
Total extent of the properties	~5480ha (Portion 3 of the farm Matjesrivier 41) ~8440ha (Lot 944)
Total extent of the Development area (including associated infrastructure)	~350ha
SG 21 Digit Code (s)	Matjesrivier 41 portion 3: C03600000000004100003 Lot 944: C03600090000094400000
Current zoning of the study area	Agricultural land-use.
Site Co-ordinates (corner co-ordinates of PV1)	1) 28°31'9.25"S, 21°30'27.12"E 2) 28°31'8.58"S, 21°31'55.03"E 3) 28°31'47.47"S, 21°31'55.72"E 4) 28°31'47.73"S, 21°30'28.18"E

3.3. Receptiveness of the site to development of a PV Project

From a regional perspective, the greater Upington area is considered desirable for the development of commercial solar energy facilities from a technical perspective by virtue of the prevailing climatic conditions (as the economic viability of a solar energy facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the affected property, the availability of a direct grid connection (i.e. a point of connection to the national grid) and the availability of land on which the development can take place. The detail regarding site-specific characteristics and the motivation for the selection of the broader study and development area for the development of Upilanga PV1 is provided in the sections which follow.

National and Provincial Planning Considerations: The site is proposed to form part of the Upington Ilanga Solar Park (Upilanga Solar Park), located at Karoshoek Solar Valley, which includes a number of authorised and proposed solar (CSP and PV) facilities, including the operational Ilanga 1 CSP facility. The siting of the Upilanga Solar Park considered these technical factors as well as various other critical criteria such as national, provincial and local planning in terms of renewable energy development and the sensitivity of the broader site. The broader study area is designated as a Solar Corridor in terms of the Provincial Spatial Development Framework (PSDF) (as detailed in Chapter 2), and is also located within the Upington REDZ and the Northern Grid Corridor.

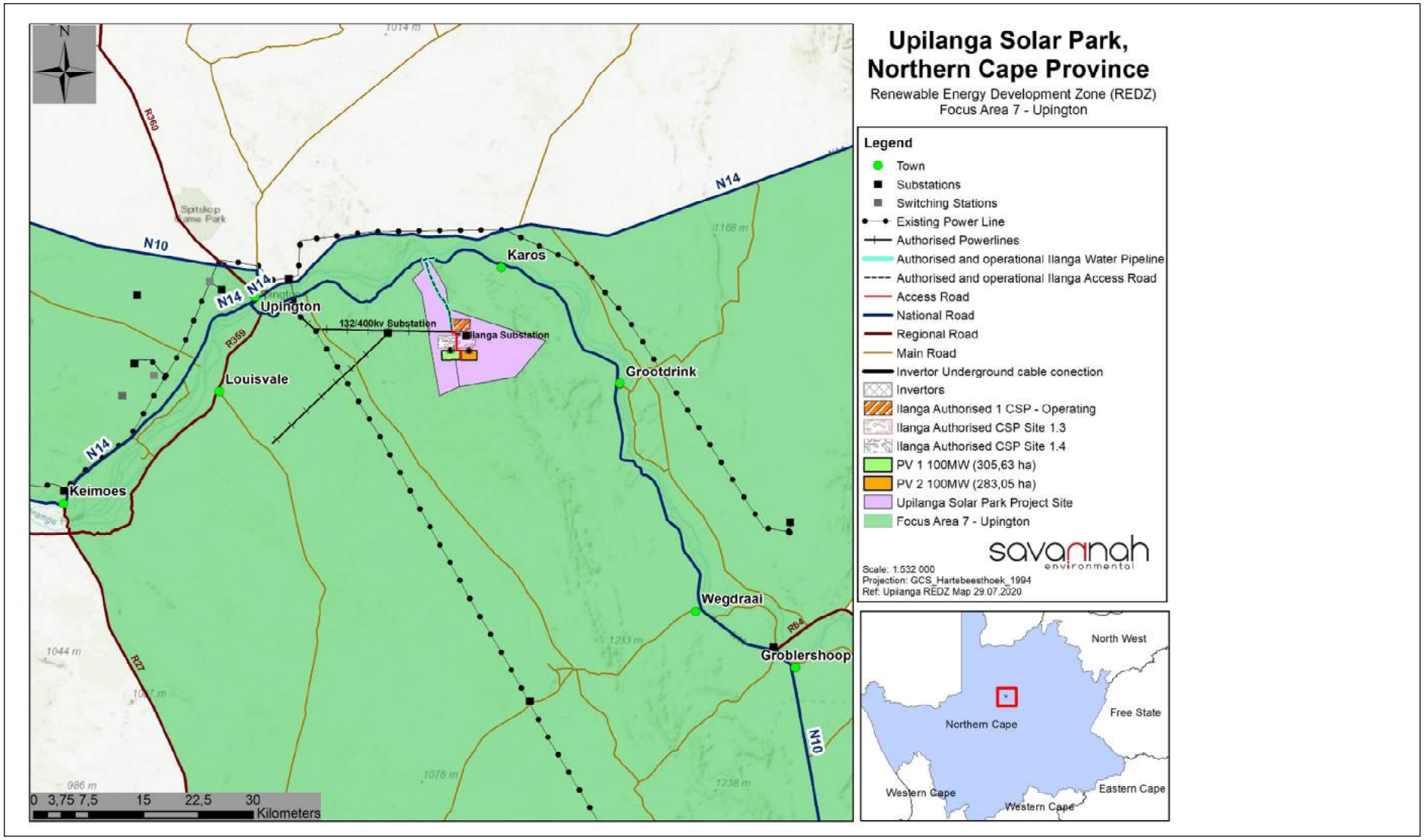


Figure 3.1. Upilanga PV1 within Renewable Energy Development Zone

Prevailing climatic conditions: The area surrounding Upington in the Northern Cape has been earmarked as a hub for the development of solar energy projects due to the viability of the solar resource for the area. The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values of the area within which it will operate. The Global Horizontal Irradiation (GHI) for the study area is in the region of approximately 2278kWh/m^2/annum. The Northern Cape Province is considered to have the highest solar irradiation values of the country and therefore enables the development of solar energy projects and the successful operation thereof.(refer to **Figure 3.2**).

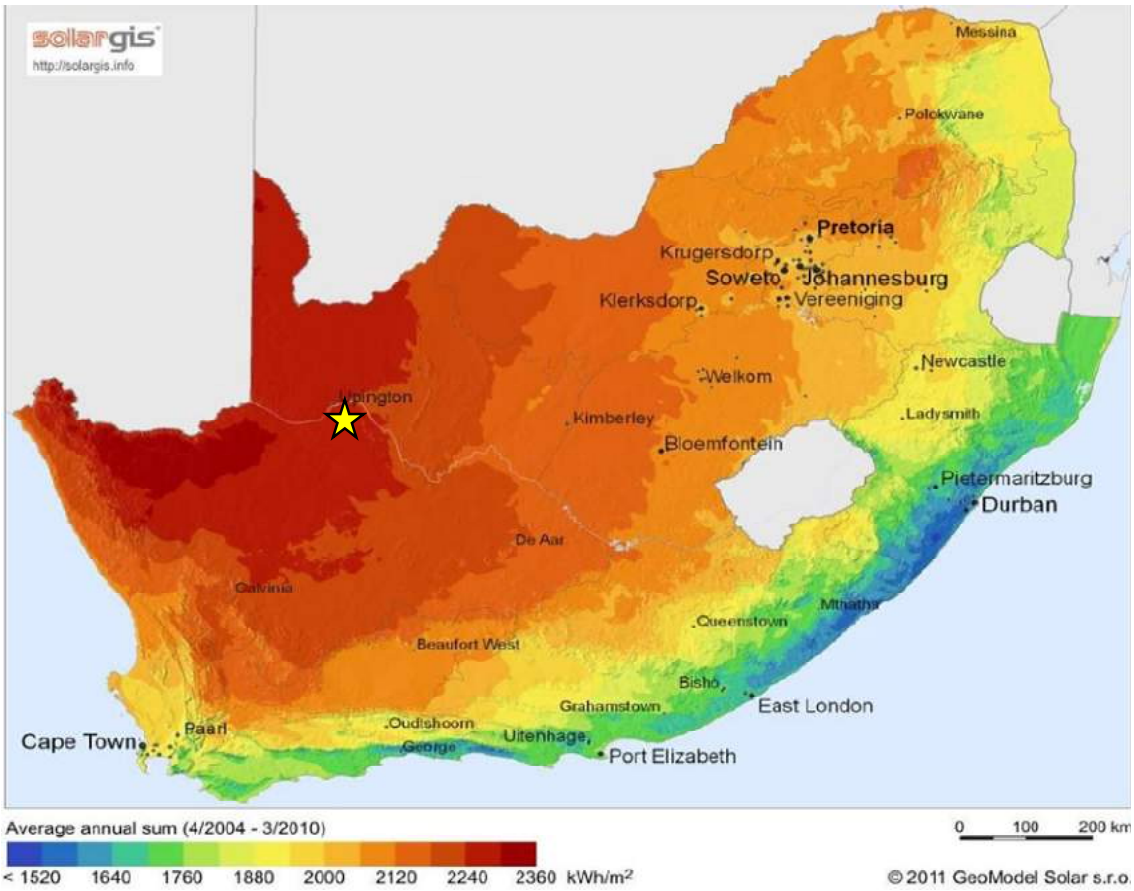


Figure 3.2: Solar irradiation map for South Africa; the proposed Upilanga PV1 Project position is shown by the yellow star on the map. (Source: adapted from GeoModel Solar, 2011).

Site extent: The affected properties (i.e. Portion 3 of the Farm Matjesrivier 41 and Lot 944), known as the study area, is approximately 13 920 ha in extent, which is sufficient for the installation of a facility with a contracted capacity of up to 100MW and allowing for avoidance of environmental site sensitivities. A development area of ~350ha has been identified within the study area within which the solar PV facility will be sited. The development footprint of the facility, i.e. facility infrastructure, would occupy an area of ~306ha, which is equivalent to approximately 87% of the extent of the development area.

Geographic location: The study area and development area are located within the Upington REDZ 7 which is a node identified by National Government for the development of renewable energy projects. Development of renewable energy projects within the area has been on-going with the operational Ilanga 1 CSP facility and the authorised CSP sites 1.3 , 1.4, authorised CSP sites 2, 3, 4 and 5 located in close proximity to the development area (refer to **Figure 3.1**). The development area is also adjacent to a cluster or node

of other proposed renewable energy solar PV developments, which compliments existing and future land use activities in the area and is in line with the vision of National Government through the promulgation of the REDZ areas.

Topography: The study area consists of extensive to irregular plains on a slightly sloping plateau sparsely vegetated with an average slope of between 0% and 3%. The development area of the project is situated between elevations 800m and 1180m above sea level, with an average elevation of 990m. The terrain surrounding the farm is predominantly flat with an even slope towards the Orange River valley that forms the most distinct hydrological feature in the region. The flat topography of the area under investigation is considered as beneficial in terms of the construction activities that will be required.

Site access: Access to the study area is considered as an important characteristic as appropriate access is required for the transportation of project related infrastructure and heavy machinery during construction. The proximity of the study area to viable access routes decreases the traffic impact on secondary roads during the construction and operation phases of the project. The project site can be readily accessed via the N10, and the existing unnamed tarred road via the Karoshoek CSP One site, which will be required to be extended to the proposed Upilanga PV1 site either via a ±15 km long, ± 8m wide tarred road tarred road or a gravel access road.

Considering the readily available site access to the development area, the location of Upilanga PV1 and associated infrastructure is considered to be suitable and appropriate from a technical perspective.

Grid access: A key factor in the siting of any solar PV project is that the project must have a viable grid connection. The Ilanga Substation is located approximately 2km north of the development area and is proposed as the preferred grid connection point for the facility via the authorised CSP site 1.4 via underground cabling.

Existing grid infrastructure (i.e. power lines and substations) within close proximity to Upilanga PV1 provide an opportunity for the project to connect to the national grid with minimal new linear infrastructure (i.e. of less than 15km) required to be developed. In order to connect the project to the national grid through the use of the Ilanga substation, a grid connection solution comprising specific grid connection infrastructure alternatives as per the following:

1) On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation.
2) An onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation).
3) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation.

Access to water: During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase (i.e. 12-18 months) ~10 000m3 of water will be required. Water for the construction phase will be sourced directly from the Orange River using trucks and the water pipeline.

Land use considerations: The current land use of the development area is an important consideration for site selection in terms of limiting disruption to existing land use practices. The affected properties are currently used for renewable solar energy generation as the existing Ilanga 1 CSP facility is located on Lot 944, to the north of the development area identified for the development of Upilanga PV1. In addition, the authorised Ilanga 100MW CSP Sites 1.3 and 1.4 are proposed to be developed to the south of the Ilanga 1 CSP facility on Lot 944, also just north of where Upilanga PV1 is proposed. Sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major rock outcrops etc.) are also favoured during the site selection process and the proposed development area fits this criterion. In addition, other solar renewable energy projects have been previously approved by the DEA on directly adjacent properties. These include the following:

Project Name	DEA Reference	Project Status
100MW Concentrating Solar Power (CSP) Facility on Site 1.1	14/12/16/3/3/2/293	Operational
100MW Concentrating Solar Power (CSP) Facility on Site 1.3	14/12/16/3/3/2/294	Approved
100MW Concentrating Solar Power (CSP) Facility on Site 1.4	14/12/16/3/3/2/299	Approved
25MW Concentrating photovoltaic or parabolic dish technology project) on Site 2	14/12/16/3/3/2/292	Approved
25MW Concentrating photovoltaic or parabolic dish technology project) on Site 2	14/12/16/3/3/2/291	Approved
25MW Concentrating photovoltaic or parabolic dish technology project) on Site 2	14/12/16/3/3/2/290	Approved
25MW Concentrating photovoltaic or parabolic dish technology project) on Site 2	14/12/16/3/3/2/289	Approved
50MW Concentrating Solar Power (CSP) Facility on Site 3	14/12/16/3/3/2/297	Approved
100MW Concentrating Solar Power (CSP) Facility on Site 4	14/12/16/3/3/2/296	Approved
100MW Concentrating Solar Power (CSP) Facility on Site 5	14/12/16/3/3/2/295	Approved

Considering the current land uses and activities undertaken within the broader study area and the surrounding areas, the proposed development is not considered to be in contradiction with these uses and will rather add to the current activities being undertaken. Therefore, the location of the broader study area is considered to be acceptable in this regard.

Landowner support: The selection of a site where the landowner is supportive of the development of a renewable energy facility is essential for ensuring the success of the project. The affected properties, Portion 3 of the Farm Matjesrivier 41and Lot 944, are privately owned. Emvelo Capital Projects (Pty) Ltd, the proponent for this application, will enter into a notarial lease agreement with the respective landowner. The landowner is therefore in favour of the development and does not view the establishment of the solar PV facility as a conflict with the current land use practices on Portion 3 of the Farm Matjesrivier 41 Lot 944.

Based on the above site-specific attributes, the proponent considers the development area located within the study area as highly preferred for the development of a solar PV facility, and expects that Upilanga PV1 will be able to draw on synergies with existing and under construction projects within the vicinity of the study area. As a result, no location/property alternatives are proposed as part of this BA process.

3.4. Description of the Project Technology

Upilanga PV1 will have a contracted capacity of up to 100MW AC and will make use of PV technology. Solar energy facilities, such as those which utilise PV technology, use the energy from the sun to generate electricity through a process known as the Photovoltaic Effect. Generating electricity using the Photovoltaic Effect is achieved through the use of the following components:

PV Cells

A PV cell is made of silicone (Si) that is doped (i.e. another element is introduced to the Si-structure to enhance its electrical properties) to produce the Photovoltaic Effect. PV cells are arranged in multiples / arrays and placed behind a protective glass sheet to form a PV panel (refer to **Figure 3.3**). Each PV cell is positively charged on one side and negatively charged on the opposite side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electric current (i.e. DC).

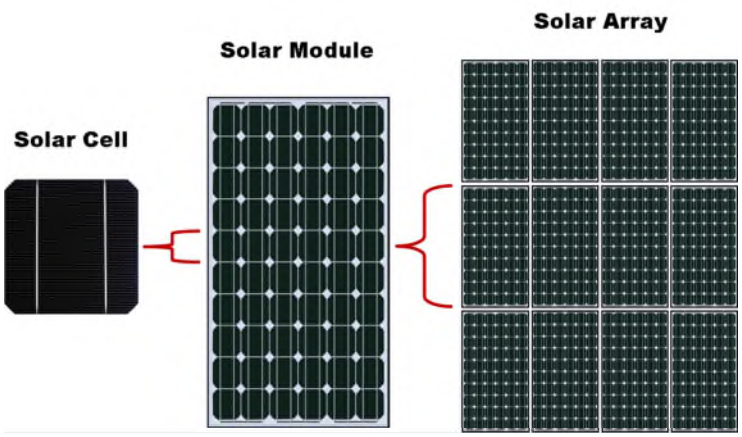


Figure 3.3: Overview of a PV cell, module and array / panel (Source: pveducation.com).

Inverters

Inverters are used to convert electricity produced by the PV cells from DC into AC, to enable the facility to be connected to the national electricity grid. In order to connect a large solar facility such as the one being proposed to the national electricity grid, numerous inverters will be arranged in several arrays to collect, and convert power produced by the facility.

Transformers

Transformers are required to transform (i.e. step-up) the power generation by the PV facility from a low voltage to a higher voltage to allow for it to be integrated into the national electricity grid.

Support Structures

PV panels will be fixed to a support structure. PV panels can either utilise fixed / static support structures, or single or double axis tracking support structures (refer to **Figure 3.4**). PV panels which utilise fixed / static

support structures are set at an angle (fixed-tilt PV system) so as to optimise the amount of solar irradiation. With fixed / static support structures the angle of the PV panel is dependent on the latitude of the proposed development, and may be adjusted to optimise for summer and winter solar radiation characteristics. PV panels which utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

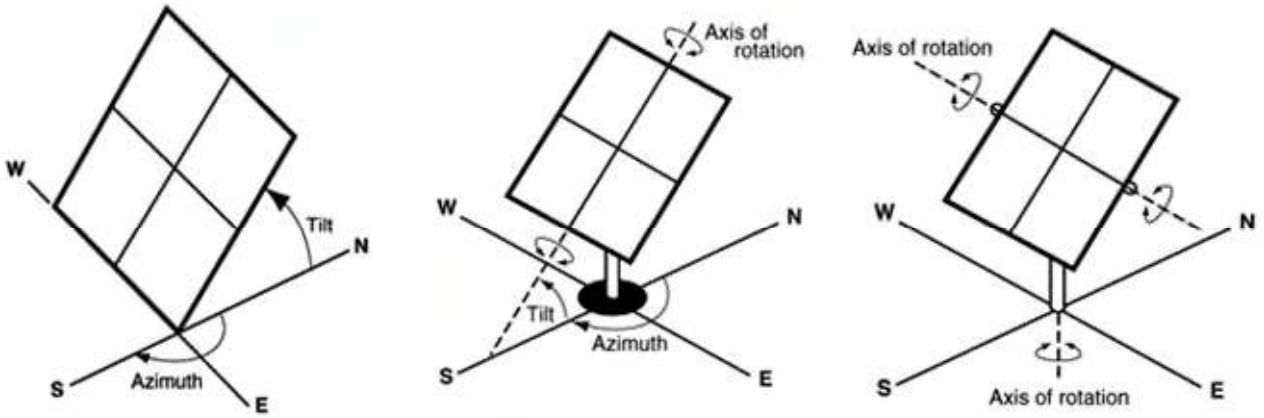


Figure 3.4: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance.

3.5. Description of the Project Components

The project will comprise the following key infrastructure and components:

» Solar PV panels with a maximum height of 5m.
» Grid alternatives using underground cables to connect to the on-site substations at authorised site and 1.4 and authorised grid connection to the Ilanga substation.
»
» A step-up facility (transformer) to step up the electricity current from 11kV/22kV/33kV to 132kV.
» A temporary laydown area.
» Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
» An access road to the development area no more than 8m wide.
» Perimeter security fencing around the development area.
» Internal access roads within the PV panel array area with a maximum width of 4m.
» Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Table 3.2 provides the details of Upilanga PV1, including the main infrastructure components and services that will be required during the project life cycle.

Table 3.2: Overview of the project and associated infrastructure for Upilanga PV1

Total extent of the Development area (including associated infrastructure)	**~350ha**
Contracted capacity of the facility	100MW AC
Technology	Static or Tracking Photovoltaic Systems
PV panels	» Height: ~5m from ground level (installed). » The PV panel areas will be constructed over an area of up to 306ha and associated infrastructure (access roads, underground cabling etc) to generate up to 100MW AC electricity with a total of 350ha. » 263 160 panels required. » Fixed tilt, single axis or double axis tracking systems.
Grid connection	1) On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation. 2) An onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation). 3) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation
Site access	Direct access to the broader study area and the development area is provided by the existing road running from the N10 national road past the operational Ilanga 1 CSP facility. A section of this road is paved, and the remaining section is gravel.
Temporary laydown area	Up to 20ha.
Other infrastructure	» Gate and security house » Control centre » Office building » Warehouse » Staff locker rooms
Services required	» Refuse material disposal - all refuse material generated from the proposed development will be collected by a contractor and will be disposed of at a licensed waste disposal site off site. This service will be arranged with the municipality and suitable contractors when required. » Sanitation – all sewage waste will be collected by a contractor and will be disposed of at a licensed waste disposal site during the construction phase. This service will be arranged with the municipality when required during the operational phase.

A layout for the PV facility has been proposed by the proponent for consideration and assessment within this BA Report (refer to **Figure 3.3 and 3.4**).

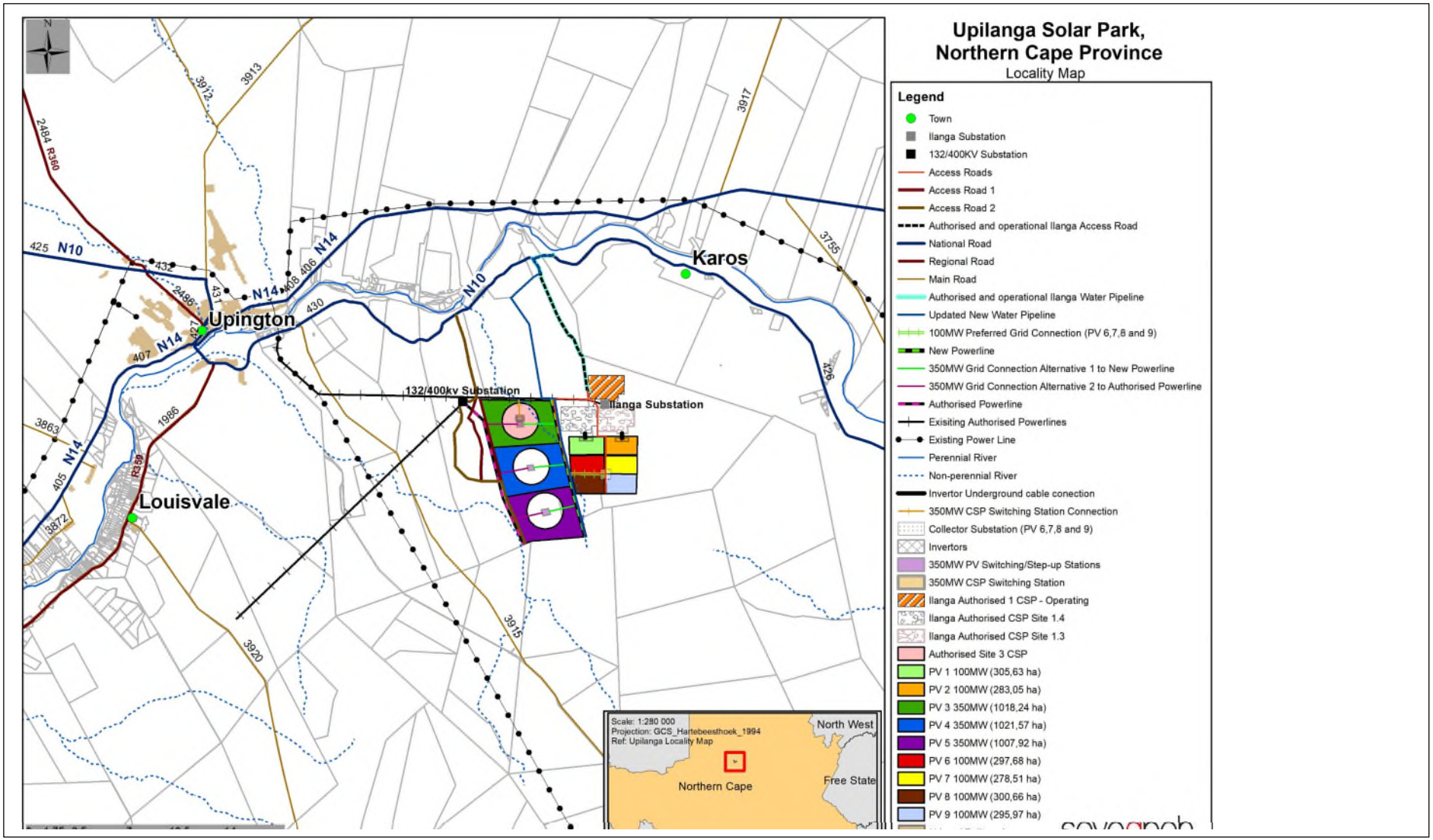


Figure 3.5: Map illustrating the proposed facility layout for Upilanga PV1 within the Upilanga Solar Park Development

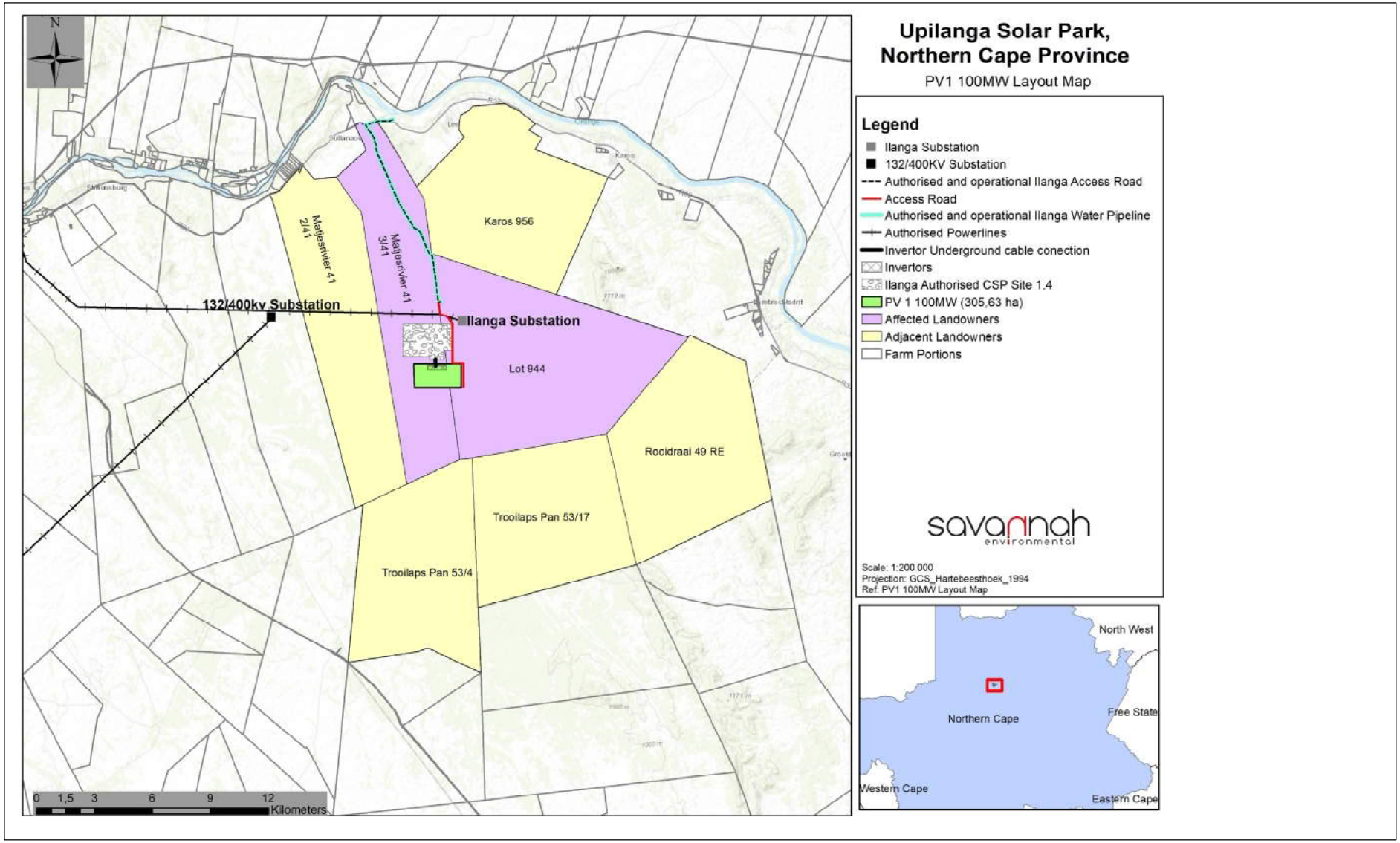


Figure 3.6: Map illustrating the proposed facility layout for Upilanga PV1 within the development area, which is assessed in this BA Report

3.6. Description of Project Alternatives

In accordance with the requirements of Appendix 3 of the 2014 EIA Regulations (GNR 326), an EIA process must contain a consideration of alternatives, which can include site (i.e. development footprint), activity, technology and site access alternatives, as well as the "do-nothing" alternative. Alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

The DEA Guideline for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

» Fundamentally (totally) different alternatives to the project.
» Incrementally different (modifications) alternatives to the project.

3.6.1. Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level, and as a result project-specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. At a strategic level, electricity generating alternatives have been addressed as part of the DoE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP), 2019[5], and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation (including solar and wind) has been identified as part of the technology mix for power generation in the country in the next 20 years. Of particular relevance to the proposed project is the allocation of 6000MW of new capacity to large scale PV included in the IRP 2019. The site is considered most suitable for the development of a PV solar energy facility as a result of local irradiation. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

3.6.2. Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives to:

» The property on which, or location where the activity is proposed to be undertaken.
» The type of activity to be undertaken.
» The design or layout of the activity.
» The technology to be used in the activity.
» The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

The applicable alternatives are discussed under the respective sub-headings below and where no alternatives are applicable, a motivation has been included.

[5] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

i) Property or Location Alternatives

The consideration of the suitability of the site for the proposed project is in line with a typical mitigation hierarchy:

1. First Mitigation: avoidance of adverse impacts as far as possible by use of preventative measures (in this instance a sensitivity analysis assisted in the avoidance of identified ecological, avifaunal and bat sensitive areas).
2. Second Mitigation: minimisation or reduction of adverse impacts to 'as low as practicable' (in this instance minimisation of impact on identified ecological, avifaunal and bat sensitive areas through implementing mitigation).
3. Third Mitigation: remedy or compensation for adverse residual impacts, which are unavoidable and cannot be reduced further.

In determining the preferred site for the proposed facilities within the Upilanga Solar Park Development at Karoskoek Solar Valley, a 'funnel-down approach' was used and commenced with the consideration of the larger site.

The siting of the initial facilities within the broader Upilanga Solar Park Development considered various critical criteria (as discussed in Section 3.3), including the sensitivity of the broader site in order to inform the positioning of these facilities (refer to **Figure 3.5**), as well as provincial and local planning in terms of renewable energy development (as discussed in Chapter 2). As previously indicated, the broader site is located within the identified Solar Development Corridor as defined by the PSDF, as well as within the Upington REDZ. The siting of the broader Upilanga Solar Park Development, and consequently that of the Upilanga PV1 is considered to be acceptable from an environmental perspective.

As the Upilanga PV1 Project is required to be located immediately adjacent to the authorised Site 1.4 in order to facilitate the connection to the grid (as detailed in Section 3.5), no feasible or reasonable site alternatives are available for consideration for this project. In addition, as the site location is constrained by other authorised facilities within the broader Upilanga Solar Park Development and environmentally sensitive areas (such as drainage lines on the site), no feasible local siting alternatives were identified.

ii) Design and Layout Alternatives

Upilanga PV1 will have a development footprint of approximately 306ha, to be located within the development area of approximately 350ha. Specialist field surveys and assessments were undertaken as part of the BA process in order to provide the proponent with site specific information regarding the study area and the development area considered for the development (refer to **Appendices D-J**). The site selection of Upilanga PV1 and associated infrastructure was based on the close proximity to the existing Ilanga 1CSP facility and availability of existing grid infrastructure.

As a result, the preferred development area (350ha) within the affected properties (i.e. 139 200ha in extent) is considered as the most feasible and appropriate location for Upilanga PV1, based on the following considerations:

i) Emvelo Capital Projects (Pty) Ltd, the proponent to this application for environmental authorisation has will enter into a notarial lease agreement with the landowners of the respective properties; and

ii) the development area is considered suitable for the development of a solar PV facility from a technical perspective to ensure the success of the development.

No feasible design or layout alternatives were identified for the proposed project.

iii) Grid Connection Alternatives

Three main grid connection alternatives are proposed by the proponent to provide grid evacuation solutions to the Upilanga PV1 development area during the construction, operation and the decommissioning phase of the proposed development. These include the following:

» **Alternative 1 (technically preferred):** consists of an on-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation.

» **Alternative 2:** consists onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation); and

» **Alternative 3:** Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

iv) Technology Alternatives

The Upington area has been identified for the development of solar energy renewable facilities due to the solar resource for the area. The area is not considered suitable for the development of wind energy projects due to the low average wind speeds.

Solar energy is therefore considered to be the most suitable renewable energy technology for this area, based on the site location, ambient conditions and energy resource availability. Few technology options are available for solar facilities, and the use of those that are considered are usually differentiated by weather and temperature conditions that prevail in the area, so that optimality is obtained by the final site selection.

The Integrated Resource Plan (IRP) 2019, excludes the procurement of power from CSP facilities until 2030; whereas new additional capacity of approximately 6 000MW will be required from solar PV facilities. Therefore, PV technology was identified as being the preferred option for the study area. Solar PV consists of a lower visual profile and limited water requirements when compared to the CSP technology option. Furthermore, the development of Upilanga PV1 in close proximity to Ilanga 1 CSP provides for a feasible grid connection point and an opportunity to optimally use a site that is currently used for energy generation through making use of solar PV technology, but with reduced visual intrusion and/or impacts and reduced water use requirements.

Therefore, considering the above, no other technology alternatives are being assessed for development on the proposed site.

When considering PV as a technology for the development of a solar facility, two types of panels could be installed, which include:

» Fixed mounted PV systems (static / fixed-tilt panels).
» Single-axis tracking or double-axis tracking systems (with solar panels that rotate around a defined axis to follow the sun's movement).

The primary difference between PV technologies available, which affect the potential for environmental impacts, relate to the extent of the facility, as well as the height of the facility (visual impacts). For example, fixed mounted PV systems are able to occupy a smaller extent and have a lower height when compared to tracking PV systems, which require both a larger extent of land, and are taller in height. However, both options are considered to be acceptable for implementation from an environmental perspective. The preference will therefore be determined on the basis of technical considerations and the site conditions.

The PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance. The impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be the same irrespective of the PV panel selected for implementation.

v) The 'Do-Nothing' Alternative

The 'Do-Nothing' alternative is the option of not constructing Upilanga PV1. Should this alternative be selected, there would be no environmental impacts or benefits as a result of the construction and operation activities associated with a solar PV facility. The 'Do-Nothing' alternative has been assessed as part of the BA process (refer to **Chapter 8** and **Chapter 10** of this BA Report).

3.7. Activities during the Project Development Stages

In order to develop Upilanga PV1 and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases. These are discussed in more detail below.

3.7.1 Design and Pre-Construction Phase

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV plant design/or associated infrastructure. While the main objective of the Engineering, Procurement and Construction (EPC) Contractor, who will be responsible for the overall construction phase of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications such as the optimisation of the design will take place. This BA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project following the layout being approved, the DEA will need to be notified and where relevant, approval obtained.

Conduct surveys: Prior to initiating construction, several surveys will be required including, but not limited to, confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, on-site collector

substation and the facility's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed site. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

3.7.2 Construction Phase

The construction phase will entail a series of activities including:

Procurement and employment

Upilanga PV1 is likely to create approximately 400-600 (at its peak) temporary employment opportunities for a period of ~12 to 18 months, depending on the final design, during the construction phase. Approximately 60% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 15% of employment opportunities will be available to skilled individuals (engineers, project managers, site managers etc.). Solar PV facilities make use of high numbers of low skilled and semi-skilled labour during the construction phase which provides opportunity to local labour, where available within the surrounding areas and towns. Employment opportunities for Upilanga PV1 will peak during the construction phase and significantly decline during the operation phase.

Establishment of an Access Road to the Broader Study Area

The broader study area is accessible via an existing road off the N10 national road, which is currently used for the Ilanga 1 CSP facility. Within the broader study area itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). A main access road, which will be gravel in nature or tarred where necessary, will route from the Ilanga CSP 1 road in a southerly direction towards the broader study area. The road will be no more than 8m in width. Furthermore, a network of internal access roads, also gravel in nature will be required, to route between the various project components. The internal access roads will be 4m wide and ~10km long.

Undertake Site Preparation

Site preparation activities will include the clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and/or spread on site.

Water Usage and Waste Requirements

During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase (i.e. 12-18 months) ~10 000m^3 of water will be required. Water for the construction phase will be sourced directly from the Orange River using trucks and the water pipeline.

Services Required

During the construction phase specific services will be required for the undertaking of the construction activities. The services required include refuse material disposal and sanitation. Chemical toilets will be the primary source of effluent collection. Any other effluent discharge during the construction phase will be collected in sealed containers/tanks and collected via a honey-sucker truck and treated by a service provider (either the local municipality or a Contractor) at a licensed disposal site.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For Upilanga PV1, transport of the components would be via the N10 and the unnamed tarred road via Ilanga 1 CSP facility. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)[6] by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

Establishment of Laydown Areas on Site

A temporary laydown and storage area will be required for the typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and a laydown area (of approximately up to 20ha in extent) will be established. The equipment construction camp serves to confine activities and storage of equipment to one designated area and to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for the storage of the PV panels and the general placement/storage of construction equipment.

Erect PV Panels and Construct Substation and Invertors

The construction phase involves installation of the solar PV panels and the structural and electrical infrastructure to make the plant operational. In addition, preparation of the soil and improvement of the access roads would continue for most of the construction phase. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the geotechnical report a different foundation method, such as screw pile, helical pile, micro-pile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site substation at the authorised CSP (Site 1.4).

[6] A permit will be required for the transportation of these abnormal loads on public roads.

Figure 3.7: Frame, structural details (*Photo courtesy of Igeteam, 2011*).

As the on-site substation at the authorised CSP Facility at site 1.4 will be used for Upilanga PV's 1 connection to the grid, no new sub-station will be constructed on-site at Upilanga PV1. Therefore activities associated with construction activities for an on-site substation will not be undertake at the Upilanga PV1 site.

Establishment of Ancillary Infrastructure

Ancillary infrastructure will include the cabling for the connection to the sub-station at the authorised CSP facility (site 1.4), workshop and maintenance building, storage and laydown areas, gatehouse, security offices, and other storage areas under roof. The establishment of these facilities/buildings will require the localised clearing of vegetation (~1ha) and levelling of the development area and the excavation of foundations prior to construction.

Undertake Site Rehabilitation

Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the solar PV facility, any access points to the site that are not required during the operation phase must be closed and rehabilitated.

3.7.3 Operation Phase

Upilanga PV1 is expected to be operational for a minimum of 20 years. The facility will, under normal operating conditions, operate continuously during daylight conditions, 7 days a week.

Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the facility, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operation phase of Upilanga PV1 will create a maximum of approximately 15-20 full-time employment opportunities. The number of skilled personnel during the operation phase will comprise 5%, semi-skilled 25% and low-skilled 70%. Employees that could be sourced from the local municipal pool and local townships include the less skilled and semi-skilled such as safety and security staff and certain maintenance crew. Highly skilled personnel may need to be recruited from outside the local area.

Water will be required for the operation phase of Upilanga PV1. Approximately 5 000m^3 of water per annum will be required for the operation of the solar PV facility, which is anticipated to be 20 years. The water required will be sourced directly from the Orange River via the existing abstraction point and delivered to the site for the operational phase.

Other services required for the operation of Upilanga PV1 include refuse material disposal and sanitation. No effluent is anticipated to be produced during the operational phase, except for normal sewage due to the presence of the operations staff. The sewage generated over this period will be collected and treated as per normal standards using a septic or conservancy tank. Should the local municipality not permit the use of the septic tank, sewage will be stored in the conservancy tank and collected either by a honey-sucker truck or by a service provider (contractor) for treatment at a licensed disposal site.

3.7.4 Decommissioning Phase

Depending on the continued economic viability of Upilanga PV1 following the initial 20-year operation period, the solar PV facility will either be decommissioned, or the operation phase will be extended. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the solar PV facility, the following activities will form part of the project scope.

Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components

When the solar PV facility is ultimately decommissioned, the equipment to be removed will depend on the proposed future land use for the site at that time. At this time, all above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will be removed, and the surface restored. Much of the above ground wire, steel, and PV panels, of which the system is comprised, are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and returned to a beneficial land use.

Future plans for the site and infrastructure after decommissioning

The capacity of Upilanga PV1 would have degraded by ~15% over 20 years. The expectation is that the development area will be used for future renewable energy procurement as the operation phase approaches the termination date of the 20-year Power Purchase Agreement (PPA). If decommissioning were to occur, it would be 20 years (or the stated years) after the commencement of the PPA. Another option for the site after decommissioning is for a compatible land use, such as grazing, to resume following site rehabilitation.

CHAPTER 4: PROJECT NEED AND DESIRABILITY

Appendix 1 of the EIA Regulations, 2014 (as amended) requires the inclusion of a motivation for the need and desirability for the proposed development including the need and desirability of the activity in the context of the preferred location. This Chapter provides an overview of the anticipated suitability of Upilanga PV1 being developed at the preferred location from an international, national, regional, and site-specific perspective. It also provides an overview of the need and desirability and perceived benefits of the project specifically.

4.1. Need and Desirability from an International Perspective

The need and desirability of Upilanga PV1, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols, and conventions. South Africa is signatory to a number of international treaties and initiatives, including the United Nations Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address social and economic development issues such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanization, environment and social justice. The SDGs comprise 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SGDs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets		Indicators	
7.1	By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 7.1.2	Proportion of population with access to electricity. Proportion of population with primary reliance on clean fuels and technology.
7.2	By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1	Renewable energy share in the total final energy consumption.
7.3	By 2030, double the global rate of improvement in energy efficiency.	7.3.1	Energy intensity measured in terms of primary energy and GDP.
7.A	By 2030, enhance international cooperation to facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	7.A.1	Mobilized amount of United States dollars per year starting in 2020 accountable towards the $100 billion commitment.
7.B	By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1	Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of Upilanga PV1 would contribute positively towards Goal 7 of the SGDs through the following means:

- By generating up to 100MW of affordable and clean energy.
  - A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent IPP announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the DoE's REIPPP and Coal Baseload IPP Procurement (CBIPPP) Programmes found that solar PV and wind were 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal).
  - PV technology is one of the cleanest electricity generation technologies, as it is not a consumptive technology and does not result in the release of emissions during its operation.
- By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

4.2. Need and Desirability from a National Perspective

4.2.1. Policy and Planning

Upilanga PV1 is proposed in specific response to the requirement for diversification of the country's energy mix to include renewable energy such as solar PV as detailed in the IRP 2019. As a result, the need and desirability of Upilanga PV1 from a national perspective, can largely be assimilated from the project's alignment with national government policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in **Chapter 2**). The following key plans have been developed by government to consider South Africa's current energy production, projected future demands, and provides the necessary framework within which energy generation projects can be developed:

- Integrated Energy Plan (IEP)
- Integrated Resource Plan (IRP)

The abovementioned energy plans have been extensively researched and are updated on an ongoing basis to take into consideration changing scenarios, new information, developments in new technologies, and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The latest iteration of the IEP (25 November 2016) contained the following statement regarding solar power in South Africa:

"*South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The daily solar radiation in South Africa varies between 4.5 and 6.5 kilowatt hours per square meter (kWh/m²) (16 and 23 megajoules per square meter [MJ/m²]) (Stassen, 1996), compared to about 3.6kWh/m² in parts of the United States and about 2.5kWh/m² in Europe and the United Kingdom. The total area of high radiation in South Africa amounts to approximately 194 000km², including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64GW. Solar energy has the potential to contribute quite substantially*

to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres."

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding solar energy's contribution to the diversified energy mix:

- *Solar should play a much more significant role in the electricity generation mix than it has done historically, and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.*
- *Several interventions which could enhance the future solar energy landscape are recommended as follows: – Large scale CSP projects with proven thermal storage technologies and hybridisation / industrial steam application projects should be incentivised in the short to medium term. In the long term the existing incentives could be extended to promote locally developed CSP technology storage solutions and large scale solar fuel projects.*
- *A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape Province and extended to other provinces deemed to have high solar radiation levels.*
- *Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.*

The IRP for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. The IRP 2010 included 9.6GW of nuclear, 6.25GW of coal, **17.8GW of renewables**, and approximately 8.9GW of other generation sources such as hydro and gas in addition to all existing and committed power plants.

Since the promulgated IRP 2010, the following capacity developments have taken place:

- A total of **6 422MW** under the REIPP Programme has been procured with **3 876MW** being operational and made available to the grid;
- **1 005MW** has been commissioned by IPPs from the two (2) Open Cycle Gas Turbine (OCGT) peaking plants; and
- Under the Eskom Build Programme, **1 332MW** has been commissioned from the Ingula Pump Storage Project in KwaZulu-Natal, **1 588MW** and **800MW** from the Medupi and Kusile power stations, and **100MW** has been commissioned from the Sere Wind Farm.

Besides capacity additions, a number of assumptions changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection, Eskom's existing plant performance, as well as new technology costs. In addition, environmental considerations such as South Africa's contribution to Greenhouse gases which contribute to climate change, local air quality and water availability have come to the fore.

These considerations necessitated the review and update of the IRP and ultimately the promulgation of a revised plan in October 2019. In terms of the IRP 2019, South Africa continues to pursue a diversified energy

mix that reduces reliance on a single or a few primary energy sources. In the period prior to 2030, the system requirements are largely for incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity. South Africa is a signatory to the Paris Agreement on Climate Change and has ratified the agreement. In line with NDCs (submitted to the UNFCCC in November 2016), South Africa's emissions are expected to peak, plateau and from year 2025 decline.

As detailed in Chapter 2 of this report, the IRP 2019 provides for the development of 6000MW of new capacity from large scale PV.

Upilanga PV1 will make use of renewable energy technology and would contribute positively towards reducing South Africa's GHG emissions and ensure compliance with all applicable legislation and permitting requirements. In addition, by making use of PV technology, Upilanga PV1 would have reduced water requirements when compared with some other generation technologies in alignment with one of the Vision 2030 themes of the then Department of Water and Sanitation's (now the Department of Human Settlements, Water and Sanitation) National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

4.2.2. Renewable Energy Development Zones (REDZ)

The DEA has committed to contribute to the implementation of the NDP, the National Infrastructure Plan (NIP) and the undertaking of Strategic Environmental Assessments (SEAs) to identify adaptive processes that streamline the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment.

The solar photovoltaic (PV) and wind SEA was accordingly commissioned by the DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large-scale solar PV and wind energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZ).

The procedure to be followed in applying for environmental authorisation for a large-scale project in a REDZ was formally gazetted on 16 February 2018 (in GN R113 and GN R114). The aim of the zones is to streamline the regulatory process, identifying geographical areas where wind and solar PV technologies can be incentivised and where intense grid expansion can be directed. These REDZ will ensure a transition to a low carbon economy, accelerating infrastructure development and contributing to a more coherent and predictable regulatory framework.

As illustrated in **Figure 4.1**, the complete extent of the study area and development area of Upilanga PV1 falls within the Upington REDZ, which was selected by the DEA as an area highly suitable for the development of solar energy facilities given a range of factors considered, including solar irradiation and environmental sensitivities. This alignment with the REDZ area provides further support for the desirability of the specific site selected for this project

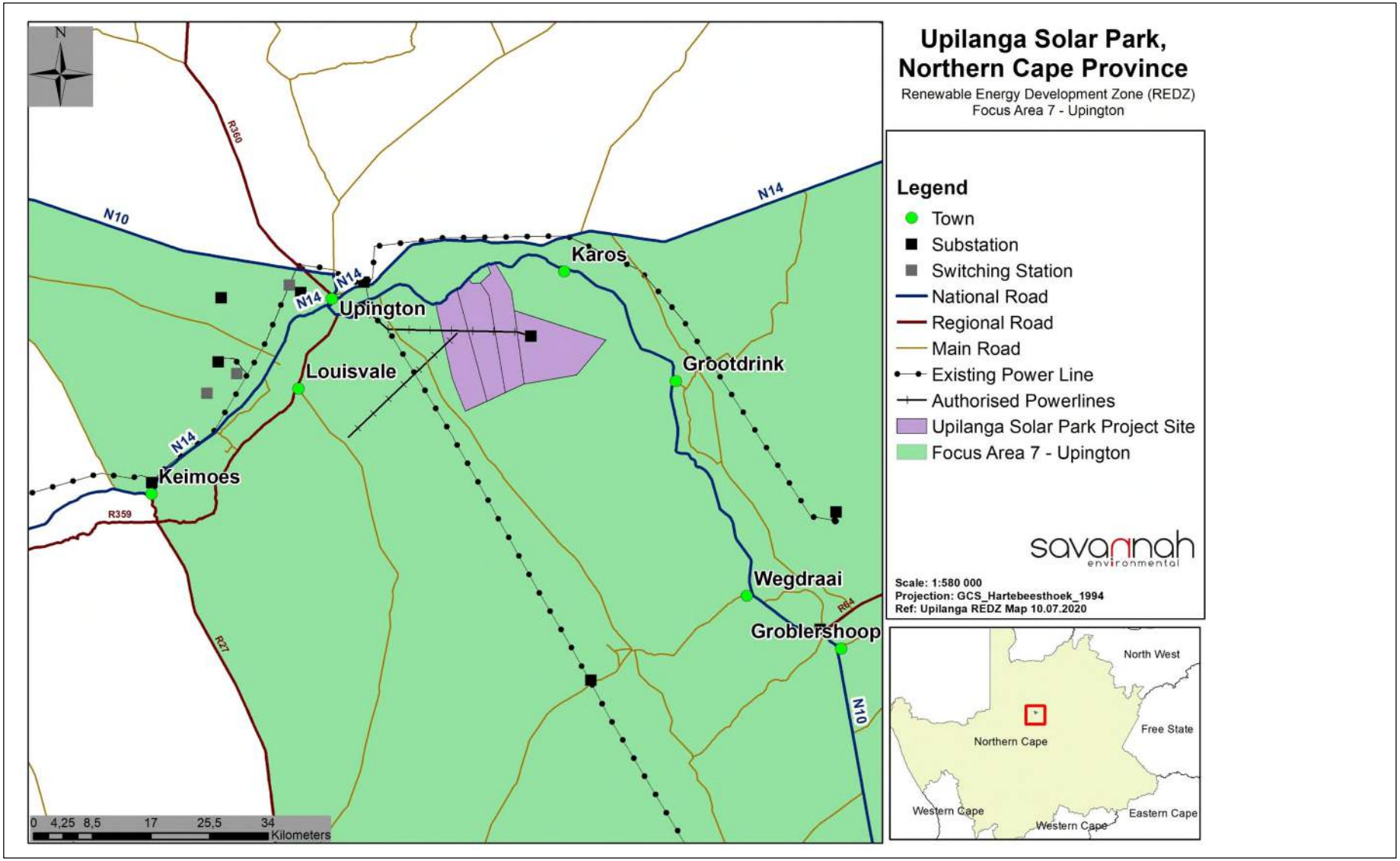


Figure 4.1: Upilanga PV1 is located within the north-western corner of the Upington REDZ area (Zone 7), known as the Upington REDZ

4.3. Need and Desirability of the project from a Regional Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. In 2016, South Africa had a total generation capacity of 237 006GWh. Approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal (predominantly located in Mpumalanga and Limpopo), and only 0.9% (equivalent to 2 151GWh) was generated by solar (refer to **Figure 4.2**).

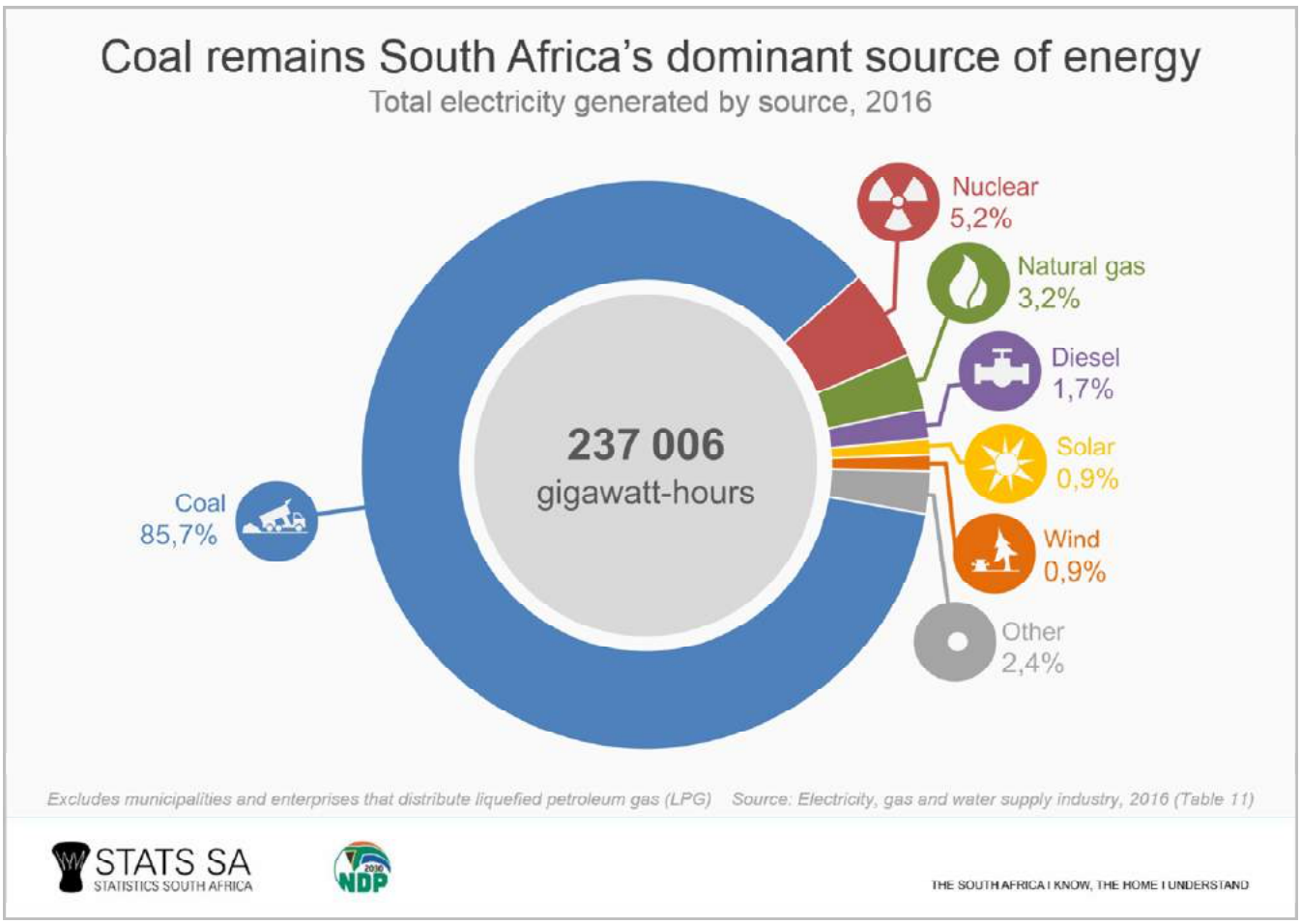


Figure 4.2: Overview of South Africa's electricity generation by source (Source: StatsSA 2016 Electricity, gas and water supply industry).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where the development of solar energy facilities is a feasible and suitable option for electricity generation.

The Upington area has been ear-marked as a hub for the development of solar energy projects due to the viability of the solar resource for the area, and this area is included in the solar corridor which has been identified by the Northern Cape Spatial Development Framework (refer to Chapter 2 for more details), as well as within the Upington REDZ (an area identified for the development of solar PV facilities). The overarching objective for the solar energy facility is to maximise electricity production through exposure to

the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values. The GHI for the area derived from the World Bank Group's Global Solar Atlas is approximately 2 264kWh/m^2/annum, equivalent to the highest GHI values in the country (refer to **Figure 4.3**). The project site is therefore suitably located for the proposed development.

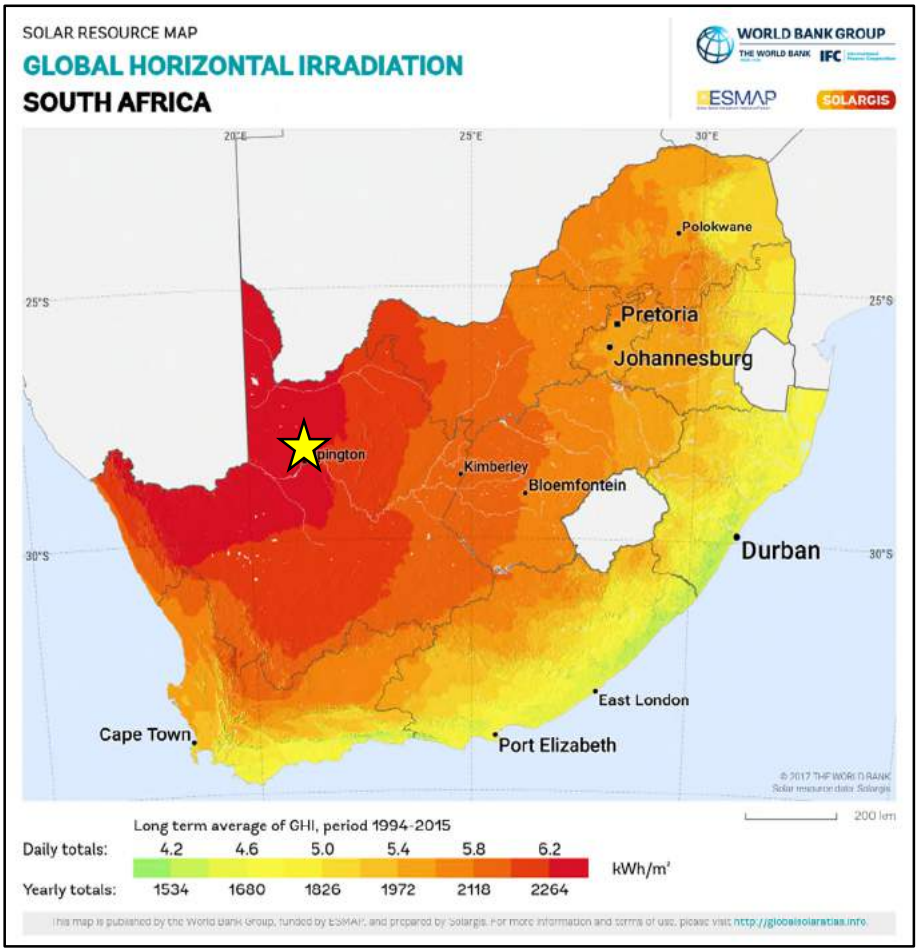


Figure 4.3: Solar irradiation map for South Africa, the proposed position of Upilanga PV1 is shown by the yellow star on the map. (Source: World Bank Groups Global Solar Atlas).

4.4. Need and Desirability of the project from a Local Perspective

The Upilanga PV1 Project is proposed to be constructed outside of the Upington urban edge within a broader site identified to be developed as a solar park. The project site itself has not been considered for an alternative land use such as urban development, nor is it currently used for agriculture as a result of limited potential due to scarcity of water resources. Although currently used for grazing, this land use will cease in 2021 as a result of the ongoing droughts in the area. The proposed development of the site for renewable energy is therefore considered to be a suitable land use.

From a local perspective, the site has specifically been identified by the project proponent as being highly desirable for the development of a PV facility due to its suitable topography (i.e. in terms of slope and local topography), site access (i.e. to facilitate the movement of machinery during the construction phase and

operations staff in the long-term), land availability (i.e. the land is secured for the intended use), the extent of the site (i.e. the land parcel is able to accommodate the 350 ha required for the facility) (refer to Section 3.2 for details), and enabling optimal placement of the infrastructure considering potential environmental sensitivities or technical constraints, as well as the consolidation of renewable projects within an already identified node, being within an identified Solar Corridor and REDZ.

The site is located within an area which has become a node for solar energy projects, with the following operational preferred bidder projects (PB) located directly within a 30km radius from the project development site: Upington Airport Solar Energy Facility to the east of the site, and the Ilanga 1 CSP (within the Upilanga Solar Park area) to the north of the proposed project. According to current records there are 20 other developments proposed within a 50km radius of the proposed development site (refer to **Chapter 8** for more details of these developments and the expected cumulative impacts). The consolidation of similar developments within an area is considered desirable, provided that these developments are placed in areas of lower environmental sensitivity. This consolidation of projects will result in a consolidation of impacts within one area rather than a spread of the impacts across a larger area, enabling focussed management and mitigation within a single area.

CHAPTER 5: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (amended in April 2017) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Upilanga PV1 is a listed activity requiring environmental authorisation. In terms of GNR114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the Upilanga project site within the Upington REDZ.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed solar PV facility and associated infrastructure[7]. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the facility, detailed independent specialist studies were undertaken as part of the BA process.

During the undertaking of the BA process South Africa was subjected to the spread of COVID-19 throughout the country which lead to the declaration and enforcing of Government Gazette 43096 which placed the country in a national state of disaster limiting the movement of people to curb the spread of the virus. Considering the limitations experienced during this time a comprehensive consultation process was designed and implemented to cater for the undertaking of a full-scale, innovative public participation process which included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders. This chapter serves to outline the process that was followed during the BA process.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered as a result of the development of Upilanga PV1 have been included in section 5.2, **Table 5.1**. The specific project activity relating to the relevant triggered listed activity has also been included in **Table 5.1**.
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	The details of the public participation process undertaken for Upilanga PV1 has been included and described in section 5.3.2.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	All comments raised during the 30-day review and comment period of the BA Report and through on-going consultation with I&APs will be included as part of a C&R report (**Appendix C8**) to be submitted as part of the Final BA Report to DEFF for decision-making..
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.	The methodology used to assess the significance of the impacts of Upilanga PV1 has been included in section 5.4.

[7] The grid connection solution for Upilanga PV1 has been assessed as part of this Basic Assessment process.

Requirement	Relevant Section
(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.	The assumptions and limitations of the BA process being undertaken for Upilanga PV1 is included in section 5.6.

5.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to Upilanga PV1 as identified at this stage in the process are described in more detail under the respective sub-headings.

5.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(1) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. Due to the fact that Upilanga PV1 is a power generation project and therefore relates to the IRP 2010 – 2030, 2019[8], the National DEFF has been determined as the Competent Authority in terms of GNR 779 of 01 July 2016. The Provincial Northern Cape Department of Environment and Nature Conservation (NC DENC) is a Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for Environmental Authorisation.

The BA process being conducted for Upilanga PV1 is being undertaken in accordance with Section 24 (5) of the NEMA. Section 24 (5) of NEMA pertains to Environmental Authorisations (EAs), and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 7 of the Renewable Energy Development Zones (REDZ) (also known as the Upington REDZ), one of the eight (8) designated REDZ areas, the EIA process to be followed for Upilanga PV1 will be as per GN R114, as formally gazetted on 16 February 2018. Upilanga is now subject to a Basic Assessment process and not a full Scoping & EIA process, as well as a shortened timeframe of 57 days for the processing of an application for environmental authorisation.

Table 5.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) which apply to Upilanga PV1, and for which an Application for Environmental Authorisation has been submitted to DEFF.

[8] The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

The table also includes a description of the specific project activities which relate to the applicable listed activities.

Table 5.1: Listed activities as per the EIA regulations which are triggered by Upilanga PV1

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN 327, 08 December 2014 (as amended on 07 April 2017)	11(i)	The development of facilities or infrastructure for the transmission and distribution of electricity - (i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts. ***Upilanga PV1 will require the construction and operation of an on-site step up facility to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs (a) within a watercourse or (c) within 32 meters of a watercourse, measured from the edge of a watercourse. ***The development of Upilanga PV1 will require the construction of infrastructure with a physical footprint of ~350ha, part of which will be within and within 32m of ephemeral watercourses identified within the development footprint.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	14	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more, but not exceeding 500 cubic meters. ***The development and operation of Upilanga PV1 will require the storage of up to 80 cubic metres of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site facility substation transformers, lubricants and solvents***
GN 327, 08 December 2014 (as amended on 07 April 2017)	19	The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse. ***The development of Upilanga PV 1 will require the removal or moving of soil within a watercourse during the construction of the solar PV facility. Ephemeral watercourses have been identified within the development footprint and the removal or moving of ~10m³ of soil will be required.***
GN 327, 08 December 2014 (as amended on 07 April 2017)	24(ii)	The development of a road (ii) with a reserve wider than 13.5 meters or where no reserve exists where the road is wider than 8 meters.

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
		Upilanga PV 1 will require the development of access roads (including internal access roads) with a width of between 4 and 10 meters.
GN 327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development (ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare. ***Upilanga PV 1 (considered to be an industrial development) will be constructed and operated on land used for agricultural purposes. The development area of the project is located outside of an urban area and the development footprint will have an extent of ~350ha.***
GN 325, 08 December 2014 (as amended on 07 April 2017)	1	The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more. ***Upilanga PV1 will make use of solar energy as a renewable energy resource and will have a contracted capacity of up to 100MW (AC).***
GN 325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. ***The project will require the clearance of an area of up to 350ha (equivalent to the development footprint) of vegetation. The project is proposed on a property where the predominant land use is grazing and comprises of indigenous vegetation. The project would therefore result in the clearance of an area of indigenous vegetation greater than 20ha in extent.***
GN 324, 08 December 2014 (as amended on 07 April 2017)	10(g)(ii)(iii)(bb)	The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic meters in the (g) Northern Cape, (ii) in areas within a watercourse or wetland; or within 100 meters from the edge of a watercourse or wetland; and (iii) outside urban areas. ***Upilanga PV1 will require the storage and handling of dangerous goods for the construction and operation of the solar PV facility. Containers with a combined capacity of ~80m^3 will be required. Ephemeral watercourses have been identified within the development footprint and storage of dangerous goods will be located within 100m of the watercourses.***
GN 324, 08 December 2014 (as amended on 07 April 2017)	14(ii)(a)(c)(g)(ii)(bb)	The development of (ii) infrastructure or structures with a physical footprint of 10 square meters or more, where such development occurs (a) within a watercourse, or (c) within 32 meters of a

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
		watercourse, measured from the edge of a watercourse, in (g) the Northern Cape, (ii) outside urban areas. ***The development of Upilanga PV1 and associated infrastructure will require the construction of infrastructure with a physical footprint of ~350ha within and within 32m of ephemeral watercourses identified within the development footprint. The development area is located within the Northern Cape, outside urban areas.***

5.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional DWS). Water use is defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

Error! Reference source not found. lists Water Uses associated with the proposed project and identified in t erms of the NWA which require licensing either in the form of a GA, or in the form of a WUL. The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 5.2: List of Water Uses published under Section 21 of NWA, as amended.

Notice No.	Activity No.	Description of Water Use
NWA (No. 36 of 1998)	Section 21 (c)	Impeding or diverting the flow of water in a watercourse. ***The development area considered for the establishment of Upilanga PV is associated with the presence of ephemeral watercourses. Activities pertaining to the establishment of the solar PV facility might encroach on watercourses which may lead to an impediment and diversion of the flow of water in the watercourses.***
	Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. ***The development area considered for the establishment of Upilanga PV is associated with the presence of ephemeral watercourses. Activities pertaining to the establishment of the solar PV facility might encroach on watercourses which may lead to the altering of the characteristics of the watercourses.***

In the event that the flow of water in the ephemeral watercourses is affected and the bed, banks or course characteristics are altered, application would need to be made for a WUL in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GNR 267), or a GA registered in accordance with the requirements of Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive

EA has been received and the project selected as a Preferred Bidder. This is in line with the requirements of the Department of Water and Sanitation.

5.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

1). Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –

a. the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;

b. the construction of a bridge or similar structure exceeding 50m in length;

c. any development or other activity which will change the character of a site –

i). exceeding 5 000m² in extent; or

ii). involving three or more existing erven or subdivisions thereof; or

iii). involving three or more erven or divisions thereof which have been consolidated within the past five years; or

iv). the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of such development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by the proposed solar PV facility, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GNR 668).

A Heritage Impact Assessment has been undertaken as part of the BA Process (refer to Appendix H).

5.3 Overview of the Basic Assessment Process for Upilanga PV1

Key tasks undertaken for the BA included:

» Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
» Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DEFF) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.

- Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project
- Considerations on the restrictions enforced in terms of Government Gazette 43096 which placed the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus.
- Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended.
- Preparation of a BA report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GNR326.
- 30-day public and authority review period of the BA report.
- Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
- Submission of a final BA report to the DEFF for review and decision-making

The tasks are discussed in detail in the sub-sections below.

5.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Environment, Forestry and Fisheries (DEFF) is the competent authority for all projects related to the IRP. As the project is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (DENC) is the commenting authority. Consultation with the regulating authorities (i.e. DEFF and DENC) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

- Undertaking of a pre-application consultation meeting with the DEFF.
- Submission of a Public Participation Plan for approval prior to the commencement of the process.
- Submission of the project notification letters and application for Environmental Authorisation to the DEFF.
- Submission of the BA Report for review and comment by:
  - The competent and commenting authorities.
  - State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
  - Organs of State which have jurisdiction in respect of the activity to which the application relates.

As per DEFF's Directions issued 05 June 2020, Annexure 3, applicable during COVID-19 Alert Level 3 all correspondence with stakeholders and I&AP's has been via electronic communication/electronic formats in accordance with the Regulations. A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C.**

5.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of

public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process the online stakeholder engagement platform will allow for the following:
» provide an opportunity to submit comments regarding the project;
» assist in identifying reasonable and feasible alternatives;
» contribute relevant local information and knowledge to the environmental assessment;
» allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
» foster trust and co-operation;
» generate a sense of joint responsibility and ownership of the environment; and
» comment on the findings of the environmental assessments.

During the decision-making phase:
» to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

» Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review.
» The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
» Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project.
» Various ways are provided to I&APs to correspond and submit their comments i.e. online stakeholder engagement platform, fax, post, email, whatsapp and sms.
» An adequate review period is provided for I&APs to comment on the findings of the BA Report.

The Public Participation Process undertaken for the proposed development of Upilanga PV1 considers the restrictions and limitations imposed by Government through section 27 (2) of the Disaster Management Act (Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Forestry and Fisheries (DEFF) in terms of consultations with I&APs. A Public Participation Plan was prepared and submitted to the DEFF on 06 July 2020 Approval of the Plan was provided by the DEFF Case Officer via email on **08 July 2020** (**Appendix B**).

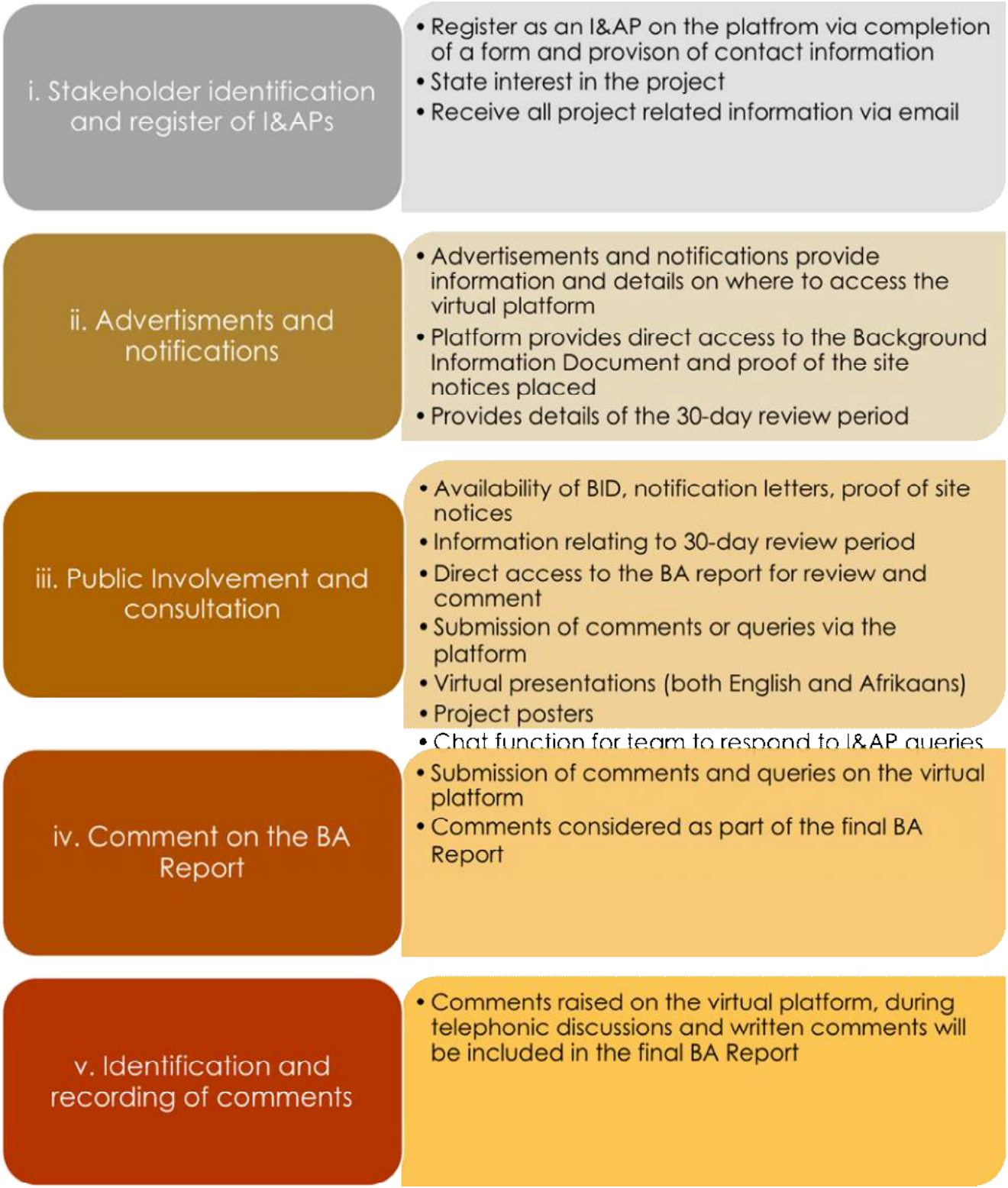
Together with the standard public participation approach, additional alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation

process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014 as amended. The Public Participation Plan (**Appendix C9**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, limitations which certain I&APs may have in terms of access to computers and internet, as well as access to public spaces currently not open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations and posters. The platform also contains the BA report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process. The online platform allows for instant feedback and comments to be submitted, in so doing saving time for the stakeholder and also giving the assurance that their comments have been submitted for inclusion in the project reporting. Where I&APs do not have access to the online platform, information has been shared via other means such as telephone, email, WhatsApp CD and communication via the Ward Councillor and community representatives.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks have been undertaken:

- Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
  - (i) the site where the activity to which the application relates is or is to be undertaken; and
  - (ii) any alternative site mentioned in the application;
- Give written notice to:
  - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
  - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
  - (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
  - (v) the municipality which has jurisdiction in the area;
  - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
  - (vii) any other party as required by the competent authority.
- Place an advertisement in one local newspaper.
- Open and maintain a register of I&APs and Organs of State.
- Release a BA Report for a 30-day review period.
- Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and the responses provided by the project team.

The schematic illustration overleaf provides an overview of the tools that are available to I&APs and stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.



i. Stakeholder identification and Register of Interested and Affected Parties

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
(a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;

(b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
(c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project through either directly contacting the Savannah Environmental Public Participation team via email or fax or use of the online stakeholder engagement platform. An initial list of key stakeholders identified and registered is listed in **Table 5.3**.

Table 5.2: List of Stakeholders identified for the inclusion in the project database during the public participation process for Upilanga PV1

Organs of State
National Government Departments
Department of Mineral Resources and Energy (DMRE)
Department of Environment, Forestry and Fisheries (DEFF)
Department of Agriculture, Rural Development and Land Reform (DARDLR)
Department of Human Settlement, Water and Sanitation (DHSWS)
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
Square Kilometre Array Project (SKA)
Telkom SA SOC Limited
Transnet SA SOC Limited
Provincial Government Departments
Northern Cape Department of Agriculture
Northern Cape Department of Environment and Nature Conservation (DENC)
Northern Cape Department of Roads and Public Works
Ngwao Boswa Kapa Bokone (NBKB)
Local Government Departments
ZF Mgcawu District Municipality
Dawid Kruiper Local Municipality
Key Stakeholders
BirdLife South Africa
Endangered Wildlife Trust (EWT)
SENTECH
Wildlife and Environment Society of South Africa (WESSA)
Landowners
Affected landowners, tenants and occupiers
Neighbouring landowners, tenants and occupiers

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C1** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names of[9]:

- all persons who requested to be registered on the database through the use of the online stakeholder engagement platform or in writing and disclosed their interest in the project;
- all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and all persons who submitted written comments or attended virtual meetings and viewed the narrated presentations on the Savannah Environmental online platform during the public participation process.

I&APs have been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs will be on-going for the duration of the BA process. The database of I&APs will be updated throughout the BA process and will act as a record of the I&APs involved in the public participation process.

ii. Advertisements and Notifications

40.(2)(a)	Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of – (i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and (ii) Any alternative site.
40.(2)(b)	Giving written notice, in any of the manners provided for in section 47D[10] of the Act, to – (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken; (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area; (iv) The municipality which has jurisdiction in the area; (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and (vi) Any other party as required by the competent authority.

[9] Contact details and addresses have not been included in the I&AP database as this information is protected by the Protection of Personal Information Act (Act No. 4 of 2013).

[10] Section 47D of NEMA pertains to the delivery of documents, and states that:

(1) A notice or other document in terms of this Act or a specific environmental management Act may be issued to a person –
(a) By delivering it by hand;
(b) By sending it by registered mail –
(i) To that person's business or residential address; or
(ii In the case of a juristic person, to its registered address or principal place of business;
(bA) By faxing a copy of the notice or other document to the person, if the person has a fax number;
(bB) By e-mailing a copy of the notice or other document to the person, if the person has an e-mail address; or
(bC) By posting a copy of the notice or other document to the person by ordinary mail, if the person has a postal address;
(c) Where an address is unknown despite reasonable enquiry, by publishing it once in the Gazette and once in a local newspaper circulating in the area of that person's last known residential or business address.
(2) A notice or other document issued in terms of subsection (1)(b), (bA), (bB), (bC) or (c) must be regarded as having come to the notice of the person, unless the contrary is proved."

40.(2)(c)	Placing an advertisement in – (i) One local newspaper; or (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
40.(2)(d)	Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and
40.(2)(e)	Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to – (i) Illiteracy; (ii) Disability; or (iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

- Compilation of a background information document (BID) (refer to **Appendix C3**) providing technical and environmental details on the project and how to become involved in the BA process. The BID and the BA process notification letter announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/IAPs of Upilanga PV1, providing background information of the project and inviting I&APs to register on the project's database were distributed via email on **10 July 2020**. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (http://www.savannahsa.com/public-documents/energy-generation).
- Placement of site notices announcing the BA process at visible points along the boundary of the study area (i.e. the boundaries of the two affected properties), in accordance with the requirements of the EIA Regulations on **16 July 2020 and 17 July 2020**. Photographs and the GPS co-ordinates of the site notices are contained in **Appendix C2** of the BA Report and are also available on the Savannah Environmental online platform. Process notices announcing the BA were places at the notice board of the Municipal offices in Upington and at the local petrol filling station Leerkrans General Dealers
- BA process notification letters announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/I&APs of the Upilanga solar PV1 facility project, providing background information of the project and inviting I&APs to register on the project's database, were distributed via email on **10 July 2020.** The evidence of the distribution of the process notification letters are contained in **Appendix C** of the BA Report.
- Placement of an advertisement in the Volksblad Newspaper on **03 August 2020** at the commencement of the 30-day review and comment period. This advert announced the project, the BA process, the details to access the Savannah Environmental online platform, as well as the availability of the BA report on this platform, and invited comment on the BA Report. This advert also included the details on the review period for the BA report.
- The BA Report was made available for review by I&APs for a 30-day review and comment period from 03 August 2020 to 04 September 2020. Electronic versions of the BA Report and CD copies were requested have been circulated to Organs of State via courier at the commencement of the review period. The BA Report was also available for download on the Savannah Environmental's website.
- An advertisement was placed in the Gemsbok Newspaper on the 11 November 2020 prior to commencement of the 30-day review and comment period for the revised Basic Assessment report.

» The Revised BA Report was made available for review by I&APs for a 30-day review and comment period from **11 November 2020** to **11 December 2020**. Electronic versions of the revised BA Report and CD copies that were requested were circulated to Organs of State via courier at the commencement of the review period. The BA Report was also available for download on the Savannah Environmental's website.

iii. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the greater study area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 5.3: Consultation undertaken with I&APs for Upilanga PV1

Activity	Date
Distribution of the process notification and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database. The BID, notification letter, and electronic reply form was also made available on the virtual platform.	10 July 2020
Placement of site notices on-site and in public places. Proof of placement of site notices were also made available on the online platform.	16 July 2020
Distribution of the BID	10 July 2020
Advertising of the availability of the BA Report for a 30-day review period in the Volksblad newspaper, including details on how to access the online platform and the BA Report via this means.	03 August 2020
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	03 August 2020
30-day review and comment period of the BA Report.	03 August - 04 September 2020
Virtual Meetings through virtual presentations on the Savannah Environmental Virtual Platform: » Registered I&APs making use of the online platform » Adjacent Landowners Authorities and key stakeholders (including Organs of State, local municipality and community-based organisations. Where an I&AP does not have access to a computer and/or internet to view the virtual presentation telephonic discussions will be set-up to provide the presentation electronically with the discussion being recorded and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions.	26 August 2020 (DWS Northern Cape) 27 August 2020 (Cllr Moya)' 11 November 2020 (DAFF, NC DAERDLR)
Advertising of the availability of the revised BA Report for a 30-day review period in the Gemsbok newspaper (as the Volksblad newspaper is now only available online and is no longer in print version, it was determined	11 November 2020

Activity	Date
that as the Gemsbok newspaper that is available in print version would have a wider reach and is easily accessible) including details on how to access the online platform and the BA Report via this means.	
Distribution of notification letters announcing the availability of the revised BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners), registered I&APs and key stakeholder groups.	09 November 2020
30-day review and comment period of the revised BA Report.	11 November 2020 – 11 December 2020
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs	Throughout BA Report 30-day review period

iv. Registered I&APs entitled to Comment on the BA Report

43.(1) A registered I&AP is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.

(2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.

44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.

(2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –

(a) A lack of skills to read or write;
(b) Disability; or
(c) Any other disadvantage;

Reasonable alternative methods of recording comments must be provided for.

The BA Report was made available for review by I&APs for a 30-day review and comment period from **03 August 2020** to **04 September 2020.** Electronic versions of the BA Report and CD copies were circulated to Organs of State via courier at the commencement of the review period. The BA Report was also available for download on the Savannah Environmental's website. The evidence of distribution of the BA Report is included in Appendix C.

This revised BA report was made available for review by I&APs for a 30-day review and comment period from 11 November 2020 to 11 December 2020. Electronic versions of the revised BA Report and CD copies that were requested were circulated to Organs of State via courier at the commencement of the review period. The revised BA report was also made available for download on the Savannah Environmental's website. The evidence of distribution of the revised BA Report is included in Appendix C of this final BA report.

I&APs registered on the database were notified by means of a notification letter via e-mail of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made. Notification letters were also distributed announcing the availability of the revised BA Report for a 30-day review and comment period, proof of notification has been included within Appendix C.

The report has been made available in soft copies to I&APs due to restrictions and limitations on public spaces during the national state of disaster related to COVID-19. Where possible to maintain sanitary conditions. Electronic copies of the BA Report available for download from the Savannah online platform and in CD format (where requested) have also been made available for a 30-day review and comment period to specific Organs of State including the Department of Water and Sanitation and Northern Cape Department of Environment and Nature Conservation.

The BA Report and Revised BA Report were made available on the Savannah Environmental website (https://www.savannahsa.com/public-documents/energy-generation/). The notification was distributed prior to commencement of the 30-day review and comment period, on **03 August 2020 for the BA Report and 09 November 2020 for the Revised BA Report.** Where I&APs were not able to provide written comments, other means of consultation, such telephonic discussions were used to provide the I&APs with a platform to verbally raise their concerns and comments on the proposed development. Submission of comments and queries were also enabled through the use of the Savannah Environmental online platform. The comments raised during the discussions and written comments have been recorded and included in **Appendix C8** of the BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs over the duration of the BA process have been synthesised into a Comments and Responses (C&R) Report which is included in **Appendix C8** of the BA Report. This includes all written comments received. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised during the public participation process.

Notes of all the telephonic discussions held and minutes of virtual meetings conducted during the 30-day review and comment period of the BA Report are included in **Appendix C7**.

The C&R Report has been updated with all comments received during the 30-day review and comment period for the revised BAR and is included in **Appendix C8** in this final BA Report that has been submitted to the DEFF for decision-making. Below is a summary of comments received on the Revised Basic Assessment report:

- A meeting was held with DEFF: Provincial Biodiversity (Jacoline Mans) and NC DAEARDLR (Samantha De La Fontaine) on the 11 November 2020 to discuss the Offset Analysis report (Appendix D1) as presented in the Revised Basic Assessment report. The specialist who undertook the Offset Analysis was present during the meeting to address comments and provide clarity on the findings of the Offset Analysis. It was indicated by both authorities that the Offset Analysis report would serve as a good proposal for an Offset Plan and that the proposal will serve as basis for further discussion. It was also indicated by DEFF: Provincial Biodiversity that it would not be possible to finalise the offset before the Authorisation for the project is issued. The minutes of the meeting are included in Appendix C7 of the report.
- Comments regarding the amended basic assessment report were received from the DEFF case officer with aspects to be included and addressed within the final BAR. These comments have been addressed within the Comments and Responses Report included in Appendix C6 of report.

5.4 Assessment of Issues Identified through the BA Process

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulation 19 and 21 of the 2014 EIA Regulations.

The requirement for the submission of a Screening Report (**Appendix K**) for the proposed development is applicable as it triggers Regulation 19 of the 2014 EIA Regulations (as amended). **Table 5.5** provides a summary of the specialist assessment requirements identified for the project site in terms of the screening tool and responses to each assessment requirement based on the nature and extent of the project.

Table 5.5: Sensitivity ratings from the DEFF's web-based online Screening Tool associated with the development of Upilanga PV1

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Agricultural Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	An Agricultural Impact Assessment has been undertaken for the Upilanga and included as Appendix G of the BA Report.
Landscape/Visual Impact Assessment	Low	Although a low sensitivity rating of the landscape/visual theme is applicable, a Visual Impact Assessment has been undertaken for Upilanga PV1 and is included in this BA Report as **Appendix I.**
Archaeological and Cultural Heritage Impact Assessment	High	A Heritage Impact Assessment (which considers the impact on both archaeological and cultural aspects of the study area and the development area) has been undertaken for Upilanga PV1 and is included in this BA Report as **Appendix H**.
Palaeontology Impact Assessment	Medium	The Heritage Impact Assessment (included as **Appendix H** of the BA Report) includes an assessment of the potential impact on palaeontological resources within the study area and development area.
Terrestrial Biodiversity Impact Assessment	Very High	An Ecological Impact Assessment (including consideration of flora and fauna) has been undertaken for Upilanga PV1 and is included as **Appendix D** of the BA Report.
Aquatic Biodiversity Impact Assessment	Very High	An Aquatic Impact Assessment has been undertaken for Upilanga PV1 and is included as **Appendix F** of the BA Report.
Avian Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	An Avifauna Impact Assessment Report has been undertaken for the Upilanga PV1 and included as **Appendix E** of the BA Report.

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating to the need for the study)	Project Team Response
Civil Aviation Assessment	Medium	The proposed development is located 28km to the south-east of the Upington International Airport. The Civil Aviation Authority will be consulted throughout the BA process.
Defence Assessment	Medium	The proposed study area and development area is not located within the vicinity of any military bases. The nearest military base is the 8 South African Infantry Battalion (Mechanized Infantry) which is located outside the town of Upington near the Upington International Airport. The base will be consulted throughout the BA process.
RFI Assessment	Medium	The development area under consideration for the development of Upilanga PV1, is outside the radius of the Karoo Central Astronomy Advantage Area declared in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) of 2007. The South African Square Kilometre Array Project (SKA) will however be consulted during the 30-day review and comment period of the BA Report to provide written comments on the proposed development.
Geotechnical Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified as required prior to commencement of the activity.	A Geotechnical Assessment of the development area will be undertaken by the proponent as part of the final design and planning process.
Socio-Economic Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified.	A Social Impact Assessment has been undertaken and is included in the BA Report as **Appendix J**.
Hydrological Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified.	The specialist that undertook the aquatic assessment (**Appendix F)** indicated that due to ephemeral flows within the site area that a hydrological assessment would not be deemed necessary.
Plant Species Assessment	Medium	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Upilanga PV1 and is included as **Appendix D** of the BA Report.
Animal Species Assessment	High	

Based on the results of the screening, and from experience on similar projects and in the study area, the EIA project team has identified the following issues as requiring investigation.

Table 5.6: Issues identified for investigation and specialist consultants appointed to evaluate the potential impacts associated with Upilanga PV1

Issue/Assessment	Specialist Name	Specialist Company	Appendices
Ecology Impact Assessment.	Simon Todd	3Foxes Biodiversity Consulting	Appendix D
Avifauna Impact Assessment	Eric Hermann	3Foxes Biodiversity Consulting	Appendix E
Aquatic Assessment	Brian Colloty	EnviroSci (Pty) Ltd	Appendix F
Soils and Agricultural Potential Impact Assessment	Garry Paterson	Agriculture Research Council – Soil, Climate and Water	Appendix G
Visual Impact Assessment	Lourens de Plessis	LOGIS	Appendix I
Heritage and Archaeological Impact Assessment	Jenna Lavin	CTS Heritage	Appendix H
Social Impact Assessment	Lisa Opperman	Savannah Environmental	Appendix J
Social Impact Assessment Peer Review	Tony Barbour	Independent Consultant	Appendix J

Specialist studies considered direct, indirect and cumulative environmental impacts associated with the development of all components of Upilanga PV1. Issues were assessed in terms of the following criteria:

- The **nature**, 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 score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
- The **duration**, wherein it is indicated whether:
  - The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
  - The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
  - Medium-term (5–15 years) – assigned a score of 3;
  - Long term (> 15 years) - assigned a score of 4;
  - Permanent - assigned a score of 5.
- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
  - 0 is small and will have no effect on the environment;
  - 2 is minor and will not result in an impact on processes;
  - 4 is low and will cause a slight impact on processes;
  - 6 is moderate and will result in processes continuing but in a modified way;
  - 8 is high (processes are altered to the extent that they temporarily cease);
  - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability of occurrence**, which describes the likelihood of the impact actually occurring. Probability is estimated on a scale, and a score assigned:
  - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
  - Assigned a score of 2 is improbable (some possibility, but low likelihood);
  - Assigned a score of 3 is probable (distinct possibility);
  - Assigned a score of 4 is highly probable (most likely);
  - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which is determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high;
- The **status**, which is described as either positive, negative or neutral;
- The degree to which the impact can be reversed;
- The degree to which the impact may cause irreplaceable loss of resources;
- The degree to which the impact can be mitigated.

The **significance** is determined by combining the criteria in the following formula:

S = (E+D+M) P; where

S = Significance weighting.
E = Extent.
D = Duration.
M = Magnitude.
P = Probability.

The **significance weightings** for each potential impact are as follows:

» **< 30 points:** Low (i.e. where this impact would not have a direct influence on the decision to develop in the area);
» **30-60 points:** Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated);
» **> 60 points:** High (i.e. where the impact must have an influence on the decision process to develop in the area).

As the Applicant has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) is included as **Appendix L**.

5.6 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

» All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
» It is assumed that the development footprint for the solar PV facility and grid connection identified by the developer represents a technically suitable site for the establishment of Upilanga PV1 which is based on the design undertaken by technical consultants for the project.
» This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – J** for specialist study specific limitations.

5.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA Report:

» National Environmental Management Act (Act No. 107 of 1998);
» EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended in GNR R326 in Government Gazette No 40772 of April 2017);

- Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
- Procedures for the assessment and minimum criteria for reporting on identified environmental themes in terms of sections 24(5)(a) and (h) and 44 of the National Environmental Management Act, 1998, when applying for environmental authorisation; and
- International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 5.7 provides an outline of the legislative permitting requirements applicable to Upilanga PV1 as identified at this stage in the project process.

Table 5.7: Applicable Legislation, Policies and/or Guidelines associated with the development of Upilanga PV1

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that: "*Everyone has the right –* » *To an environment that is not harmful to their health or well-being, and* » *To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:* ∗ *Prevent pollution and ecological degradation,* ∗ *Promote conservation, and* ∗ *Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development*."	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326). In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation. Considering the location of the project site within the Upington Renewable Energy Development Zone (REDZ 7) and the requirements GNR114 of 16 February 2018, a Basic Assessment Process is required to be undertaken for the	DEFF – Competent Authority Northern Cape DENC – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for		
National Environmental Management Act (No 107 of 1998) (NEMA)	In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment. In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.	DEFF Northern Cape DENC	While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.
Environment Conservation Act (No. 73 of 1989) (ECA)	The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces. The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties. In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).	DEFF Northern Cape DENC Dawid Kruiper Local Municipality	Noise impacts are expected to be associated with the construction phase of the project. As the site is located a great distance from noise sensitive receptors and communities, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.
National Water Act (No. 36 of 1998) (NWA)	A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is	Regional Department of Water and Sanitation	Ephemeral watercourses are present within the Upilanga PV1 development footprint as identified within the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	permissible under a GA, or if a responsible authority waives the need for a licence. Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation. Consumptive water uses may include taking water from a water resource (Section 21(a)), and storing water (Section 21(b)). Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).		Freshwater Impact Assessment (**Appendix F**). Where development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the DWS.
Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)	In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.	Department of Mineral Resources and Energy	Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA is not required to be obtained.
	Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.		In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources to ensure that the proposed development does not sterilise a mineral resource that might occur on site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas. In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme. Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.	Northern Cape DENC / ZF Mgcawu District Municipality	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, Upilanga PV1 is not anticipated to result in significant dust generation.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance. Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites. Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority. Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.	South African Heritage Resources Agency Ngwao Boswa Kapa Bokone (NBKB)	A full Heritage Impact Assessment (HIA) and Archaeological Impact Assessment (with field work) has been undertaken as part of the BA process (refer to **Appendix H** of this BA Report). No heritage resources were identified within the Upilanga development footprint, although several isolated stone artefacts attributable to background scatter were noted. Should a heritage resource be impacted upon, a permit may be required from SAHRA or Ngwao Boswa Kapa Bokone (NBKB) in accordance with of Section 48 of the NHRA, and the SAHRA Permit Regulations (GNR 668). This will be determined once the final location of the

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.		development footprint and its associated infrastructure within the development area has been determined.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process. Three government notices have been published in terms of Section 56(1) of NEM:BA as follows: » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596, GNR 324), 29 April 2014).	DEFF	Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species. Protected species which occur in this habitat type include *Boscia foetida* and occasional *Acacia erioloba.* (Ecological Impact Assessment included as **Appendix D**).
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	Chapter 5 of NEM:BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM:BA, and that a permit may only be issued after a prescribed	DEFF Northern Cape DENC	Restricted Activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA,

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	assessment of risks and potential impacts on biodiversity is carried out. Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).		together with the requirements of the Risk Assessment to be undertaken.
National Environmental Management: Draft National Biodiversity Offset Policy (2017)	The Draft National Policy presents a draft policy on biodiversity offsets for South Africa. The implementation of the policy would ensure that due remedy is obtained for significant adverse impacts on biodiversity resulting from development. The policy contributes to securing priority biodiversity and ecosystem functioning in perpetuity, for the benefit of both present and future generations. The policy defines offsets; the purpose and desired outcomes of biodiversity offsets in the country and specifies when biodiversity offsets would and would not be appropriate. The policy requires offsets be considered an integral part of the mitigation sequence during the planning of all EIAs conducted in terms of the NEMA EIA Regulations. The draft policy also sets out the legal framework and principles of offsets and specifies the requirements of the offset process in the country.	DEFF Northern Cape DENC	Offset analysis (Appendix D1)has been undertaken for the greater Upilanga Solar Park project as a the large number of protected trees are anticipated to be lost to the development as well as the potential for habitat fragmentation and loss of broad-scale ecological function. Protected tree species occur at the site, *Boscia albitrunca*. Within footprint of the proposed Upilanga Solar Park, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 0.8-1 trees/ha with the result that the cumulative impact of the development would result in the loss of approximately 8000 individuals of this species as well as numerous individuals of some other protected trees and many individuals of provincially protected species. The loss of 8000 individuals of *Boscia albitrunca* for the development of the Upilanga Solar Park exceeds the threshold amount of trees that DEFF finds acceptable for loss without an offset. Due to the concern associated with the loss of the Boscia trees from the site, a review and spatial analysis has been provided as part of the offset study.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	Section 05 of CARA provides for the prohibition of the spreading of weeds. Regulation 15 of GNR 1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur. Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.	Department of Agriculture, Forestry and Fisheries (DAFF)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented. The permission of DAFF will be required if Upilanga PV1 requires the draining of vleis, marshes or water sponges on land outside urban areas. However, this is not anticipated to be relevant for the project. In terms of Regulation 15E (GNR 1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods: » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			plants concerned, subject to the provisions of sub-regulation (4). » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
National Forests Act (No. 84 of 1998) (NFA)	According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was published in GNR 734. The prohibitions provide that "no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister".	DAFF	A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to protected tree species present in the development area for the submission of relevant permits to authorities prior to the disturbance of these individuals. The Ecological Impact Assessment undertaken as part of the BA Report indicated that two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; Vachellia (Acacia) erioloba and Boscia albitrunca. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. A license in terms of the NFA will be required for the protected species identified at the site, (refer to **Appendix D** of this BA Report).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it. Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of Upilanga PV1, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.	Department of Health (DoH)	It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.		
National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)	The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment. The Minister may amend the list by – » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities. Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that: » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unlit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking.	DEFF – hazardous waste Northern Cape DENC – general waste	No listed activities are triggered by Upilanga PV1 and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	» The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented.		
National Road Traffic Act (No. 93 of 1996) (NRTA)	The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed. Legal axle load limits and the restrictions imposed on abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts. The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.	SANRAL – national roads Northern Cape DoT	An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site substation components may not meet specified dimensional limitations (height and width).
Provincial Policies / Legislation			
Northern Cape Nature Conservation Act (Act No. 9 of 2009)	This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the	Northern Cape Department of Environment and Nature Conservation (DENC).	A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project: » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; The Act provides lists of protected species for the Province.		The Ecological Impact Assessment (**Appendix D**) Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia* (Acacia) *erioloba* and *Boscia albitrunca*. There is a relatively high density of the protected tree species *Boscia albitrunca* within the development footprint and as many as 3000 individuals would be impacted. An offset analysis for this species has been undertaken to investigate the need and quantum of the offset to account for the loss of individuals from the current and other proposed Upilanga PV1 facilities (Appendix D1).

5.7.2 Best Practice Guidelines Birds & Solar Energy (2017)

The Best Practice Guidelines Birds & Solar Energy (2017) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by Bird Life South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of solar generation facilities on birds in Southern Africa. The guidelines recognise the impact that solar energy may have on birds, through for example the alteration of habitat, the displacement of populations from preferred habitat, and collision and burn mortality associated with elements of solar hardware and ancillary infrastructure; and the fact that the nature and implications of these effects are poorly understood.

The guidelines are aimed at EAPs, avifaunal specialists, developers and regulators and propose a tiered assessment process, including:

(i) Preliminary avifaunal assessment – an initial assessment of the likely avifauna in the area and possible impacts, preferably informed by a brief site visit and by collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary.
(ii) Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work (as specified by the preliminary assessment), intended to inform the avian impact study.
(iii) Impact assessment – a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at preliminary assessment.
(iv) Monitoring – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective, or require further refinement. Monitoring may only be necessary for projects with the potential for significant negative impacts on birds (i.e. large area affected and / or vulnerable species present).

In terms of the guidelines the quantity and quality of baseline data required to inform the assessment process at each site should be set in terms of the size of the site and the predicted impacts of the solar technology in question, the anticipated sensitivity of the local avifauna (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites) and the amount of existing data available for the area.

Data collection could vary from a single, short field visit (Regime 1, for e.g. at a small or medium sized site with low avifaunal sensitivity), to a series of multi-day survey periods, including the collection of various forms of data describing avian abundance, distribution and movement and spread over 12 months (Regime 3, for e.g. at a large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna). **Table 5.8** is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

Table 5.8: Recommended avian assessment regimes in relation to proposed solar energy technology, project size, and known impact risks.

Type of technology*	Size**	Avifaunal Sensitivity***		
		Low	Medium	High
All except CSP power tower	Small (< 30ha)	Regime 1	Regime 1	Regime 2
	Medium (30 – 150ha)	Regime 1	Regime 2	Regime 2
	Large (> 150ha)	Regime 2****	Regime 2	Regime 3
CSP power tower	All	Regime 3		

Regime 1: One site visit (peak season); minimum 1 – 5 days.
Regime 2: Pre- and post-construction; minimum 2 – 3 x 3 – 5 days over 6 months (including peak season); carcass searches.
Regime 3: Pre- and post-construction; minimum 4 – 5 x 4 – 8 days over 12 months, carcass searches.

* Different technologies may carry different intrinsic levels of risk, which should be taken into account in impact significance ratings

** For multi-phased projects, the aggregate footprint of all the phases should be used. At 3ha per MW, Small = < 10MW, Medium = 10 – 50MW, Large = > 50MW.

*** The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development. For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone:

1) Avifaunal habitat (e.g. a wetlands, nesting or roost sites) of regional or national significance.
2) A population of a priority species that is of regional or national significance.
3) A bird movement corridor that is of regional or national significance.
4) A protected area and / or Important Bird and Biodiversity Area.

An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone

1) Avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance.
2) A locally significant population of a priority species.
3) A locally significant bird movement corridor.

An area would be considered to be of low avifaunal sensitivity if it is does not meet any of the above criteria.

**** Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

The Upilanga PV1 study area, including the development area, has been classified as a Regime 2 site, as the area has been defined as a medium sensitive area in terms of the Bird Life South Africa Guidelines. The development area considered for the development of Upilanga PV1 is located south of the operational Ilanga 1 CSP Facility; therefore, there already is an impact on birds in the area. A desktop assessment and and use of the two seasons of monitoring data for 2015 and 2016 has therefore informed the findings of the Avifauna Impact Assessment.

5.7.2 The IFC EHS Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the proposed project:

» IFC EHS General Guidelines
» IFC EHS Guidelines for Electric Power Transmission and Distribution

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, however no Industry Sector EHS Guidelines have been developed for PV solar power to date. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project, and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

- Environmental:
  - Air Emissions and Ambient Air Quality
  - Energy Conservation
  - Wastewater and Ambient Water Quality
  - Water Conservation
  - Hazardous Materials Management
  - Waste Management
  - Noise
  - Contaminated Land
- Occupational Health and Safety:
  - General Facility Design and Operation
  - Communication and Training
  - Physical Hazards
  - Chemical Hazards
  - Biological Hazards
  - Radiological Hazards
  - Personal Protective Equipment (PPE)
  - Special Hazard Environments
  - Monitoring
- Community Health and Safety:
  - Water Quality and Availability
  - Structural Safety of Project Infrastructure
  - Life and Fire Safety (L&FS)
  - Traffic Safety
  - Transport of Hazardous Materials
  - Disease Prevention
  - Emergency Preparedness and Response
- Construction and Decommissioning:
  - Environment
  - Occupational Health & Safety
  - Community Health & Safety

5.7.4 IFC's Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015)

While no Industry Sector EHS Guidelines have been developed for PV Solar Power, the IFC has published a Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (IFC, 2015). Chapter 8 of the

Project Developer's Guide pertains to Permits, Licensing and Environmental Considerations, and states that in order to deliver a project which will be acceptable to international lending institutions, environmental and social assessments should be carried out in accordance with the requirements of the key international standards and principles, namely the Equator Principles and IFC's Performance Standards.

Some of the key environmental considerations for solar PV power plants contained within the Project Developer's Guide include:

Construction Phase Impacts

Construction activities lead to temporary air emissions (dust and vehicle emissions), noise related to excavation, construction and vehicle transit, solid waste generation and wastewater generation from temporary building sites and worker accommodation. In addition, Occupational Health and Safety (OHS) is an issue that needs to be properly managed during construction in order to minimise the risk of preventable accidents leading to injuries and / or fatalities. Proper OHS risk identification and management measures should be incorporated in every project's management plan and standard Engineering, Procurement and Construction (EPC) contractual clauses.

Response:
Impacts associated with the construction phase of the development have been identified and assessed as part of the detailed independent specialist studies undertaken as part of the BA process. Where applicable, appropriate mitigation measures with which to minimise the significance of construction phase impacts have been identified and included in the EMPr prepared for Upilanga PV1 and attached as Appendix L to this BA Report.

Water Usage

Although water use requirements are typically low for solar PV plants, clusters of PV plants may have a high cumulative water use requirement in arid areas where local communities rely upon scarce groundwater resources. In such scenarios, water consumption should be estimated and compared to local water abstraction by communities (if any), to ensure no adverse impacts on local people. O&M methods in relation to water availability and use should be carefully reviewed where risks of adverse impacts to community usage are identified.

Response:
Upilanga PV1 would require 10 000m³ of water during the 18 month construction period, and approximately 5 000m³ of water per year over the 20 year operational lifespan. The water required will be sourced from the Orange River following a approval of water use activities from the DWS. Alternatively, water will be transported to site by trucks.

The preferred water source will be determined through consultation with stakeholders and relevant authorities. The recommendation that measures with which to minimise the projects water requirements must be investigated by the project developer.

Land Matters

As solar power is one of the most land-intensive power generation technologies, land acquisition procedures and in particular the avoidance or proper mitigation of involuntary land acquisition / resettlement are critical to the success of the project. This includes land acquired either temporarily or permanently for the project site itself and any associated infrastructure – i.e., access roads, powerlines and construction camps (if any).. If involuntary land acquisition is unavoidable, a Resettlement Action Plan (RAP) (dealing with physical displacement and any associated economic displacement) or Livelihood Restoration Plan (LRP) (dealing with economic displacement only) will be required. This is often a crucial issue with respect to local social license to operate, and needs to be handled with due care and attention by suitably qualified persons.

Response:
Upilanga PV1 and its associated infrastructure is proposed on Portion 3 of the farm Matjesrivier 41 and Lot 944 . The project site comprises of two, privately owned agricultural properties. A landowner / lease agreement will be entered into between the project developer and landowner to provide for the utilisation of the land for the development of Upilanga PV1 and its associated infrastructure. No involuntary land acquisition or resettlement is required or will take place as a result of the project.

Landscape and Visual Impacts

Key impacts can include the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities. Common mitigation measures to reduce impacts can include consideration of layout, size and scale during the design process and landscaping / planting in order to screen the modules from surrounding receptors. Note that it is important that the impact of shading on energy yield is considered for any new planting requirements. Solar panels are designed to absorb, not reflect, irradiation. However, glint and glare should be a consideration in the environmental assessment process to account for potential impacts on landscape / visual and aviation aspects.

Response:
Potential visual impacts associated with the development of Upilanga PV1 have been assessed as part of the Visual Impact Assessment specialist study conducted as part of the BA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative visual impacts have been identified, and are contained within the EMPr prepared for the project and attached as Appendix L to this BA Report.

Ecology and Natural Resources

Potential impacts on ecology can include habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species. Receptors of key consideration are likely to include nationally and internationally important sites for wildlife and protected species such as bats, breeding birds and reptiles. Ecological baseline surveys should be carried out where potentially sensitive habitat, including undisturbed natural habitat, is to be impacted, to determine key receptors of relevance to each site. Mitigation measures can include careful site layout and design to avoid areas of high ecological value or translocation of valued ecological receptors. Habitat enhancement measures could

be considered where appropriate to offset adverse impacts on sensitive habitat at a site, though avoidance of such habitats is a far more preferable option.

Response:
Potential ecological impacts associated with the development of Upilanga PV1 have been assessed as part of the Ecology Impact Assessment (refer to Appendix D) and Avifauna Impact Assessment (refer to Appendix E) conducted as part of the BA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative ecological impacts have been identified, and are contained within the EMPr prepared for the project and attached as Appendix L to this BA Report. Areas of ecological sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to Chapter 10 and Appendix M) and have been utilised to inform the development footprint so that such areas are suitably avoided.

Cultural Heritage

Potential impacts on cultural heritage can include impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction. Where indicated as a potential issue by the initial environmental review / scoping study, field surveys should be carried out prior to construction to determine key heritage and archaeological features at, or in proximity to, the site. Mitigation measures can include careful site layout and design to avoid areas of cultural heritage or archaeological value and implementation of a 'chance find' procedure that addresses and protects cultural heritage finds made during a project's construction and/or operation phases.

Response:
Heritage impacts associated with the development of Upilanga PV1 have been assessed as part of the Heritage Impact Assessment conducted as part of the BA process, which includes the consideration of heritage, archaeological, and palaeontological resources. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative heritage impacts (including those on heritage, archaeology, and palaeontology) have been identified, and are contained within the EMPr prepared for the project and attached as Appendix L to this BA Report.

Transport and Access

The impacts of transportation of materials and personnel should be assessed in order to identify the most appropriate transport route to the site while minimising the impacts on project-affected communities. The requirement for any oversized vehicles / abnormal loads should be considered to ensure access is appropriate. Onsite access tracks should be permeable and developed to minimise disturbance to agricultural land. Where project construction traffic has to traverse local communities, traffic management plans should be incorporated into the environmental and social management plan and EPC requirements for the project.

Response:
The project site can be readily accessed via the national route (N10) to the existing Karoshoek CSP 1 facility located to the North of the project site. e. Access routes within the surrounding areas are also an important characteristic to consider. The N10 national route provides access to the area from Upington. . The most appropriate access route will be utilised for the solar PV facility. Within the facility development footprint, access will be required from new / existing roads for construction purposes (and limited access

for maintenance during operation). The facility layout has been determined following the identification of site related sensitivities.

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar PV facility. Some of the components (i.e. on-site substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTO) by virtue of the dimensional limitations. A permit will be required in accordance with Section 81 of the National Road Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of the Act.

Drainage / Flooding

A review of flood risk should be undertaken to determine if there are any areas of high flood risk associated with the site. Existing and new drainage should also be considered to ensure run-off is controlled to minimise erosion.

Response:
A stormwater management plan has been prepared for the project, and is included in Appendix L(g) of the EMPr, prepared for the project and attached as Appendix L to this BA Report.

Consultation and Disclosure

It is recommended that early stage consultation is sought with key authorities, statutory bodies, affected communities and other relevant stakeholders. This is valuable in the assessment of project viability, and may guide and increase the efficiency of the development process. Early consultation can also inform the design process to minimise potential environmental impacts and maintain overall sustainability of the project. The authorities, statutory bodies and stakeholders that should be consulted vary from country to country but usually include the following organisation types:

- Local and / or regional consenting authority.
- Government energy department / ministry.
- Environmental agencies / departments.
- Archaeological agencies / departments.
- Civil aviation authorities / Ministry of Defence (if located near an airport).
- Roads authority.
- Health and safety agencies / departments.
- Electricity utilities.
- Military authorities.

Community engagement is an important part of project development and should be an on-going process involving the disclosure of information to project-affected communities. The purpose of community engagement is to build and maintain over time a constructive relationship with communities located in close proximity to the project and to identify and mitigate the key impacts on project-affected communities. The nature and frequency of community engagement should reflect the project's risks to, and adverse impacts on, the affected communities.

Response:
A Public Participation Process as prescribed by Chapter 6 of the 2014 EIA Regulations (GNR 326) is being conducted as part of the BA process being undertaken for the project. This Public Participation Process includes consultation with key authorities, affected and surrounding landowners, local communities, and other relevant stakeholders.

Environmental and Social Management Plan (ESMP)

Whether or not an ESIA or equivalent has been completed for the site, an ESMP should be compiled to ensure that mitigation measures for relevant impacts of the type identified above (and any others) are identified and incorporated into project construction procedures and contracts. Mitigation measures may include, for example, dust suppression during construction, safety induction, training and monitoring programs for workers, traffic management measures where routes traverse local communities, implementation of proper waste management procedures, introduction of periodic community engagement activities, implementation of chance find procedures for cultural heritage, erosion control measures, fencing off of any vulnerable or threatened flora species, and so forth. The ESMP should indicate which party will be responsible for (a) funding, and (b) implementing each action, and how this will be monitored and reported on at the project level. The plan should be commensurate to the nature and type of impacts identified.

Response:
Impacts associated with the construction phase of development have been identified and assessed as part of the independent specialist studies undertaken as part of the BA process. Appropriate mitigation measures with which to minimise the significance of negative impacts have been identified and are included in the EMPr prepared for the project and attached as Appendix L to this BA Report.

CHAPTER 6: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This Chapter provides a description of the environment that may be affected by the development of Upilanga PV1. The information is provided in order to assist the reader in understanding the pre-development environment and the possible effects of the project on the environment within which it is proposed to be developed. Aspects of the biophysical and social environments that could be directly or indirectly affected by the development or could affect Upilanga PV1 have been described. This information has been sourced from both existing information available for the area as well as collected field data by specialist consultants and aims to provide the context within which this BA process is being conducted.

6.1 Legal Requirements as per the EIA Regulations, 2014 (as amended) for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report.

Requirement	Relevant Section
(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The environmental attributes associated with the development of Upilanga PV1 are included within this chapter. The environmental attributes that are assessed within this chapter include the following: » The regional setting of Upilanga PV1 is described in section 6.2. » The climatic conditions of Upington and the study area are included in section 6.3. » Biophysical characteristics of the development area, study area and the surrounding areas are described in section 6.3 and section 6.4. These include landscape features such as, geology, soil and land types and biodiversity (i.e. ecology ((including fauna & flora)) and avifauna) of the area to be affected by the development of Upilanga PV1. » Heritage resources, including the archaeology and palaeontology of the study area and development area are described in section 6.5. » The visual quality of the affected area surrounding Upilanga PV1 is described in section 6.6 » Social characteristics of the area surrounding Upilanga PV1 is described in section 6.7. » A description of the site accessibility of the study area and the surrounding areas is included in section 6.8.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within **Appendix D – J**.

6.2 Regional Setting

The Northern Cape Province is located in the north-western extent (**Figure 6.1**) of South Africa and constitutes South Africa's largest province, occupying an area of 372 889km² in extent, equivalent to nearly a third (30.5%) of the country's total land mass. It is also South Africa's most sparsely populated province with a population of 1 145 861, and a population density of 3.1/km². The capital city is Kimberley, and other important towns include Upington, Springbok, Kuruman, De Aar and Sutherland. It is bordered by the Western Cape, and Eastern Cape provinces to the south and south-east, Free State, and North West provinces to the east, Botswana and Namibia to the north, and the Atlantic Ocean to the west. The Northern Cape is the only South African province which borders Namibia and plays an important role in terms of providing linkages between Namibia and the rest of South Africa. The Orange River, which is South Africa's largest river, is a significant feature and is also the main source of water in the Province, while also constituting the international border between the Northern Cape (i.e. South Africa) and Namibia.

The Northern Cape is rich in minerals including alluvial diamonds, iron ore, asbestos, manganese, fluorspar, semi-precious stones and marble. The mining sector in the province is the largest contributor of the provincial Gross Domestic Product (GDP) and of a great importance to South Africa as it produces ~37% of the country's diamonds, 44% of its zinc, 70% of its silver, 84% of its iron ore, 93% of its lead and 99% of its manganese.

The province has fertile agricultural land in the Orange River Valley, especially at Upington, Kakamas and Keimoes, where grapes and fruit are cultivated intensively. The interior Karoo relies on sheep farming, while the karakul-pelt industry is one of the most important in the Gordonia District of Upington. Wheat, fruit, peanuts, maize and cotton are produced at the Vaalharts Irrigation Scheme near Warrenton. The agricultural sector employs approximately 19.5% of the total formally employed individuals in the province. The sector is also experiencing significant growth in value-added activities, including game-farming, while food production and processing for the local and export markets is also growing significantly (PGDS, July 2011). Furthermore, approximately 96% of the land in the province is used for livestock and game farming, while only approximately 2% is used for crop farming, mainly under irrigation in the Orange River Valley and the Vaalharts Irrigation Scheme.

The Northern Cape offers unique tourism opportunities including wildlife conservation destinations, natural features, historic sites, festivals, cultural sites, star gazing, adventure tourism, agricultural tourism, ecotourism, game farms, and hunting areas, etc. The Province is home to the Richtersveld Botanical and Landscape World Heritage Site, which comprises a United Nations Educational, Scientific and Cultural Organisation (UNESCO) World Heritage Site under the World Heritage Convention. The province is also home to two (2) Transfrontier National Parks, namely the Kgalagadi Transfrontier Park, and the Richtersveld /Ai-Ais Transfrontier Park, as well as five (5) national parks and six (6) provincial reserves. In addition, the province plays a significant role in South Africa's science and technology sector, as it is home to the Square Kilometre Array (SKA), the Southern African Large Telescope (SALT), and the Karoo Array Telescope (MeerKAT). In addition, the Augrabies National Park, a major tourist destination in the Province, is located 120km east of Upington near the town of Kakamas.

The Northern Cape is made up of five (5) district municipalities, namely Francis Baard, John Taolo Gaetsewe, Namakwa, Pixley ka Seme and ZF Mgcawu (refer to **Figure 6.2**).

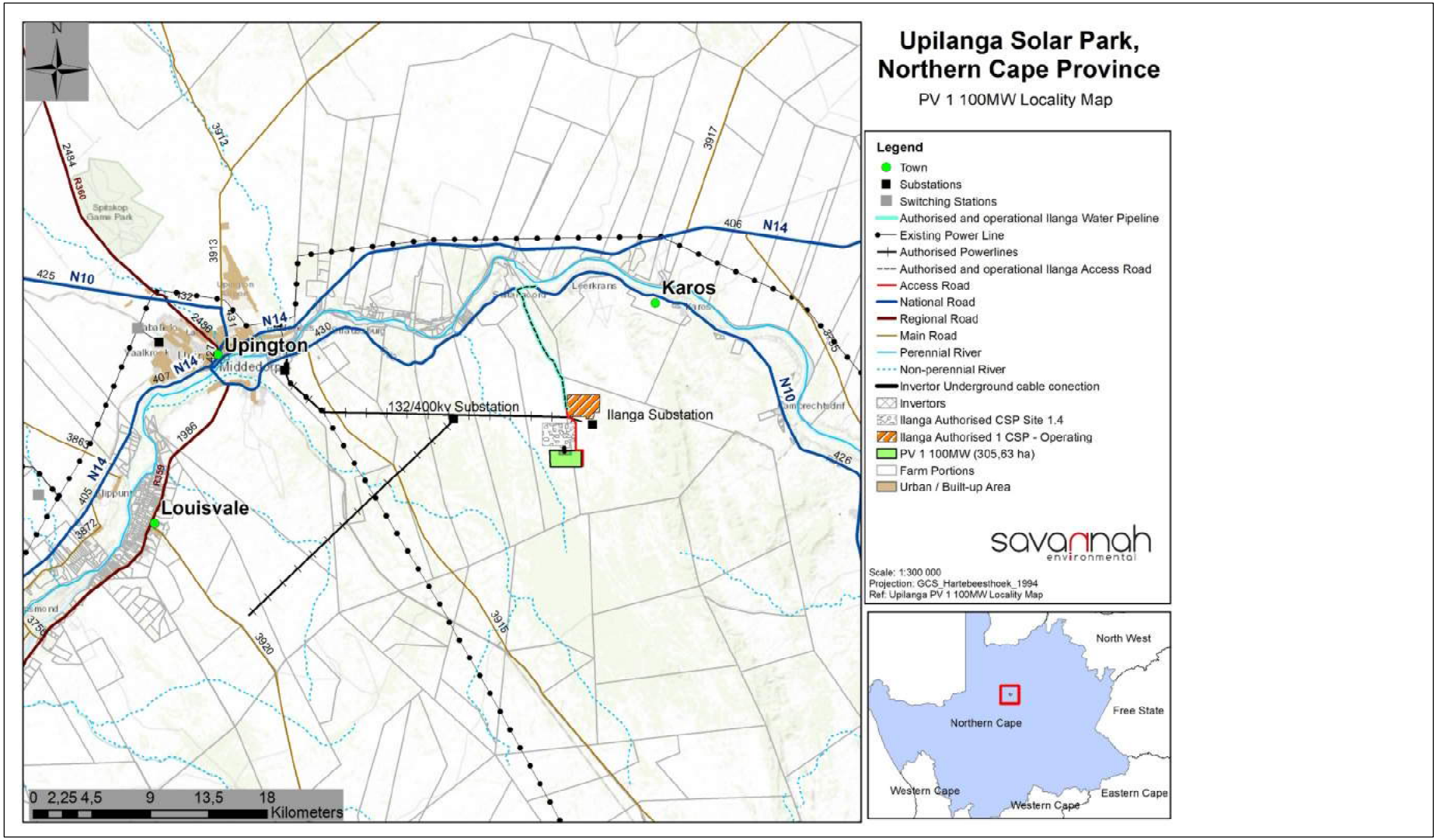


Figure 6.1: A locality map indicating the location of the study area for Upilanga PV1 and its regional context.

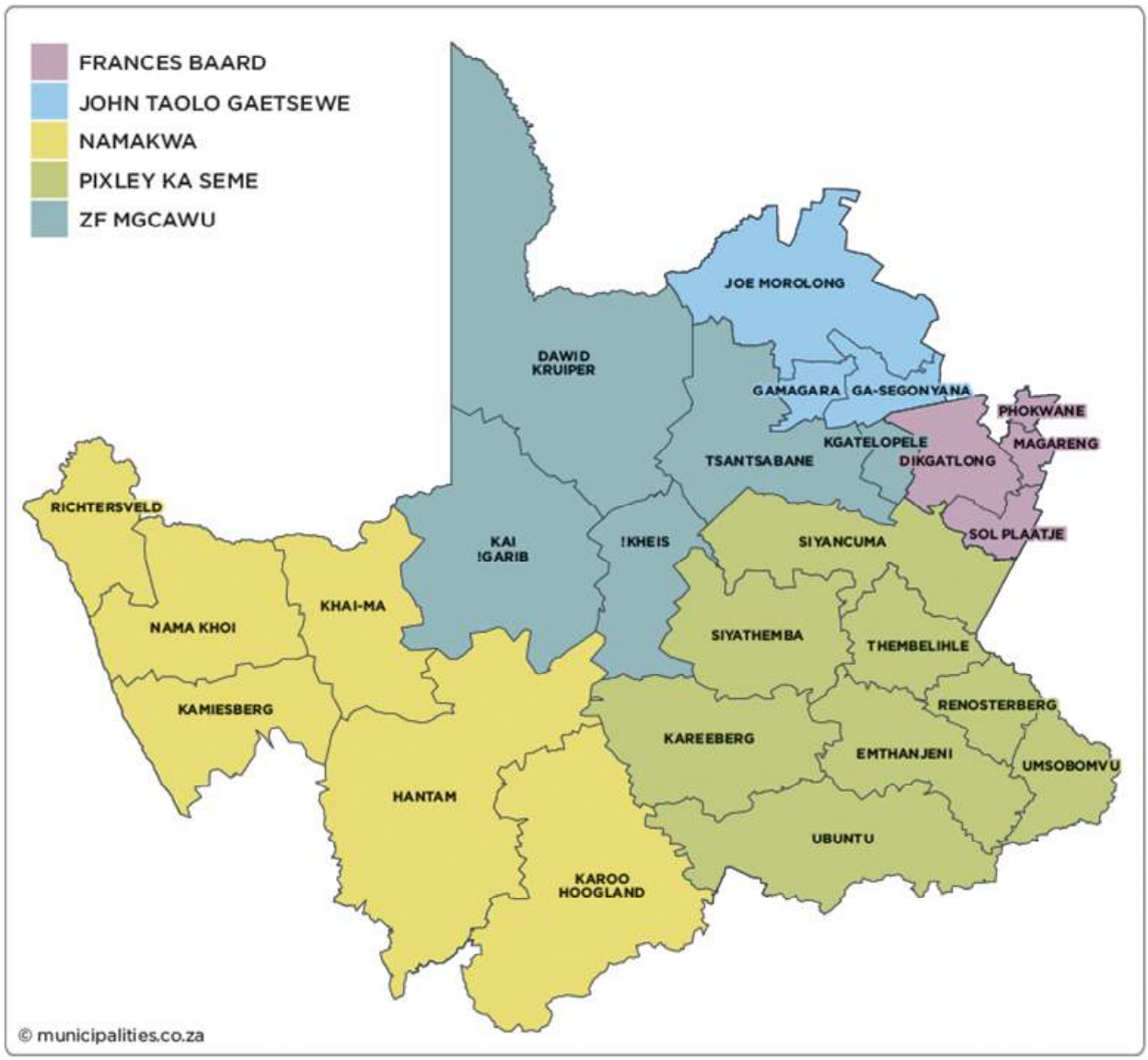


Figure 6.2: District municipalities of the Northern Cape Province (Source: Municipalities of South Africa)

The ZF Mgcawu District Municipality[11] (DM), within which the proposed Upilanga PV1 is located, is situated in the north-central extent of the Northern Cape Province, and is bordered by the Namakwa DM to the south-west and south, the Pixley ka Seme DM to the south and south-east, the Frances Baard and John Taolo Gaetsewe DM to the east, Botswana to the north, and Namibia to the west. The ZF Mgcawu DM occupies an area of land of approximately 102 484km² in extent, which is equivalent to over one quarter (approximately 27%) of the Northern Cape Province. Approximately 65 000km² of the DM's land mass comprises the Kalahari Desert, Kgalagadi Transfrontier Park, and the former Bushman Land.

The ZF Mgcawu DM includes the town of Upington, which is the capital of the DM, and where the DM's seat of government is located. The town is also the largest town in the DM and is located on the banks of the Orange River. Upington is also the centre of the karakul sheep and dried-fruit industries and is the most northerly winemaking region in South Africa. Other prominent cities and towns located within the DM

[11] Previously known as the Siyanda District Municipality

include, Beeshoek, Brandboom, Danielskuil, Eksteenskuil, Groblershoop, Kakamas, Keimoes, Kenhardt, Lime Acres, Mier, Postmasburg, and Rietfontein. The main economic activities within the DM include agriculture, mining, and tourism.

The ZF Mgcawu DM comprises five (5) local municipalities (LMs), namely Dawid Kruiper, Kai !Garib, Tsantsabane, Kheis and Kgatelopele (refer to **Figure 6.3**).

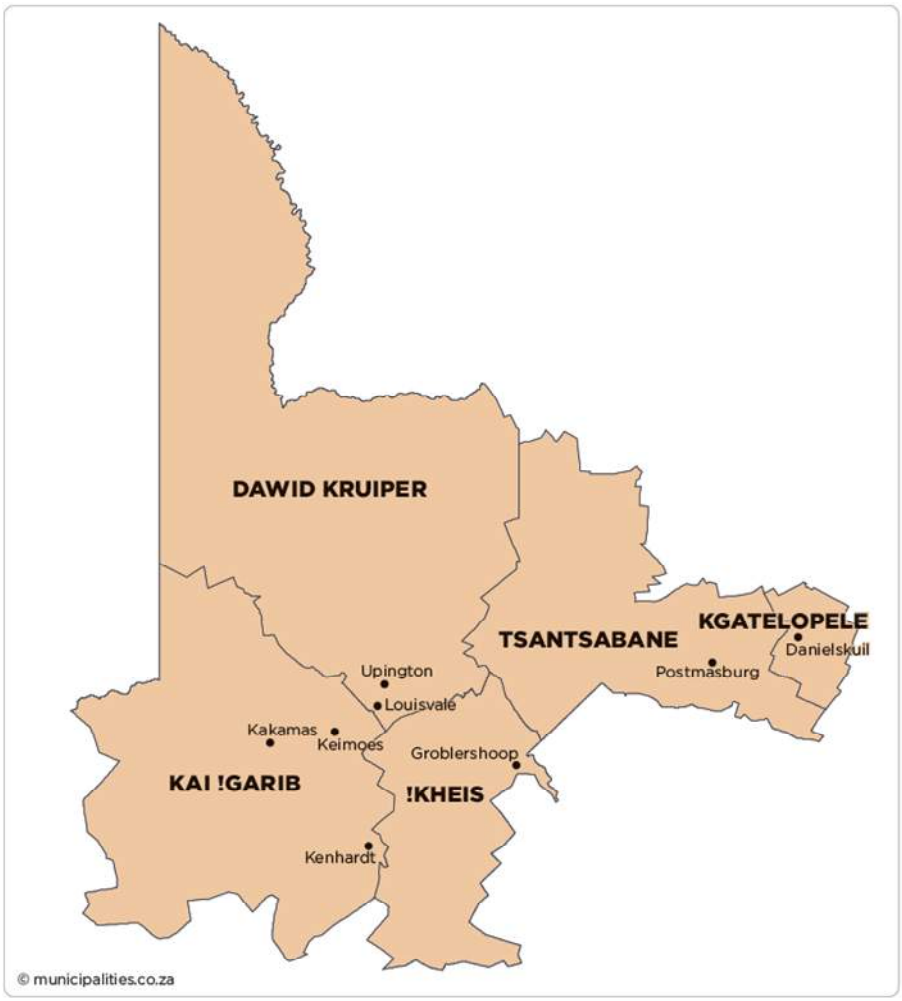


Figure 6.3: Local Municipalities of the ZF Mgcawu DM (Source: Municipalities of South Africa)

6.3 Local Setting: Location and Description of the Study Area and Development Area

Study Area and Development Area

The study area of Upilanga PV1 is 13920 ha in extent and comprises of two (2) properties, namely Portion 3 of the Farm Matjesrivier 41 and Lot 944, which are currently used for renewable energy generation and grazing. The entire extent of the development area of Upilanga PV1 is located within these farm portions. The development area will accommodate the layout proposed for the facility, which is anticipated to occupy an area not exceeding 350ha. The study area is located within the Dawid Kruiper Local Municipality.

The Dawid Kruiper LM is a Category B[12] municipality and is situated along the Orange River within the ZF Mgcawu DM. It borders with the Kgalagadi Transfrontier Park in the north, Botswana in the north-east, and Namibia in the west. The Dawid Kruiper LM is the largest of five municipalities in the district, making up almost half its geographical area, with an extent of 44 231km^2 [13]. The key towns within the LM include !Khomani San community, Rietfontein, which is one of the main towns, is situated approximately 280km north-west from the nearest big town of Upington. The agriculture sector with 52%, is the biggest contributor of the LM's GDP and of great importance to the economy of the ZF Mgcawu DM. The government and services sector contributes 16%, the wholesale and retail trade sector 11%, the financial services sector 7.6% and the manufacturing sector 5%.

The majority of the area within which the study area is located is sparsely populated and consists of an undulating landscape of wide-open expanses. The local population is primarily concentrated in the town of Upington and smaller towns / settlements along the Orange River. In addition, the area surrounding the study area is characterised as a semi-arid desert region and vegetation cover is restricted to low shrublands, described as the Kalahari Karroid Shrubland and the Gordonia Duneveld. Vineyards and cotton field plantations are found along the banks of the Orange River located to the south of the study area which flows towards Keimoes, Kakamas and other towns in the Northern Cape Province. Furthermore, the towns of Upington, Keimoes and Kakamas, and the study area for Upilanga PV1 are characterised by some of the highest levels of solar irradiation in the country, therefore making the area an ideal location for solar energy production. Upington and the study area for Upilanga PV1 fall within the Northern Cape Solar Corridor (as defined in the Provincial SDF) and the Upington Renewable Energy Development Zone (REDZ) as defined by the DEA.

The Upington REDZ (also referred to as, 'Zone 7') has been specifically identified as an area where large-scale solar PV facilities can be developed in terms of the Strategic Integrated Project (SIP) 8. The REDZ area in this region, stretches from the south of the N10 national road and Upington in the north, to Kenhardt and Marydale in the south, and from Keimoes in the west, to Groblershoop in the east. The study area for the Upilanga PV1 PV is located along the northern boundary of the Upington REDZ.

The main access routes to the area include the N14 and the N10. Regional roads include the R360 and the R27 from Keimoes. These roads, as well as the local roads are generally in a good condition even though large volumes of heavy vehicle traffic are experienced on the main routes. Industrial infrastructure includes the Upington Airport , transmission, and distribution power lines (e.g. the Garona-Gordonia No 1 132kV line to the north east of the proposed development site, and the Garona-Kleinbegin No 1 132kV line to the west of the proposed development site), as well as several substations. The railway line through Upington connects the area to Karasburg in Namibia, Keimoes, and Kakamas to the west of Upington and De Aar in the south, which again links with Johannesburg, Kimberley and Cape Town.

Development Area

The entire extent of the development area of Upilanga PV1 is located within Portion 3 of the Farm Matjesrivier 41 and Lot 944. The larger project area is 13 920ha in extent and will accommodate the layout proposed for the facility, which is anticipated to occupy an area not exceeding 350ha. Settlement areas located

[12] A municipality that shares municipal executive and legislative authority in its area with a District Municipality within whose area it falls: https://www.brandsouthafrica.com/governance/government/south-african-local-and-municipal-governments

[13] https://municipalities.co.za/overview/1245/dawid-kruiper-local-municipality

within 20km of the development area include, Karos Settlement, Lambrechtsdrift, Leerkrans, Ntsikelelo and Luisvale. The residents of the communities are primarily employed by the local agricultural sector in the area, particularly viticulture and fruit farms and associated agro-processing facilities.

Land uses within the vicinity of the development area include the operational Karoshoek CSP 1 Facility (as illustrated in **Figure 6.4**) which is located directly to the north of the development area on Lot 944.

Major grid connection infrastructure available in the vicinity of the development area include, the Ilanga Substation (for Karoshoek CSP One) transmission, and distribution power lines (e.g. the Garona-Gordonia No 1 132kV line to the north east of the proposed development site, and the Garona-Kleinbegin No 1 132kV line to the west of the proposed development site), as well as several substations and solar energy facilities. The Upington Main Transmission Substation (MTS) is located approximately 40km to the west of the development area.

Figure 6.4: An aerial view of the operational Ilanga 1 CSP facility located in the north western corner of Lot 944 (source: https://www.ee.co.za/article/black-company-makes-renewable-energy-history.html).

6.4 Climatic Conditions

The Upington area is typically characterised as having a desert climate (BWh / hot desert climate). Very little rainfall occurs during the year, and the area is characterised by an average annual temperature of 19.3°C, and an average annual rainfall of 180mm.

Temperatures range from maximum highs of 34.6°C in January, to minimum lows of 2.5°C in July. January is the warmest month with average temperatures of 26.2°C, and July is the coldest month with average

temperatures of 11.5°C. July is also typically the driest month, receiving an average of 2mm of rainfall, while March is the wettest month, receiving an average of 39mm of rainfall (as illustrated in **Figure 6.5** and **Table 6.1**). Rainfall within the area is erratic, both locally and seasonally, and therefore cannot be relied on for agricultural practices. The average evaporation is 2 375mm per year, peaking at 11.2mm per day in December. Frost occurs most years on 6 days on average between mid-June and mid-August.

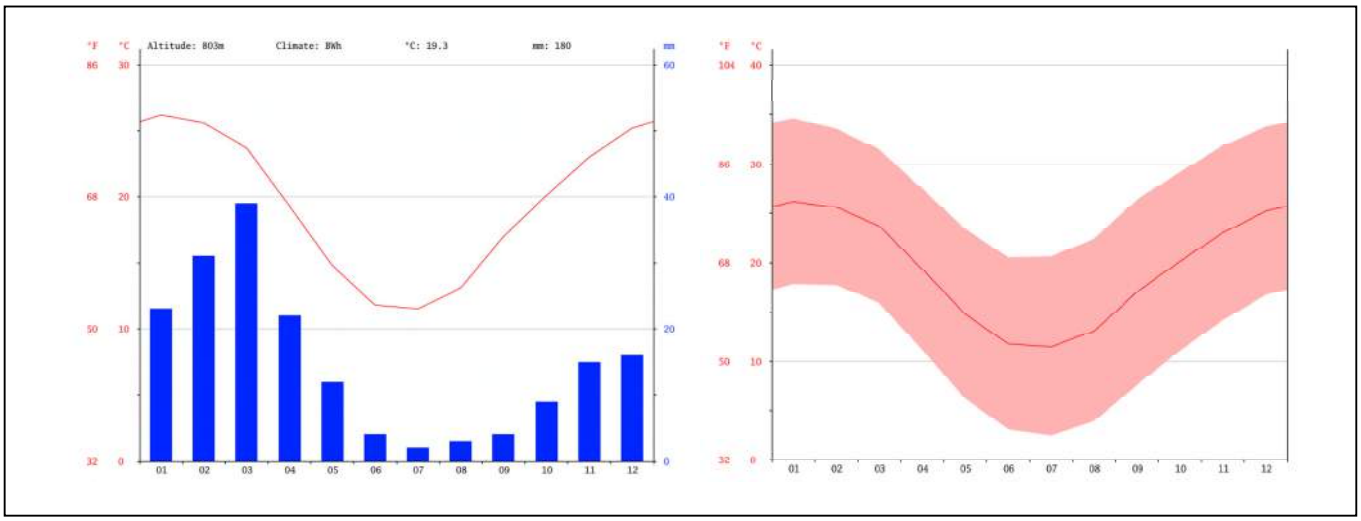


Figure 6.5: Climate and Temperature graphs for Upington, Northern Cape Province (Source: en.climate-data.org).

Table 6.1: Climate data for Upington, Northern Cape Province (Source: en.climate-data.org).

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Temp. (˚C)	26.2	25.6	23.7	19.3	14.8	11.8	11.5	13.1	17	20.1	23	25.2
Minimum Temp. (˚C)	17.8	17.7	15.9	11.2	6.2	3.1	2.5	3.9	7.6	11.1	14.2	16.7
Maximum Temp. (˚C)	34.6	33.6	31.5	27.5	23.4	20.5	20.6	22.4	26.4	29.2	31.9	33.8
Precipitation (mm)	23	31	39	22	12	4	2	3	4	9	15	16

The suitability of a site for the development of a solar energy facility is dependent on the prevailing climatic condition of the area. The viability of the solar energy facility is directly affected by the amount of solar irradiation received in the area. The Global Horizontal Irradiance (GHI) for the Northern Cape Province varies between 2 045 and 2 377kWh/m^2/annum, which is present within the higher end of the spectrum. The irradiation received in Upington and the location of the study area for Upilanga PV1 is approximately 2 278kWh/m^2/annum which is the highest in South Africa, and comparable on a global scale (refer to **Figure 6.6**).

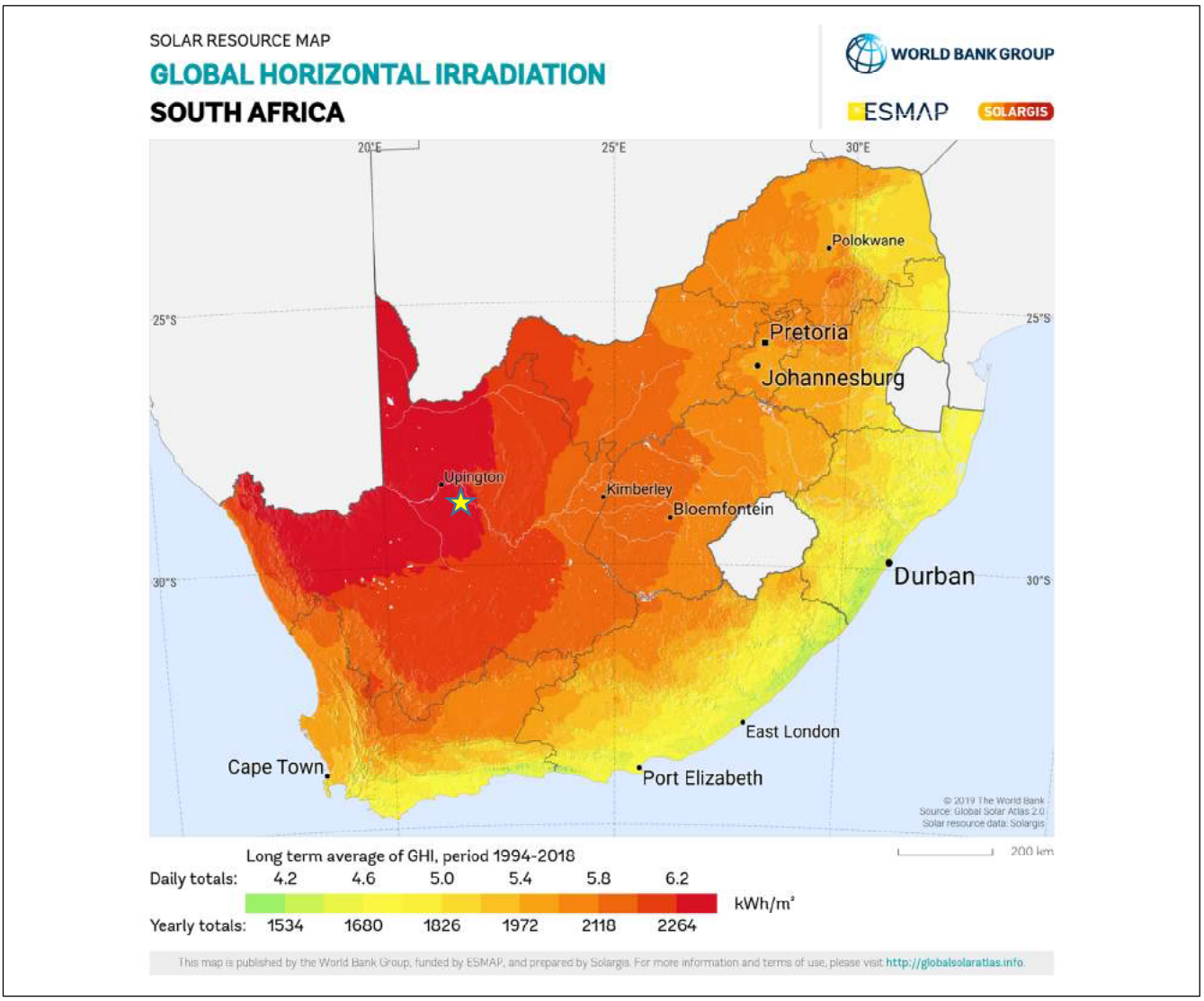


Figure 6.6: GHI map for South Africa (Source: World Bank Group Solar Map). The development area for Upilanga Pv1 is shown by the yellow star on the map.

6.5 Landscape Features

The study area occurs on land that ranges in elevation from 800m (at the Orange River) to 1180m (at the top of the Langberg hills located east of the Upington Ilanga Solar Park). The terrain surrounding the farm is predominantly flat with an even slope towards the Orange River valley that forms the most distinct hydrological feature in the region.

The terrain surrounding the affected properties, Portion 3 of the Farm Matjesrivier 41 and Lot 944, is generally flat and sloping towards the Orange River Valley which forms a distinct hydrological feature in the region.

Due to this flat topography, the area, particularly south of the river, is characterised by the occurrence of many non-perennial drainage lines and pans.

Relatively prominent low hills (or koppies) occur in the east of the study area. Some isolated hills also occur randomly in the north west of the study area. The Orange River meanders from the east to the west in the northern section of the study area.

The river has, to a large degree, dictated the settlement pattern in this arid region by providing a source of permanent water for the cultivation of grapes and cotton. This and the associated production of wine are the primary agricultural activities of this district. Cattle and game farming practises also occur at a less intensive degree.

6.6 Geology

The geology of the area comprises a mixture of various types of igneous rocks (mainly gneiss and schist), along with sandy sedimentary materials (Geological Survey, 1988). The site lies mainly within an area of underlying schist and gneiss.

The study area is located within the Namaqualand Metamorphic Belt which comprises very old and very highly deformed sedimentary and igneous rocks of the Mokolian and Namibian Erathem that form part of the Southern African Basement Complex. The rocks have undergone both regional and contact metamorphism and the culminating deformation phase has been dated at about 1000Ma. These basement rocks are covered by Quaternary sands of the Gordonia Formation and sporadic Tertiary Calcrete deposits (refer to Figure 6.3.). A significant percentage of the proposed site is underlain by unconsolidated or semi-consolidated Quaternary soil cover of the Gordonia Formation. Aerial photography indicates that rock outcrops are likely to be concentrated in the northern and eastern portions of the study area, with sand cover likely to be thickest in the southern lowland areas. There are several geological faults traversing the study area which are considered dormant with a low seismic activity. (refer to Figure 6.7.)

6.7 Soil and Land Types

A land type is defined as an area with a uniform terrain type, macroclimate and broad soil pattern. The entire development area for Upilanga PV1 consists of one land type , Ag5. (refer to **Figure 6.8)**. This land type is dominated by Shallow, red, freely-drained, structureless soils, high base status.

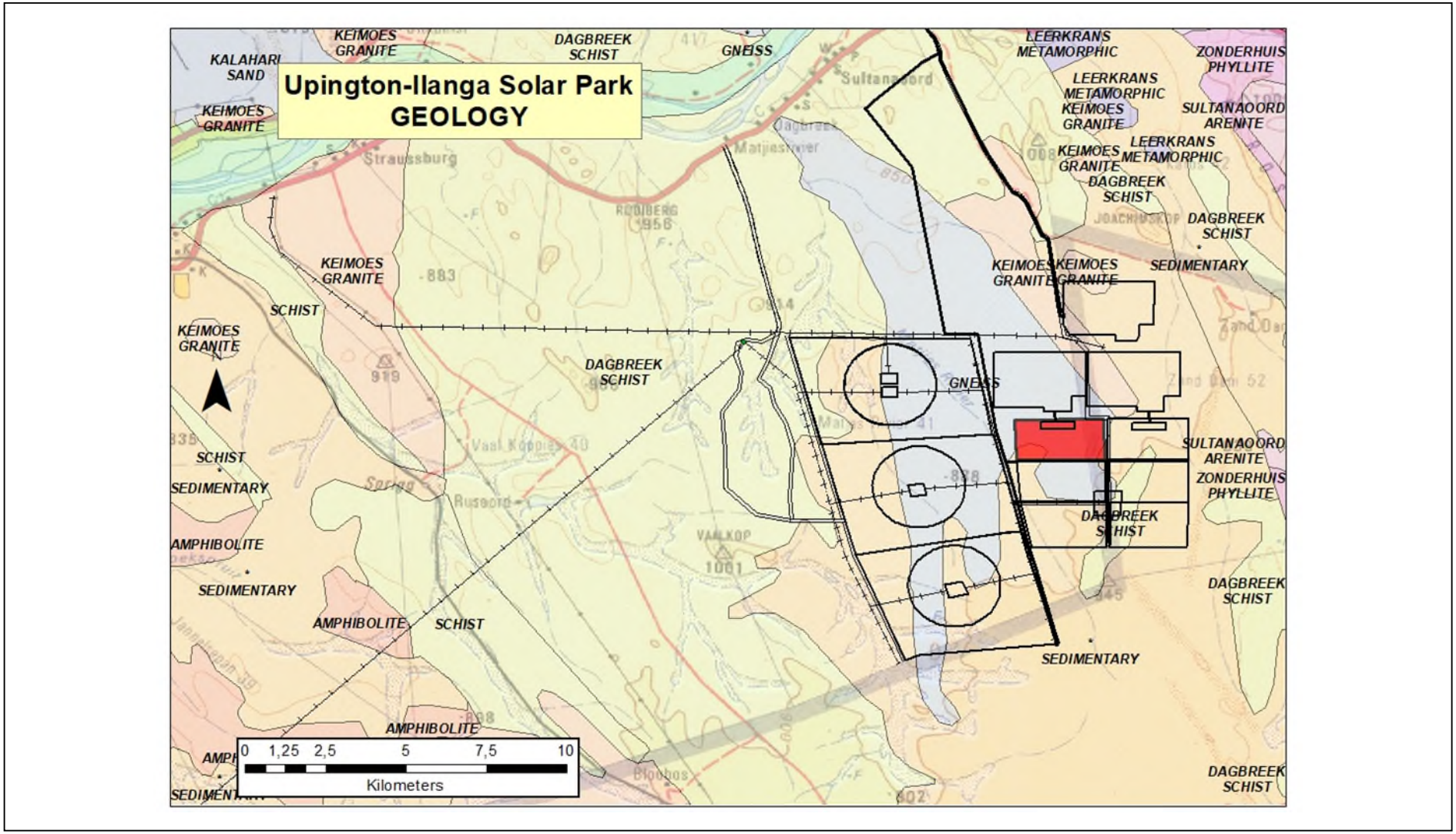


Figure 6.7: The geology of the area comprises a mixture of various types of igneous rocks (mainly gneiss and schist), along with sandy sedimentary materials (Geological Survey, 1988) with the project site overlayed.

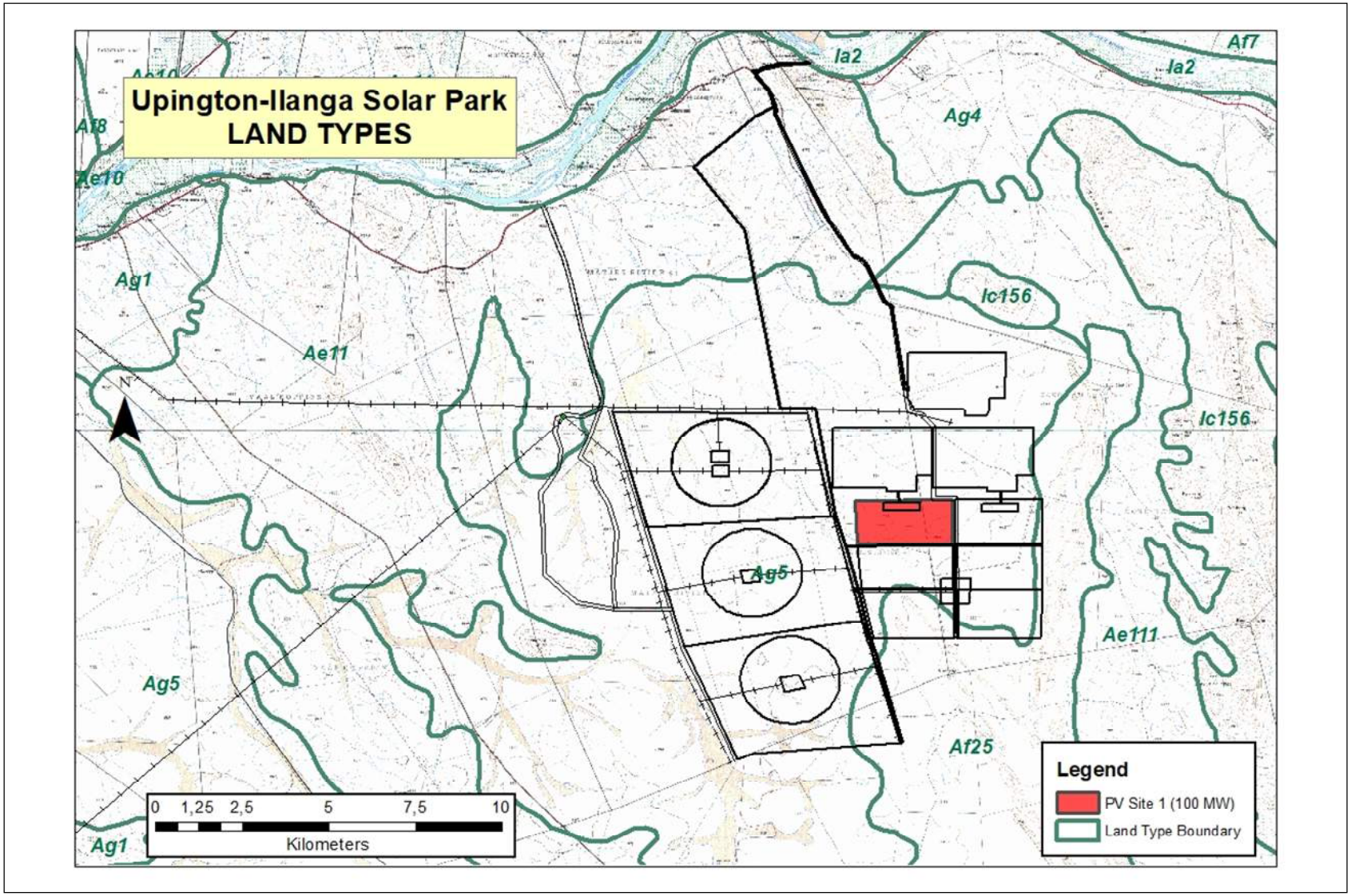


Figure 6.8: Land Type Map of the Upilanga PV1 development area.

6.8 Agricultural Potential & Land Capability

The area occupied by Upilanga PV1 comprises red, sandy soils, many of which are shallow with only a limited portion of moderately deep to deep soils. In addition, the very low rainfall in the area indicates that the only means of cultivation would be by irrigation and the remote sensing (satellite) image of the area indicated no signs of any agricultural infrastructure and certainly none of irrigation (the red area denotes the project site in Figure 6.8). The climatic restrictions mean that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 40-50 ha/large stock unit (ARC-ISCW, 2004). The dominant class of agricultural potential is low. The site falls within a portion of land type Ag5 (shallow red soils). Using the latest land cover data, no areas classed as degraded (such as erosion areas) were present in the vicinity.

6.9 Hydrology and Surface Water

The study area site is situated within quaternary catchment D73E, which is dominated by a large number of highly ephemeral river systems associated with the Orange River (DWAF, 2004). Potential runoff from the site would flow in a northerly direction towards the Orange River via drainage systems such as the Klein-leerkransspruit and Majties (Matjes) River or directly into the canal systems and siphons that run along the Orange River. These are all located within the the Nama Karoo ecoregion.

Overall, these watercourses within the study area are largely in a natural state, when compared the associated Orange River reach, which has modified floodplains and flows. The National Wetland Inventory v5.2 (2018) spatial data (NWI), indicates a variety of wetland types located near the study area and include depressions / pans and the riverine floodplain, the latter being considered alluvial watercourses in this landscape setting (Figure 6.9).

The study area systems are ephemeral and only carried water for a short week-long period in 2014 and in 2019. Thus, the observed development area systems do not support any wide riparian zones, with the vegetation associated with these watercourses being between 0.5 m and 12 m in width and mostly terrestrial.

Fifteen woody plant species were recorded to be associated with the riparian and pan systems within the development area. Although none of these were obligate or facultative river/wetland species, they do show a preference for areas exposed to runoff, but none of these would be considered listed or protected under any National or Provincial legislation.

The only obligate wetland plants observed were those found in association with the man-made dams found at the confluence of the Majties (Matjes) River and the Orange River and along the Orange River itself. Species observed included *Typha capensis*, *Phragmites australis*, *Prosopis glandulosa* and *Cyperus marginatus*. Notably the prevalence of *Prosopis* and alien invasive tree species had increased between 2010 and this survey within the study area that had been visited previously by the specialist.

In terms of the National Freshwater Ecosystems Priority Areas (NFEPA) assessment, all the systems within the development area have been assigned a condition score of AB (Nel et al. 2011), indicating that they are largely intact and of biological significance. The NFEPA project (Nel et al., 2011) then earmarked sub-quaternaries, based either on the presence of important biota (e.g. rare or endemic fish species) or conversely the degree of riverine degradation, i.e. the greater the catchment degradation the lower the

priority to conserve the catchment. The important catchments areas are then classified as Freshwater Ecosystems Priority Areas (FEPAs). The survey area falls within an FEPA , associated with the Matjes River, although no permanent fish habitat occurs within the proposed development area based on site observations and the fragmentation mentioned above (dams), the overall catchment is still important from a hydrological standpoint.

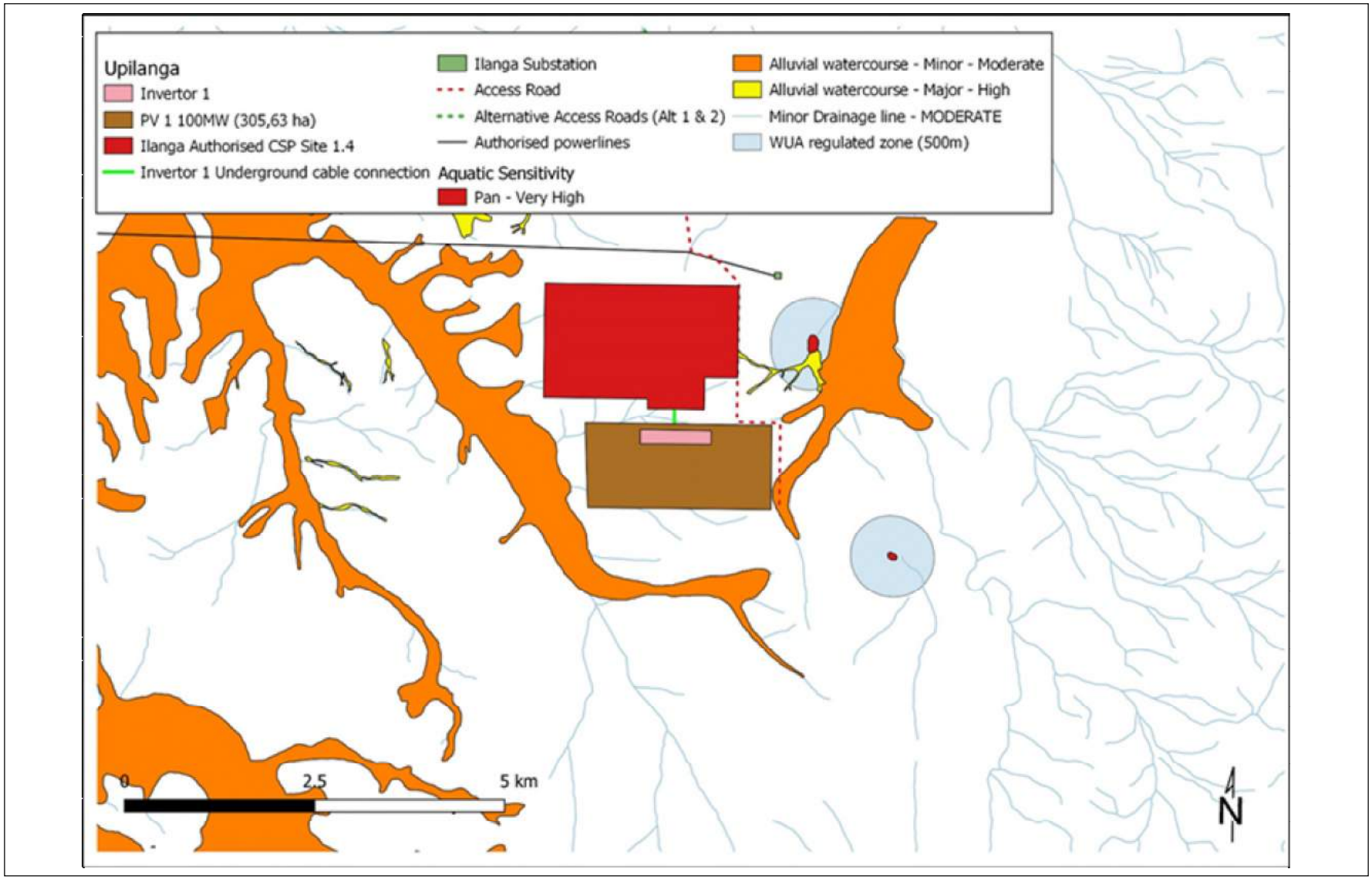


Figure 6.9: A map showing the aquatic features identified within the development area for Upilanga PV1.

6.10 Ecological Profile of the Study Area and Development Area

According to the National Vegetation Map (Mucina & Rutherford 2006 and 2018 update), there are several vegetation types within the broader study area including Bushmanland Arid Grassland, Gordonia Duneveld, Kalahari Karroid Shrubland and Lower Gariep Broken Veld. The Upilanga PV 1 footprint is restricted to the Bushmanland Arid Grassland vegetation type. The Bushmanland Arid Grassland vegetation type is an extensive vegetation type and is the second most extensive vegetation type in South Africa, occupying an area of 45 478 km^2. It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300mm deep. Due to the arid nature of the unit, which receives between 70 and 200 mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact. Kalahari Karroid Shrubland and Bushmanland Arid Grassland form a mosaic across the area reflecting substrate conditions especially soil depth and texture.

Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia* (Acacia) *erioloba* and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. Within the Upilanga PV 1 footprint, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 10 trees/ha with the result that the development would result in the loss of approximately 3000 individuals of this species. This exceeds the guideline amount of trees that DEFF finds acceptable for loss without an offset. An offset analysis has been undertaken to investigate the need and quantum of an offset to account for the loss of individuals from the Upilanga PV 1 facility and other proposed Upilanga PV facilities within the broader Upilanga Solar Park. The nature of this offset involves formally protecting some nearby land with similar numbers of trees. In terms of evaluating the actual ecological impact of the loss these trees, it is important to note that the loss of these individuals from the site would generate a local impact, but would not compromise the wider Boscia population in the Upington area which is orders of magnitude larger.

Although there are no well-developed drainage lines within the footprint, there are some wash areas where runoff water collects during larger showers and which are characterised by taller more dense vegetation.

The current veld condition of the development area can be considered to be fair and while there are some areas that have clearly suffered some degradation in the past, the vegetation cover and composition can be considered typical for the study area. There are some localised areas of Prosopis invasion, usually around watering points, but in general there are few alien species present across most of the development area and it can be considered to be largely intact and in moderate.

The majority of the site lies within an area classified as "Other natural areas" and has not been classified as a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA). There are no CBAs in close proximity to the development area, indicating that the establishment of Upilanga PV 1 does not pose a threat to any CBAs or other areas considered to be of significance from a broad-scale conservation planning perspective. Furthermore, the site does not lie within an area identified as a priority area for future conservation expansion under the Northern Cape Protected Area Expansion Strategy.

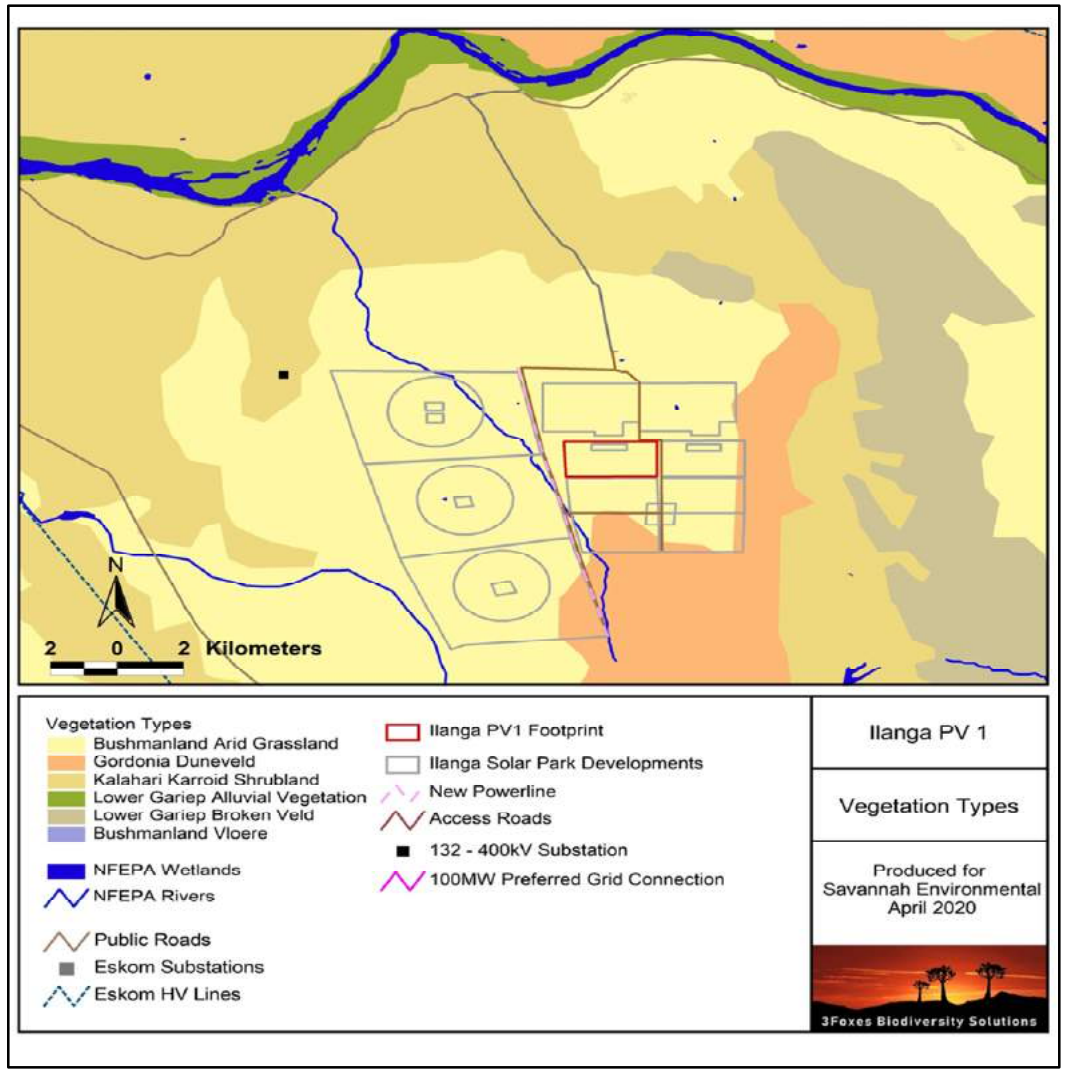


Figure 6.14: Map illustrating the broad-scale overview of the vegetation in and around the Upilanga PV development area. The vegetation map is an extract of the National Vegetation Map (Mucina & Rutherford 2006 & 2016 update), and also includes drainage lines delineated by the NFEPA Assessment (Nel et al., 2011)

The site falls within the distribution range of 46 terrestrial mammals, indicating that the mammalian diversity of the area is of a moderate potential. The variety of habitats present at the site is however fairly low and the overall mammalian diversity at the site is likely to be lower than the richness of the study area. Overall, there are no significant issues regarding mammals and the development of Upilanga PV 1. No reptile species of conservation concern 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.

There is a large amount of renewable energy development in the Upington area. This is concentrated in two main areas, west of Upington along the N14 and then southeast of Upington in the Karoshoek area. The Upilanga PV1 project would potentially contribute approximately up to 330ha of additional habitat loss and fragmentation to the area. On the one hand, concentrating development within certain areas can be seen as positive, as it reduces the overall level of fragmentation, but on the other hand, local impacts (such as on protected trees) may increase. Which is ultimately preferable in terms of reducing fragmentation versus increased local impacts is context dependent. In the current case, the addition of several solar PV development areas adjacent to the existing Ilanga CSP 1 facility is seen as preferable to development further away from the existing concentration of existing and proposed development. However, in order to ensure the long-term maintenance of ecological processes in the broader study area, it is important that ecological connectivity between the Orange River and the areas south of the river is maintained. In the long-term specific corridors free from development should be identified and kept free from major development.

The broader study and development area consists primarily of Bushmanland Arid Grassland habitat with some components of Kalahari Karroid Shrubland in some areas and likely supports a fairly typical avifaunal assemblage expected for the area. Eleven (11) red data listed species are known to occur within the surrounding environment, of which at least four (4) terrestrial species (Ludwig's Bustard, Karoo Korhaan, Kori Bustard, and Secretarybird) are considered common while others appear to occur less frequently. Due to the presence of these species and likely utilization of the plains the developmental area is generally considered of medium sensitivity and areas where well-developed drainage lines and washes occur have been classified as high sensitivity. Some limited development in these high sensitivity areas is considered acceptable but while no high sensitivity areas fall within the PV footprint, there are some high sensitivity areas along the grid connection alternatives. The extent of habitat loss along the below-ground grid connection would be low and would not significantly affect the high sensitivity habitats. Apart from the pans, broader study area supports no known features of very high sensitivity, such as nesting or roosting sites of red-listed species, however verification would be required prior to construction.

The majority of the greater Upilanga Solar Park site and the area lost to development falls within the Bushmanland Arid Grassland vegetation type. Towards the Orange River and on stony ground more widely, the vegetation consists of Kalahari Karroid Shrubland. There is also a fairly large extent of Gordonia Duneveld associated with the deeper sands and red dunes of the site. Particularly in the east of the site, but also in smaller unmapped extents across the site, Lower Gariep Broken Veld occurs on the rocky hills of the site. It is fairly unusual in the context of the Northern Cape and the Kalahari/Bushmanland Bioregion to have at least five different vegetation types present within an area. As such, the site is considered to be fairly diverse in terms of the number of different vegetation types and habitats that it would offer fauna and flora.

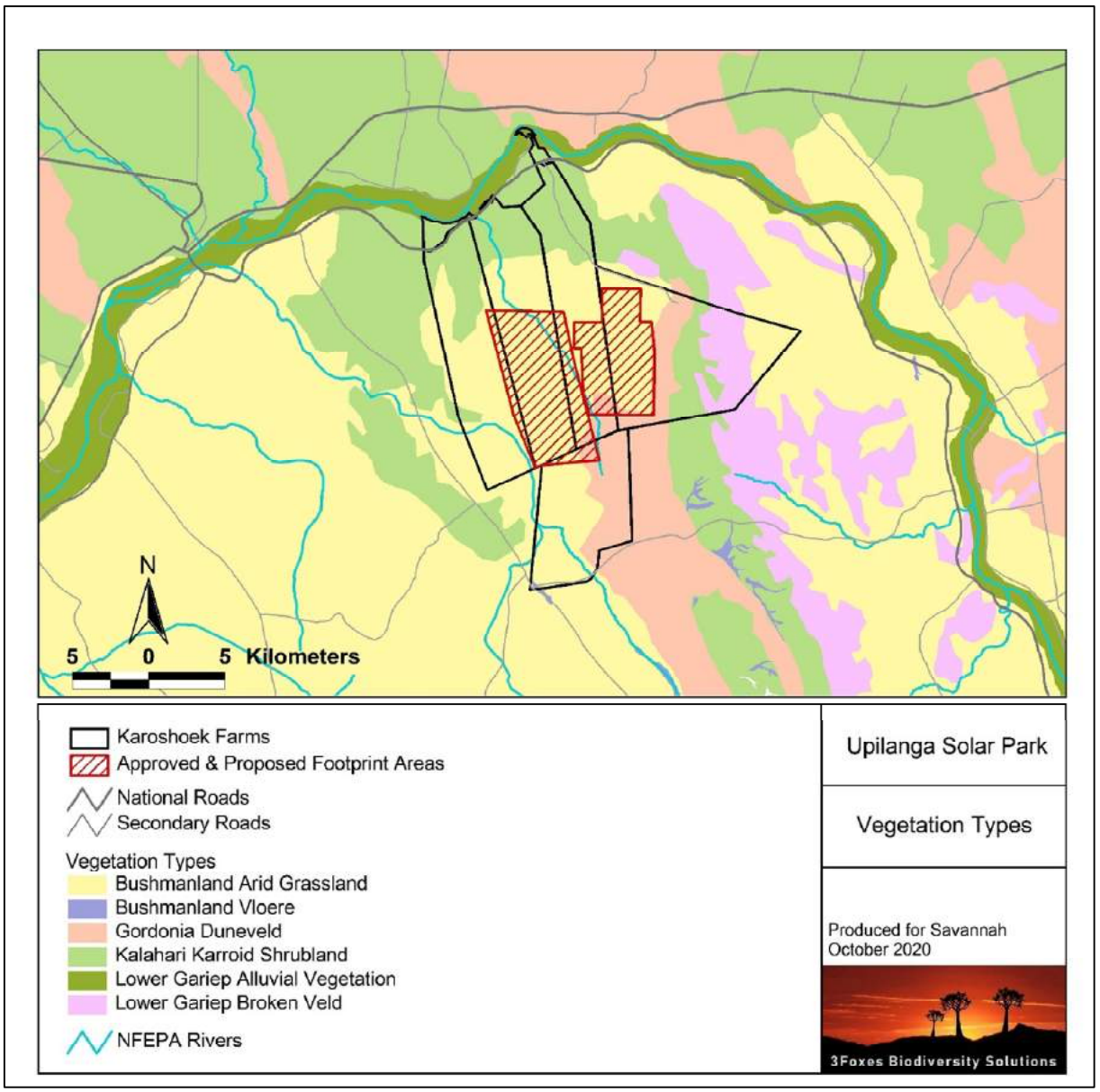


Figure 6.15. Vegetation map of the study area according to the 2018 update of the Mucina & Rutherford (2006) vegetation map depicting the greater Upilanga Solar Park site.

The relevant section of the Northern Cape Conservation Plan which maps CBAs for the Northern Cape is depicted below in Figure 6.16. The map illustrates that the northern part of the site including some of the proposed PV and CSP areas fall within a CBA 2. There is also a small drainage line that runs through the proposed development areas that has a CBA 1 buffer area. However, overall it is clear that the development of the site would not generate a very large impact on the CBAs of the site, with the loss of some CBA 2 area not likely to compromise the ecological function of the broader area. There are no Protected Area Expansion Strategy Focus Areas within or near the site (Figure 6.16), indicating that the site and adjacent areas have not been identified as important current priorities for conservation expansion. It is however worth noting that the site falls within an area that remains severely under-protected. The impact of the development on NPAES Focus Areas and CBAs is not considered sufficient to warrant the implementation of an offset in their own right.

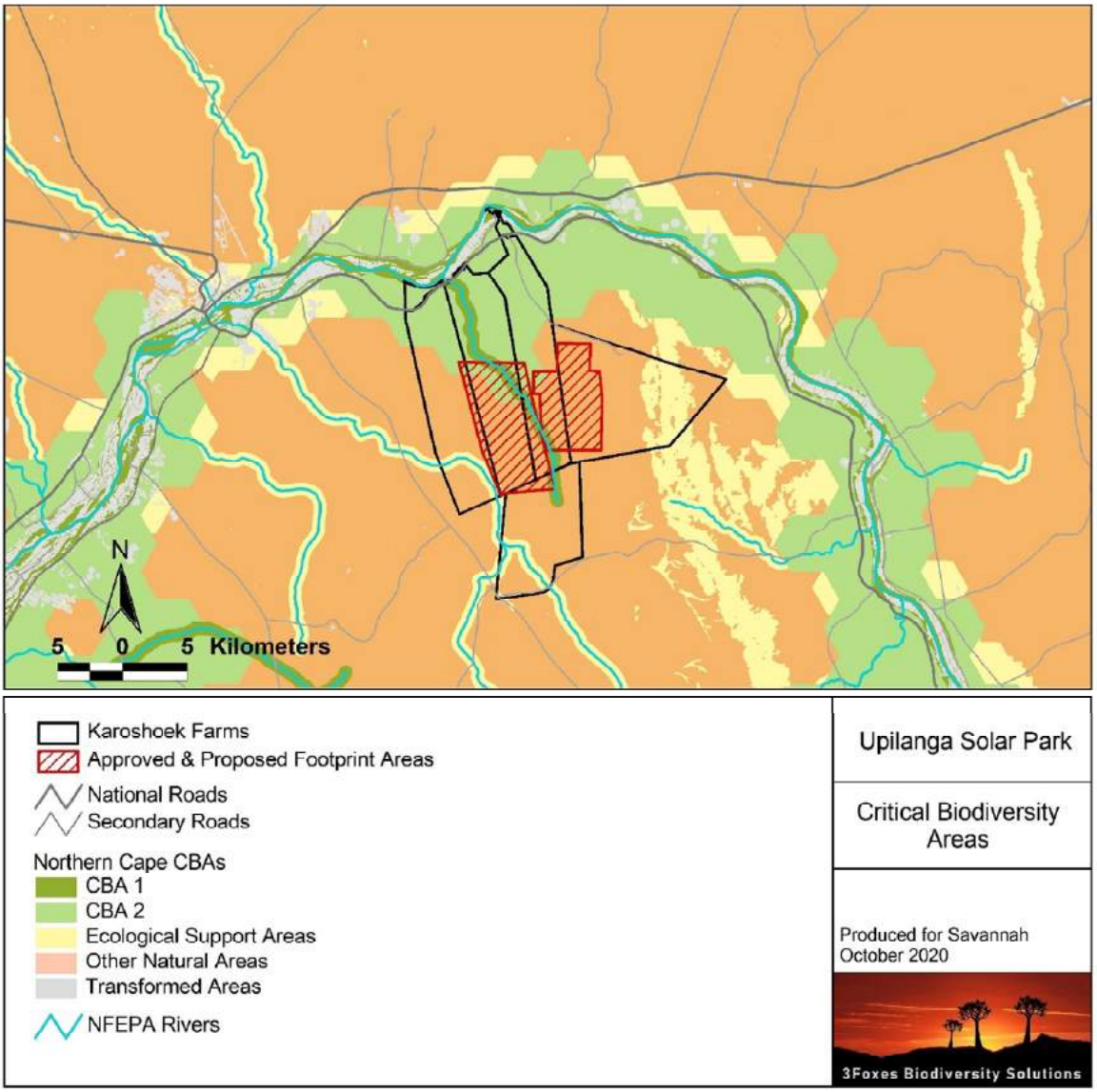


Figure 6.16. Critical Biodiversity Areas map for the study area, showing that the majority of the proposed Upilanga Solar Park is within other natural areas with a small portion of CBA 2 in the north.

Three National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia* (Acacia) *erioloba, Vachelia haematoxylon* and *Boscia albitrunca*. Within footprint of the proposed Upilanga Solar Park, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 10 trees/ha with the result that the cumulative impact of the development would result in the loss of approximately 8000 individuals of this species as well as numerous individuals of some other protected trees such as *Vachelia erioloba* and many individuals of provincially protected species. The loss of 8000 individuals of *Boscia albitrunca*, exceeds the threshold amount of trees that DEFF finds acceptable for loss without an offset. Due to the concern associated with the loss of the Boscia trees from the site, a review and spatial analysis has been undertaken as part of this Basic Assessment. The offset analysis is included as **Appendix D1** of this report and specifically investigates the natural history of both Boscia species and provides an analysis as to whether the loss of the affected individuals justifies the implementation of an offset for the development.

6.11 Heritage Resources, including archaeology and palaeontology

6.11.1 Archaeology and the Built Environment

The greater Upington area has a rich historical and archaeological past, which includes Stone Age artefacts of varying significance. In terms of Upilanga PV1 and its associated infrastructure no significant heritage resources were identified within the footprint. The stone age occurrences identified consisted of isolated finds, and low-density ex-situ surface scatters containing predominantly of Middle Stone Age (MSA) material, with a few incidences of Later Stone Age (LSA) lithics. Whether indicative of the original discard patterns, or subsequent displacement by erosion and animal activity, the material is too scattered to be connected to knapping sites, and no evidence of concurrent human occupation was found in association with the lithics. No engravings, formal or informal graves were identified within the development footprint and the only built structures included modern cattle farming kraals, jeep tracks and fences.

The identified archaeological materials are therefore of low significance, as the archaeological sample is small and without context, and therefore of little scientific value. These Stone Age heritage finds are not considered conservation-worthy. This means these sites have been sufficiently recorded and no further action is required.

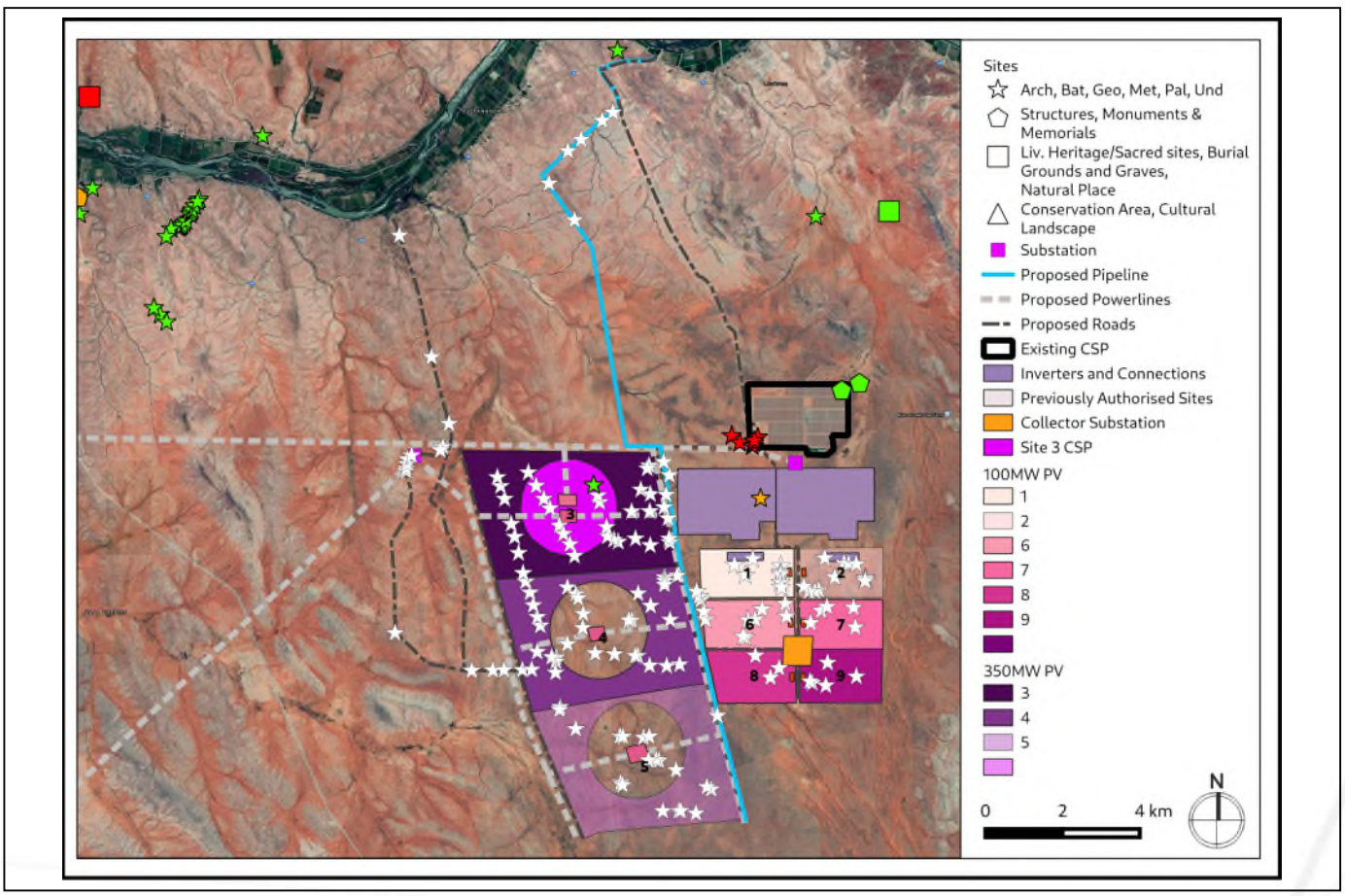


Figure 6.17: Map illustrating the heritage sites identified within the entire study area and development area of the Upilanga Solar Park and PV1.

6.11.2 Palaeontology

According to Almond's Desktop PIA for the proposed additional CSP sites within the Karoshoek Solar Valley (November 2015, SAHRIS ID 344305), which covers this area proposed for this development, the development area is underlain by PreCambrian basement rocks as well as late Caenozoic superficial sediments. Almond (2015) further notes that "The Precambrian igneous and metamorphic basement rocks underlying the entire study area at depth are entirely unfossiliferous. The fossil record of the Pleistocene to Recent Kalahari Group is generally sparse and low in diversity. The Gordonia Formation dune sands were mainly active during cold, drier intervals of the Pleistocene Epoch that were inimical to most forms of life, apart from hardy, desert-adapted species. Porous dune sands are not generally conducive to fossil preservation.

Freshwater bivalves and gastropods (e.g. Corbula, Unio) and snails, ostracods (seed shrimps), charophytes (stonewort algae), diatoms (microscopic algae within siliceous shells) and stromatolites (laminated microbial limestones) are associated with local watercourses and pans. Microfossils such as diatoms may be blown by wind into nearby dune sands. These Kalahari fossils (or subfossils) can be expected to occur sporadically but widely, and the overall palaeontological sensitivity of the Gordonia Formation is therefore considered to be low.

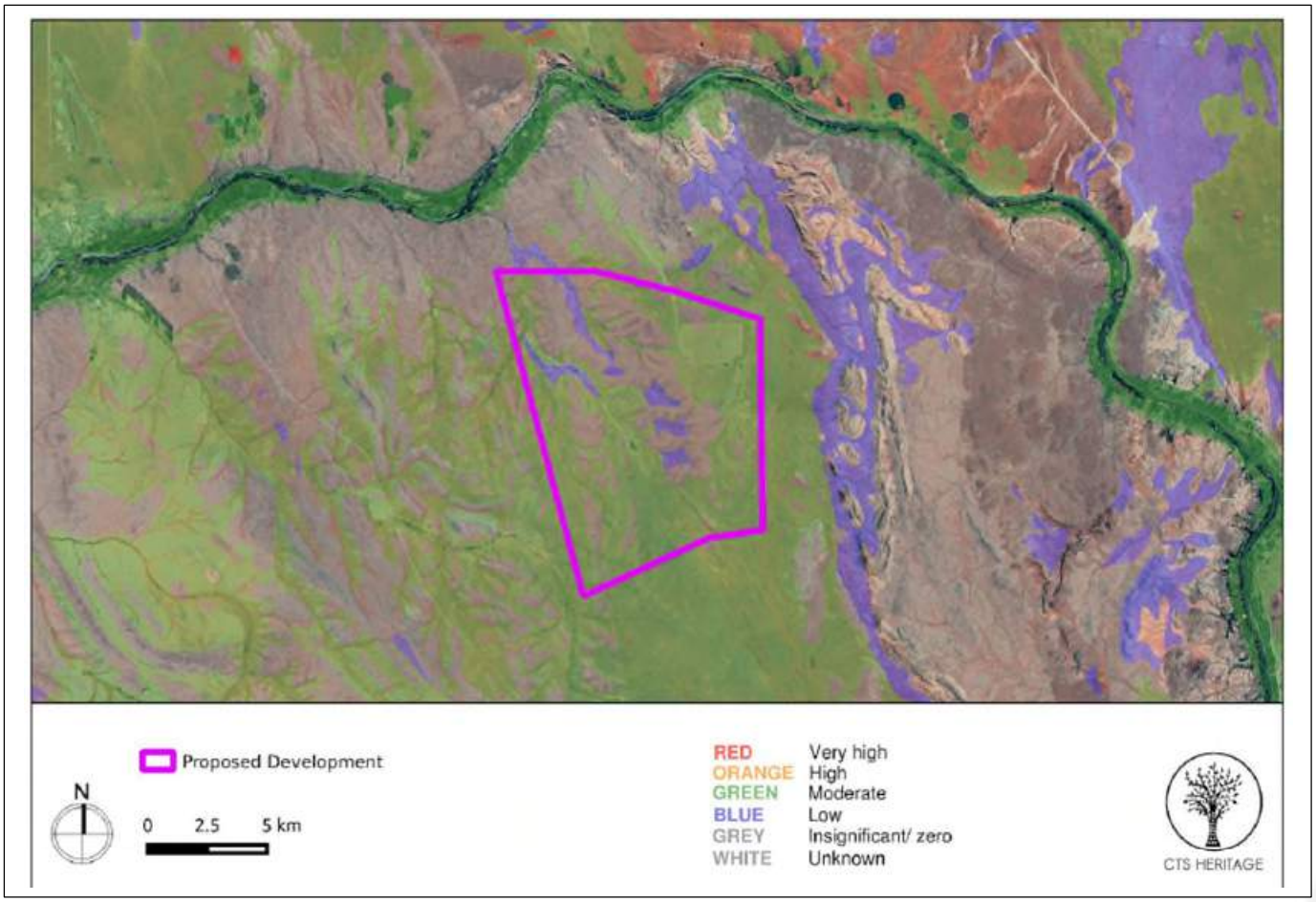


Figure 6.18 A palaeosensitivity map illustrating the location of the entire Upilanga Solar Park development area.

6.12 Visual Quality

The study area occurs on land that ranges in elevation from 800m (at the Orange River) to 1180m (at the top of the Langberg hills located east of the Upilanga Solar Park). The terrain surrounding the project site is predominantly flat with an even slope towards the Orange River valley that forms the most distinct hydrological feature in the region. Due to this flat topography, the area, particularly south of the river, is characterised by the occurrence of many non-perennial drainage lines and pans. The dominant topographical unit or terrain type of the region is relatively homogenous and is described predominantly as lowlands with hills, dune hills and irregular or slightly irregular plains. Relatively prominent low hills (or koppies) occur in the east of the study area. Some isolated hills also occur randomly in the north west of the study area. The Orange River meanders from the east to the west in the northern section of the study area.

The majority of the study area is sparsely populated (less than 10 people per km^2) and consists of a landscape of wide-open spaces and very little development. The scarcity of water and other natural resources has dictated the settlement patterns of this region. The study area has a rural character with little development outside of Upington. Exceptions occur where power lines traverse the study area. These include the Garona-Gordonia 1 132kV line to the north of the study area and the Garona-Kleinbegin 1 132kV line to the west of the site. In addition, the Karoshoek Solar One development is located to the north of the site, and changes the immediate character of the area to be more industrialised.

The core area of visual exposure is entirely restricted to the properties earmarked for the Upilanga Solar Park and there are no potentially sensitive visual receptors located within a 1 - 3km radius of the proposed development. Visibility within 3 - 6km is more scattered and interrupted due to the undulating nature of the topography. There are similarly no potentially sensitive visual receptors located within this zone.

Visibility beyond 6km is generally restricted to the elevated slopes of the hills (e.g. Karosberg and Langberg) facing the Upilanga Solar Park. At distances exceeding 6km the intensity of visual exposure is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer. The 100MW PV Plant will therefore not likely be visible from any settlements of major roads within the region.

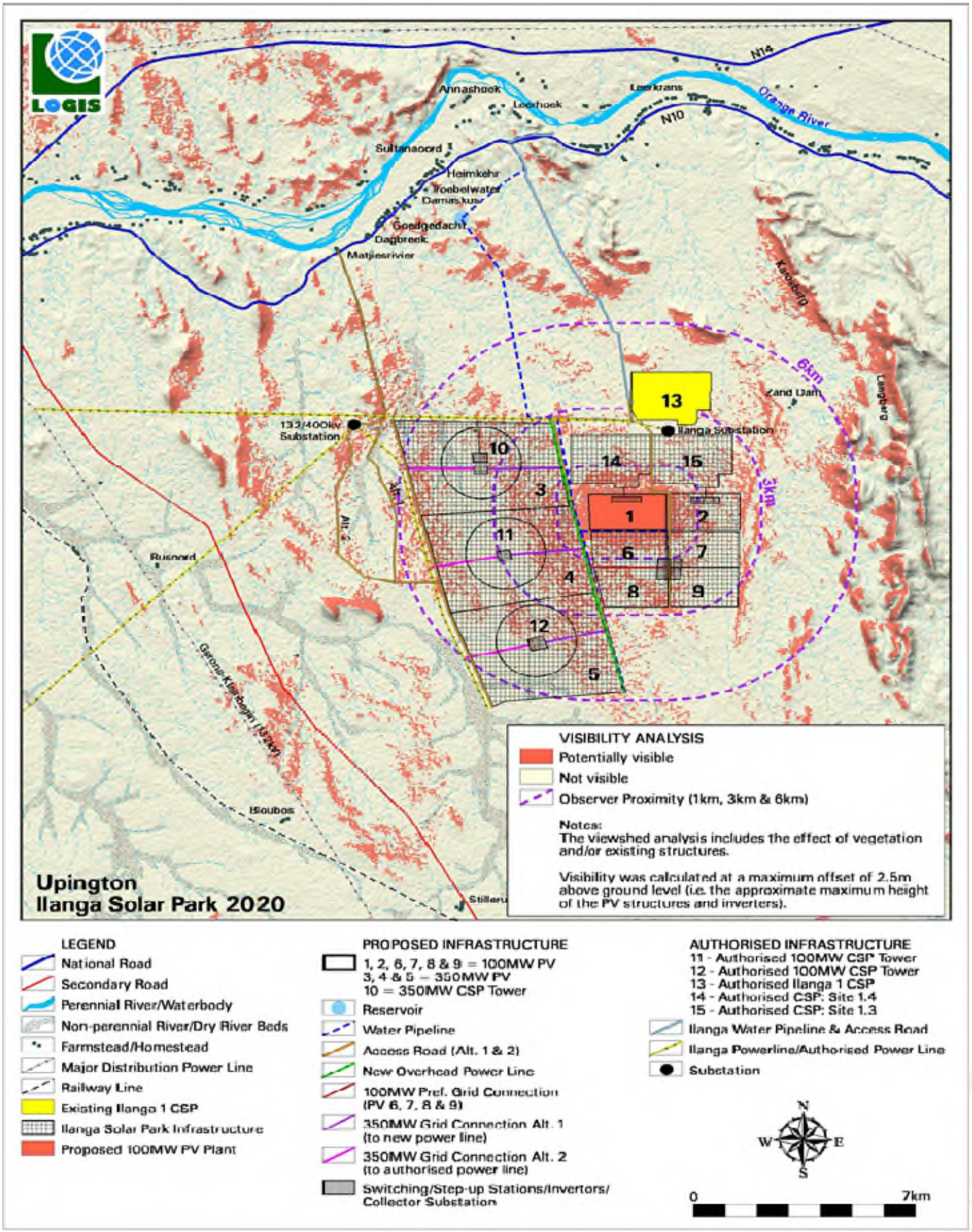


Figure 6.19: Viewshed analysis of the proposed 100MW PV Plant.

6.13 Social Profile

The social profile provides an indication of the specific social aspects within the area which will be relevant to the development of the Upilanga PV1, and which may be affected with the development of the proposed project.

Within the vicinity of the development area for Upilanga PV1, there are no major social receptors located within or directly adjacent to the development area. Social receptors that could be affected are the local travellers making use of the N10 and surrounding gravel roads. Other social receptors include the settlements surrounding the development area, as well as the agricultural activities undertaken along the Orange River to the north. Due to the fact that renewable energy development has already been undertaken within the surrounding area of the social features, i.e. the construction and operation of the Ilanga 1 CSP Facility, the Khi Solar One CSP Facility and numerous PV facilities, the development of the proposed project will not introduce solar energy as a land use to the area. The distance of the area proposed for development of Upilanga PV1 to these social receptors also provides a buffer in terms of direct impact.

Table 6.2 provides a baseline summary of the socio-economic profile of the Dawid Kruiper LM within which Upilanga PV1 is proposed. The data presented in this section have been derived from the 2011 Census, the Local Government Handbook South Africa 2019, the Northern Cape Provincial Spatial Development Framework (PSDF), and the ZF Mgcawu DM and Dawid Kruiper LM .

Table 6.2: Baseline description of the social characteristics of the area proposed for Upilanga PV1

Location characteristics
» The project is proposed within the Northern Cape Province, which is South Africa's largest, but least populated Province. » The project is proposed within the Dawid Kruiper LM and the ZF Mgcawu DM. » The Dawid Kruiper LM was established by the amalgamation of the Mier LM and //Khara Hais LM on 3 August 2016, and covers an area of land 44 231km² in extent, formally making it the largest LM in South Africa.
Population characteristics
» The Dawid Kruiper LM has a total population of 107 161. » In terms of the age structure 28.6% of the population is under 15 years of age, 65.8% of the population falls between 15 and 64, with 5.6% of the population being over 65. » Between 2001 and 2011 the Dawid Kruiper LM experienced a population growth rate of -1.8% per year. » The Dawid Kruiper LM is female dominated, with females comprising approximately 50.6% of the LM population, while the ZF Mgcawu DM is male dominated, with males comprising approximately 50.8% of the DM population. » Coloureds comprise the predominant population group within the Dawid Kruiper LM and ZF Mgcawu DM. » Within the Dawid Kruiper LM 65.2% of the populations is coloured, 23.1% is black African, 9.9% is white and 0.7% is Indian/Asian. With 1.2% categorised as other. » The dominant language spoken in the Dwaid Kruiper LM is Afrikaans at 85.2%. The remaining spoken languages in the area includes English (1.9%), IsiNdebele (0.2%), IsiXhosa (5%), IsiZulu (0.3%), Sepedi (0.2%), Sesotho (0.9%), Setswana (3.5%) and Tshivenda (0.1%). » The Dawid Kruiper LM, ZF Mgcawu DM, and Northern Cape provincial, and South African national population age structures are all youth dominated. A considerable proportion of the respective populations therefore comprise individuals within the economically active population between the ages of 15 and 64 years of age
Economic, education and household characteristics
» The Dawid Kruiper LM has a dependency ratio of 35.6, which correlates closely with the ZF Mgcawu DM (34.4), Northern Cape Province (35.8), and South Africa (34.5).

- Education levels within the Dawid Kruiper LM are low with approximately 58.3% of the population over 20 years of age not having completed Grade 12 / Matric. This means that the majority of the population can be expected to have a relatively low-skill level and would either require employment in low-skill sectors, or skills development opportunities in order to improve the skills level of the area.
- The unemployment rate of the Dawid Kruiper LM is only fractionally lower than that of the ZF Mgcawu DM (i.e. 11.9% for the LM and 11.3% for the DM), and the percentage of economically inactive individuals within the Dawid Kruiper LM is higher than in the ZF Mgcawu DM (i.e. 43.3% in the LM and 38.3% in the DM). This could have a negative impact in terms of the local human capital available for employment.
- Household income levels of the Dawid Kruiper LM are low within the area, with over half (54%) falling within the poverty level (i.e. R0 – R38 400 per annum). The area can therefore be expected to have a high poverty level with associated social consequences such as not being able to pay for basic needs and services and poor living conditions.
- The primary economic activities within the Dawid Kruiper LM comprise trade and retail as a result of the strong tourism and agricultural sectors.
- The majority of households within the Dawid Kruiper LM comprise formal brick dwellings, with only a very small proportion (0.8%) comprising traditional dwellings.

Services

- The Dawid Kruiper LM is poorly serviced in terms of public sector health facilities with 2 hospitals (one public and one private hospital), 2 Community Healthcare Centres (CHC) and 6 Fixed Primary Healthcare Clinics (CHC), and 5 Satellite Healthcare Clinics.
- The majority of households within the Dawid Kruiper LM are well serviced with regards to water, sanitation, electricity, and refuse removal, with the LM often exhibiting higher levels of service provision that the ZF Mgcawu, Northern Cape Province, and South Africa.

6.14 Site Accessibility

The main access routes to the Dawid Kruiper Municipality are the national roads, namely the N14 and the N10. The study area is relatively accessible from Upington via the N10 which runs from Upington to Groblershoop (through the northern parts of the site against the Orange River). There is an unnamed access road to the central part of the site directly from the N10. Regional roads include the R360 and the R27 (from Keimoes). These roads, as well as the local roads are generally in a good condition even though large volumes of heavy vehicle traffic are experienced on the main routes.

Direct access to the broader study area and the development area is provided by the existing road running from the N10 national road past the operational Ilanga 1 CSP facility. A section of this road is paved, and the remaining section is gravel.

Internal access roads are required to be established for construction and maintenance purposes. Internal roads equal to or greater than ±10km in length and between 4m-8m wide gravel internal service roads are required within the plant boundary.

CHAPTER 7: ASSESSMENT OF POTENTIAL IMPACTS

This Chapter serves to assess the significance of the positive and negative environmental impacts (direct, indirect, and cumulative) expected to be associated with the development of Upilanga PV1 and its associated infrastructure. This assessment has considered the construction of a PV facility with a contracted capacity of up to 100MW, within a development area of 350ha in extent. Upilanga PV1 will comprise the following key infrastructure and components:

- Solar PV panels with a maximum height of 5m utilising Single axis tracking; Fixed axis tracking; Dual axis tracking or Fixed Tilt mounting structures made of galvanised steel and aluminium.
- Grid alternatives using underground cables to connect to the on-site substations at authorised site and 1.4 and authorised grid connection to the Ilanga substation.
- A step-up facility (transformer) to step up the electricity current from 11kV/22kV/33kVto 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
- An access road to the development area no more than 6m wide.
- Internal access roads within the PV panel array area with a maximum width of 4m.
- Perimeter security fencing around the development area.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Three grid connection alternatives have been assessed within this Basic Assessment process:

4) On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 33kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref: 14/12/16/3/3/2/299) to the existing Ilanga substation.
5) An onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation).
6) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

The full extent of the study area was considered through the BA process by the independent specialists and the EAP. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys. A development footprint for the PV facility within the development area was proposed by the proponent through consideration of the sensitive environmental features and areas identified following the commencement of the BA process. A layout for Upilanga PV1 was designed within the development area and avoids very high environmentally sensitive areas not considered to be suitable for development or infringement (refer to **Figure 7.1** and **Figure 7.2**). In addition, the layout of Upilanga PV1 is considered as least intrusive on the very high sensitive features and most suitable for development within the area surrounding the study area.

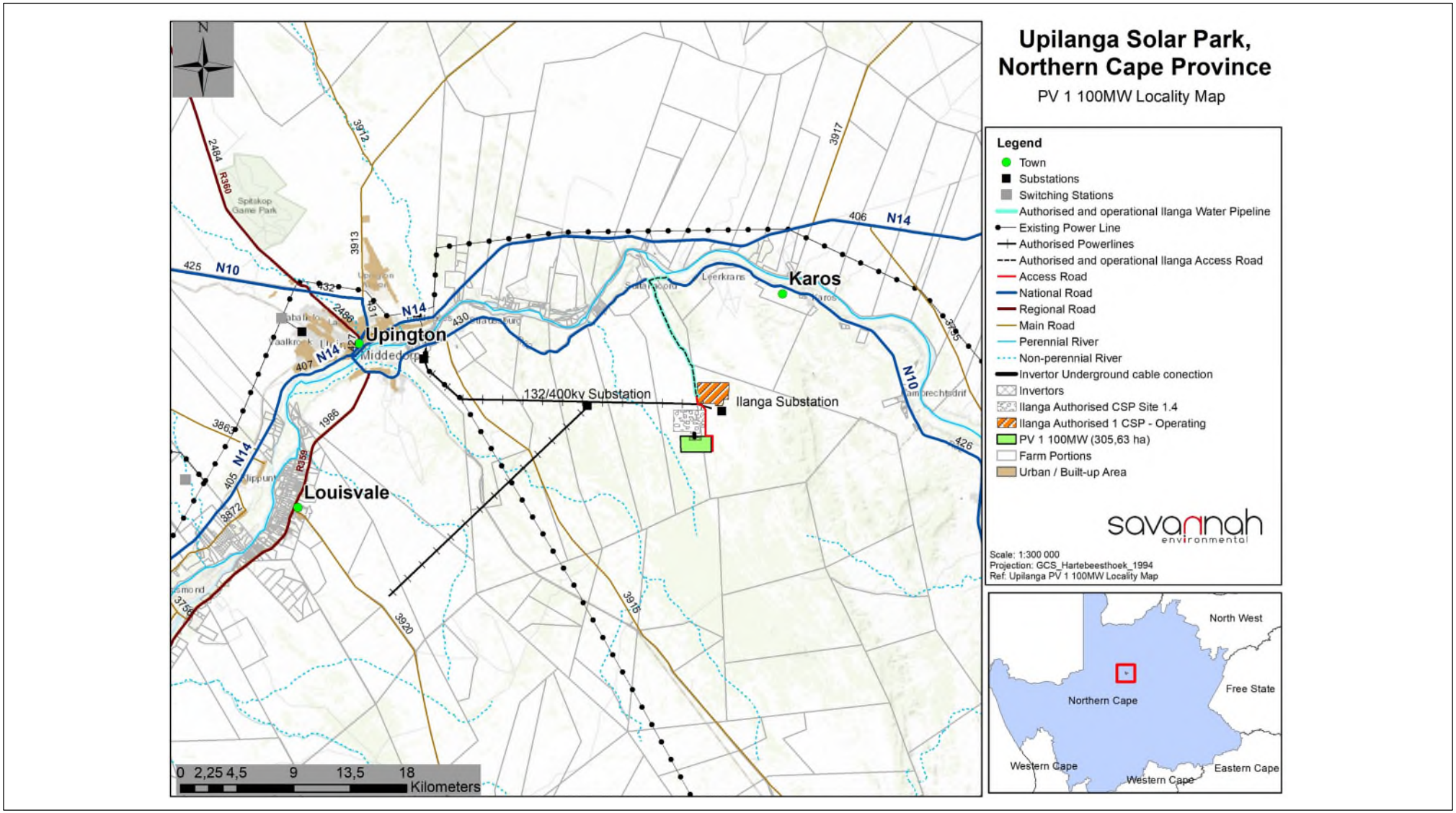


Figure 7.1: Map illustrating the Upilanga PV1 development area located within the study area.

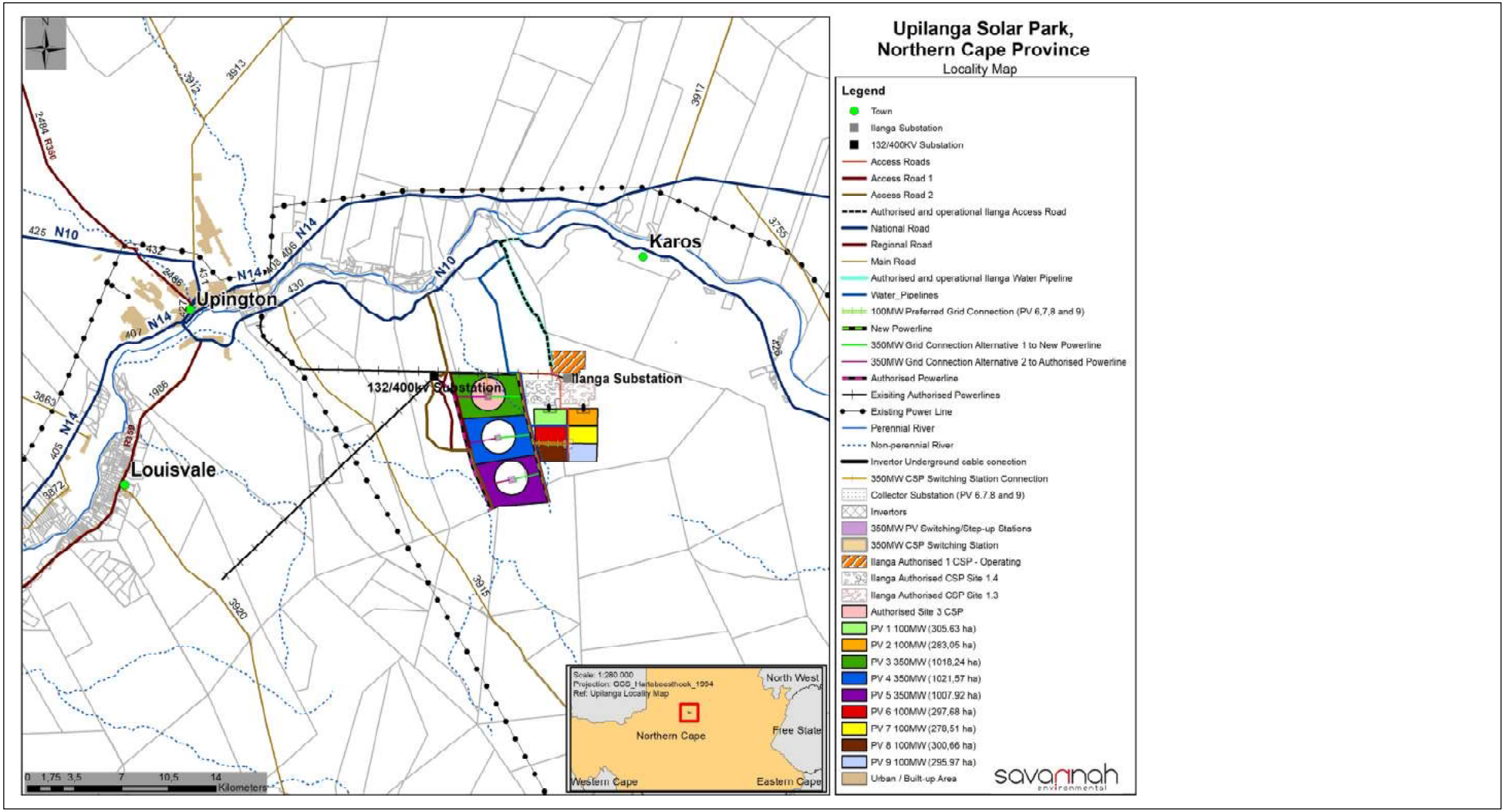


Figure 7.2: A layout map of Upilanga Solar Park with Upilanga PV1 and related infrastructure showing the development footprint of the facility within the development area (The proposed additional PV's and CSP facilities illustrated are to be confirmed via separate basic assessment and EIA process. Should these facilities be confirmed, all I&AP's and stakeholders will be informed of the environmental processes)

The proposed development of Upilanga PV1 will comprise the following phases:

» *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads; a temporary laydown area and facility infrastructure; construction of foundations involving excavations, the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for Upilanga PV1 is estimated at 12 – 18 months.

» *Operation* – will include the operation of the solar PV energy facility and the generation of electricity, which will be fed into the national grid via the on-site substation at the authorised site 1.4 via underground cables and connect to the Ilanga substation. The operation phase of the Upilanga PV1 is expected to be approximately 20 years (with maintenance).

» *Decommissioning* – depending on the economic viability of the solar PV facility, the length of the operation phase may be extended beyond a 20-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the PV facility its associated infrastructure, clearance of the relevant infrastructure at the PV panel area, and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities; however, in certain instances decommissioning impacts have been considered separately.

Environmental impacts associated with the pre-construction, construction (and decommissioning) of Upilanga PV1 will include, among others, habitat loss (for fauna and avifauna species); impacts on vegetation and protected plant species and habitat degradation as a result of erosion and alien plant species invasion; a reduced ability to meet conservation obligations and targets; and impacts on broad-scale biological resources; a loss of the major riparian systems and an impact on riparian systems through the possible increase in surface water run-off on riparian form and function. In addition, impacts anticipated for the operation phase of the solar PV facility, among others include, visual impacts, particularly, from the security lighting of the facility on night-time observers.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be avoided, managed or mitigated.	The impacts and risks associated with the development of Upilanga PV1 including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources are included in 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3 and 7.10.3.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing	The positive and negative impacts associated with the development of Upilanga PV1 are included in sections 7.3.2, 7.4.2, 7.5.2, 7.6.2, 7.7.2, 7.8.2. 7.9.2 and 7.10.2.

Requirement	Relevant Section
on the geographical, physical, biological, social, economic, heritage and cultural aspects	
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with Upilanga PV1 are included in sections 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3 and 7.10.3.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures.	A description of all environmental impacts identified for Upilanga PV1 during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in sections 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3 and 7.10.3.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of Upilanga PV1, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3 and 7.10.3.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 7.3.3, 7.4.3, 7.5.3, 7.6.3, 7.7.3, 7.8.3, 7.9.3 and 7.10.3.

7.2. Quantification of Areas of Disturbance within the Development Area

Site-specific impacts associated with the construction and operation of Upilanga PV1 predominantly relate to site clearance activities that could impact protected and listed plant species (i.e. *Boscia* species); cause an increased risk of soil erosion as a result of the loss of vegetation cover; a loss of the major riparian system and an impact on riparian systems through the possible increase in surface water run-off on riparian form and function. In order to quantitively assess the impacts associated with the development of Upilanga PV1, it is necessary to consider the extent of the identified development area (i.e. 350ha) to be affected by the pre-construction and construction activities of the proposed solar PV facility.

Particular concerns also include the large number of protected trees that would be lost to the development of the Upilanga Solar Park as well as the potential for habitat fragmentation and loss of broad-scale ecological function. Emvelo Capital Projects (Pty) Ltd has indicated that the entire property could potentially be set aside for conservation purposes as an offset to mitigate some of the impacts of the renewable energy developments on biodiversity.

The extent of each vegetation type within the site and within the development footprint is detailed below:

Vegetation Type	Total Extent within Site (Ha)	Total Extent within Development footprint (Ha)	Proportion not in footprint (%)
Bushmanland Arid Grassland	18 958	7 655	59.6
Kalahari Karroid Shrubland	6 338	0	100
Gordonia Duneveld	4 110	573	86
Lower Gariep Broken Veld	1 824	0	100
Bushmanland Vloere	15.8	0	100
Totals	**31 246**	**8 228**	**3.8**

The remaining extent of the site would not be adequate as an offset if it was comprised solely of Bushmanland Arid Grassland or other vegetation types of low diversity. However, the fact that the site contains a significant extent of Lower Gariep Broken Veld is notable and significantly increases the conservation value of the site. Although the remaining extent of the site (ca. 23 000ha) is not that large in context of an arid environment, it is considered sufficient to provide for the maintenance of ecological processes across the site. The potential contribution of the site to conservation targets and outcomes is considered to be significant and as such is therefore adequate to offset the residual impacts of the development.

7.3. Assessment of Impacts on Ecology (Fauna and Flora)

The development and operation of Upilanga PV1 will have an impact on the ecological resources identified within the development area. These resources include vegetation, protected and listed plant species; fauna; habitat; conservation and broad-scale ecological processes.

A summary of the ecological impacts identified and the significance thereof for the proposed development are included below. Refer to **Appendix D** for more detail.

The field assessment as well as a desktop review of the available ecological information for the area was revealed that the vegetation of the development area consists of Kalahari Karroid Shrubland with some Bushmanland Arid Grassland on deeper soils across the site.

In terms of sensitive features, the vegetation of the development area is considered generally moderate to low sensitivity with few plant species of concern present. There is a relatively high density of the protected tree species *Boscia albitrunca* within the development footprint and as many as 3000 individuals would be impacted. An offset analysis for this species has been conducted to investigate the need and quantum of an offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities. Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; Vachellia (Acacia) erioloba and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. Within the Upilanga PV 1 footprint, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 10 trees/ha with the result that the development would result in the loss of approximately 3000 individuals of this species. This far exceeds the guideline amount of trees that DEFF finds acceptable for loss without an offset.

Although there are quartz patches in the area which are home to several local endemics or specialised species such as Lithops, no quartz patches home to such species were observed within the development area.

The majority of the site lies within an area classified as "Other natural areas" and has not been classified as a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA). There are no CBAs in close proximity to the development area, indicating that the establishment of Upilanga PV 1 does not pose a threat to any CBAs or other areas considered to be of significance from a broad-scale conservation planning perspective

In terms of fauna, there are few species of conservation concern that are likely to be present or abundant at the site and the primary impact of the development on fauna would be some habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur as a result of the development. Consequently, the impacts of the development on fauna and flora are considered acceptable and would be of low significance after mitigation.

7.3.1 Description of Ecological Impacts

Negative impacts on fauna and flora anticipated to occur with the development of Upilanga PV1 include the impacts on vegetation and protected plant species, faunal impacts, habitat degradation due to erosion and alien plant invasion, reduced ability to meet conservation obligations & targets and impacts on broad-scale ecological processes.

» Impacts on vegetation and protected plant species
Several protected species occur at the site which may be impacted by the development of Upilanga PV, most notably *Boscia albitrunca, Vachellia erioloba* and *Boscia foetida subsp. foetida*. The density of these species within the development area is relatively high for B.albitrunca and relatively low for both Vachellia erioloba and Boscia albitrunca. Vegetation clearing during the construction phase will lead to the loss of currently intact habitat within the development area and is an inevitable consequence of the establishment of Upilanga PV. As this impact is certain to occur during the construction phase, it is assessed for the construction phase only, although the consequences will persist for a long time after construction has been completed.

» Direct faunal impacts
Increased levels of noise, pollution, disturbance and human presence during the construction phase will be detrimental to fauna. Sensitive and shy fauna would move away from the development area during the construction phase 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 impact on fauna is highly likely to occur during the construction and operation phase and this impact is therefore assessed for the construction phase and operation phase.

» Habitat Degradation due to Erosion and Alien Plant Invasion
Disturbance within the development area generated during the construction phase will leave the area vulnerable to erosion and alien plant invasion, which would lead to the degradation of the local environment. Although, the disturbance would be created during the construction phase, the major impacts would manifest during the operation phase.

» Reduced ability to meet conservation obligations & targets
The loss of unprotected vegetation types on a cumulative basis from the broader study area may impact the country's ability to meet its conservation targets. The development area is however not within an NPAES Focus Area, indicating that it has not been identified as being of high significance

for conservation expansion. Kalahari Karroid Shrubland is however a relatively restricted vegetation type for an arid area and is therefore vulnerable to cumulative impacts. This impact is therefore assessed in light of the proposed development as well as any other developments in the surrounding area which would also contribute to cumulative impacts.

» Impact on broad-scale ecological processes
Transformation of intact habitat due to Upilanga PV alone as well as on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. These impacts are assessed for Upilanga PV alone as well as on a cumulative basis considering other existing or proposed developments in the wider area.

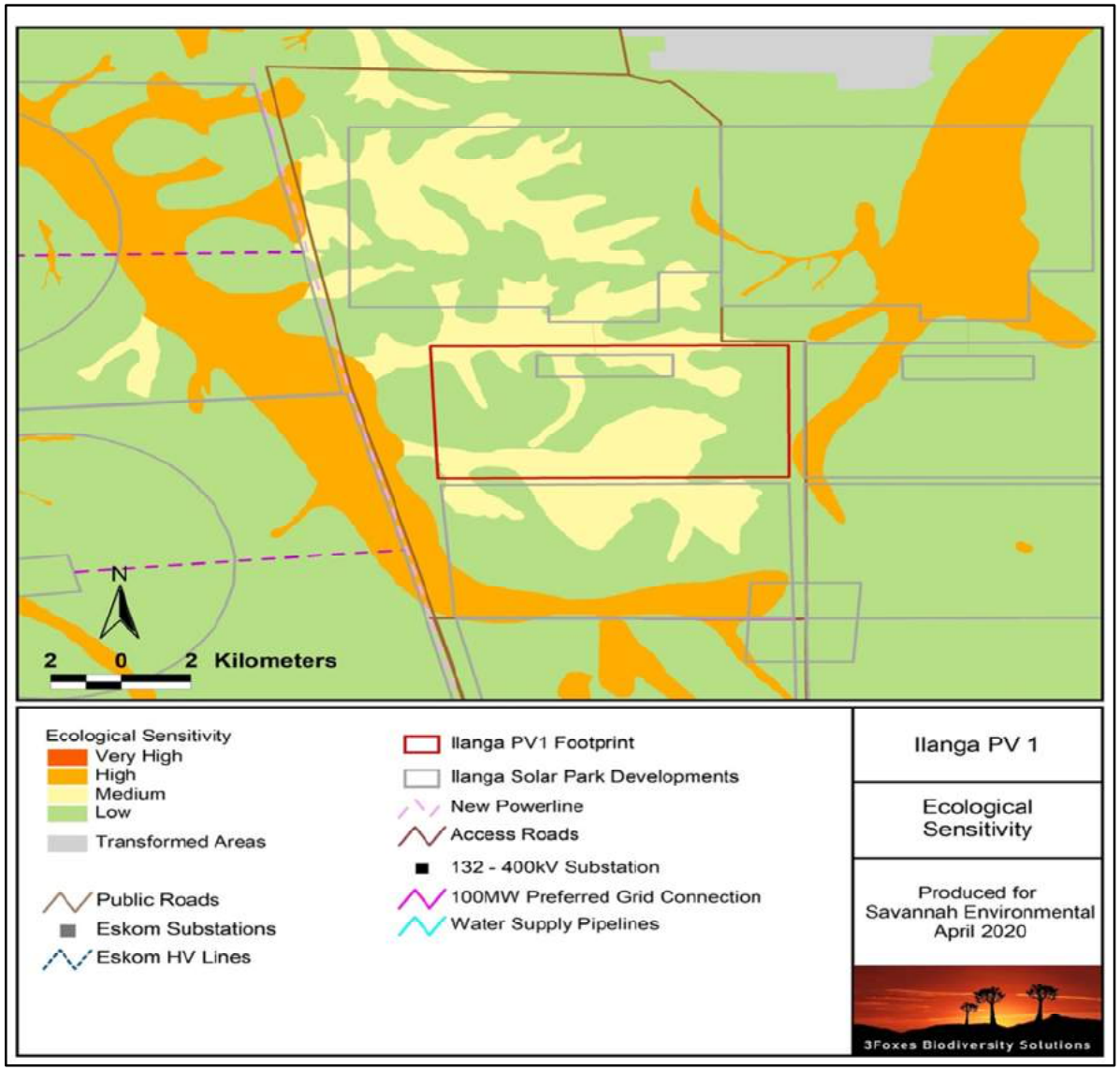


Figure 7.3: Sensitivity map for the study area and the Upilanga PV development area. Although there are some high and very high sensitivity wash areas within the development area, the larger parts are outside of the PV array areas and the overall impact on these features would be relatively low

7.3.2 Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning

The various identified impacts are assessed below for the different phases of the development:

Construction and Operation Phase Impacts

Nature: Impacts on vegetation and listed or protected plant species resulting from construction activities Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the facility. In addition, it is likely that some loss of individuals of protected trees will occur.		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (40)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation is unavoidable and is a certain outcome of the development.	
Mitigation	» A protected tree offset strategy report has been developed to inform the potential need for an offset for the loss of protected trees within the current as well as other Upilanga PV footprint areas. » Pre-construction walk-through of the facility's final layout in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC/DEFF permit conditions. » Search and rescue for identified species of concern before construction. » Vegetation clearing to commence only after walk-through and search and rescue has been conducted and necessary permits obtained. » Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, and remaining within demarcated construction areas etc. » Contractor's Environmental Officer (EO) to provide supervision and oversight of vegetation clearing activities within sensitive areas such as near the pans. » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. » Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of low sensitivity. These areas should be rehabilitated after use.	
Residual Risks	As the loss of currently intact vegetation is an unavoidable consequence of the development, the habitat loss associated with the development remains a	

	moderate residual impact even after mitigation and avoidance of more sensitive areas.

Nature: Direct Faunal Impacts Due to Construction Activities Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during the construction phase. Due to noise and the operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. This will however be transient and restricted to the construction phase.		
	Without Mitigation	With Mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low to Medium (5)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (32)	Low (28)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Although, the large amounts of noise and disturbance generated within the development area during the construction phase is largely unavoidable, impacts such as those resulting from the presence of construction personnel within the development area can be easily mitigated.	
Mitigation	» All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition. » Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer. » All construction vehicles should adhere to a low speed limit (40km/h for light vehicles and 30km/h for heavy vehicles) to avoid collisions with susceptible species such as snakes and tortoises. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the development area. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » If trenches need to be dug for electrical cabling, these should not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches that are standing open should have places where there are soil ramps allowing fauna to escape the trench. Larger fauna can be excluded with barrier nets.	
Residual Risks	It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.	

Nature: Faunal Impacts due to Operation The operation and presence of the facility may lead to disturbance or persecution of fauna within or adjacent to the facility.		
	Without Mitigation	**With Mitigation**

Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (27)**	**Low (21)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	To a large extent, but some low-level residual impact due to noise and human disturbance during maintenance is likely.	
Mitigation	» Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. » If the site must be lit at night for security purposes, this should be done with downward-directed low-Ultraviolet (UV) type lights (such as most LEDs), which do not attract insects. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles accessing the site should adhere to a low speed limit (30km/h max for heavy vehicles and 40km/h max for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises. » If the facility is to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted, but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.	
Residual Risks	Disturbance from maintenance activities will occur at a low level with the result that disturbance would be largely restricted to the site.	

Nature: Habitat Degradation due to Erosion and Alien Plant Invasion

Disturbance created during the construction phase will leave the development area vulnerable to erosion and alien plant invasion for several years into the operation phase.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	**Medium (36)**	**Low (21)**
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Moderate	Low

Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.
Mitigation	» Erosion management within the development area should take place according to the Erosion Management Plan and Rehabilitation Plan. » Access roads should have run-off control features which redirect water flow and dissipate any energy in the water which may pose an erosion risk. » Regular monitoring for erosion during operation to ensure that no erosion problems have developed as a result of the disturbance, as per the Erosion Management and Rehabilitation Plans for the project. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » There should be follow-up rehabilitation and re-vegetation of any remaining bare areas with indigenous perennial shrubs and succulents from the local area. » Alien management at the site should take place in accordance with the Alien Invasive Management Plan. » Regular monitoring for alien plant proliferation during the operation phase to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan for the project. » Woody alien plant species should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.
Residual Risks	Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact.

Decommissioning Phase Impacts

Nature: Habitat Degradation due to Erosion and Alien Plant Invasion

Disturbance created during decommissioning will leave the development area vulnerable to erosion and alien plant invasion for several years.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	Medium (36)	Low (21)
Status	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation	» Erosion management within the development area should take place in accordance with the Erosion Management and Rehabilitation Plan. This should make provision for monitoring of the development area for at least 5 years after the decommissioning phase. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.	

	» There should be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area. » Alien management at the site should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management for at least 5 years after decommissioning. » Regular (annual) monitoring for alien plants during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan for the project. » Woody aliens should be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present. This might include the use of herbicides where no practical manual means are available.
Residual Risks	Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact if effectively managed.

Nature: Direct Faunal Impacts Due to Decommissioning Activities

Due to disturbance, noise and the operation of heavy machinery, faunal disturbance due to decommissioning will extend beyond the footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	**Low (28)**	**Low (18)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Although the noise and disturbance generated at the site during decommissioning is probably largely unavoidable, this will be transient and ultimately, the habitat should be restored to something useable by the local fauna.	
Mitigation	» All personnel should undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition. » Any fauna threatened by the decommissioning activities should be removed to safety by an appropriately qualified environmental officer. » All vehicles should adhere to a low speed limit (30km/h for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site and ultimately removed from the site as part of decommissioning. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill.	

	» The site should be rehabilitated with locally occurring species to restore ecosystem structure and function.
Residual Risks	Although some components of disturbance cannot be avoided, the site itself would have low faunal abundance at decommissioning and no significant residual impacts are likely.

7.3.3 Comparative Assessment of the Grid Connection Alternatives

In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding.

7.3.4 Implications for Project Implementation

The development area identified for the establishment of Upilanga PV is restricted largely to low and moderate sensitivity habitat typical of the Upington/Karoshoek area. The affected area is considered largely suitable for development. Although there are no impacts associated with the establishment of Upilanga PV that cannot be mitigated to a medium or low significance, the impact of the development on the protected tree, *B.albitrunca* has been further investigated in terms of the potential for the establishment of an offset to counter the impact on this species (Appendix D1). Although cumulative impacts in the area are a concern due to the high density of renewable energy developments in the Upington area, the proximity of Upilanga PV1 to the existing developments is seen as a positive aspect of the development and overall cumulative impacts associated with the Upilanga PV development are considered acceptable. In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Upilanga PV1 can be supported from a terrestrial ecology point of view.

7.4. Assessment of Impacts on Avifauna

A total of 163 bird species have been recorded within the broader study area and surrounds. Eleven (11) are red-listed species, six (6) are listed as near-endemic and a further ten (10) species are biome-restricted. There are no known Important Bird Areas (IBAs) or wetlands of significant avifaunal importance within the vicinity of the broader study area (other than the Orange River located within 12 km to the north).

The broader study and development area consists primarily of Bushmanland Arid Grassland habitat with some components of Kalahari Karroid Shrubland in some areas and likely supports a fairly typical avifaunal assemblage expected for the area. Eleven (11) red data listed species are known to occur within the surrounding environment, of which at least four (4) terrestrial species (Ludwig's Bustard, Karoo Korhaan, Kori Bustard, and Secretarybird) are considered common while others appear to occur less frequently.

Five (5) of the eleven (11) red-listed species are considered most important as they would potentially be impacted the most due to habitat loss and displacement. Species considered to be most important include the Ludwig's Bustard *Neotis ludwigii* (Endangered), *Secretarybird Sagittarius serpentarius (*Vulnerable), Karoo Korhaan *Eupodotis vigorsii* (Near-threatened) and Kori Bustard *Ardeotis kori* (Near-threatened). The White-

backed Vulture Gyps africanus (Critically Endangered) and Lappet-faced Vulture (*Torgos tracheliotos*) have been recorded in the wider area but are unlikely to be highly affected by the development and as their presence is likely sporadic during infrequent foraging trips. The Black Stork Ciconia nigra (Vulnerable) is unlikely to occur due to the absence of suitable habitat, but may occur along the nearby Orange River where more suitable habitat exists. A Black Harrier Circus maurus (Endangered) and breeding pair of Verreaux's Eagle Aquila verreauxii (Vulnerable) have been recorded within the broader study area however neither species were recorded on either SABAB1 or SABAB2 cards thus likely have a low frequency of occurrence and only be affected by reduced foraging ground. Use was made of the data from two seasons of monitoring for 2015 and 2016. Each visit included surveys in 1km transects across the site. These transects covered all main habitat types present. Vantage Point observations were also undertaken covering 12 hours in each season as promoted by the draft BARESG guidelines (Jenkins et al. 2015). . It is possible that there is a Secretarybird nest within the vicinity of the broader study area. Consequently, a conservative approach has been adopted when assessing the impact of the development on the avifauna.

A number of red-listed species do occur in the broader area primarily for foraging within their normally large home ranges, and are therefore not likely to be significantly impacted by the potential loss of a portion of foraging habitat as large tracks of suitable habitat remain within the surrounding environment. In essence, the sensitivity of the area in general can be considered to be of medium significance with respect to avifauna.

7.4.1 Description of Avifaunal Impacts

Negative impacts on avifauna anticipated to occur with the development of Upilanga PV1 include habitat loss and disturbance of small passerines, habitat loss, disturbance and collision risk of medium terrestrial birds and raptors and habitat loss, disturbance and collision risk of large terrestrial birds and raptors.

Habitat loss and disturbance of small passerines

For the smaller passerine species the most important impacts will involve displacement from the area encompassed by the development footprint as a result of habitat destruction. The loss of habitat will be permanent while disturbance may be continuous during the operational phase of the solar facility. While numerous species will be impacted, all of these species have large distribution ranges and will therefore only experience population decline within the footprint and immediate surroundings, and not regionally or nationally. Some of the most abundant species that will be impacted, and which are also common in neighbouring habitats, include (reporting rates in parentheses) Black-chested Prinia (100%), Sociable Weaver (92%), Acacia Pied Barbet (83%), Bokmakierie (83%), Yellow Canary (83%), Cape Sparrow Passer melanurus (83%), Southern Masked Weaver *Ploceus velatus* (83%), Lark-like Bunting *Emberiza impetuani* (75%), Sabota Lark *Calendulauda sabota* (75%), Dusky Sunbird (75%), Spike-heeled Lark Chersomanes *albofasciata* (67%), Southern Fiscal *Lanius collaris* (67%), and Rufous-eared Warbler Malcorus pectoralis (67%). Other impacts such as disturbances caused by reflective panels and grid connection power lines are not likely to have any appreciable impact on the populations of most of these small species. The impacts in general can be expected to be minimal as these smaller species are far less susceptible to the associated impacts than larger species.

Habitat loss, disturbance and collision risk of medium terrestrial birds and raptors

Small to medium-sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Pale Chanting Goshawk, and the terrestrial Namaqua Sandgrouse *Pterocles namaqua,* Northern Black Korhaan and Double-banded Courser, and the potentially the Near-Threatened Karoo Korhaan. These species may also be susceptible to collisions with associated infrastructure such as the PV panels, but this is not expected to have a major impact on most of these species. Northern Black Korhaan and Karoo Korhaan, may, however, be at more risk based on the recent research depending on the type of perimeter fencing used (Visser, 2016).

Habitat loss, disturbance and collision risk of large terrestrial birds and raptors

The group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as the White-backed Vulture, Lappet-faced Vulture, Ludwig's Bustard, Martial Eagle, Verreaux's Eagle, Secretarybird and the Lanner Falcon, as well as the Near Threatened Kori Bustard. These species are expected to lose a portion of their large foraging ranges, while disturbances during construction and maintenance of the facility is also expected to have some negative impact, but primarily on the Karoo Korhaan, Kori Bustard and possibly the Secretarybird.

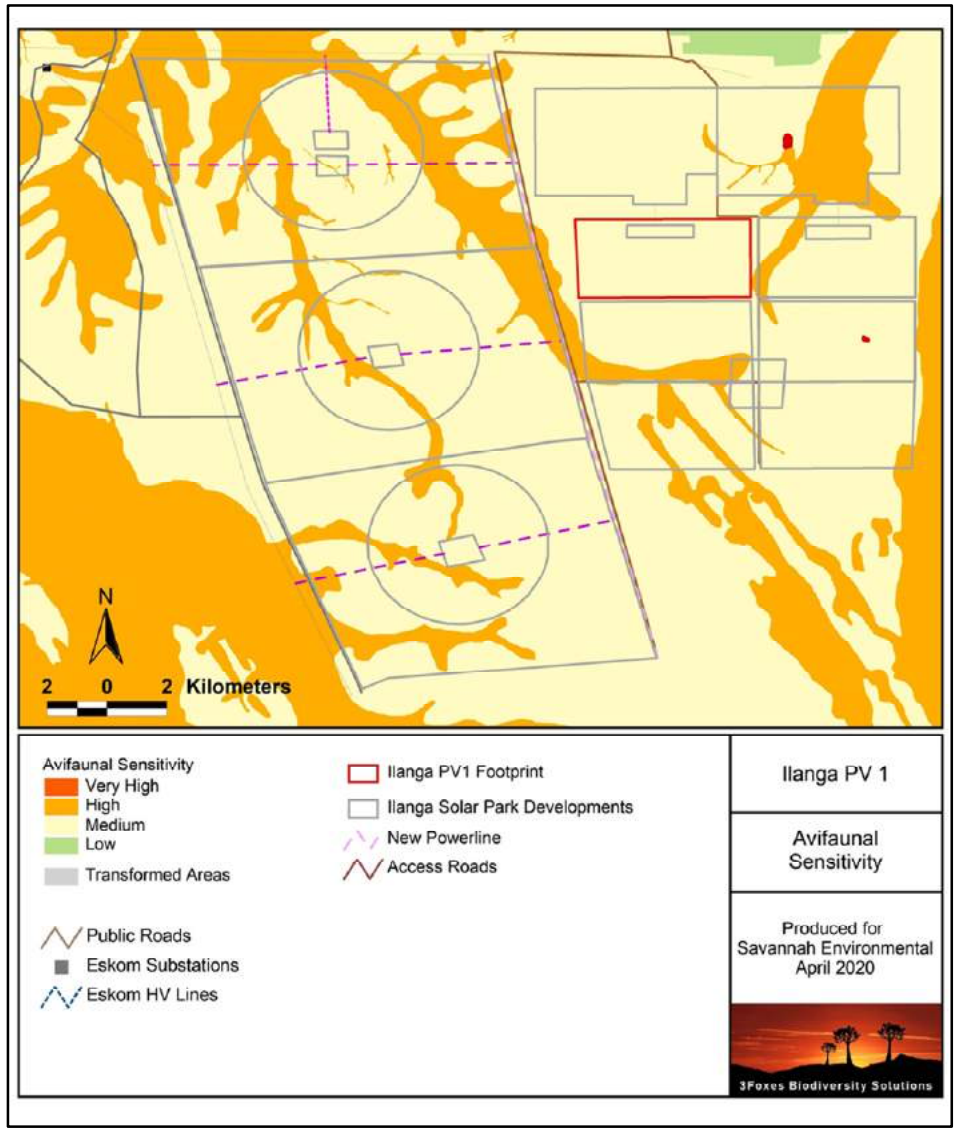


Figure 7.4: Avifaunal Sensitivity Map for the Upilanga PV1 broader study and development area, showing the Medium sensitivity plains that cover most of the area and the High sensitivity drainage lines and washes

7.4.2 Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning

The various identified impacts are assessed below for the different phases of the development:

Construction and Operation Phase Impacts

Nature: Direct avifaunal impacts during construction – habitat loss and disturbance due to vegetation clearing		
	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	**Medium (45)**	**Medium (40)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of habitat is unavoidable and is a definite outcome of the development.	

Mitigation

- Preconstruction walk-through of the development footprint to locate and identify any bird nests within the site that need to be avoided if active or removed prior to construction.
- The use of laydown areas within the footprint of the development should be used where feasible, to avoid habitat loss and disturbance to adjoining areas.
- The major drainage lines and pans within the plains habitat should be avoided were feasible, as these contribute to habitat diversity and connectivity.
- All building waste produced during the construction phase should be removed from the development area and be disposed of at a designated waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed vessels/ponds within the development area and be disposed of at a designated waste management facility after use. Any liquid and chemical spills should be dealt with accordingly to avoid contamination of the environment.
- Pre-construction environmental induction for all construction staff on site to ensure that basic environmental principles are adhered to, and awareness about not harming or hunting terrestrial species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- This induction should also include awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimizing wildlife interactions, remaining within demarcated construction areas etc.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- All construction vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
- Any avifauna threatened by the construction activities should be removed to safety by Environmental Officer (EO) or any suitably qualified person.
- If holes or trenches need to be dug, these should not be left open for extended periods of time as terrestrial avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- No construction activity should occur near to active raptor or Secretarybird nests should these be discovered prior to or during the construction phase. If there are active nests near construction areas, these should be

	reported to Environmental Control Officer (ECO) and should be monitored until the birds have finished nesting and the fledglings left the nest. » The perimeter fence around the facility should be designed with potential impacts on terrestrial avifauna in mind. Double-fence designs where the inner electric fence is positioned within one (1) metre of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped between these (Visser, 2016). Single-fence designs, whereby the electrical fencing component is attached to the inside of the mesh fence, are considered preferable as terrestrial birds cannot be trapped between these components.
Cumulative Impacts	The development will contribute to cumulative impacts on avifaunal habitat loss and transformation in the area.
Residual Risks	As the loss of currently intact habitat is an unavoidable consequence of the development, the habitat loss associated with the development remains a moderate residual impact even after mitigation and avoidance of more sensitive areas.

Nature: Avifaunal Impacts due to operational activities – collisions with PV panels, potential entrapment along perimeter fencing, and disturbance due to traffic and night lighting

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	**Medium (40)**	**Low (27)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	Yes, to a large degree, but it may be more difficult to prevent collisions and impacts related to the perimeter fence where double-fencing is used as opposed to bird-friendly single-fencing.	

Mitigation

» All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. Post-construction monitoring with the aid of video surveillance should be considered, particularly if there are high collision rates, as this will contribute towards understanding bird interactions with solar panels.

» If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most Light-emitting diodes (LEDs)), which do not attract insects. The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise disturbance to birds flying over the facility at night.

» If birds nest on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing nesting sites by using mesh or other manner of excluding them. Birds should not be shot, poisoned or harmed as this is not an effective control method and has negative ecological consequences. Birds with eggs or nestlings should be allowed to fledge their young where possible or be removed to a suitable area outside of the facility area.

» If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.

» Any movements by vehicle and personnel should be limited to within the footprint of the solar facility and other associated infrastructure, especially during routine maintenance procedures.

» All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such as nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads at night.

» Maintenance of the perimeter fencing must ensure that it minimises impacts on terrestrial species susceptible

	to entrapment between the fencing components, where double-fence designs are used (though not recommended). If double-fence designs must be used instead of preferred single-fence designs, the space between the outer mesh fence and inner electrical fence should be kept clear of vegetation which may attract terrestrial species to forage there, while also ensuring that there are no gaps/holes in these fences that will allow terrestrial birds to enter the space between the two fences.
Cumulative Impacts	The development will contribute to cumulative impacts on avifaunal habitat loss and transformation in the area, as well as minor disturbances (traffic and night lighting).
Residual Risks	Although high rates of mortality due to collisions have not been recorded in South Africa, there is some risk that this may occur, in addition to some potential mortality associated with entrapment of terrestrial birds along perimeter fencing (double-fence designs only).

Decommissioning Phase Impacts

Nature: Avifaunal impacts due to decommissioning activities – habitat loss due to clearing of solar facility, and disturbance due to traffic and presence of personnel.

	Without Mitigation	**With Mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (4)	Low to Moderate (3)
Probability	Definite (5)	Definite (5)
Significance	**Medium (35)**	**Medium (30)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated?	The disturbance impact can be mitigated to an extent as it will be transient and have no long-term impact.	

Mitigation

- All infrastructure should be removed from the development area and disposed of in the appropriate manner.
- All waste produced during decommissioning must be disposed of at a designated waste management facility.
- Environmental induction for all personnel on site to ensure that basic environmental principles are adhered to, and awareness about not harming or hunting terrestrial species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- This induction should also include awareness as to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, and remaining within demarcated decommissioning areas.
- All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed in undisturbed natural areas outside of the decommissioning area.
- All construction vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such as nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
- Any avifauna threatened by the activities should be removed to safety by the EO or any suitably qualified person.
- If holes or trenches need to be dug, these should not be left open for extended periods of time as terrestrial avifauna or their flightless young may become entrapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- No activity should occur near to active raptor/Secretarybird nests should these be discovered prior to or during the decommissioning phase. If there are active nests near the decommissioning areas, these should be

	reported to the ECO and should be monitored until the birds have finished nesting and the fledglings left the nest.
Cumulative Impacts	There are no cumulative impacts associated with the decommissioning of the proposed development.
Residual Risks	Disturbance during the decommissioning phase is an unavoidable consequence but will have low residual impact with implementation of the mitigations.

7.4.3 Comparative Assessment of the Grid Connection Alternatives

The extent of habitat loss along the below-ground grid connection would be low and would not significantly affect any high sensitivity habitats along the route. There is however also an overhead line alternative (alternative 3) associated with the project and in terms of the three alternatives, either of the two underground cables are considered preferable to the overhead line. However, given the length of the overhead line (320m), it is also considered acceptable and would not generate significant impact with the appropriate mitigation.

7.4.3 Implications for Project Implementation

The proposed development area for the Upilanga PV1 facility is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the broader study area supports a typical bioregional avifaunal assemblage, there are no impacts associated with the development that are considered to be of high residual significance and which cannot be mitigated to an acceptable level. As there are no high residual impacts associated with the development it can be supported from an avifaunal perspective. It is, therefore, the reasoned opinion of the specialists that the Upilanga PV1 development be authorised, subject to a verification site visit and the implementation of the recommended mitigation measures.

7.5. Assessment of Impacts on Aquatic Resources

The study area site is situated within quaternary catchment D73E, which is dominated by a large number of highly ephemeral river systems associated with the Orange River (DWAF, 2004). Potential runoff from the site would flow in a northerly direction towards the Orange River via drainage systems such as the Klein-leerkransspruit and Majties (Matjes) River or directly into the canal systems and siphons that run along the Orange River. These are all located within the Nama Karoo ecoregion. The outcomes of the Aquatic Resources Impact Assessment (**Appendix F**) have indicated that these alluvial systems are in a natural state, when compared to the Orange River reach which has modified floodplains and flows.

A variety of wetland types were identified near the study area and included depressions / pans and riverine floodplain, the latter being considered alluvial watercourses in this landscape setting (Figure 7.5). Current impacts occur in a localised area within the development area and included the following:

» Erosion due small road crossings and tracks;
» Ruderal alien plants from previous construction projects; and
» Grazing.

The study area systems are ephemeral and only carried water for a short week long period in 2014 and in 2019, thus the observed development area systems don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.25 m and 5 m wide were mostly terrestrial.

This coupled to the fact that the footprints will largely avoid the mainstem rivers it is anticipated that a detailed hydrological assessment is not required.

Fifteen woody plant species were found associated with the riparian and pan systems within the development area. Although none of these were obligate or facultative river/wetland species, they do show a preference for areas exposed to runoff, but none of these would be considered listed or protected under any National or Provincial legislation.

The only obligate wetland plants observed were those found in association with the man-made dams found at the confluence of the Majties (Matjes) River and the Orange River and along the Orange River itself.

Based then on the information collected in the field, assessment of the previous reports and current aerial photographs, the various aquatic features within the site were then delineated to a fine scale. These where then categorised based on the hydrogeomorphic approach, catchment position, which could then be linked to sensitivity of these to the proposed development, and compared to the ratings of the DEA Screening Tool results:

1. Alluvial water courses – major with riparian zones
2. Alluvial water courses – minor with no distinct riparian vegetation
3. Secondary water course and drainage lines
4. Pans / Depressions

7.5.1 Description of Aquatic Impacts

Negative impacts on aquatic resources anticipated to occur with the development of Upilanga PV1 include the loss of major riparian systems, impact on secondary alluvial watercourses and minor drainage lines through physical disturbance, impact on riparian and wetland systems, an increase in sedimentation and erosion, and risks on the general aquatic environment as a result of water quality impacts.

» *Loss of major riparian systems such as the mainstem rivers Klein-leerkransspruit and Majties (Matjes) rivers through physical disturbance.*
The physical removal or disturbance of the narrow woody riparian zones being replaced by hard engineered surfaces will alter the hydrological regime of the area by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. The biological impact would however be localised, as a large portion of the remaining farm and the Klein-leerkransspruit and Majties (Matjes) catchment would remain intact with no new direct crossings being proposed by this project on these major systems. Furthermore, all of the remaining infrastructure for the Upilanga PV1 has been located well outside any of these mainstem systems that were associated with a high sensitivity, i.e. only secondary alluvial water courses and drainage lines will be affected by the internal roads.

» *Impact on Secondary alluvial water courses (Moderate Sensitivity) and minor drainage lines through physical disturbance.*
The physical removal of narrow strips of woody riparian zones being replaced by hard engineered surfaces will alter the hydrological nature of the area, by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact would however be localised, as it is intended that the PV panels and mounting structures traverse the watercourses and will not be placed within the watercourse, i.e. span the watercourses which will reduce the proposed impacts.

» *Impact on riparian systems through the possible increase in surface water runoff on riparian form and function*

The increase in hard surface areas and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the riparian systems, which are currently ephemeral, i.e. riparian systems species composition changes, which then results in habitat change / loss.

» *Increase in sedimentation and erosion within the development footprint.*

Increase in hard surface areas, and roads that require stormwater management will increase erosion potential through the concentration of surface water flows. These higher volume flows, with increased velocity result in downstream erosion and sedimentation.

» *Impact on localised surface water quality*

During both preconstruction, construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems. .

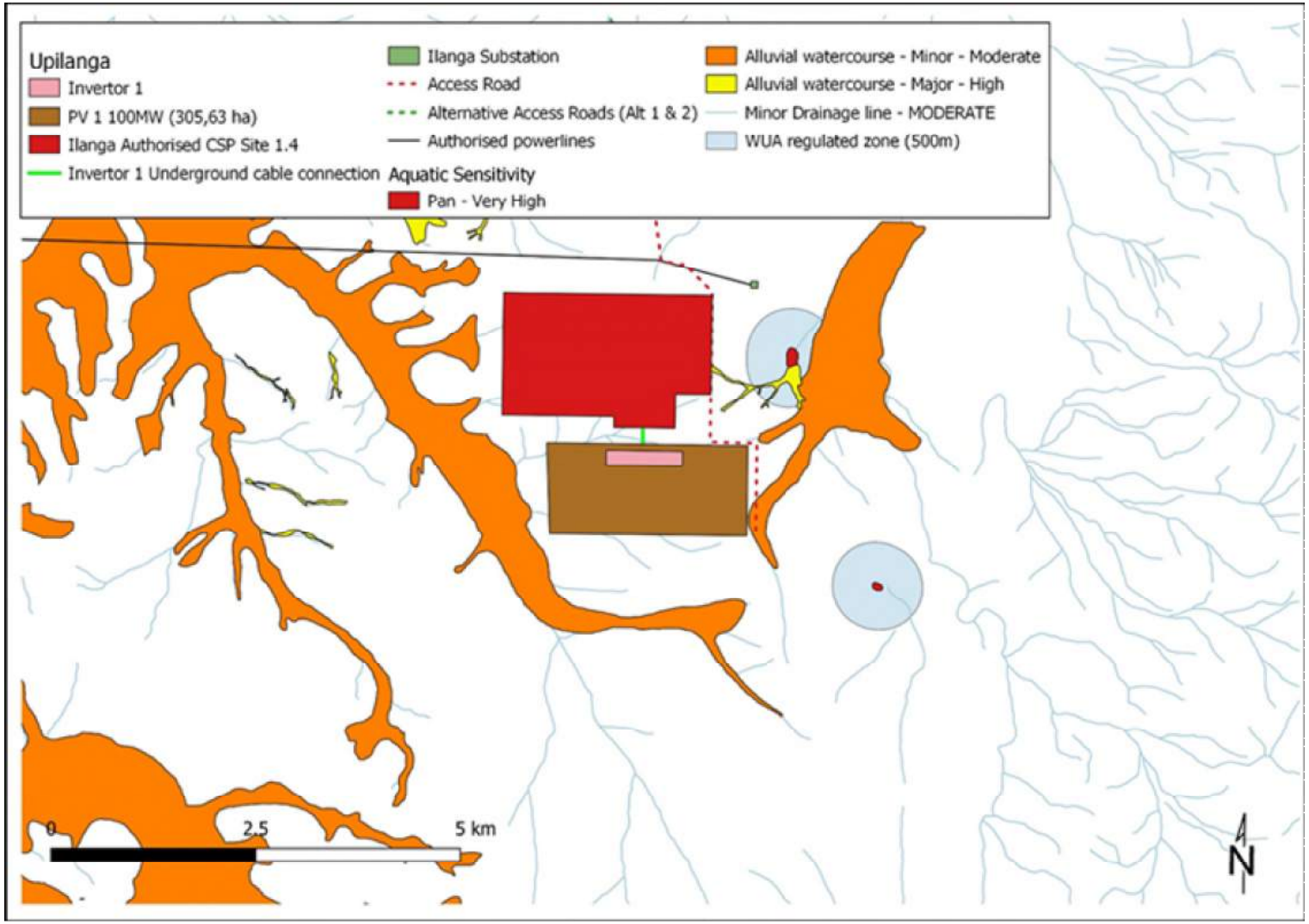


Figure 7.5: A map illustrating the delineated watercourses within the study area and development area for Upilanga PV1

7.5.2 Impact tables summarising the significance of impacts on aquatic resources during construction, operation, and decommissioning

The impacts assessed below apply to the development area assessed for Upilanga PV1. It is anticipated that all of the grid connection alternatives will avoid any of the observed watercourses, directly (underground cables) or span these areas via the overhead routes. There are therefore no impacts expected to be associated with this infrastructure.

The nature of the impacts on aquatic resources anticipated for the decommissioning phase would be similar to those of the construction phase, therefore, the impacts associated within the development of Upilanga PV1 for this phase are no assessed separately in the tables below.

Construction and Operation Phase Impacts

Nature: *Loss of major riparian systems such as the mainstem rivers Klein-leerkransspruit and Majties (Matjes) rivers through physical disturbance*

The physical removal or disturbance of the narrow woody riparian zones, being replaced by hard engineered surfaces. This biological impact would however be localised, as a large portion of the remaining farm and the Klein-leerkransspruit and Majties (Matjes) catchment would remain intact with no new direct crossings being proposed by this project on these major systems. Furthermore, all of the remaining infrastructure has been located well outside any of these mainstem systems that were considered having a HIGH sensitivity, i.e. only secondary alluvial water courses and drainage lines will be affected by the internal roads.

	Without mitigation	**With mitigation**
Extent	High (3)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (7)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**High (70)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

The most significant form of mitigation would be to select development options that contain no aquatic features. The proposed layout has been developed to avoid the important main stem systems, thus requiring only crossings or footprints within alluvial watercourses and drainage lines demarcated to be a low/medium sensitivity and is therefore considered to be an acceptable infringement and loss of the features or sections thereof.

Additional general mitigations include:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel. It

is therefore suggested that all construction camps, laydown areas, or other temporary areas and stores should located more than 50 m from any demarcated watercourses, as the only allowable features would be the PV panels mounting structures, that will span any of the observed watercourses (i.e. footings will be outside of these areas), and certain access roads.

- » It is also advised that an Environmental Officer (EO), with a good understanding of the local flora be appointed during the construction phase. The EO, in consultation with the ECO, should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in this report assisted by an appropriate specialist.
- » All alien plant re-growth must be monitored and, should these alien plants reoccur these plants should be re-eradicated. The scale of the development does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- » It is further recommended that a comprehensive rehabilitation plan be implemented from the project onset to ensure a net benefit to the environment within all areas that will remain undisturbed but were affected during the construction phase. This should from part of the suggested walk down as part of the final EMP preparation.

Residual Impacts:
Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Impact on Secondary alluvial water courses and minor drainage lines through physical disturbance*

The physical removal of narrow strips of woody riparian zones being replaced by hard engineered surfaces will alter the hydrological nature of the area, by increasing the surface run-off velocities, while reducing the potential for any run-off to infiltrate the soils. This impact would however be localised, as it is intended that the PV panels and mounting structures traverse the watercourses and will not be placed within the watercourse, i.e. span the watercourses which will reduce the proposed impacts.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Probable (3)
Significance	**Medium (45)**	**Low (27)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

The most significant form of mitigation would be to select a development area, which contained no drainage lines. The proposed layout has been developed to avoid the important systems, thus requiring only crossings or footprints within minor watercourse (dry drainage lines) which is considered to be an acceptable infringement and loss of the features or sections thereof.

An additional general mitigation measure is:

- » Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment. Suitable dust and erosion control mitigation measures should be included in the EMP to mitigate these impacts.

Residual Impacts:
Diversion of run-off away from downstream systems is unlikely to occur as the annual rainfall figures are low.

Nature: *Impact on riparian systems through the possible increase in surface water runoff on riparian form and function.*

An Increase in hard surface areas, and roads that require stormwater management will increase through the concentration of surface water flows that could result in localised changes to flows (volume) that would result in form and function changes within the riparian systems, which are currently ephemeral, i.e. riparian systems species composition changes, which then results in habitat change / loss.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (2)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes.	

Mitigation:

» Any stormwater within the development area must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments, and reduce flow velocities (e.g. water used when washing the panels). The project should also try to capture and recycle any form of run-off created by the daily operations. This would minimise the amount of water required by the project, but also serve to limit the downstream impacts on the riparian systems through an increase in run-off, a situation that these systems are currently unaccustomed too.

Residual Impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development area.

Nature: *Increase in sedimentation and erosion within the development footprint*

Increase in hard surface areas, and roads that require stormwater management will increase erosion potential through the concentration of surface water flows. These higher volume flows, with increased velocity result in downstream erosion and sedimentation.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Any stormwater within the development area must be handled in a suitable manner, i.e. separate clean and dirty water streams around the plant, and install stilling basins to capture large volumes of run-off, trap sediments and reduce flow velocities (e.g. water used when washing the PV Panels).

» Suitable stormwater management features with erosion control measures (gabions) should also be installed in areas where concentrated flows are anticipated.

Residual Impacts:

During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream.

Nature: *Impact on localised surface water quality*

During both preconstruction, construction and to a limited degree the operational activities, chemical pollutants (hydrocarbons from equipment and vehicles, cleaning fluids, cement powder, wet cement, shutter-oil, etc.) associated with site-clearing machinery and construction activities could be washed downslope via the ephemeral systems.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (2)	Low (1)
Probability	Definite (5)	Probable (3)
Significance	**Medium (35)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- Undertake strict use and management of all hazardous materials used on site.
- Undertake strict management of potential sources of pollution (e.g. litter, hydrocarbons from vehicles & machinery, cement during construction, etc
- Undertake containment of all contaminated water by means of careful run-off management on site.
- Appropriate ablution facilities should be provided for construction workers during construction and on-site staff during the operation of the facility.
- Strict control over the behaviour of construction workers.
- Appropriate waste management.
- Working protocols incorporating pollution control measures (including approved method statements by the contractor) should be clearly set out in the Construction Environmental Management Plan (CEMP) for the project and strictly enforced.

Residual Impacts:

Residual impacts will be negligible after appropriate mitigation.

7.5.3 Comparative Assessment of the Grid Connection Alternatives

As it is expected that all 3 alternatives would avoid the watercourses observed either via underground cabling to the authorised CSP site 1.4 or through spanning of the watercourses via an overhead power line, there is no preference regarding alternatives from an aquatic perspective. Therefore, the preferred technical alternative, Alternative 1, is supported.

7.5.4 Implications for project implementation

In summary, the aquatic impact assessment concluded that the proposed layout for the Upilanga PV1 facility would have no detrimental impact on the following:

- Any Very High sensitivity areas identified by the DEA Screening Tool
- Mainstem rivers and Pans that do contain functioning aquatic environments that received a Very High sensitivity rating as indicated in Figure 9.

Some impacts (panel areas & road crossings) are located in secondary alluvial water courses and minor drainage lines that were either fragmented or contained no riparian zones, with a Moderate sensitivity.

With the proposed mitigation (proper stormwater management and post construction rehabilitation), the impacts would be Low and acceptable for development, as these areas contained no aquatic habitat, and only functioned as a means to sustain / convey baseflows within the greater catchment. The proposed development would in essence not impact on this as surface runoff, although managed to prevent erosion, would still emanate from the site (when significant rainfall occurs), thus maintain this aspect of the hydrological system observed.

Therefore, based on the results of this report, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be LOW. This includes the internal roads proposed that would need to cross some of these systems. Thus, based on the findings of this study no objection to the authorisation of any of the proposed activities is made at this point based on the current layout as provided by the developer.

The following mitigation measures are required to be implemented:

- Vegetation clearing should occur in a phased manner in accordance with the construction programme to minimise erosion and/or run-off. Large tracts of bare soil will either cause dust pollution or quickly erode and then cause sedimentation in the lower portions of the catchment, and suitable dust and erosion control mitigation measures should be included in the EMP to mitigate.
- All construction materials including fuels and oil should be stored in demarcated areas that are contained within berms / bunds to avoid spread of any contamination / leaks outside of any delineated waterbodies and their buffers. Washing and cleaning of equipment should also be done in berms or bunds, to trap any cement / hazardous substances and prevent excessive soil erosion. Mechanical plant and bowsers must not be refuelled or serviced within or directly adjacent to any channel.
- It is also advised that an Environmental Officer (EO), with a good understanding of the local flora be appointed during the construction phase. The EO, in consultation with the ECO, should be able to make clear recommendations with regards to the re-vegetation of the newly completed / disturbed areas along aquatic features, using selected species detailed in the Aquatic Resources Impact Assessment Report (refer to **Appendix F**) assisted by a suitably qualified person, where possible.
- All alien plant re-growth must be monitored, and should these alien plants reoccur these plants should be re-eradicated. The scale of the operation does however not warrant the use of a Landscape Architect and / or Landscape Contractor.
- A comprehensive rehabilitation plan and the stormwater management plan (**Appendix G** of the EMPr) must be implemented from the project onset (i.e. pre-construction and construction phase) within watercourse areas (including of buffers) to ensure a net benefit to the aquatic environment. The comprehensive rehabilitation plan should form part of the suggested walk-down as part of the final EMPr preparation.
- Any activities within these areas, the buffers or 500m from the wetland boundary will require a Water Use license under Section 21 c and i of the National Water Act (Act 36 of 1998).

7.6. Assessment of Impacts on Soils, Land Types and Agriculture Potential

The majority of the extent of the development area is located within the Ag5 land type (shallow red soils) (**Figure 7.6**), many of which are shallow with only a limited portion of moderately deep to deep soil.

Very low rainfall in the area indicated that the only means of cultivation would be via irrigation and the remote sensing imagery of the area indicated no signs of any agricultural infrastructure and certainly none of irrigation. The climatic restrictions indicate that this part of the Northern Cape is suited at best for grazing and here the grazing capacity is very low, around 40-50 ha/large stock unit (ARC-ISCW, 2004). For the Upilanga PV1 site the dominant class of agricultural potential was determined to be low. The site falls within a portion of land type Ag5 (shallow red soils). The climatic restrictions mean that the potential impacts would be relatively low, from the viewpoint of soils or agricultural potential. Using the latest land cover data, no areas classed as degraded (such as erosion areas) were present in the vicinity.

The majority of the solar power applications in this area of the Northern Cape comprise some of the lowest agricultural potential that one will find anywhere in South Africa, with very hot, dry conditions and usually shallow soils with rock outcrops and sandy soils, often with dunes.

Due mainly to the prevailing unfavourable climatic conditions for arable agriculture, as well as the prevalence of soils with limited depth, it was not envisaged that any further detailed soil investigation will be required.

7.6.1 Description of Soil, Agriculture Potential and Land Type Impacts

Considering the characteristics of the development area proposed for Upilanga PV1 in terms of the soil, agricultural potential, and land type the following impacts are expected to occur (refer to **Appendix G** for more details).

Loss of potentially productive agricultural land

In areas of permanent changes, such as roads and the erection of infrastructure, rock spoil material discards from site and topsoil stockpiles, the current land capability and land use of the development area will be lost completely. The very low rainfall and hot conditions in the area, coupled with the sandy and/or rocky soils, mean that the prevailing agricultural potential is very low, hence any impacts on this will be minimal.

Soil erosion

Soil erosion is anticipated due to slope and vegetation clearance. Due to the predominance of very sandy soils, often with a fine grade of sand, the hazard of wind erosion when the topsoil is disturbed may be significant, as these areas are mapped as "highly susceptible" (ARC-ISCW, 2004).

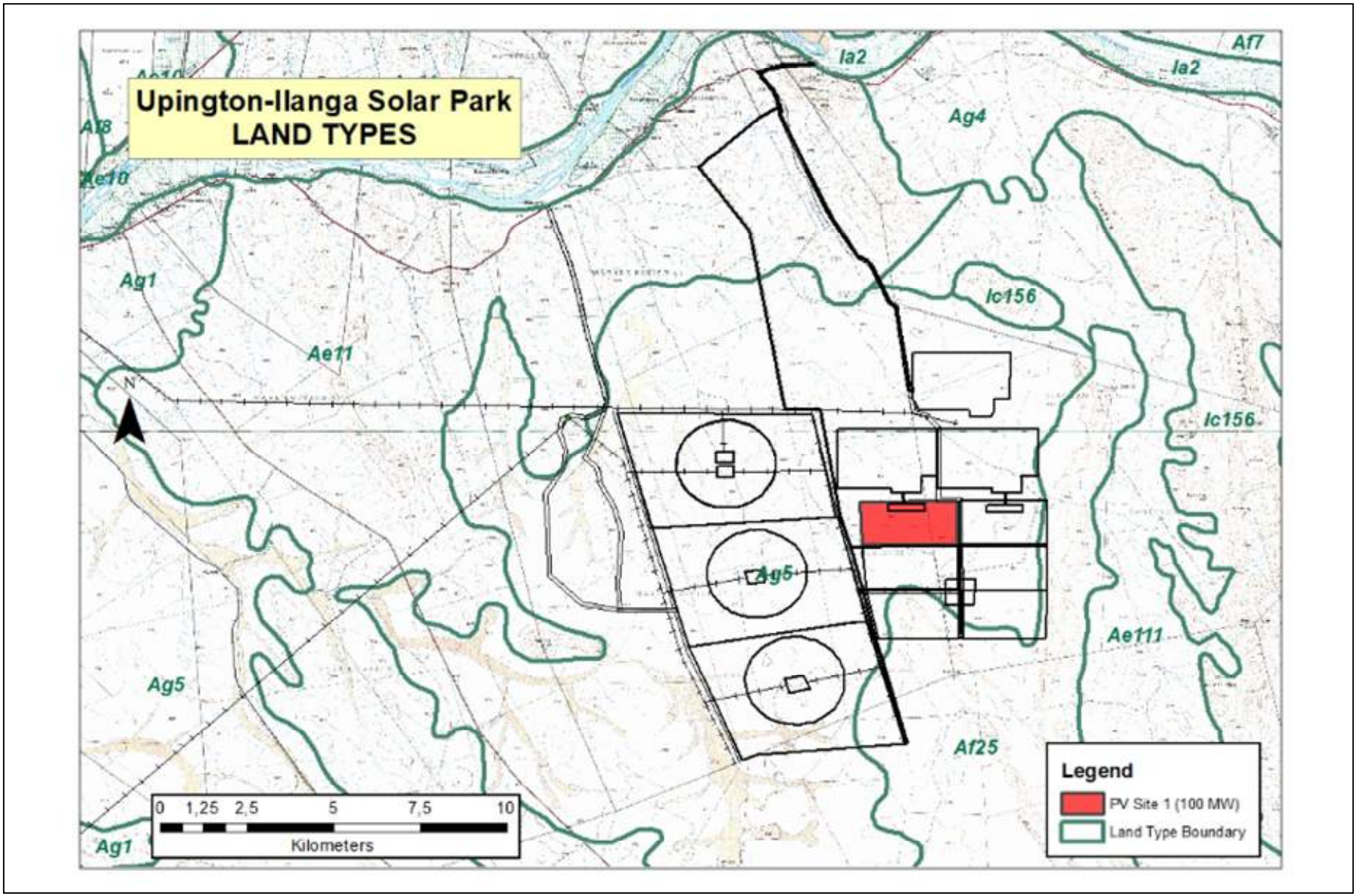


Figure 7.6: Map illustrating the land types of the development area of Upilanga PV1 site and the Upilanga Solar Park

7.6.2 Impact tables summarising the significance of impacts on soil, agriculture potential and land types during construction, operation and decommissioning

The impacts assessed below apply to the development area and grid connection alternatives assessed for Upilanga PV1.

The nature of the impacts on soils and agricultural resources anticipated for the decommissioning phase would be similar to those of the construction phase, therefore, the impacts associated within the development of Upilanga PV1 for this phase are no assessed separately in the tables below.

Construction and Operation Phase Impacts

Nature: *Loss of potentially productive agricultural land*		
	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Minimise the footprint of construction as much as possible		
Residual Impacts: The residual impact is likely to be low, since the implementation of the appropriate mitigation measures will enable more or less complete rehabilitation during and after the life of the project.		

Nature: *Increased soil erosion hazard by wind*		
	Without mitigation	**With mitigation**
Extent	Local to regional (3)	Local (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	**High (64)**	**Low (10)**
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Very possible	No
Can impacts be mitigated?	Yes	
Mitigation: » Minimise the footprint of construction as much as possible. » Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible. » Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure).;		
Residual Impacts: The residual impact if mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.		

7.6.3 Comparative Assessment of the Grid Connection Alternatives

All 3 alternatives assessed for the power line are expected to have similar impacts on soils and agricultural potential. There is therefore no preference regarding alternatives from a soils and agricultural potential perspective. The preferred technical alternative, Alternative 1, is supported.

7.6.4 Implications for Project Implementation

The significance of the negative impacts on soil, land types and agricultural potential expected with the development of Upilanga PV1 has been assessed as low with the implementation of the mitigation measures. From the outcomes of the soil, land type and agricultural potential impact assessment, it is concluded that the PV facility can be developed, and the impacts managed by taking the following into consideration:

- Care should be taken within all aspects of the construction phase to ensure that erosion is managed and mitigated appropriately. The project site is a dry area, with fragile vegetation and sandy topsoils and will be susceptible to uncontrolled topsoil removal by wind. The long-term effects of ignoring this aspect could be severe, both for the project and for the surrounding environment.
- The storage of all topsoil that is disturbed (maximum height 2 m; maximum length of time before re-use 18 months).
- Topsoil must be replaced immediately after the undertaking of construction activities within an area.
- Soil conservation measures must be put in place to ensure soil stabilisation.

7.7. Assessment of Impacts on Heritage (including archaeological and palaeontological resources)

Stone Age archaeological resources were identified within the development footprint. These are however not considered to be conservation-worthy as they are widely scattered and have no associated contextual material. The findings made during the field assessment were consistent with previous work undertaken in the area. Larger quantities of debitage were found where quarrying of quartz and quartzite had taken place, hornfels percentages climbed in areas closer to the Orange River to the north and east of the study site and almost all of the observations were of Middle Stone Age material. Later Stone Age remains were very sparse and limited across the study site. No engravings, formal or informal graves were identified within the development footprint and the only built structures included modern cattle farming kraals, jeep tracks and fences.

As per Almond's Desktop PIA for the proposed additional CSP sites within the Karoshoek Solar Valley (November 2015, SAHRIS ID 344305), which covers this area proposed for this development, the development area is underlain by PreCambrian basement rocks as well as late Caenozoic superficial sediments. The area is located within an area considered to be of moderate to low palaeontological sensitivity. The probability of significant impacts on palaeontological heritage is considered to be low because of (a) the generally very sparse occurrence of paleontologically valuable fossils (i.e. unusual fossils such as well-preserved vertebrate remains) within the superficial sediments, (b) the widespread occurrence of the most of the fossils concerned outside the study area (i.e. not unique).

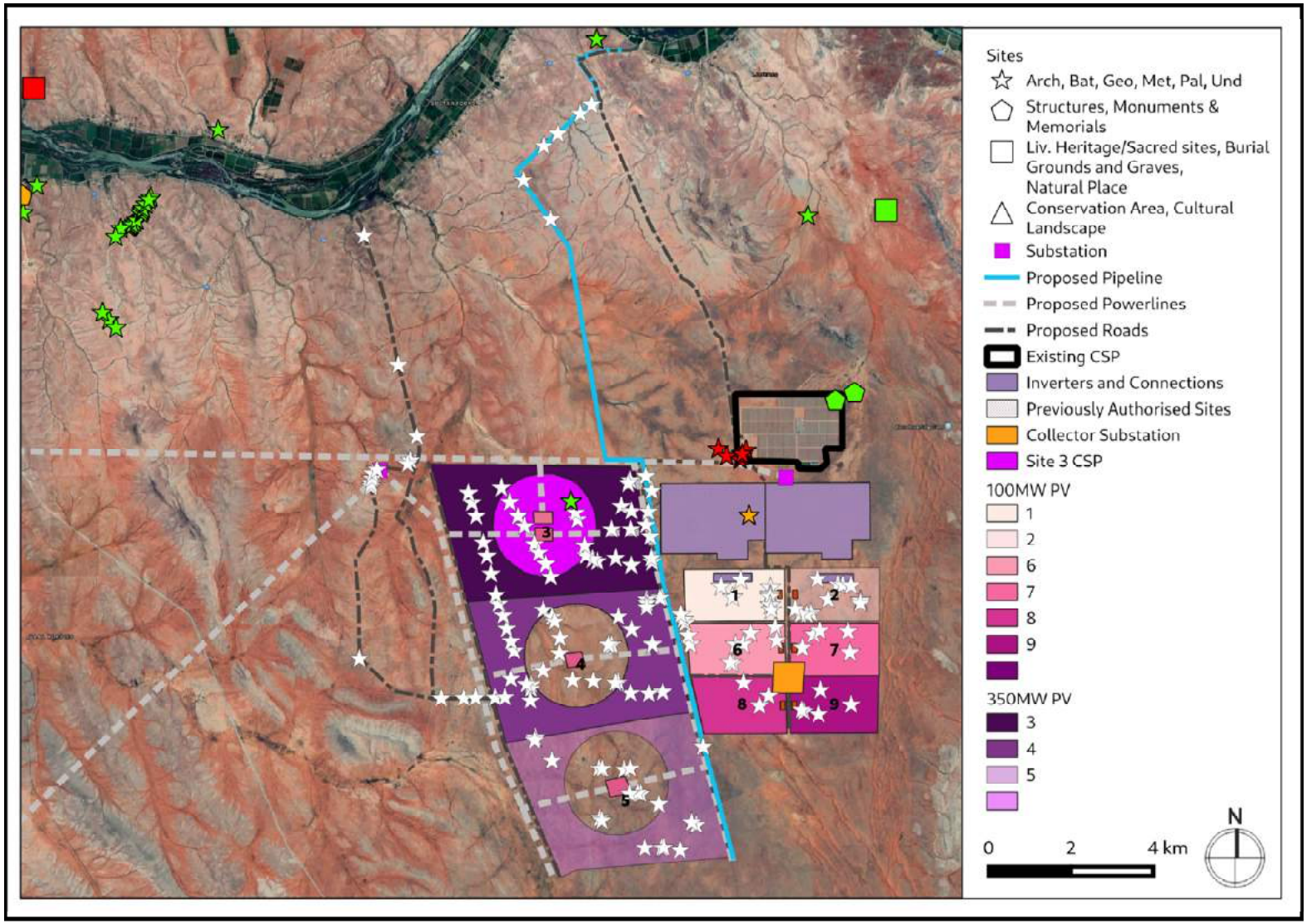


Figure 7.7: Map illustrating the heritage sites identified within the broader study area and development area of Upilanga PV1. All sites are graded as not being conservation worthy, as a result of their small sample size and lack of archaeological context which offers minimal scientific value.

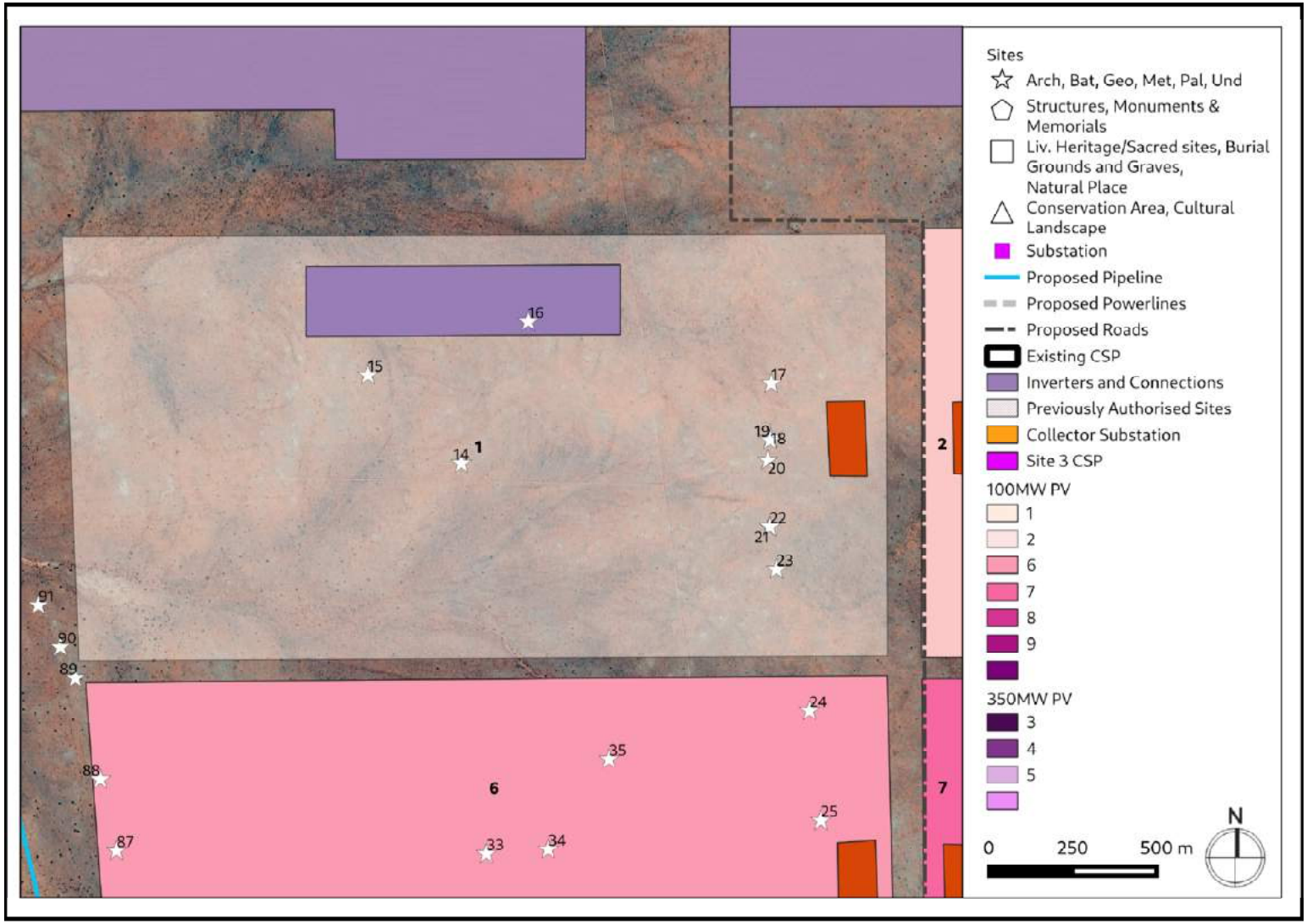


Figure 7.8: Map illustrating the heritage sites identified within the development area of Upilanga PV1. All sites are graded as not being conservation worthy, as a result of their small sample size and lack of archaeological context which offers minimal scientific value.

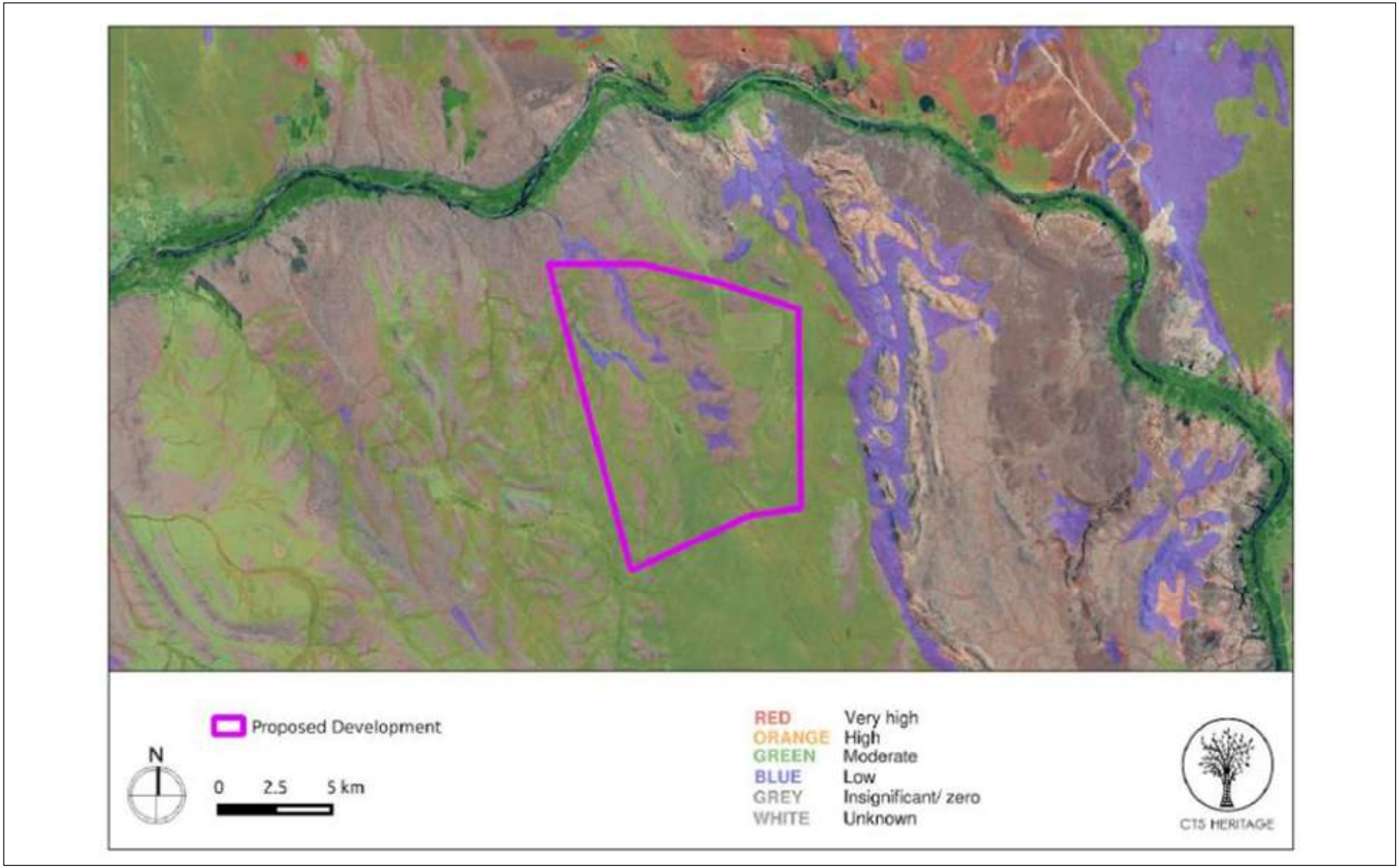


Figure 7.9: Map illustrating the location of the Upilanga Solar Park within an area of moderate paleo-sensitivity.

7.7.1 Description of Heritage Impacts (including archaeology and palaeontology)

The development of Upilanga PV1 will not have a negative impact on the heritage resources (including archaeological and palaeontological resources) found within the vicinity of the development area and study area. The identified lithic and historical material identified is of a low significance and although these resources may be destroyed during the construction phase, the impact will not be significant. In addition, it is also extremely unlikely that any fossils would be preserved within the area.

It must be noted that archaeological and palaeontological impacts are only expected to occur during the construction phase when groundworks are undertaken. No impacts are expected during the operation and decommissioning phases of Upilanga PV1.

7.7.2 Impact table summarising the significance of the impact on heritage and palaeontological resources during construction

The impacts assessed below apply to the development area assessed for Upilanga PV1 and associated grid connection.

Nature: *Impact to archaeological resources located within the development area.*

No heritage resources of significance were identified during the field assessments for archaeology and the desktop assessment for palaeontology within the development footprint.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (5)	Long-term (5)
Magnitude	Low (2)	Low (2)
Probability	Improbable (1)	Improbable (1)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts to heritage resources that do occur are irreversible.	Any impacts to heritage resources that do occur are irreversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	N/A	

Mitigation:

» During the construction phase all deeper (> 1 m) excavations into sedimentary bedrock should be monitored for fossil remains by the responsible Environmental Officer (ECO). Should substantial fossil remains such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible EO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist,.

Residual Impacts:

Should any significant resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources.

Nature: *Impact to palaeontological resources located within the development area.*

No palaeontological resources of a high significance were identified during the field-based survey of the development area of Upilanga.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (5)	Long-term (5)
Magnitude	Low (2)	Low (1)
Probability	Improbable (1)	Probable (3)
Significance	**Low (8)**	**Low (8)**
Status (positive or negative)	Negative	Negative
Reversibility	Any impacts to heritage resources that do occur are irreversible.	Any impacts to heritage resources that do occur are irreversible.
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » During the construction phase all deeper (> 1 m) excavations into sedimentary bedrock should be monitored for fossil remains by the responsible Environmental Officer (EO). Should substantial fossil remains such as vertebrate bones and teeth, petrified wood, plant-rich fossil lenses or dense fossil burrow assemblages be exposed during construction, the responsible EO should safeguard these, preferably in situ, and alert the South African Heritage Resources Authority (SAHRA) so that appropriate action can be taken by a professional palaeontologist.		
Residual Impacts: Should any significant resources be impacted (however unlikely) residual impacts may occur, including a negative impact due to the loss of potentially scientific cultural resources		

7.7.3 Comparative Assessment of the Grid Connection Alternatives

The specialist determined that based on the assessment completed, there is no additional impact to heritage resources associated with any of the proposed grid connection alternatives on condition that the recommendations within the HIA report are implemented. There is therefore no preference regarding alternatives from a heritage perspective. The preferred technical alternative, Alternative 1, is supported.

7.7.4 Implications on Project Implementation

The development of Upilanga PV1 will not have a negative impact on the heritage resources situated within the development area. The identified lithic and historic material is of a low significance. Although these resources may be destroyed during the construction phase, the impact is inconsequential. Based on the lack of any previously recorded fossils from the area, it is extremely unlikely that any fossils would be preserved in the Gordonia Formation. It is therefore concluded that the significance of the impacts with the implementation of the recommended mitigation measures is low, which is acceptable from a heritage and palaeontology perspective.

7.8. Assessment of Visual Impacts

The proposed 100MW PV Plant is expected to have a very contained core area of visual exposure, generally restricted to a 1 - 3km radius of the site. This is due to the generally constrained height of the PV Plant structures. The core area of visual exposure is entirely restricted to the properties earmarked for the Upilanga Solar Park and there are no potentially sensitive visual receptors located within a 1 - 3km radius of the proposed development.

Visibility within 3 - 6km is more scattered and interrupted due to the undulating nature of the topography. There are similarly no potentially sensitive visual receptors located within this zone.

Visibility beyond 6km is generally restricted to the elevated slopes of the hills (e.g. Karosberg and Langberg) facing the Upilanga Solar Park. At distances exceeding 6km the intensity of visual exposure is expected to be negligible and highly unlikely due to the distance between the object (development) and the observer. The 100MW PV Plant will therefore not likely be visible from any settlements of major roads within the region.

In general terms it is envisaged that the structures, where visible from shorter distances (e.g. less than 3km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a high visual impact.

Given the remote location of the proposed PV Plant, this scenario is highly unlikely as observers in this zone are expected to be associated with the Upilanga Solar Park, and therefore not sensitive to these developments and associated structures.

7.8.1 Description of the Visual Impacts

Visual impacts associated with the development of Upilanga PV1 include the following:

- Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV Plant Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the PV Plant structures
- Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility.
- Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures.
- The visual impact of solar glint and glare as a visual distraction and possible air travel hazard; and
- The potential impact on the sense of place of the region.

The combined results of visual exposure, viewer incidence/perception and visual distance of the proposed 100MW PV Plant are displayed on **Figure 7.10**. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a potentially negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential magnitude of the visual impact.

The index indicates that potentially sensitive visual receptors (if present) within a 1km radius of the 100MW PV Plant may experience a high visual impact. The magnitude of visual impact on sensitive visual receptors subsides with distance to:

- Moderate within a 1 – 3km radius
- Low within a 3 – 6km radius
- Very low beyond 6km.

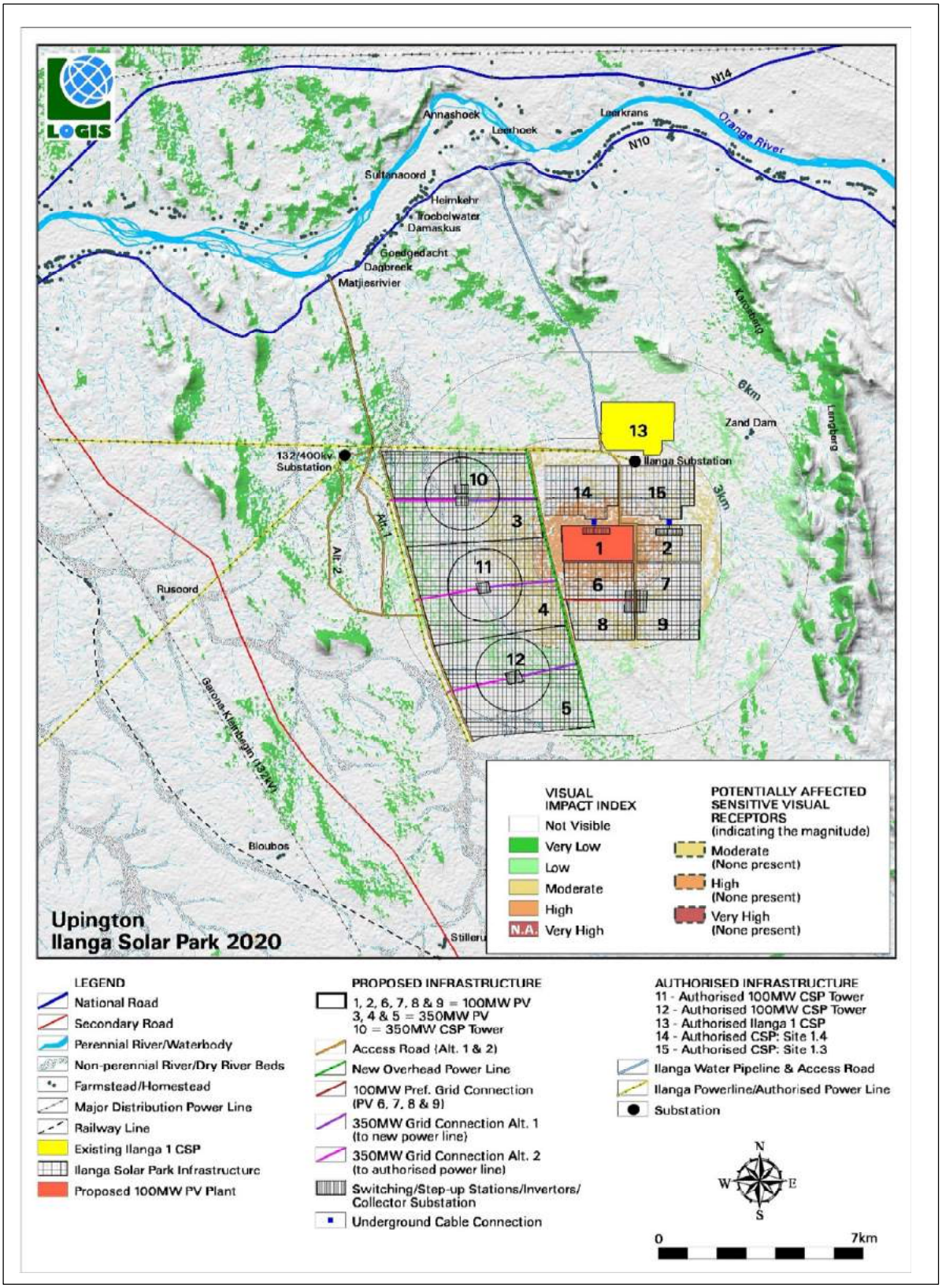


Figure 7.10: Map showing the Visual impact index and potentially affected sensitive visual receptors. The map illustrates the proposed infrastructure of the project in relation to potentially sensitive visual receptors.

There are no potentially affected visual receptors within a radius of 6km from the proposed PV Plant, implying that the overall magnitude of visual impact is expected to be low.

The closest residence to the plant is *Zand Dam* which is not expected to be visually exposed to the 100MW PV Plant. The residence is furthermore located on the farm earmarked for the PV Plant, assuming the owner's approval of the specific proposed plant, as well as their general consent for the Upilanga Solar Park as a whole.

7.8.2 Impact tables summarising the significance of the visual impacts during construction, operation and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Upilanga PV1 and associated grid connection. The nature of the impacts on soils and agricultural resources anticipated for the decommissioning phase would be similar to those of the construction phase, therefore, the impacts associated within the development of Upilanga PV1 for this phase are no assessed separately in the tables below.

Construction, Operation and Decommissioning Phases

Nature: *Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV Plant* During construction, there may be a noticeable increase in heavy vehicles utilising the roads to the development site that may cause, at the very least, a visual nuisance to other road users and landowners in the area.		
	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	Moderate **(40)**	Low **(24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes.	
Mitigation: Planning: » Retain and maintain natural vegetation immediately adjacent to the development footprint. Construction: » Ensure that vegetation is not unnecessarily removed during the construction phase. » Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. » Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. » Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). » Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. » Rehabilitate all disturbed areas immediately after the completion of construction works.		
Residual Risks:		

None, provided rehabilitation works are carried out as specified.

Nature: *Visual impact on observers travelling along the roads and residents at homesteads within a 3km radius of the PV Plant structures road*

The operational 100MW PV Plant is expected to have a limited impact on observers travelling along the major roads, residents of homesteads and visitors to the region within a 3km radius of the operational PV Plant structures. This is due to the general absence of potentially sensitive visual receptors brought about by the remote location of the plant.

	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate to Low **(30)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

- Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.
- Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns.

Operations:

- Maintain the general appearance of the facility as a whole.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use.
- Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual Risks:

The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the PV Plant structures*

The operational PV Plant could have a low visual impact on observers located between a 3 – 6km radius of the PV Plant structures, both before and after the implementation of mitigation measures.

	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, however best practice measures are recommended.	

Mitigation:

Planning:

» Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications
Residual Risks: The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.

Nature: *Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility.*

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions, and which are visible over long distances. It is possible that the PV Plant may contribute to the effect of sky glow within the environment which is currently undeveloped.

	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate to Low **(30)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

Planning & operation:

- » Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
- » Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights.
- » Make use of minimum lumen or wattage in fixtures.
- » Make use of down-lighters, or shielded fixtures.
- » Make use of Low-Pressure Sodium lighting or other types of low impact lighting.
- » Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

Residual Risks:

The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

Nature: *The visual impact of solar glint and glare as a visual distraction and possible air travel hazard*

Glint and glare occur when the sun reflects of surfaces with specular (mirror-like) properties. The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relative close proximity to the source (e.g. residents of neighbouring properties), or aviation safety risk for pilots (especially where the source interferes with the approach angle to the runway). The proposed PV Plant is not located near any airports or airfields and is very remote in terms of exposure to other potentially sensitive visual receptors. As such, the potential visual impact related to solar glint and glare is expected to be of low significance

	Without mitigation	***With mitigation***
Extent	Local **(2)**	N/A
Duration	Long term **(4)**	
Magnitude	Low **(4)**	

Probability	Improbable **(2)**	
Significance	Low **(20)**	
Status (positive or negative)	Negative	
Reversibility	Reversible **(1)**	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Not required	
Residual Risks: None		

Nature: *Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures.*

On-site ancillary infrastructure associated with the PV Plant includes smaller substations (inverters), invertor underground cable connection, up to 33kV cabling between the PV Arrays, meteorological measurement station, internal access roads, workshop, office buildings, etc.

No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the PV Arrays or be located underground. The anticipated visual impact resulting from this infrastructure is likely to be of low significance both before and after mitigation.

	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	***No, only best practise measures can be implemented***	

Mitigation:

Planning:

- *Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/power line servitude.*

Operations:

- *Maintain the general appearance of the infrastructure.*

Decommissioning:

- *Remove infrastructure not required for the post-decommissioning use.*
- *Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.*

Residual Risks:

No residual risk.

Nature: *The potential impact on the sense of place of the region.*

The anticipated visual impact of the proposed PV Plant on the regional visual quality, and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of low significance. This is due to the relatively low viewer incidence within close proximity to the proposed development site

	Without mitigation	***With mitigation***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**

Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(20)**	Low **(20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications		
Residual Risks: The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.		

7.8.3 Comparative Assessment of the Grid Connection Alternatives

All 3 alternatives assessed for the power line are expected to have similar impacts from a visual perspective. There is therefore no preference regarding alternatives from a soils and agricultural potential perspective. The preferred technical alternative, Alternative 1, is supported.

7.8.4 Implications for Project Implementation

The findings of the Visual Impact Assessment undertaken for the proposed 100MW PV Plant is that the visual environment surrounding the site, especially within a 3km radius, may be visually impacted during the anticipated operational lifespan of the facility (i.e. a minimum of 20 years). There are a very limited number of potentially sensitive visual receptors within a 6km radius of the Upilanga Solar Park, although the possibility does exist for visitors to the region to venture into closer proximity to the solar power generating structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

Overall, the significance of the visual impacts is expected to range from moderate to low as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. Potential mitigation factors for the 100MW PV Plant include the fact that the facility utilises a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers.

The following mitigation is possible from a visual perspective:

» Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.
» Make use of existing roads wherever possible and plan the layout and construction of roads and infrastructure with due cognisance of the topography to limit cut and fill requirements.

- Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised.
- Consult a lighting engineer in the design and planning of lighting to ensure the correct specification and placement of lighting and light fixtures for the PV Plant and the ancillary infrastructure. The following is recommended:
    - Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).
    - Limit mounting heights of fixtures or use foot-lights or bollard lights.
    - Make use of minimum lumen or wattage in fixtures.
    - Making use of down-lighters or shielded fixtures.
    - Make use of Low-Pressure Sodium lighting or other low impact lighting.
    - Make use of motion detectors on security lighting, so allowing the site to remain in darkness until lighting is required for security or maintenance purposes.
    - Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas.
- Ensure that vegetation is not unnecessarily cleared or removed during the construction phase.
- Reduce the construction phase through careful logistical planning and productive implementation of resources.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
- Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
- Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
- Rehabilitate all disturbed areas, construction areas, servitudes, etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
- Maintain the general appearance of the facility as a whole, including the PV panels, servitudes and the ancillary structures.
- Maintain roads and servitudes to forego erosion and to suppress dust.
- Monitor rehabilitated areas, and implement remedial action as and when required
- Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites.
- Remove infrastructure not required for the post-decommissioning use of the site.
- Rehabilitate access roads and servitudes not required for the post-decommissioning use of the site. If necessary, an ecologist should be consulted to give input into rehabilitation specifications.
- Monitor rehabilitated areas quarterly for at least a year following decommissioning and implement remedial action as and when required.

7.9. Assessment of Social Impacts

Impacts on the social environment are expected during both the construction and operation phases.

The construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures. A number of potential

positive and negative social impacts have been identified for the development. An assessment of the potential social impacts indicated that there are no perceived negative impacts that are sufficiently significant to allow them to be classified as "fatal flaws".

7.9.1 Description of the Social Impacts

The following positive and negative impacts have been identified and assessed for Upilanga PV1.

Positive and negative social impacts associated with the construction phase of Upilanga PV1:
- Direct and indirect employment opportunities
- Economic multiplier effects
- Influx of jobseekers and change in population
- Safety and security impacts
- Impacts on daily living and movement patterns
- Nuisance impacts, including noise and dust
- Visual impacts and sense of place impacts

Positive and negative social impacts associated with the operation phase of Upilanga PV1:

- Direct and indirect employment opportunities
- Development of non-polluting renewable energy infrastructure
- Contribution to Local Economic Development (LED)and social upliftment
- Visual impact and sense of place impacts
- Impacts associated with the loss of agricultural land

7.9.2 Impact tables summarising the significance of the social impacts during construction, operation and decommissioning (with and without mitigation)

The impacts assessed below apply to the development area assessed for Upilanga PV1 and associated grid infrastructure.

Construction Phase

Nature: *The creation of direct and indirect employment opportunities during the construction phase of the project.*
It is anticipated that the construction of Upilanga PV1 will result in the creation of approximately 400 employment opportunities at the peak of construction, comprising a mixture of skilled (15%), semi-skilled (25%), and low-skilled (60%) opportunities. Employment opportunities generated as a result of the project will be temporary in nature and will last for the duration of the construction period (i.e. 12- 18 months). The majority of the general labour force will, as far as possible, be sourced from the local labour pool, providing employment opportunities to residents surrounding the project (where the required skill sets are available). Where relevant skills are unavailable from the local labour pool, these would need to be sought elsewhere. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

A number of indirect employment opportunities will also be created. Indirect employment opportunities will predominantly be created in the service industry, through the opportunity for the provision of secondary services to the construction team. Services may include, but are not limited to, accommodation, catering, and laundry services.

Skills development will also be undertaken as part of the construction phase. The skills development will broaden the skills of employees associated with the project and enable possible future opportunities where these become available.

	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (36)**	**Medium (44)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	

Enhancement:

» A local employment policy must be adopted to maximise opportunities made available to the local labour force.
» Labour must be sourced from the local labour pool where possible. If the necessary skills are unavailable, labour should be sourced from (in order of preference) the greater Dawid Kruiper LM, ZF Mgcawu DM, Northern Cape Province, South Africa, or elsewhere. Where required, training and skills development programmes must be initiated prior to the commencement of the construction phase.
» Labour force suppliers must as far as possible be sourced locally.
» Where feasible local suppliers and contractors, that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria, must be used as far as possible to ensure that the benefits resulting from the project accrue as far as possible to the local communities which are also likely to be most significantly impacted / affected by the project.
» The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.
» Proof of skills development must be provided to the upskilled individual.

Residual impacts:

» Improved pool of skills and experience in the local area.
» Improved overall quality of life.
» Economic growth for small-scale entrepreneurs

Nature*: Significance of the impact from the economic multiplier effects from the use of local goods and services.*

There are likely to be opportunities for local businesses and service providers to provide services and materials for, and in doing so benefit from, the construction phase of the proposed project. Off-site accommodation in the nearest towns (Upington), and smaller settlements, may be required for contract workers and certain employees. The economic multiplier effects from the use of local goods and services will include, but is not limited to, construction materials and equipment, and workforce essentials such as catering, trade clothing, safety equipment, accommodation, transportation and other goods.

In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. The increase in demand for new materials and services in the nearby area may stimulate local business and local economic development. There is likely to be a direct increase in industry and indirect increase in secondary businesses where gaps in the market open up.

	Without enhancement	**With enhancement**
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Highly Probable (4)
Significance	**Low (21)**	**Medium (36)**

Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	

Enhancement:

» A local procurement policy must be adopted to maximise the benefit to the local economy and the existing local SMMEs.
» A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) must be created and companies listed thereon must be invited to bid for project-related work where applicable.
» Local procurement must be encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.

Residual impacts:

» Improved local service sector, growth in local business.

Nature: *In-migration of labourers in search of employment opportunities, and a resultant change in population, and increase in pressure on local resources and social networks, or existing services and infrastructure.*

An influx of people looking for employment or other economic opportunities could result in increased pressure being placed on economic and social infrastructure, and a change in the local population. Population change refers to the size, structure, density as well as demographic profile of the local community.

An influx of jobseekers into an area, could lead to a temporary increase in the level of crime, cause social disruption and put pressure on basic services. This includes municipal services such as sanitation, electricity, water, waste management, health facilities, transportation and the availability of housing. It could also potentially create conflict between locals and outsiders due to potential differences in racial, cultural and ethnic composition. A further negative impact that could result due to an influx of jobseekers into an area is an increase in unemployment levels due to an oversupply of available workforce, particularly with respect to semi- and unskilled workers.

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Low (18)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.
» Develop and implement a local procurement policy which prioritizes "locals first" to prevent the movement of people into the area in search of work.
» Engage with local community representatives prior to construction to facilitate the adoption of the local's first procurement policy.
» Provide transportation for workers (from towns such as Upington) to ensure workers can easily access their place of employment and do not need to move closer to the site.
» Compile and implement a grievance mechanism.

» Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour.
» Prevent the recruitment of workers at the site.
» Implement a method of communication whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
» Establish clear rules and regulations for access to the proposed site.
» Appoint a security company and implement appropriate security procedures to ensure that workers to not remain onsite after working hours.
» Inform local community organisations and policing forums of construction activities and times and the duration of the construction phase.

Residual impacts:

» Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure, resources and services.

***Nature**: Temporary increase in safety and security concerns associated with the influx of people during the construction phase.*

The commencement of construction activities can be associated with an increase in crime within an area. The perceived loss of security during the construction phase of a project due to an influx of workers and / or outsiders to the area (as in-migration of newcomers, construction workers or jobseekers are usually associated with an increase in crime), may have indirect effects such as increased safety and security concerns for neighbouring properties, damage to property, increased risk of veld fire, stock theft, poaching, crime and so forth.

The labour force will not permanently reside within the area, or have any reason to be on-site after hours

	Without mitigation	**With mitigation**
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (36)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Working hours must be kept within daylight hours during the construction phase.
» Employees must be easily identifiable and must adhere to the security rules of the site.
» Provide transportation for workers (from towns such as Upington and the smaller surrounding settlements) to ensure workers do not need to move closer to the site.
» The perimeter of the construction site must be appropriately secured to prevent any unauthorised access to the site. The fencing of the site must be maintained throughout the construction and operation phases.
» The appointed EPC contractor must appoint a security company and implement appropriate security procedures and measures.
» Access in and out of the construction site must be strictly controlled by a security company appointed for the project.
» A Community Liaison Officer (CLO) must be appointed to implement a grievance mechanism. A communication protocol must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
» A stakeholder management plan must be implemented by the EPC contractor to address neighbouring farmer concerns regarding safety and security.

Residual impacts:

» Residual impacts related to losses through crime and lasting damage to properties.

***Nature**: Temporary increase in traffic disruptions and movement patterns during the construction phase.*

Project components and equipment will be transported to site using road transport. The N10 and N14 national roads provides the primary access to the project area, while the development area itself can be accessed via gravel roads. Local farmers utilise the gravel access roads to access their farms and the surrounding areas.

Increased traffic due to construction vehicles could cause disruptions to the local community and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. This impact will be magnified since farm roads of a gravel nature are not necessarily designed to carry heavy traffic and are prone to erosion. Noise, vibrations, dust and visual pollution from heavy vehicle traffic during the construction phase could also negatively impact local residents and road users.

Where specific land use activities are being undertaken on affected and adjacent properties, these may be impacted. This could impact tenants making use of portions of the affected properties for agricultural activities (i.e. grazing), as well as affected and surrounding landowners which use their properties for game farming, hunting and other leisure activities.

	Without mitigation	**With mitigation**
Extent	Local-Regional (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	**Medium (33)**	**Low (24)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Working hours must preferably be restricted to daylight hours during the construction phase. Where deviation of the working hours is required it must be approved by the relevant authorities and surrounding landowners must be notified.
» All vehicles must be road worthy and drivers must be licensed, obey traffic rules, follow speed limits and made aware of the potential road safety issues.
» Construction vehicles should be inspected regularly by the EPC contractor to ensure their road worthiness.
» Adequate and strategically placed traffic warning signs and control measures must be implemented along the N10 and gravel farm access roads to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be visible at all times, and especially at night. Signage must be maintained throughout the construction phase.
» Implement penalties for reckless driving as a way to enforce compliance to traffic rules.
» Avoid heavy vehicle activity through residential areas during "peak" hours (when children are taken to school, people driving to work, etc.).
» The developer and EPC contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed or damaged due to construction activities.
» The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged (i.e. wear and tear) due to construction activities.
» A protocol communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
» Communication channels between the affected and surrounding landowners and the EPC contractor must be established.

» Undertake information sessions with the surrounding communities prior to construction in order to ensure that communities are fully informed of the project to be developed in its final form. This must be undertaken through the appointment of a Community Liaison Officer (CLO).

Residual impacts:

» None anticipated.

***Nature**: Nuisance impacts in terms of temporary increase in noise and dust.*

Nuisance impacts associated with construction related activities include noise, dust, and possible disruption to adjacent properties and the land use activities being undertaken on the adjacent properties at the time of construction.

Site clearing activities increase the risk of dust and noise being generated, which can in turn negatively impact on adjacent properties, especially where noise sensitive land use activities are being undertaken. The movement of heavy construction vehicles and construction activities and equipment also have the potential to create noise in the development area, as well as along the N10 and N14 national roads, and gravel access roads. The primary sources of noise during construction would be from construction equipment, vehicle and truck traffic. Noise levels can be audible over a large distance although are generally short in duration.

Dust would be generated from construction activities as well as trucks / vehicles driving on gravel access roads. This impact will negatively impact sensitive receptors within the vicinity of the construction activities. The impact of noise and dust on sensitive receptors can be reduced through the application of appropriate mitigation measures.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	**Medium (44)**	**Low (21)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» The movement of heavy vehicles associated with the construction phase through populated areas must be timed to avoid weekends, public holidays and holiday periods, where feasible.
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers
» A speed limit of 40km/hr must be implemented on gravel roads. Should the speed limit be exceeded appropriate action must be taken against the offender of the rules.
» Ensure all vehicles are road worthy, drivers are licensed and are made aware of the potential noise and dust issues.
» A CLO must be appointed. A method of communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.

Residual impacts:

» Residual damage from construction activities.

***Nature**: Intrusion impacts from construction activities will have an impact on the areas "sense of place".*

Intrusion impacts such as aesthetic pollution (i.e. building materials, construction vehicles, etc.), noise and light pollution will impact the "sense of place" for the local community and the surrounding landowners, specifically where land use activities sensitive to visual impacts and impacts on the "sense of place" are undertaken.

Construction related activities have the potential to negatively impact a local area's "sense of place". Such an impact is likely to be present during the construction phase. It is however expected that the project will mostly affect areas and receptors that have already been exposed to other existing energy generation infrastructure (i.e. Ilanga CSP 1) and other industrial infrastructure (i.e. for which the sense of place has already been altered).

Given the location of Upilanga PV1 on a private property, within an area characterised as having a low population density, and given the project's location within close proximity to the operational Ilanga CSP 1 Facility the visual impact and impact on the area's sense of place, from a social perspective, associated with the construction of the proposed project is anticipated to be of a low significance.

The identification of the significance of the impact on sense of place for the construction phase was undertaken through the consideration of the Visual Impact Assessment (LOGIS, 2020) undertaken for the project. The Visual Impact Assessment states that the environment has a rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development represents existing visual disturbance. The impact on the sense of place is expected to be of a low significance from a visual perspective due to the relatively low viewer incidence in close proximity to the project.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (10)**	**Low (6)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Limit noise generating activities to daylight working hours and avoid weekends and public holidays.
» The movement of heavy vehicles associated with the construction phase must be timed to avoid weekends, public holidays and holiday periods where feasible.
» Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
» All vehicles must be road-worthy, and drivers must be licensed and made aware of the potential road safe-ty issues and need for strict speed limits.
» Communication, complaints and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the study area.
» Ensure proper management and tidiness of the construction site.
» Implement the relevant mitigation measures as recommended in the Visual Impact Assessment.

Residual impacts:

» None anticipated.

Operation Phase

Nature: *The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy.*

During the operation phase, it is expected that approximately 15-20 full-time employment opportunities will be available, depending on the operational requirements of the facility. These employment opportunities will include low-skilled (70%), semi-skilled (25%) and skilled (5%) opportunities. The employment opportunities generated as a result of the project will be long term and will last for the duration of operation (i.e. approximately 20 years). None of the employees appointed during the operation phase will be housed on-site. In addition to the direct employment opportunities it is anticipated that additional indirect employment opportunities will be generated during the operation of the project.

	Without enhancement	**With enhancement**
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Minor (1)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Low (24)**	**Low (28)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	

Enhancement:

» A local employment policy must be adopted to maximise the opportunities made available to the local community.
» The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.
» Vocational training programs must be established to promote the development of skills of the employees.
» Proof of skills development must be provided to the upskilled individual.

Residual impacts:

» Improved pool of skills and experience in the local area.

Nature: *Development of non-polluting, renewable energy infrastructure.*

South Africa currently relies predominantly on coal-generated electricity and as a result, the country's carbon emissions are considerably higher than those of most developing countries. The use of solar technology for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions during its operation. The generation of renewable energy (RE) utilising solar power will contribute positively to South Africa's electricity market. Given South Africa's reliance on Eskom as a power utility, the benefits associated with provision of electricity by an IPP are regarded as an important contribution, and the advancement of RE has been identified as a priority for South Africa.

Increasing the contribution of the RE sector to the local economy would contribute to the diversification of the local economy and provide greater economic stability. The growth in the RE sector as a whole could introduce new skills and development into the area. This is especially true with regards to solar power specifically considering the number of other solar power projects proposed and operational within the broader area.

The development of RE projects have the potential to contribute to the stability of the economy and could contribute to the local economy through employment generation (direct, indirect, and local service providers) and revenue generation for the LM. While the overall contribution of the project to South Africa's total energy requirements is small the facility will also contribute towards offsetting the total carbon emissions associated with energy generation in South Africa. It should however be noted that such a benefit is associated with all RE projects and not only solar power projects in particular.

	Without enhancement	**With enhancement**
Extent	Local- Regional- National (4)	N/A

Duration	Long term (4)	N/A
Magnitude	Low (4)	N/A
Probability	Highly probable (4)	N/A
Significance	**Medium (48)**	N/A
Status (positive or negative)	Positive	N/A
Reversibility	Yes	
Irreplaceable loss of resources?	Yes (impact of climate change)	
Can impacts be mitigated?	No	
Mitigation/Enhancement:		
» None required.		
Residual impacts:		
» Reduced carbon emissions through the use of renewable energy and contribute to reducing global warming.		

Nature: *Contribution to LED and social upliftment during the operation of the project*

Projects which forms part of the DoE's REIPPP Programme are required as part of their bidding requirements to contribute towards LED and social upliftment initiatives within the area in which they are proposed. In addition, they are required to spend a percentage of their revenue on socio-economic and enterprise development, as well as allocate ownership shares to local communities that benefit previously disadvantaged communities around the project. A portion of the dividends generated by each development also need to be invested into LED projects and programmes. Upilanga PV1 therefore has the potential to contribute positively towards socio-economic development and improvements within the local area.

Socio-economic spin-offs from the project could contribute towards upliftment of the surrounding communities. An in-depth Community Needs Assessment (CNA) is required to ensure that the beneficiary community's needs are understood and sufficiently addressed by the proposed development programmes in order to contribute meaningfully towards local economic growth and development.

	Without enhancement	**With enhancement**
Extent	Local-Regional (3)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	**Medium (44)**	**Medium (52)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	

Enhancement:

» A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful.
» Ongoing communication and reporting is required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused.
» The programmes must be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time).

Residual impacts:

» Social upliftment of the local communities through the development and operation of the project.

Nature: *Visual impacts and sense of place impacts associated with the operation phase of Upilanga PV1.*

An area's sense of place is created through the interaction of various characteristics of the environment, including atmosphere, visual resources, aesthetics, climate, lifestyle, culture, and heritage. An area's sense of place is however subjective and largely dependent on the demographics of the population residing within the area and their perceptions regarding trade-offs. For example, while some individuals may prefer not to see any form of infrastructure development, others may be interested in large-scale infrastructure, or engineering projects, and operation of the facility, and consider the impact to be less significant. Such a scenario may especially be true given that the project comprises a renewable energy project and could therefore be seen as benefitting the local environment, when compared to non-renewable energy generation projects.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The social impacts associated with the impact on sense of place relate to the change in the landscape character and visual impact of Upilanga PV1. Given the location of Upilanga PV1 on a private property, within an area characterised as having a low population density, and given the project's location within close proximity to the operational Ilanga CSP 1 facility the visual impact and impact on the area's sense of place associated with the operation of Upilanga PV1 is anticipated to be of a low significance from a social perspective. The alteration of the sense of place in view of the local residents and road users will start during the construction phase and remain for the project's operational lifetime.

The identification of the significance of the impact on sense of place was undertaken through the consideration of the Visual Impact Assessment (LOGIS, 2020) undertaken for the project. The Visual Impact Assessment identified that the impact on sense of place will be of a low significance with or without the implementation of the recommended mitigation measures.

	Without mitigation	**With mitigation**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (18)**	**Low (14)**
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Maintain and manage the facility to be in a good and neat condition to ensure that no degradation of the area and site takes place and impacts the visual quality of the area.
» Implement the relevant mitigation measures as recommended in the Visual Impact Assessment for the change in character and sense of place of the landscape setting.

Residual impacts:

» The visual impact of Upilanga PV1 will remain until the infrastructure is completely decommissioned and removed. Thereafter the impact will be removed.

***Nature**: Loss of agricultural land and overall productivity as a result of the operation of the proposed project on an agricultural property.*

The development area of Upilanga PV1 comprises red, sandy soils, many of which are shallow with only a limited portion of moderately deep to deep soils. In addition, the very low rainfall in the area means that cultivation can only be undertaken by irrigation.

The climatic restrictions experienced in the area means that the site is best suited for grazing, however the grazing capacity is very low, around 40-50ha/large stock unit.

From an agricultural potential perspective, the area proposed for the development of the project within the development area has low agricultural potential.

Considering the agricultural potential of the site, the significance of the impact on the loss of agricultural land will be low from a social perspective.

The Soils and Agricultural Potential Impact Assessment (ARC, 2020) was considered for the identification of the significance relating to the impact on loss of agricultural land.

	Without mitigation	**With mitigation**
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	**Low (21)**	**Low (15)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

» Keep the project footprint as small as possible.
» Implement mitigation measures recommended by the soils specialist.

Residual impacts:

» None expected to occur

Decommissioning Phase Impacts

Typically, major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income and will be similar to the impacts during the construction phase. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of Upilanga PV1 it is anticipated that the proposed facility will be refurbished and upgraded to prolong its lifespan, where possible, and decommissioning will only take place once the economic viability of the project has come to an end.

7.9.3 Comparative Assessment of the Grid Connection Alternatives

From the three grid connection alternatives proposed by the proponent, the impact on the social environment associated with the development of each of the alternatives is considered to be similar. Based on this, all three alternatives are considered to be acceptable from a social perspective. It is therefore recommended that the technically preferred alternative, Alternative 1, be nominated as the preferred alternative from a social perspective.

7.9.4 Implication for Project Implementation

The social impacts identified will be either of a low, medium or high significance. No negative impacts with a high significance rating have been identified to be associated with the development of Upilanga PV1, only positive social impacts are considered to be of a high significance. All negative social impacts are within acceptable limits with no impacts considered as unacceptable from a social perspective. The

recommendations proposed for the project are considered to be appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts.

Based on the findings of the social impact assessment, the following recommendations are made:

- A Community Liaison Officer (CLO) must be appointed to assist with the management of social impacts and to deal with community issues, if feasible.
- Develop and implement a recruitment protocol in consultation with the municipality and local community leader. Ensure that the procedures for applications for employment are clearly communicated.
- It is recommended that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction phase where possible.
- Local procurement of services and equipment is required where possible in order to enhance the multiplier effect.
- Involve the community in the project process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- Employ mitigation measures to minimise the dust and noise pollution and damage to existing roads.
- Safety and security risks should be taken into account during the planning / construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

All other recommended mitigation measures provided in this SIA Report must also be adhered to.

The proposed project and associated infrastructure will create a number of potential socio-economic opportunities and benefits and is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. The project is also considered to be acceptable from a social perspective considering the location of the site within the Upington REDZ. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that the project can be authorised from a social perspective.

7.9.5 Implications for Project Implementation Related to the Storage and Handling of Dangerous Goods

During the construction and operation phase, the Upilanga PV1 facility will require the storage of materials which may be considered to be dangerous goods.

"Dangerous goods" is defined under the Listing Notices that deal with the storage, or storage and handling, of dangerous goods. "Dangerous goods" are defined in the Listing Notices as:

"Goods containing any of the substances as contemplated in South African National Standard No. 10234, supplement 2008 1.00: designated "List of classification and labelling of chemicals in accordance with the Globally Harmonized Systems (GHS)" published by Standards South Africa, and where the presence of such goods, regardless of quantity, in a blend or mixture, causes such blend or mixture to have one or more of the characteristics listed in the Hazard Statements in section 4.2.3, namely physical hazards, health hazards or environmental hazards".

The above definition makes specific reference to SANS 10234. South Africa has implemented the Globally Harmonized System of Classification and Labelling of Chemicals by issuing this national standard.

7.9.6 Assessment of Impacts Related to the Storage and Handling of Dangerous Goods

The operation of the PV facility requires the storage of fuels and other chemicals for everyday operation and maintenance. The facilities or infrastructure for storage and handling of a dangerous good will be located in containers with a combined capacity of 30 but not exceeding 80m³ (cubic metres). These chemicals will be stored on-site in appropriate storage vessels within bunded areas/ on impervious surfaces. A designated storage and dangerous good handling area is considered as part of the facility design. The storage and handling of dangerous goods has the potential to result in soil and/or water contamination should any spillages/leakages occur. This is considered to be the most significant risk, other than a direct risk to personnel on site, which is an occupational health and safety issue and is considered in line with the OH&S Act. While not all materials to be stored on site are considered to be hazardous (or have a hazard rating), materials such as fuel and oils are flammable and also have the potential to cause fires, explosions, damage to infrastructure, as well as injuries of staff.

The proposed project will require the construction of facilities or infrastructures for the storage of the following dangerous goods. The construction phase will require the handling and storage of materials including hydraulic oil, fuel and cement with an estimated volume of up to 50 m^3 at any one time. The operation phase will require the handling and storage of lube oil and diesel with an estimated volume of 30m^3.

The combined volumes of dangerous good stored or handled on the site at any one time are:

» Construction phase: approximately 50 m^3
» Operations phase: approximately 30 m^3

7.9.7 Impact tables summarising the significance of the Storage and Handling of Dangerous Goods

Nature: Soil and water contamination due to the handling and storage of dangerous goods during the construction and operational phases.		
Listed Activities: GNR 546, 18 June 2010 Listed Activity 10 (a)(ii)(ee)		
	Without mitigation	**With mitigation**
Extent	Local (5)	Local (5)
Duration	Short (2)	Short (1)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	**Medium (45)**	**Low (20)**
Status (positive or negative)	Negative	Negative
Reversibility	Irreversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation:: » Any spillages of dangerous substances must be contained as soon as possible, and remedial and clean-up actions initiated immediately. » Regular inspections of the permanent bunded areas for storage of dangerous goods must be undertaken throughout the life cycle of the project.		

» Appropriate spill kits must be available on site. » Maintenance vehicles must have access to spill kits. » An emergency spill response plan must be developed for implementation during the construction and the operational phase. Personnel should be suitably trained to attend to any spills which may occur. » A fire management plan must be developed for implementation during the construction and the operational phase. Personnel must be suitably trained to manage any fires which may occur on site. » Flammable substances must be stored in enclosed containers away from heat, sparks, open flames, or oxidizing materials. » Develop a monitoring and leak detection procedure for monitoring of the chemical spillages.
Cumulative impacts: The development of the wind farm and its proximity to other facilities in the region will increase the cumulative environmental risk of contamination due to the storage and handling of chemicals and flammable substances.
Residual Impacts: If spillages occur and are not cleaned up, contamination can result in impacts which remain after decommissioning of the project

7.10. Assessment of the 'Do Nothing' Alternative

The do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Upilanga PV1. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a solar PV facility.

a) Land use and agriculture

There are no high potential soils present within the development area and the soils are of low to moderate potential at best due as these are shallow with only a limited portion of moderately deep to deep soils which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the development area, can be identified.

Considering the state of the agricultural potential and the land capability of the study area and development area, the undertaking of productive agricultural activities will not be possible and will be highly restricted if attempted. The property is currently being used for grazing, which is limited due to the current drought in the area. The development of Upilanga PV1 provides an opportunity to undertake an efficient and productive land use activity on a property which is currently restricted in use. Furthermore, the properties, Portion 3 of Matjesrivier 43 and Lot 944 on which the Upilanga PV1 is located has been previously authorised for the development of the CSP site 1.4, with other operational and authorised solar facilities in the near vicinity. Therefore, the proposed use of the property for the development of a solar PV facility is not in conflict to other land uses in the area.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current land use (i.e. grazing), losing out on the opportunity to generate renewable energy from solar energy in addition to current land use activities. Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use for the broader study area which allows the current land-use activities to continue.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

- The benefits would be that there is no disruption from an influx of jobseekers into the Upington area, nuisance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- There agricultural potential of the study area is low, with no irrigation infrastructure present; therefore, the no-go option would be a lost opportunity for area to be used for an appropriate land use as a result of the solar resource availability over the area. Should the no-go option be considered, the low agricultural potential of the area will remain due to no irrigation infrastructure being present to warrant for the undertaking of commercial farming practices and the area having a low land capability.
- The main and current land use of the study area is renewable energy generation (due to the operations of Ilanga CSP1) and the undertaking of grazing activities to a limited extent, which is not considered to be an effective land use and offers limited benefit and income to the landowners. The 'do nothing' alternative would result in a lost opportunity for the landowner (in terms of implementing a compatible alternative land use option, while still retaining the current land use, as well as a loss in long-term revenue).
- Negative impacts would be associated with an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

The project has the potential to make a positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPP Programme, the project will commit benefits to the local community, in the form of job creation, localisation, and community ownership. In accordance with the DoE bidding requirements of the REIPPP Programme, a percentage of the revenue generated per annum during operation will be made available to local communities through a social beneficiation scheme. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for local communities is significant. Secondary social benefits can be expected in terms of additional spend in nearby towns due to the increased demand for goods and services. These socio-economic benefits would include an increase in the standard of living for local residents within the area as well as overall financial and economic upliftment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the towns of Upington, Keimoes and Kakamas, as well as the smaller settlements located within the surrounding areas of the development area. The local services sector and specifically the trade, transportation, catering and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during

the construction phase. New business sales that will be stimulated as a result of the establishment of the solar PV facility, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore, from a business perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of new business opportunities.

Employment: Upilanga PV1 is likely to create approximately ~300 (at its peak) employment opportunities (temporary) for a period of ~12 to 18 months, depending on the final design, during the construction phase. Of this approximately 70% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 5% of employment opportunities will be for skilled individuals (engineers, project managers, site managers etc.). The development of Upilanga PV1 within the Dawid Kruiper Local Municipality, will aid in a reduction of the unemployment rate, however if the facility is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of Upilanga PV1 will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various PV facilities are proposed to be developed in the area, which is demarcated as a REDZ, and in the Northern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where PV facilities have been constructed and operated within the Province and the rest of the country. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The implementation of Upilanga PV1 would contribute towards addressing the Local Municipality's key issue regarding high levels of poverty and unemployment, skills shortage, and inequalities, through the creation of employment opportunities, the provision of skills training opportunities, and local economic growth, including growth in personal income levels of those community members who would be employed on the project.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised should the no-go option be considered and implemented. The Northern Cape has an ample solar resource. Although Upilanga PV1 is only proposed to contribute a contracted capacity of up to 100MW, this would assist in meeting the electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

» **Increased energy security:** Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply

quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines) were running at >30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was such that some customers' energy supply would have had to be curtailed ('unserved') had it not been for the renewables. The avoidance of unserved energy cumulated into the effect that for 15 days, from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding prevented due to the contribution of renewable wind and PV projects.

» **Resource saving (i.e. fossil fuels and water):** It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free while compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January – June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2015 (6 months)	2014 (12 months)
R3.60 billion saving in diesel and coal fuel costs	R3.64 billion saving in diesel and coal fuel costs
200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy	120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy
Generated R4.0 billion more financial benefits than cost	Generated R0.8 billion more financial benefits than cost

» **Exploitation of South Africa's significant renewable energy resource:** At present, valuable renewable resources including biomass by-products, solar radiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

» **Economics:** As a result of the excellent renewable energy resources and competitive procurement processes, both wind power and solar PV power have now been proven as cheaper forms of energy generation in South Africa than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy. The IRP 2019 gazetted by the Minister of Mineral Resources and Energy in October 2019, updating the energy forecast for South Africa from the current period until the year 2030. The IRP 2019 has made an allocation of 6000MW in addition to the already installed/committed capacity of 2 288MW from solar PV facilities which will be developed from 2022 – 2030.

» **Pollution reduction:** The release of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar radiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

- **Climate friendly development:** The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of GHG emissions. South Africa is estimated to currently be responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. Since its inception, the REIPPP Programme has achieved carbon emission reductions[14] of 25.3 million tonnes of CO_2 (IPP Office, March 2018). The development of Upilanga PV1, and the associated electricity generated as a result of the facility, will result in considerable savings on tons of CO_2 emissions.

- **Support for international agreements:** The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under the Kyoto Protocol, and for cementing its status as a leading player within the international community.

- **Employment creation:** The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. By the end of March 2018, the REIPPP Programme had created 35 702 job years (equivalent of a full-time employment opportunity for one person for one year) for South African citizens including people from communities local to IPP operations (IPP Office, March 2018).

- **Acceptability to society:** Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

- ***Protecting the natural foundations of life for future generations:*** Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential largely untapped to date.

The Integrated Resource Plan (IRP) 2019 developed by the Department of Energy indicates that South Africa continues to pursue a diversified energy mix that reduces reliance on a single or a few primary energy sources. Renewable energy, including Solar PV, wind and CSP with storage present an opportunity to diversify the energy mix, to produce grid connected or distributed off-grid electricity. In order to achieve this diversified mix and harness the benefits of renewable energy, the IRP 2019 includes an allocation of 6000MW of new capacity to large scale PV, and a further 6000MW allocated to embedded generation.

d) Conclusion

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the Department of Energy. However, as the surrounding area experiences ample solar resource, not developing Upilanga PV1

[14] Carbon emission reduction is calculated based on a displacement of power, from largely coal-based to more environmentally friendly electrical energy generation, using a gross Eskom equivalent emissions factor of 1.015 tons CO_2/MWh.

would see such an opportunity being lost. As current land use activities can continue on the study area once the project is operational, the loss of the land to this project during the operation phase (equivalent to 0,25% of the larger study area) is not considered significant. In addition, the Northern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with Upilanga PV1. All impacts associated with the project can be mitigated to acceptable levels. If the solar PV facility is not developed the following positive impacts will not be realised:

- Job creation and skills development from the construction and operation phases.
- Economic benefit to participating landowners due to the revenue that will be gained from leasing the land to the developer.
- Meeting of the energy generation mix in a most economic and rapid manner.
- Provision of clean, renewable energy in an area where the energy resource is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is, therefore, not preferred and not proposed to be implemented for the development of Upilanga PV1

CHAPTER 8: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 7, a solar PV facility may have impacts (positive and negative) on natural resources, the social environment and on the people living in the area surrounding the project. The preceding impact assessment chapter has reported on the assessment of the impacts associated with Upilanga PV1 largely in isolation (from other similar developments).

As previously stated in this report, the Upilanga PV1 study area and development area is located within the Upington REDZ (REDZ 7). The REDZ areas are zones identified by the DEA as geographical areas of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy developments where a concentration of such development has been undertaken and is expected to be further developed and grow. Prominent renewable energy features and infrastructure has been introduced in the broader area around the Upilanga PV1 site. Therefore, the development of Upilanga PV1 will not introduce renewable energy to an untouched, undeveloped landscape but rather expand such features and developments within the landscape and add to the concentration of such developments within the REDZ.

The DMRE, under the REIPPP Programme, released a request for proposals (RFP) in 2011 to contribute towards Government's renewable energy target and to stimulate the industry in South Africa. The REIPPP Programme has been rolled out in bid windows (rounds) since 2011, in which developers submit planned renewable energy projects for evaluation and selection. The bid selection process considers a number of qualification and evaluation criteria. The proposed tariff and socio-economic development contributions by the project bidder are the main basis for selection after the qualification criteria have been met.

As a result of the REIPPP Programme and the promulgation of the REDZ zones, there has been a substantial increase in interest in solar PV facility developments in South Africa (largely in the Northern Cape Province), with 23 PV facilities currently operational (Energyblog[15], 2020). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts[16] is considered and avoided where possible.

This chapter assesses the potential for the impacts associated with Upilanga PV1 to become more significant when considered in combination with the other known or proposed solar facility projects within the area. The projects within the area under consideration in this cumulative assessment include both PV and CSP (Concentrated Solar Power) due to the existing and proposed PV and CSP facilities located in the area.

CSP makes use of a different solar power technology (which contains a different suite of infrastructure required to be constructed and operated), but is considered as part of the cumulative impact assessment as there exists an overlap between the cumulative impacts expected with the development of both PV and CSP projects in the surrounding areas of the Upilanga PV1 study area.

[15] https://www.energy.org.za/data-and-tools/project-database?art_title=&programme=&project_type=Solar+Photovoltaic+%28PV%29&province=Northern+Cape&status=Fully+operational&cck=project&scale=Large+Scale+Utility&country=South+Africa&search=project_search&task=search

[16] Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R326) as the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the Basic Assessment Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of Upilanga PV1 are included and assessed within this chapter.

8.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the solar PV facility and its associated infrastructure in proximity to other similar developments in this area south-east of Upington and include impacts such as those listed below:

- Unacceptable loss of habitat or landscape connectivity through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning.
- Unacceptable risk to avifauna through loss of avifaunal habitats, and impacts to nesting areas.
- Unacceptable risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- Unacceptable loss of agricultural potential areas presenting a risk to current land use activities and increased soil erosion.
- Unacceptable loss of heritage resources (including palaeontological and archaeological resources).
- Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion.
- Unacceptable impact to social factors and components.

The role of the cumulative assessment is to determine and confirm if such impacts are relevant to Upilanga PV1 within the study area being considered for the development.

It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required in order to ensure that the concentration of renewable energy developments, specifically solar PV and CSP facilities does not lead to detrimental environmental impacts. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by solar PV facility developments throughout South Africa, while the significance of the cumulative impact on visual amenity and loss of land within a concentrated area may only be influenced by solar PV facility developments that are in closer proximity to each other. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

Figure 8.1 indicates the location of Upilanga PV1 in relation to all other known and viable (i.e. projects with a valid Environmental Authorisation) solar PV and CSP facilities located within a radius of 50km from the development area under assessment. These projects were identified using the DEA Renewable Energy Database and current knowledge of projects being proposed and developed in the area. In the case of Upilanga PV1, there are several solar PV facilities located within a 30km radius of the development area

(refer to **Figure 8.1** and **Table 8.1**), all at various stages of approval[17]. Further to the CSP facilities located within the area, existing and proposed CSP facilities are also located within the surrounding areas of the development area.

The potential for cumulative impacts is summarised in the sections that follow and has been considered within the specialist studies (refer to **Appendices D – J**).

Table 8.1: Solar facilities (including PV and CSP) located within the surrounding area (within a 50km radius) of the Upilanga PV1 development area

Project Name	DEA Ref. No	Location	Project Status
Ilanga CSP1 (1 x 100MW Parabolic Trough)	12/12/20/2056	Lot 944 Karos Settlement	Operational
Karoshoek Solar Valley Development	14/12/16/3/3/2/289 14/12/16/3/3/2/290 14/12/16/3/3/2/291 14/12/16/3/3/2/292 14/12/16/3/3/2/293 14/12/16/3/3/2/294 14/12/16/3/3/2/295 14/12/16/3/3/2/296 14/12/16/3/3/2/297 14/12/16/3/3/2/298 14/12/16/3/3/2/299	Matjesriver RE and 2/41, Matjesriver 3/41, Karos 956 and Lot 944 Karos Settlement	Approved
Upington Airport PV Solar Energy Facility	12/12/20/2146	Upington International Airport	Operational
Kheis Solar Phase 3 phases	14/12/16/3/3/2/569 14/12/16/3/3/2/570 14/12/16/3/3/2/571	Portion 7 and Portion 9 of the Farm Namakwari 656	Approved
Tewa Isitha Solar (2 x 100MW PV)	14/12/16/3/3/2/639 14/12/16/3/3/2/639/1	Remaining Extent of the farm Albany 405	Approved
Khunab Solar Development (4x 75MW PV), comprising: Klip Punt PV2 McTaggarts PV2 McTaggarts PV2 McTaggarts PV3	14/12/16/3/3/1/2110 14/12/16/3/3/1/2111 14/12/16/3/3/1/2112 14/12/16/3/3/1/2113	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452	Approved
Sirius Solar PV Project One (1 x 75MW PV)	14/12/16/3/3/2/469	Remaining Extent of the Farm Tungsten Lodge No. 638	Operational
Sirius Solar PV Project Two (1 x 75MW PV)	14/12/16/3/3/2/470	Remaining Extent of the Farm Tungsten Lodge No. 638	Approved

[17] Applications for Environmental authorisation for numerous CSP facilities have been undertaken within the area, however some of these applications have lapsed and are no longer considered to be valid and are therefore not considered as part of the cumulative impact assessment.

Project Name	DEA Ref. No	Location	Project Status
Sirius Solar PV Project Three (1 x 100MW PV)	14/12/16/3/3/1/2704	Remaining Extent of the Farm Tungsten Lodge No. 638	Approved
Sirius Solar PV Project Four (1 x 100MW PV)	14/12/16/3/3/1/2705	Remaining Extent of the Farm Tungsten Lodge No. 638 and Remaining Extent of the Farm Olyvenhouts Drift Agriculture Holdings 1080	Approved
Khi Solar One (1 x 50MW CSP)	12/12/20/1831	Portion 03 of the Farm McTaggarts Camp No. 435	Operational
Dyasons Klip 1 and Dyasons Klip 2 (2 x 75MW)	14/12/16/3/3/2/538/1 14/12/16/3/3/2/538/2	Remainder of the Farm Dyason's Klip No. 454	Operational
Bloemsmond Solar 1 and Bloemsmond Solar 2 (2 x 75MW PV)	14/12/16/3/3/2/815 14/12/16/3/3/2/816	Portions 5 and 14 of the Farm Bloemsmond No. 455	Approved
Bloemsmond 3, 4 & 5 (3x100MW PV)	14/12/16/3/2/2/2042 14/12/16/3/2/2/2044 14/12/16/3/2/2/2043	Portions 5 and 14 of the Farm Bloemsmond No. 455	Approved
Rooipunt (1 x 150MW CSP)	14/12/16/3/3/1/427	Farm McTaggarts Camp No. 435	Approved
Solis Power I (1 x 150MW CSP) and Solis Power II (1 x 125MW CSP)	14/12/20/16/3/3/3/82 14/12/16/3/3/2/621	Portion 443 to 450 of the Farm Van Rooys Vlei	Approved
Upington Airport Solar PV (1 x 8.9MW PV)	12/12/20/2146	Erf 6013 Upington	Operational
Allepad PV (4 x 100MW)	14/12/16/3/3/2/1105 14/12/16/3/3/2/1106 14/12/16/3/3/2/1107 14/12/16/3/3/2/1108	Erf 5315 and Erf 01 Upington	Approved
Ngwedi PV (1x 100MW PV)	TBC	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452	In Process
Naledi PV (1x 100MW PV)	TBC	Portion 3 of the Farm McTaggarts Camp 453 and Portion 12, Portion of Portion 3 of the Farm Klip Punt 452	In Process
Upilanga PV2	TBC	Lot 944	In Process

It should be noted that not all the solar facilities (PV and CSP) presently under consideration by various solar energy developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DEA, DMRE, NERSA and Eskom) due to any of the following reasons:

- There may be limitations to the capacity of the existing or future Eskom grid.
- Not all applications will receive a positive environmental authorisation.

- There are stringent requirements to be met by applicants in terms of the REIPPP Programme and a highly bidding competitive process that only selects the most competitive projects.
- Not all proposed solar facilities will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed).
- Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom.
- Not all developers will be successful in securing financial support to advance their projects further.

As there is, therefore, a level of uncertainty as to whether all the above-mentioned solar facilities will be implemented, this results in it being difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known CSP facilities in the surrounding area and Upilanga PV1 are therefore qualitatively assessed in this Chapter. The following potential impacts are considered (refer to Appendix D-J for more details):

- Cumulative impacts on ecological processes (including fauna and flora)
- Cumulative impacts on avifauna
- Cumulative impacts on aquatic resources
- Cumulative impacts on soil, land types and agricultural potential
- Cumulative impacts on heritage resources (including archaeology and palaeontology)
- Cumulative visual impacts
- Cumulative social impacts

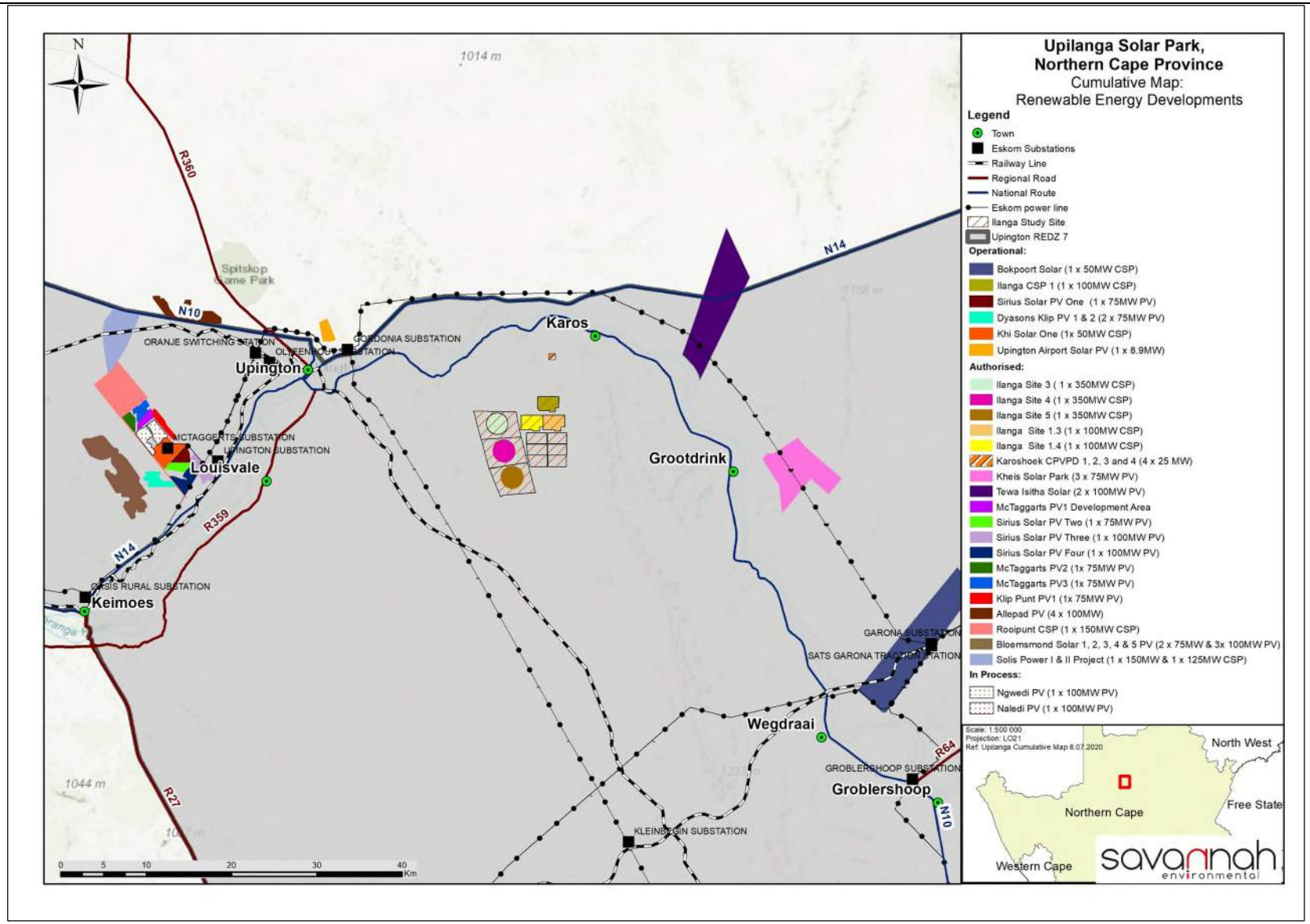


Figure 8.1: Identified solar facility projects (including PV and CSP) located within a 50km radius of the Upilanga PV1 development area that are considered as part of the cumulative impact assessment

8.3 Cumulative Impacts on Ecological Processes

Potential cumulative impacts on ecology include:

- The development of Upilanga PV will potentially contribute to cumulative habitat loss and other cumulative impacts in the wider Upington area.
- Development of Ilanga PV may impact on broad-scale ecological processes such as the ability of fauna to disperse.
- Erosion and alien plant invasion would contribute to degradation in the area, but as this can be well-mitigated, the contribution can be minimised.

The following are the cumulative impacts assessed as being a likely consequence of the development of the Upilanga PV facility. This is assessed in context of the extent of the proposed development area, other developments in the area, as well as general habitat loss and transformation resulting from agriculture and other activities in the area.

Cumulative impacts within the broader study area are of potential concern due to the proliferation of solar energy development in the wider Upington area. As there are no features contributing significantly to maintaining ecological connectivity within the development footprint, the contribution of the proposed development to cumulative impacts on habitat loss and fragmentation in the area would be moderate and acceptable. In terms of habitat loss, the affected vegetation and habitat types are widespread in the area and have not experienced significant levels of transformation to date. As a result, the loss of approximately up to 330ha of currently intact habitat likely to result from the development is not considered highly significant. Cumulative impacts associated with the development are therefore considered acceptable.

Nature: The development of Upilanga PV will potentially contribute to cumulative habitat loss and other cumulative impacts in the wider Upington area.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Medium (6)
Probability	Improbable (2)	Probable (3)
Significance	Low (18)	Medium (36)
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated	To some degree, but the majority of the impact results from the presence of the facility which cannot be mitigated.	
Mitigation: » Ensure that sensitive habitats such as drainage features, pans and quartz patches are not within the development footprint. » Ensure that the fencing around each facility is friendly with fauna and avifauna. This includes not having any electrified strands within 30cm of the ground as well as implementing a design that prevents fauna and avifauna from becoming trapped between the inner and out layer of the fence as this has been demonstrated to be a common impact associated with existing PV plants. » Ensure that an alien management plan and erosion management plan compiled for each project are effectively implemented at the site.		

Nature: Development of Upilanga PV may impact on broad-scale ecological processes such as the ability of fauna to disperse.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Medium (5)
Probability	Probable (3)	Probable (3)
Significance	**Low (24)**	**Medium (33)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	No	No
Can impacts be mitigated?	Only partly as a significant proportion of the impact results from the presence and operation of the facility which cannot be well mitigated.	
Mitigation	» Ensure that faunal movement corridors such as drainage lines are not developed, but if these are fenced into the facility that the fence should be adequately permeable to fauna so as to reduce impacts on faunal habitat loss and movement. » Ensure that the mitigation hierarchy is applied with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and minimising degradation around the site. » An open space management plan should be developed for the development area, which should include management of biodiversity within the affected areas, as well as that in the adjacent veld.	
Cumulative Impacts	The development would potentially contribute to habitat degradation and the loss of landscape connectivity and ecosystem function within the area, but this is likely to be relatively low as most species are likely to be able to avoid the facility as there are still relatively large intact corridors present in the area.	
Residual Risks	The presence of the facility will represent an obstacle for some fauna which would contribute to fragmentation in the area.	

The density of renewable energy development in the Upington area is very high, with numerous built, approved and in-process solar energy developments in the area. There are two main foci of development, the Upilanga Solar Park projects being considered here and then the projects west of Upington along the R27. These projects contribute to cumulative impacts on habitat loss and fragmentation in the area and since each project on its own generally has low residual impacts, it is the density of development in the area that is amounting to moderate overall cumulative impacts on fauna and flora.

The major impact associated with the development of renewable energy facilities in the Upington area is likely to be the disruption of landscape connectivity, especially for fauna as the facilities are either fenced with mesh fencing or electrified fencing which makes it difficult for fauna to traverse these areas. Personal observations from the area suggest that seasonal movement to and from the Orange River is important for many fauna and the major ephemeral drainage lines leading to the River are likely to be of particular significance in this regard as they provide cover for shy types of fauna which usually avoid open ground.

Given the high development pressure in the Upington area, the area would benefit from a fine-scale conservation plan, which would enhance development planning in the area. The current approach is ad-hoc with developers burdened with the responsibility of identifying offset areas where required. However, this is not likely to result in long-term sustainable development or an optimal outcome in terms of biodiversity maintenance. As such, any offsets or formal conservation areas resulting from renewable energy

development in the area should form part of a broader plan to enhance biodiversity outcomes in the area. Currently, there is no such plan available, the Upilanga Solar Park site could form the initial basis from which such a plan can be developed.

In terms of the requirements for an offset study, it is required to evaluate the adequacy of measures considered and adopted to avoid, minimize and rehabilitate potentially significant negative impacts on biodiversity. Any development must ensure that there are no residual impacts of high significance that could lead to irreplaceable loss of biodiversity and/ or priority ecosystem services. In other words, an offset does not negate the need to reduce on-site impacts to an acceptable level.

A summary of the pre- and post-mitigation impacts associated with the proposed Upilanga development is provided below. This is considered to represent the cumulative impact associated with all the proposed projects on the site and are not related to a specific project per se, but rather the overall impact associated with the whole development. This is considered appropriate because it is the cumulative and not the individual impact of any one project that warrants the need for an offset.

Pre- and post-mitigation impacts associated with the proposed Upilanga projects.

Phase/Impact	**Before Mitigation**	**After Mitigation**
Construction Phase		
Impact on plant SCC	Moderate	Moderate
Impact on Terrestrial Fauna	Moderate	Low
Impact on Avifauna	Moderate	Moderate
Operational Phase		
Increased Habitat Degradation due to alien invasion and alien plants	Moderate	Low
Increased Alien Plant Invasion	Moderate	Low
Terrestrial Faunal Impact	Moderate	Low
Avifaunal Impact	Moderate	Low
Decommissioning Phase		
Increased Habitat Degradation due to alien invasion and alien plants	Moderate	Low
Terrestrial Faunal Impact due to decommissioning	Moderate	Low
Avifaunal impact due to decommissioning	Moderate	Low
Cumulative Impacts		
Impact on Broad-Scale Ecological Processes	Moderate	Moderate
Ability to Meet Conservation Targets	Moderate	Low

Although there is not a single impact that clearly demands that the study should require an offset, the combination of several moderate residual impacts requires that exceptional mitigation is implemented at the site, which could include an offset. A protected tree offset strategy report has been developed to inform the potential need for an offset for the loss of protected trees within the current as well as other Upilanga PV footprint areas (refer to Appendix D1).

8.4 Cumulative Impacts on Avifauna

Potential cumulative impacts on avifauna include:

- The loss of unprotected vegetation types on a cumulative basis from the surrounding environment may impact avifauna, as habitat loss is a major contributor to declines in avifauna (BirdLife International, 2018). The aggregation of numerous SEFs in a region has the potential to compound environmental impacts, and because this impact has been mostly understudied, it should be considered during the early stages of land use planning (Moore-O'Leary et al., 2017).
- •Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. This is particularly a concern with regards to species and ecosystems with limited geographical distributions (Rudman et al., 2017).

The following are the cumulative impacts that are assessed as being a likely consequence of the development of the Upilanga PV facility. These are assessed in context of the extent of the current site, other developments in the area as well as general habitat loss and transformation resulting from other activities in the area.

Cumulative impacts associated with the development area may be of concern due to increasing number of solar facility developments proposed for the broader Upington area. Considering that the vegetation and avifauna that occur on the broader study area are rather typical of the bioregion, the overall cumulative avifaunal impact of the development is considered likely to be low. However, in the broader area, corridors of intact habitat, especially the gravel plains and drainage lines should be maintained in a natural state to ensure that ecological connectivity between areas of higher conservation value for certain species such as Karoo Korhaan are maintained.

Nature: Impact on avifaunal habitats, migration routes and nesting areas due to cumulative loss and fragmentation of habitat.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low to Moderate (5)
Probability	Improbable (2)	Probable (3)
Significance	**Low (18)**	**Medium (33)**
Status	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources	Low	Low
Can impacts be mitigated	Impacts can be mitigated to some degree, but the majority of the long-term impact results from the presence of the facility and other developments in the area which cannot be well mitigated.	

Mitigation:

» Minimise the development footprint as far as possible, as well as disturbance of the topsoil. A cover of indigenous grasses should be encouraged and maintained within the facility area. This prevents the invasion of weeds and is the easiest to manage in the long-term. Furthermore, the developer could consider the option of allowing livestock (sheep) grazing for maintaining a low height of the grass, which is being successfully used at existing PV facilities. This will assist in maintaining natural vegetative cover which may support avifaunal population, as opposed to complete clearing of all vegetation which is undesirable.
» Ensure that suitable ecological corridors within the surrounding area are identified and maintained, whereby ecological connectivity between areas of higher conservation value are preserved.
» The facility should be fenced off in a manner which allows small fauna to pass through the facility, but that does not result in terrestrial avifauna (e.g. bustards, korhaan, thick-knees, coursers) being trapped and electrocuted along the boundary fences (Venter, 2016). In practical terms, this means that the facility should be fenced-off to include only the developed areas and should include as little undeveloped ground or natural veld as possible. Single-fence designs (with the electrical fencing attached to the inside) as opposed to double-fence designs are preferred so as to avoid terrestrial birds becoming entrapped in the space between the two fences. In addition, there should be no electrified ground-strands present within 30cm of the ground, while the electrified strands should also be located on the inside of the fence and not the outside. Images of suitable fencing types from existing PV facilities are available on request.

8.5 Cumulative Impacts on Aquatic Resources

Potential cumulative impacts on aquatic resources include:

» An increase in surface run-off velocities and the reduction in the potential for groundwater infiltration is likely to occur, considering that the development area is near the main drainage channels, however the annual rainfall figures are low.
» Downstream alteration of hydrological regimes due to the increased run-off from the area.
» Downstream erosion and sedimentation of the downstream systems and farming operations. During flood events, the unstable banks (eroded areas) and sediment bars (sedimentation downstream) already deposited downstream could be washed into the Orange River, although currently there are no direct connections with the Orange River, extreme high flows do enter the river from the development area.

The aquatic specialist has (through his involvement in water use license processes for numerous projects in the Upington area, including the Upington REDZ) developed an understanding of the mitigation implemented or proposed to be implemented by other projects within the area. Mitigation has included the selection of the best possible sites to minimise the local and regional impacts or improving the drainage or hydrological conditions within the affected aquatic systems. The improving of affected systems is viewed as a net benefit. However, the worst-case scenario has been assessed in the cumulative impact table below, i.e. assuming that only minimum mitigation is implemented by the other projects, and that flows within these systems are sporadic.

The cumulative impact considering the other solar facilities within the surrounding area of the development area will be of a medium significance.

Nature: *Potential cumulative impacts to the aquatic resources* Cumulative impacts to aquatic resources that could occur with the development of Upilanga PV1 includes an increase in surface run-off velocities and the reduction in the potential for groundwater infiltration, downstream alteration of hydrological regimes and downstream erosion and sedimentation.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (1)	Low (2)
Probability	Probable (3)	Definite (5)
Significance	**Low (18)**	**Medium (35)**
Status (positive or negative)	Negative	Negative
Reversibility	Medium	Medium
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: » Improve the current stormwater and energy dissipation features not currently found along the tracks and roads within the region. » Install properly sized culverts with erosion protection measures at the present (i.e. existing) road / track crossings.		

8.6 Cumulative Impacts Soil, Land Types and Agricultural Potential

The overall cumulative impacts of the proposed facility on agriculture and soil conditions will be low, principally because of the local climatic conditions and the low agricultural and grazing potential of the site. There have never been any substantial farming practices (agriculture or grazing) on the property because of the dominant climatic conditions and prevailing soil conditions.

Cumulative impacts are related to an increase in the loss of agricultural land used for livestock farming (i.e. grazing) within the Upington REDZ zone, in addition to the other areas where solar facilities have been and are proposed to be constructed. These impacts can be reduced by keeping the development footprints minimised where possible and strictly implementing soil management measures pertaining to erosion control and management and monitoring of any possible soil pollution sources such as vehicles traversing over the sites.

The main potential cumulative impact would be soil removal due to wind erosion caused by developments off site. When considering the other renewable energy developments within the surrounding area, it is assumed that the impact of erosion and appropriate mitigation measures at a site-specific level for each of the facilities has been considered and the mitigation measures recommended are sufficient for the management and mitigation of erosion. Therefore, considering that the impact of erosion at each facility will be low in extent, subject to the implementation of the recommended mitigation measures, and managed for each facility separately, the cumulative impact for erosion is considered to be low. Under these circumstances, the loss associated with erosion is therefore considered to be acceptable loss, without detrimental consequences.

The significance of the cumulative soil impacts will be low.

Nature: *Cumulative impact of the Proposed Development in terms of wind erosion* The main potential cumulative impact would be soil removal due to wind erosion caused by developments off site. Due to the nature of the soil removal process, once topsoil is taken up into the atmosphere, wind action can deposit

it over a large area and at a considerable distance, depending on the strength and duration of the wind acting upon the soils.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	**Low (10)**	**Low (12)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Yes
Mitigation: » Minimise the footprint of construction for each facility as much as possible. » Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible. » Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure). » Ensure that equal responsibility and co-operation is accepted if more than one facility will be using the same access road, or if the possibility exists of sediment transfer (by wind or water) from one site to another		
Residual Risk: Significant risk of accelerated soil erosion by wind if mitigation measures of each facility are not applied correctly.		

8.7 Cumulative Impacts on Heritage (including archaeology and palaeontology)

Impacts to heritage result from all kinds of development and as such, this assessment of cumulative impacts to heritage was not limited to impact from renewable energy facilities alone. Of the 49 Heritage Assessments conducted within 25km of the proposed development area (refer to Appendix 2 of the Heritage Screening Assessment), 25 are for Renewable Energy Facilities and 6 are for associated infrastructure such as electricity lines, pipelines and roads. The remaining assessments relate to mining infrastructure and residential township developments. At this stage, there is the potential for the cumulative impact of proposed solar energy facilities to negatively impact the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial, however, due to the remoteness of the area the impact on the experience of the cultural landscape is not foreseen to be significant. In addition, it is preferable to have renewable energy facility development focussed in an area such as a REDZ.

The cumulative heritage impacts will be low due to the remote character of the landscape within which Upilanga PV1 is proposed to be developed.

Nature: *Cumulative Impact to the sense of place* There is the potential for the cumulative impact of proposed solar energy facilities to negatively impact the cultural landscape due to a change in the landscape character from natural wilderness to semi-industrial, however, due to the remoteness of the area the impact on the experience of the cultural landscape is not foreseen to be significant.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (1)	Local (1)
Duration	Medium-term (3)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Improbable (2)	Probable (3)

Significance	**Low (16)**	**Low (27)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	Low
Irreplaceable loss of resources?	Unlikely	Unlikely
Can impacts be mitigated?	No, no significant impacts are anticipated, therefore no mitigation is required.	
Mitigation: No mitigation is required.		

It must be noted that even if no mitigation is recommended by the specialist, the requirements of the National Heritage Resources Act (Act No. 25 of 1999) would still be relevant to each of the projects proposed to be developed within the area. Should any sites of significance be discovered to be associated with any of the proposed projects, these finds would need to be dealt with accordingly.

8.8 Cumulative Visual Impacts

The Upilanga Solar Park may ultimately comprise of 15 solar energy facilities. Some of the facilities have already been authorised or even constructed (e.g. Ilanga 1 CSP). The construction of all 15 of the solar energy facilities is expected to increase the cumulative visual impact of industrial type infrastructure within the region. On the other hand, the location of the Upilanga Solar Park within the Upington REDZ will contribute to the consolidation of infrastructure to this locality and avoid a potentially scattered proliferation of solar energy generation structures throughout the region. It should also be borne in mind that the approval of the power plants indicated in the table below has set the trend for applications for solar energy generation projects within this area, which is not likely to abate within the foreseeable future.

In terms of general visual quality of the landscape, the overall cumulative impact associated with proposed Upilanga Solar Park and existing solar facilities within the Upington REDZ was assessed as having a medium significance, which is considered to be acceptable considering the low number of sensitive visual receptors in the area. The contribution of Upilanga PV1 to this cumulative impact is assessed as low.

Nature: *The potential cumulative visual impact of the solar energy facilities on the visual quality of the landscape.* The anticipated cumulative visual impact of the proposed Ilanga Solar Park is expected to be of moderate significance, which is considered to be acceptable from a visual perspective. This is once again due to the relatively low viewer incidence within close proximity to the proposed development sites		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local **(2)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	High **(8)**
Probability	Improbable **(2)**	Probable **(3)**
Significance	Low **(20)**	Moderate **(45)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	No
Mitigation: Planning: » Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.		

Operations: » Maintain the general appearance of the facility as a whole. Decommissioning: » Remove infrastructure not required for the post-decommissioning use. » Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual Impacts: The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.

8.9 Cumulative Social Impacts

The potential for social cumulative impacts is likely and includes both positive and negative impacts. The significance of the negative cumulative impacts of Upilanga PV1 and other projects in the area is low, and the significance of the positive cumulative impacts of the proposed development and other projects in the areas is medium. This is based on the location of the Upilanga PV1 within the Upington REDZ.

Considering the concentration of solar energy developments within the surrounding area of Upilanga PV1 the potential for cumulative impacts to occur is likely. Potential cumulative impacts identified for the project include positive impacts on the economy, business development, and employment, as well as negative impacts such as an influx of jobseekers and change in the area's sense of place.

Cumulative benefits associated with the development of multiple renewable energy facilities within the area will be experienced including employment opportunities, skills development, community upliftment, business opportunities and the generation of clean energy.

Nature: *An increase in employment opportunities, skills development and business opportunities with the establishment of more than one solar power facility.* Upilanga PV1 and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream/spin-off business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Upilanga PV1 alone.		
	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local- Regional-National (4)	Local- Regional-National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Highly Probable (4)
Significance	**Medium (36)**	**Medium (56)**
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	N/A	N/A
Can impacts be mitigated?	Yes (enhanced)	
Mitigation/Enhancement: » The establishment of a number of solar power projects in the area has the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities, where these opportunities are localised. The positive benefits will be enhanced if local employment policies are		

adopted and local services providers are utilised by the developers to maximise the project opportunities available to the local community.

Residual Impacts:

» Improved pool of skills and experience in the local area.
» Improved standard of living through the creation of employment opportunities.
» Economic growth for small-scale entrepreneurs.

Nature: *Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area*

While the development of a single solar power project may not result in a major influx of people into the area, the development of several projects at the same time may have a cumulative impact on the in-migration and movement of people. In addition, the fact that the project is proposed within REDZ 7, which has specifically been earmarked for the development of large scale solar PV energy facilities, implies that the surrounding area is likely to be subject to considerable future applications and expansion of solar energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and standards of living.

It is very difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponent implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Local (2)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Very Improbable (1)	Improbable (2)
Significance	**Low (8)**	**Low (22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

» Develop a recruitment policy / process (to be implemented by contractors), which will source labour locally.
» Work together with government agencies to ensure that service provision is in line with the development needs of the local area.
» Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.
» Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.

Residual Impacts:

» Possibility of outside workers remaining in the area after the construction is completed and the subsequent potential pressures on local infrastructure, services and poverty problems.

8.11 Contribution of the Project to Climate Change Mitigation

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG[18].

[18] Greenhouse Gas Inventory for South Africa: 2000-2010

It has been reported internationally that the move towards renewable energy for electricity generation needs has resulted in decreased greenhouse gas emissions. The International Energy Agency announced in March 2015 that 2014 carbon dioxide emissions from the energy sector levelled off for the first time in 40 years. This has happened without being linked to an economic downturn. This was attributed to the increase in the use of renewable energy sources by China and OECD countries[19]. As GHG emissions associated with the provision of energy services are a major cause of climate change, this move to renewable energy and subsequent reduction in CO_2 emissions is considered as a positive contribution towards climate change mitigation.

The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate change and are therefore not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997.

Consequently, the South African Government has recognised the need to move towards cleaner energy and has therefore set targets for cleaner energy technologies (including of 6000MW solar PV contribution to new power generation capacity) by 2030 (IRP, 2019). Renewable energy plays a key role in mitigating global greenhouse gas emissions by radically lowering the emissions profile of the global energy system (International Renewable Energy Agency (IRENA), 2015). The proposed PV facility will assist in reducing the country's CO_2 emissions associated with energy supply relative to fossil fuels (e.g. coal). Development of numerous such facilities will have a cumulative positive impact on CO_2 emissions as this will reduce reliance on power generation from fossil fuels. This will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government is a signatory.

This is considered to be a significant positive impact for the environment and society at an international level.

8.12 Conclusion regarding Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The most significant of these will be the contribution towards a reduction in greenhouse gas emissions and consequent assistance with climate change mitigation.

The alignment of renewable energy developments with the IRP and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The social and economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant. However, there is a lack of understanding of the cumulative impacts on other environmental and social receptors such as birds, visual amenity and landscape character of the affected areas largely due to limited information of impacts from existing facilities within the country. This assessment is therefore qualitative.

The assessment of the cumulative impacts was undertaken through the consideration of the Upilanga PV1 impacts in isolation and compared to the cumulative impacts of Upilanga PV1 and other solar facilities

[19] http://ecowatch.com/2015/03/23/renewables-mitigate-climate-change/

including the proposed Upilanga Solar Park (CSP & PV facilities) within a 50km radius from the development area. Cumulative impacts are expected to occur with the development of Upilanga PV1 throughout all phases of the project life cycle and within all areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Upilanga PV1 is to determine whether the cumulative impact will be acceptable within the landscape proposed for the development, and whether the cumulative loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The significance of the cumulative impacts associated with the development of Upilanga PV1 are predominately low to medium, depending on the impacts being considered. A summary of the cumulative impacts is included in **Table 8.3**.

Table 8.3: Summary of the cumulative impact significance for Upilanga PV1 within the development area

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium
Avifauna	Low	Medium
Aquatic resources	Low	Medium
Soil and agricultural potential	Low	Low
Heritage (archaeology and palaeontology)	Low	Low
Visual	Low	Medium
Social	Medium (positive impacts) Low (negative impacts)	Medium (positive impacts) Low (negative impacts)

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Upilanga PV1 will be acceptable and the majority are rated as being of **low to medium significance** with the implementation of appropriate mitigation. On this basis, the following can be concluded considering the Upilanga PV1 Facility:

- There are no impacts associated with the establishment of Upilanga PV1 that cannot be mitigated to a medium or low significance, the impact of the development on the protected tree*, B.albitrunca* has been further investigated in terms of the potential for the establishment of an offset to counter the impact on this species. The proximity of Upilanga PV1 to the existing developments is seen as a positive aspect of the development and overall cumulative impacts associated with the Upilanga PV development are considered acceptable. In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them.
- The offset analysis (Appendix D1) indicated that although the remaining extent of the site (ca. 23 000ha) is not that large in context of an arid environment, it is considered sufficient to provide for the maintenance of ecological processes across the site. Furthermore, the fact that the majority of the surrounding environment is not transformed means that the site would not be isolated from the surrounding area and does not need to maintain all ecological functions internally. Hence, the potential contribution of the site to conservation targets and outcomes is considered to be significant and as such is therefore adequate to offset the moderate residual impacts of the development.

- Low- Medium risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected. In terms of potential losses to landscape connectivity, the development area is not considered to lie within an area that is considered a likely avifaunal movement corridor or along an important ecological gradient, and as such, the overall cumulative impact of the development is considered acceptable.
- Low risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. A number of solar projects have been constructed in the area, creating an existing impact and alteration to the current sense of place.
- The construction of the project will not result in unacceptable loss of or impact to heritage resources.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Upilanga PV1 and other proposed renewable energy facilities in the region with the implementation of appropriate mitigation measures and the offset plan are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the Upington REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

CHAPTER 9: CONCLUSIONS AND RECOMMENDATIONS

Emvelo Capital (Pty) Ltd proposes the development of Upilanga PV1, a 100MW photovoltaic (PV) solar energy facility, and associated infrastructure on a site located ~28km south-east of the town of Upington in the Northern Cape Province. A study area has been identified for the development of Upilanga PV1 which consists of Portion 3 of the Farm Matjesrivier 41 and Lot 944. The study area falls within the Dawid Kruiper Local Municipality and the greater ZF Mgcawu District Municipality.

A development area of 350ha has been identified within the study area by the proponent for the development of the Upilanga PV1 facility and associated infrastructure, which has been fully considered within this BA process and assessed in terms of its suitability from an environmental and social perspective.

The development area is regarded as being of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities. Upilanga PV1 will have a contracted capacity of up to 100MW and will include specific infrastructure, namely:

- Solar PV panels with a maximum height of 5m.
- Grid alternatives using underground cables to connect to the on-site substations at authorised site and 1.4 and authorised grid connection to the Ilanga substation.
- A step-up facility (transformer) to step up the electricity current from 11kV/22kV/33kV to 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
- An access road to the development area no more than 8m wide.
- Perimeter security fencing around the development area.
- Internal access roads within the PV panel array area with a maximum width of 4m.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Emvelo Capital Project (Pty) Ltd has confirmed that the development area is suitable for the development of a solar energy facility from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability, site-specific characteristics such as topography and accessibility, the location within the Upington REDZ and the Northern Cape Solar Corridor, as well as the proximity of the area to authorised and constructed solar energy facilities (as discussed in Chapter 8).

A summary of the recommendations and conclusions for the proposed development as determined through the BA process is provided in this Chapter.

9.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for Upilanga PV1 has been included in **section 9.2**.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of Upilanga PV1 has been included as section 10.6. Sensitive environmental features located within the Upilanga PV1 study area and development area, overlain with the proposed development footprint have been identified and are shown in **Figure 9.1.** A summary of the positive and negative impacts associated with Upilanga PV1 has been included in section 9.4.
h (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity.	A concluding statement indicating the preferred alternatives and the preferred location of the activity is included in section 9.5.
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of Upilanga PV1 have been included in section 9.6.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether Upilanga PV1 should be authorised has been included in **section 9.6**.

9.2. Evaluation of Upilanga PV1

The preceding chapters of this BA Report together with the specialist studies contained within **Appendices D-J** provide a detailed assessment of the potential impacts that may result from the development of Upilanga PV1. This chapter concludes the environmental assessment of the solar PV facility by providing a summary of the results and conclusions of the assessment of the development footprint proposed for Upilanga PV1. In doing so, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the Environmental Assessment Practitioner (EAP) and presents a combined and informed opinion of the environmental impacts associated with the development.

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. The abundance of protected tree species, especially *Boscia albitrunca* within the development footprint is relatively high and as many as 3000 individuals of this species would be lost to the development. An offset analysis for this species has been undertaken to conducted to investigate the need and quantum of the offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities. The nature of this offset has not been finalised, however it will involve formally protecting some nearby land with similar numbers of trees prior to the commencement of construction once the project is selected as a Preferred Bidder. It is the intention of

the developer to investigate a land offset of up to 30 000ha within the Upilanga Solar Park to create a conservation area. This would amount to a potentially acceptable offset solution, a specific study to address the offset calculation and the proposed offset area will need has been undertaken for the site.

The offset requirements are to be discussed and agreed with the Department of Agriculture, Forestry and Fisheries (DAFF) and implemented once the project has been selected as a Preferred Bidder. Some mitigation measures have already been considered and implemented through the siting of the solar PV facility development footprint, such as the avoidance of the major drainage features located within the development area of Upilanga PV1. Emvelo Capital Projects (Pty) Ltd has signed an agreement to commit to undertaking and implementing the offset plan following discussions with the competent authority (Appendix D2).

The potential environmental impacts associated with Upilanga PV1 identified and assessed through the BA process include:

» Impacts on ecology, flora and fauna.
» Impacts on avifauna.
» Impacts on aquatic resources.
» Impacts to soils, land types and agricultural potential.
» Impacts on heritage resources, including archaeology and palaeontology.
» Visual impacts on the landscape as a result of the facility.
» Positive and negative social impacts.

9.2.1 Impacts on Ecology

The field assessment as well as a desktop review of the available ecological information (**Appendix D**) for the area revealed that the vegetation of the development area consists of Kalahari Karroid Shrubland with some Bushmanland Arid Grassland on deeper soils across the site.

In terms of sensitive features, the vegetation of the development area is considered generally moderate to low sensitivity with few plant species of concern present. There is a relatively high density of the protected tree species *Boscia albitrunca* within the development footprint and as many as 3000 individuals would be impacted. An offset analysis for this species has been undertaken to investigate the need and quantum of an offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities (Appendix D1). Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia* (Acacia) *erioloba* and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. Within the Upilanga PV 1 footprint, *Boscia albitrunca* is relatively common and the density of this species at the site is estimated at 10 trees/ha with the result that the development would result in the loss of approximately 3000 individuals of this species. This far exceeds the guideline amount of trees that DEFF finds acceptable for loss without the offset.

Although there are quartz patches in the area which are home to several local endemics or specialised species such as Lithops, no quartz patches home to such species were observed within the development area.

The majority of the site lies within an area classified as "Other natural areas" and has not been classified as a Critical Biodiversity Area (CBA) or an Ecological Support Area (ESA). There are no CBAs in close proximity

to the development area, indicating that the establishment of Upilanga PV 1 does not pose a threat to any CBAs or other areas considered to be of significance from a broad-scale conservation planning perspective

In terms of fauna, there are few species of conservation concern that are likely to be present or abundant at the site and the primary impact of the development on fauna would be some habitat loss for the more common resident species. As such, no high long-term post-mitigation impacts on fauna are expected to occur as a result of the development. Consequently, the impacts of the development on fauna and flora are considered acceptable and would be of low significance after mitigation.

The proximity of Upilanga PV1 to the existing developments is seen as a positive aspect of the development and overall cumulative impacts associated with the Upilanga PV development are considered acceptable. In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them. As such, there are no fatal flaws or high post-mitigation impacts that should prevent the development from proceeding. Based on the layout provided for the assessment, Upilanga PV can be supported from a terrestrial ecology point of view.

9.2.2 **Offset Analysis**

The primary motivations for an offset for the Upilanga Solar Park include the cumulative impact of the development on habitat loss, fragmentation and the loss of individuals of protected tree species. The residual impact associated with each was determined to be moderate and each PV project on its own was not considered sufficient to warrant an offset. Given the scale of development at the site and combined impact on ecological function and biodiversity at the site, exceptional mitigation beyond standard avoidance and minimising of impacts is warranted. In order to address these concerns, Emvelo Capital Projects (Pty)_ Ltd has indicated that the remaining undeveloped part of the site could potentially be set aside as an offset for the development. This has been critically evaluated and the offset analysis provides an examination of the potential of the site to be used as an offset to reduce the residual impacts of the development.

The investigation determined the following outcomes and conclusions regarding the site and its potential value and limitations as an offset:

- The majority of the development footprint is within the Bushmanland Arid Grassland vegetation type. This is an extensive vegetation type with few species or features of conservation concern present. Offsetting the development within this vegetation type would not be likely to result in significant biodiversity gains and is not recommended
- The diversity of habitats at the site is quite high and this is seen as an important feature of the site as such habitat diversity does not often occur in the Kalahari/Bushmanland Bioregion. Of particular importance is the presence of approximately 2000ha of Lower Gariep Broken Veld at the site. This vegetation type is currently Poorly Protected and is likely to remain severely under-protected into the future as a sufficient extent does not fall within any NPAES focus areas.
- Should the site be committed to formal conservation, the contribution of 2000ha of Lower Gariep Broken Veld to conservation would add 0.44% of the existing extent to conservation. Although this is not highly significant at the national level, it is considered locally significant. In addition, it is important to note that many of the specialised species and species of conservation concern of the wider area are associated with the Lower Gariep Broken Veld vegetation type. As such it clear that the biodiversity value of Lower

Gariep Broken Veld is greater than that of Bushmanland Arid Grassland on a per-area basis and the two cannot be traded on a 1 to 1 basis.

- The principle of like for like is a critical element of an offset, and in the current situation it could be argued that using Lower Gariep Broken Veld as an offset for the loss of habitat within Bushmanland Arid Grassland violates this principle. This is however not a valid argument, because it is the cumulative impacts on broad scale ecological processes and protected tree species that are the primary drivers of the need for an offset and neither of these are specifically associated with Bushmanland Arid Grassland but rather the ecosystem more generally. As such, the fact that the ecosystem within the development footprint is relatively poor in terms of biodiversity value, is expected given the first two tiers of the mitigation hierarchy which aim to avoid impact on the high value ecosystems of the site. In addition, ecological processes in semi-arid and arid regions operate over large scales and the development can therefore be seen within the context of the surrounding ecosystem and should not be isolated to just the affected vegetation type. Therefore, it is clear that the undeveloped parts of the property represent the best opportunity to offset the impacts of the development on a like for like basis.
- The density of protected trees within the undeveloped area is variable, but as a rough estimate, it is estimated that there would be 2-3 times the number of protected trees outside of the development footprint as compared to those within the proposed footprint. This should however be confirmed with additional surveys across the site to better characterise the distribution and density of protected trees across the site.
- The overall conclusion and recommendation regarding the potential of the undeveloped part of the site to act as an offset is that the potential contribution of the site to conservation targets and outcomes is considered to be significant and as such is adequate to offset the moderate residual impacts of the development.
- Given the high development pressure in the Upington area, the area would benefit from a fine-scale conservation plan, which would enhance development planning in the area. This should focus on the distribution of rare and localised habitats with specific associated species such as quartz patches and pans. It should also focus on ensuring that the broad-scale connectivity and functioning of the landscape is maintained as the impacts of renewable energy development are likely to be most felt by faunal which move extensively about the landscape.

9.2.3 Impacts on Avifauna

A total of 163 bird species have been recorded within the broader study area and surrounds. Eleven (11) are red-listed species, six (6) are listed as near-endemic and a further ten (10) species are biome-restricted. There are no known Important Bird Areas (IBAs) or wetlands of significant avifaunal importance within the vicinity of the broader study area (other than the Orange River located within 12 km to the north).

The broader study and development area consists primarily of Bushmanland Arid Grassland habitat with some components of Kalahari Karroid Shrubland in some areas and likely supports a fairly typical avifaunal assemblage expected for the area. Eleven (11) red data listed species are known to occur within the surrounding environment, of which at least four (4) terrestrial species (Ludwig's Bustard, Karoo Korhaan, Kori Bustard, and Secretarybirds are considered common while others appear to occur less frequently.

Five (5) of the eleven (11) red-listed species are considered most important as they would potentially be impacted the most due to habitat loss and displacement. Species considered to be most important include the Ludwig's Bustard *Neotis ludwigii* (Endangered), *Secretarybird Sagittarius serpentarius* (Vulnerable), Karoo Korhaan *Eupodotis vigorsii* (Near-threatened) and Kori Bustard *Ardeotis kori* (Near-threatened). The White-

backed Vulture Gyps africanus (Critically Endangered) and Lappet-faced Vulture (*Torgos tracheliotos*) have been recorded in the wider area but are unlikely to be highly affected by the development and as their presence is likely sporadic during infrequent foraging trips. The Black Stork Ciconia nigra (Vulnerable) is unlikely to occur due to the absence of suitable habitat, but may occur along the nearby Orange River where more suitable habitat exists. A Black Harrier Circus maurus (Endangered) and breeding pair of Verreaux's Eagle Aquila verreauxii (Vulnerable) have been recorded within the broader study area however neither species were recorded on either SABAB1 or SABAB2 cards thus likely have a low frequency of occurrence and only be affected by reduced foraging ground. Use was made of the data from two seasons of monitoring for 2015 and 2016. Each visit included surveys in 1km transects across the site. These transects covered all main habitat types present. Vantage Point observations were also undertaken covering 12 hours in each season as promoted by the draft BARESG guidelines (Jenkins et al. 2015). . It is possible that there is a Secretarybird nest within the vicinity of the broader study area. Consequently, a conservative approach has been adopted when assessing the impact of the development on the avifauna.

The Upilanga PV1 facility is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the broader study area supports a typical bioregional avifaunal assemblage, there are no impacts associated with the development that were considered to be of high residual significance and which could not be mitigated to an acceptable level. As there were no high residual impacts associated with the development it can be supported from an avifaunal perspective. It is, therefore, the reasoned opinion of the specialists that the Upilanga PV1 development be authorised, subject to a verification site visit and the implementation of the recommended mitigation measures.

9.2.3 Impacts on Aquatic Resources

A variety of wetland types were identified near the study area and included depressions / pans and riverine floodplain, the latter being considered alluvial watercourses in this landscape setting. The study area systems are ephemeral and only carried water for a short week long period in 2014 and in 2019, thus the observed development area systems don't support any wide riparian zones and the vegetation associated with these watercourses was between 0.25 m and 5 m wide were mostly terrestrial. This coupled to the fact that the footprints will largely avoid the mainstem rivers it is anticipated that a detailed hydrological assessment is not required.

The Aquatic Resources Impact Assessment (**Appendix F**) assessed the impact of Upilanga PV1 on aquatic resources and/or features present within the study area and development area for the life-cycle of the project. In summary, the aquatic impact assessment concluded that the proposed layout for the Upilanga PV1 facility would have no detrimental impact on the following:

» Any Very High sensitivity areas identified by the DEA Screening Tool
» Mainstem rivers and Pans that do contain functioning aquatic environments that received a Very High sensitivity rating.

Some impacts (panel areas & road crossings) are located in secondary alluvial water courses and minor drainage lines that were either fragmented or contained no riparian zones, with a Moderate sensitivity.

With the proposed mitigation (proper stormwater management and post construction rehabilitation), the impacts would be Low and acceptable for development, as these areas contained no aquatic habitat, and only functioned as a means to sustain / convey baseflows within the greater catchment. The proposed

development would in essence not impact on this as surface runoff, although managed to prevent erosion, would still emanate from the site (when significant rainfall occurs), thus maintain this aspect of the hydrological system observed.

Therefore, based on the results of this report, the significance of the remaining impacts assessed for the aquatic systems after mitigation would be Low. This includes the internal roads proposed that would need to cross some of these systems. This is based on the fact that some of the aquatic features to be affected by the proposed development contain no aquatic habitat and only function as a means to sustain or convey baseflows within the catchment. The development of Upilanga PV1 would not have an impact on this aspect, as surface run-off will emanate from the development footprint (when significant rainfall occurs); therefore, the hydrological system observed within the area will be maintained.

The construction and operation of Upilanga PV1 and the associated infrastructure is supported from an aquatic resources perspective and is considered acceptable subject to the developer obtaining the necessary water use authorisation from the Department of Water and Sanitation.

9.2.5 Impacts on Soil and Agricultural Potential

The very low rainfall and hot conditions in the study area, coupled with the sandy and/or rocky soils, mean that the prevailing agricultural potential is very low. Due to the predominance of very sandy soils, often with a fine grade of sand, the hazard of wind erosion when the topsoil is disturbed may be significant, as these areas are mapped as "highly susceptible".

The Soil and Agricultural Potential Assessment for the proposed Upilanga PV1 (**Appendix G**) has identified and assessed impacts associated with the development of Upilanga PV1. These impacts are expected during the construction and operation phases and include loss of agricultural land and increased soil erosion hazard caused by wind. These impacts will be negative with a permanent to short term-term duration depending on the impact being considered and will have a magnitude of moderate to low. The significance of the impacts is low, following the implementation of the recommended mitigation measures. No impacts of a high significance have been identified.

No fatal flaws have been identified from a soils and agricultural perspective; therefore, all impacts can be mitigated to be within an acceptable level of impact during life cycle of the project. The specialist has indicated that the development of Upilanga PV1 can be authorised and that the development footprint proposed and assessed as part of this BA Report is acceptable from a soils and agricultural potential perspective. This is subject to the implementation of the recommended mitigation measures as provided by the specialist.

9.2.6 Impacts on Heritage (including archaeology and palaeontology)

The Heritage Impact Assessment (**Appendix H**) assessed the impact of Upilanga PV1 on archaeological and palaeontological resources within the study area and development area for the life cycle of the project. It is expected that impacts to heritage resources will occur during the construction phase due to the on-ground disturbance required by the construction activities.

No significant heritage resources or formal and informal graves were identified within the development area for Upilanga PV1. No significant heritage resources were identified within the footprint for the proposed

Upilanga 1 100MW Solar PV facility and associated infrastructure. The stone age occurrences identified consist of isolated finds, and low-density ex-situ surface scatters containing predominantly of Middle Stone Age (MSA) material, with a few incidences of Later Stone Age (LSA) lithics. The lithic material identified is of low significance (not conservation-worthy), and even though the resources may be destroyed during construction, the impact is inconsequential. No mitigation is required for archaeological material recorded in the footprint areas of the proposed Upilanga PV1. The significance of the impact on archaeological resources is therefore low, with a long-term duration and a low magnitude. Therefore, the development of Upilanga PV1 will not have a significant negative impact on the heritage resources identified within the development area.

The igneous and metamorphic basement rocks of Precambrian age underlying the entire study area are entirely unfossiliferous. The overlying aeolian sands, calcretes, surface gravels and stream deposits of the Kalahari Group mantling the ancient bedrocks are generally of low to very low palaeontological sensitivity. Low-level impacts on fossil heritage here are probable. However, the probability of significant impacts on palaeontological heritage is considered to be low.

Based on the nature of the heritage resources identified and the lack of any fossils recorded or expected in the area, the significance of the impacts will be low, with the implementation of the recommended mitigation measures. As such, the development of Upilanga PV1 is not associated with any fatal flaws from a heritage, archaeological and palaeontological perspective, and it is for this reason that the project is considered to be acceptable.

9.2.7 Visual Impacts

The proposed 100MW PV Plant is expected to have a very contained core area of visual exposure, generally restricted to a 1 - 3km radius of the site. This is due to the generally constrained height of the PV Plant structures. The core area of visual exposure is entirely restricted to the properties earmarked for the Upilanga Solar Park and there are no potentially sensitive visual receptors located within a 1 - 3km radius of the proposed development.

Potential visual impacts identified within the Visual Impact Assessment (**Appendix I**) include construction activities on in close proximity to the PV plant, visual impacts to observers travelling along the roads and residents at homesteads within 3km-6km of the proposed PV facility, impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility, impact of solar glint and glare as a visual distraction and possible air travel hazard, impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures and potential impact on the sense of place of the region.

The duration of the impacts is expected to be long-term for majority of the visual impacts and with a magnitude ranging from moderate to low. The significance of the impacts will be medium and low with the implementation of mitigation, depending on the impact being considered. No impacts of a high significance are expected to occur. Potential mitigation factors for the 100MW PV Plant include the fact that the facility utilises a renewable source of energy (considered as an international priority) to generate power and is therefore generally perceived in a more favourable light. It does not emit any harmful by-products or pollutants and is therefore not negatively associated with possible health risks to observers. The development of Upilanga PV1 is therefore considered to be acceptable from a visual perspective.

9.2.8 Social Impacts

The Social Impact Assessment (**Appendix J**) identified that most social impacts associated with the development of Upilanga PV1 will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. The magnitude of the impacts ranges from high to small depending on the impact being considered and the status thereof. Impacts on the social environment are expected during both the construction and operation phases. The construction phase of a PV solar development is associated with the majority of social impacts. Many of the social impacts are unavoidable and will take place to some extent but can be managed through the careful planning and implementation of appropriate mitigation measures.

During the construction phase, negative impacts include, nuisance impacts (including noise and dust); an influx of construction workers and job seekers to the area and a change in population; safety and security impacts; impacts on daily living and movement patterns; and visual and a sense of place impacts. The significance of the negative construction phase impacts will be low with the implementation of the recommended mitigation measures. The positive social impacts associated with the construction phase of Upilanga PV1 include, an economic multiplier effect, and direct and indirect employment and skills development opportunities. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures by the specialist.

Impacts associated with the operation of Upilanga PV1 will be both positive and negative. The negative impacts are related to the change in the sense of place and the loss of agricultural land and overall productivity as a result of the operation of the solar PV facility. The significance of the negative impacts will be low with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of the facility relate to the development of non-polluting renewable energy infrastructure, a contribution to Local Economic Development (LED) and social upliftment, and the creation of employment and skill development opportunities for the local economy and the country. The significance of the positive impacts will be low and medium with the implementation of the recommended enhancement measures.

Upilanga PV1 is unlikely to result in permanent damaging social impacts. From a social perspective it is concluded that the project is acceptable subject to the implementation of the recommended mitigation and enhancement measures and management actions identified for the project. Considering the findings of the report and potential for mitigation it is the reasoned opinion of the specialist that Upilanga PV1 can be authorised from a social perspective.

9.2.9 Comparative Assessment of the Grid Connection Alternatives

Three main grid connection alternatives are proposed by the proponent to provide grid evacuation solutions to the Upilanga PV1 development area during the construction, operation and the decommissioning phase of the proposed development. These include the following:

- **Alternative 1 (technically preferred):** consists of an on-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 11kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation.

» **Alternative 2:** consists onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation); and

» **Alternative 3:** Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

Alternative 1 is considered to be the preferred technical alternative.

As it is expected that all 3 alternatives would have similar impacts on the environment, as concluded by the specialist studies, there is no preference regarding the power line alternatives. Therefore, the preferred technical alternative, Alternative 1, is supported.

9.2.9 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The most significant of these will be the contribution towards a reduction in greenhouse gas emissions and consequent assistance with climate change mitigation.

The alignment of renewable energy developments with the IRP and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The social and economic benefits of renewable energy developments at a local, regional and national level have the potential to be significant. However, there is a lack of understanding of the cumulative impacts on other environmental and social receptors such as birds, visual amenity and landscape character of the affected areas largely due to limited information of impacts from existing facilities within the country. This assessment is therefore qualitative.

The assessment of the cumulative impacts was undertaken through the consideration of the Upilanga PV1 impacts in isolation and compared to the cumulative impacts of Upilanga PV1 and other solar facilities including the proposed Upilanga Solar Park (CSP & PV facilities) within a 50km radius from the development area. Cumulative impacts are expected to occur with the development of Upilanga PV1 throughout all phases of the project life cycle and within all areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Upilanga PV1 is to determine whether the cumulative impact will be acceptable within the landscape proposed for the development, and whether the cumulative loss, from an environmental and social perspective, will be acceptable without whole-scale change.

Considering the findings of the specialist assessments undertaken for the project, the cumulative impacts for the proposed Upilanga PV1 will be acceptable and the majority are rated as being of low to medium significance with the implementation of appropriate mitigation. On this basis, the following can be concluded considering the Upilanga PV1 Facility:

» There are no impacts associated with the establishment of Upilanga PV1 that cannot be mitigated to a medium or low significance, the impact of the development on the protected tree*, B.albitrunca in terms* of an offset analysis has been undertaken to counter the impact on this species (Appendix D1). The

proximity of Upilanga PV1 to the existing developments is seen as a positive aspect of the development and overall cumulative impacts associated with the Upilanga PV development are considered acceptable. In terms of the three grid alternatives, all three are considered acceptable and there are no significant ecological differences between them.

- The impact on *Boscia albitrunca* from the Upilanga PV 1 project alone does not warrant an offset in its' own right from an ecological perspective. However, when considered in light of the other impacts associated with the broader Upilanga Solar Park development, the potential impact on *Boscia albitrunca* is a significant contributor to the significance of the overall negative impacts of the development on biodiversity at the site. As such, the offset implemented at the site should include provision for the conservation and protection of this species.
- Low- Medium risk to avifauna through loss of habitat, infringement on breeding areas, or risk to collision-prone species is expected. In terms of potential losses to landscape connectivity, the development area is not considered to lie within an area that is considered a likely avifaunal movement corridor or along an important ecological gradient, and as such, the overall cumulative impact of the development is considered acceptable.
- Low risk to aquatic resources through disturbance associated with construction activities and increased runoff and erosion during the operation phase.
- The construction of the project will not result in the complete or whole-scale change in sense of place and character of the area nor will the project result in unacceptable visual intrusion. A number of solar projects have been constructed in the area, creating an existing impact and alteration to the current sense of place.
- The construction of the project will not result in unacceptable loss of or impact to heritage resources.
- The project will not significantly increase the negative impact on the social environment. However, an increase in positive impacts, specifically as a result of job creation and socio-economic benefits, can be expected.
- The project will contribute towards a reduction in greenhouse gas emissions from energy generation and will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government has committed to become a signatory.

Based on a detailed evaluation, the cumulative impacts associated with the construction and operation of the proposed Upilanga PV1 and other proposed renewable energy facilities in the region are considered to be acceptable. The low potential for cumulative impacts and risks makes the location of this project within the Upington REDZ a desirable location for further consideration provided that environmental impacts are mitigated to suitable standards as recommended within this EIA Report.

9.3. Environmental Sensitivity Mapping

As part of the specialist investigations undertaken within the development area of Upilanga PV1, specific environmental features were identified which will be impacted by the placement of the development footprint (i.e. project infrastructure) associated with the facility. The current condition of the features identified (i.e. intact or disturbed) informed the sensitivity of the environmental features and the capacity for disturbance and change associated with the proposed development.

The environmental features identified within and directly adjacent to the development area and development footprint are illustrated in **Figure 9.1**. The features identified specifically relate to ecological and avifauna habitats, aquatic resources and heritage resources. The following points provide a description of the features present within the development area, as well as the surrounding area:

- Some impacts (panel areas & road crossings) are located in secondary alluvial water courses and minor drainage lines that were either fragmented or contained no riparian zones, with a Moderate sensitivity;
- The layout avoids all Mainstem Alluvial water courses and Pans, which rated as Very High Sensitivity;
- There are no well-developed drainage lines within the footprint, there are some wash areas where runoff water collects during larger showers and which are characterised by taller more dense vegetation;
- Two National Forest Act (Act No. 84 of 1998) of 1998 (NFA) protected tree species occur at the site; *Vachellia* (Acacia) *erioloba* and *Boscia albitrunca*. Both of these species are associated mostly with the larger drainage lines and deeper soils of the area. An offset analysis for this species has been conducted to investigate the need and quantum of the offset to account for the loss of individuals from the current and other proposed Upilanga PV facilities.
- In terms of sensitive features, the vegetation of the development area is considered generally low or medium sensitivity with no features of significant concern;
- The habitat within the broader study and development area represents typical vegetation of the surrounding environment, with no features of concern present across most of the habitat.

Considering the features identified within the development area, the specialists have provided an indication of the sensitivity of the environmental features for the development of Upilanga PV1 and associated infrastructure. The features and the sensitivities thereof have been considered by the proponent for the placement of the development footprint within the development area of Upilanga PV1. The points below describe the sensitivity of the features as identified and mapped in **Figure 9.1** provide sensitivity map of the study area and development area overlain with the development footprint.

- Alluvial watercourses of high sensitivity of are located outside the Upilanga PV1 footprint; there are no well-developed drainage lines within the footprint;
- The footprint of the PV panels and associated infrastructure for Upilanga PV1 is located within area of medium ecological sensitivity; as there are protected tree species within the site footprint for Upilanga PV1 specifically;
- Avifaunal sensitivity also depicted by the ecological sensitivity layer for the Upilanga PV1 broader study and development area, indicate medium sensitivity plains that cover most of the area and the High sensitivity drainage lines and washes.
- There are no CBA or Ecological Support Areas located within the footprint of the site;
- No no-go areas of high palaeontological sensitivity were identified within the study area and has therefore not been included within the sensitivity map.

9.4. Environmental Costs of the solar PV Facility versus Benefits of the solar PV Facility

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures, as outlined in the BA Report and the EMPr, are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- *A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the solar PV facility* - The cost of loss of protected trees is considered to be acceptable provided as per the protected tree offset strategy report (Appendix D1) that informs the potential need for an offset for the loss of protected trees within the current footprint area for the greater Upilanga Solar Park.
- *Loss of avifauna habitat* – The cost of the loss of habitat is considered to be of moderate significance as the majority of the avifauna of the surrounding environment appears fairly similar to that found across the Kalahari and the Nama-Karoo bioregions in the Northern Cape Province. The presence of communal or solitary roosting and nesting sites for red-listed species within the developmental area needs to be ascertained to ensure that no species are at immediate risk. A number of red-listed species do occur in the broader area primarily for foraging within their normally large home ranges, and are therefore not likely to be significantly impacted by the potential loss of a portion of foraging habitat as large tracks of suitable habitat remain within the surrounding environment.
- *Visual impacts associated with the solar PV Facility* - The development of Upilanga PV1 may have a visual impact within an 6km radius of the solar PV facility, which will be of a medium to low significance with the implementation of the recommended mitigation measures.
- *Loss of land available for agricultural activities within the development footprint - The* environmental cost is anticipated to be very limited due the fact that the development footprint does not impact on any areas of high agricultural potential.
- *The irreplaceable loss of heritage resources has been determined to be unlikely as the lithic material identified is of low significance (not conservation-worthy), and even though the resources may be destroyed during construction, the impact is inconsequential.*
- *The impacts identified and assessed in Chapter 8 of this report have not altered the findings of the need and desirability of the project as per Chapter 4 of the report.*

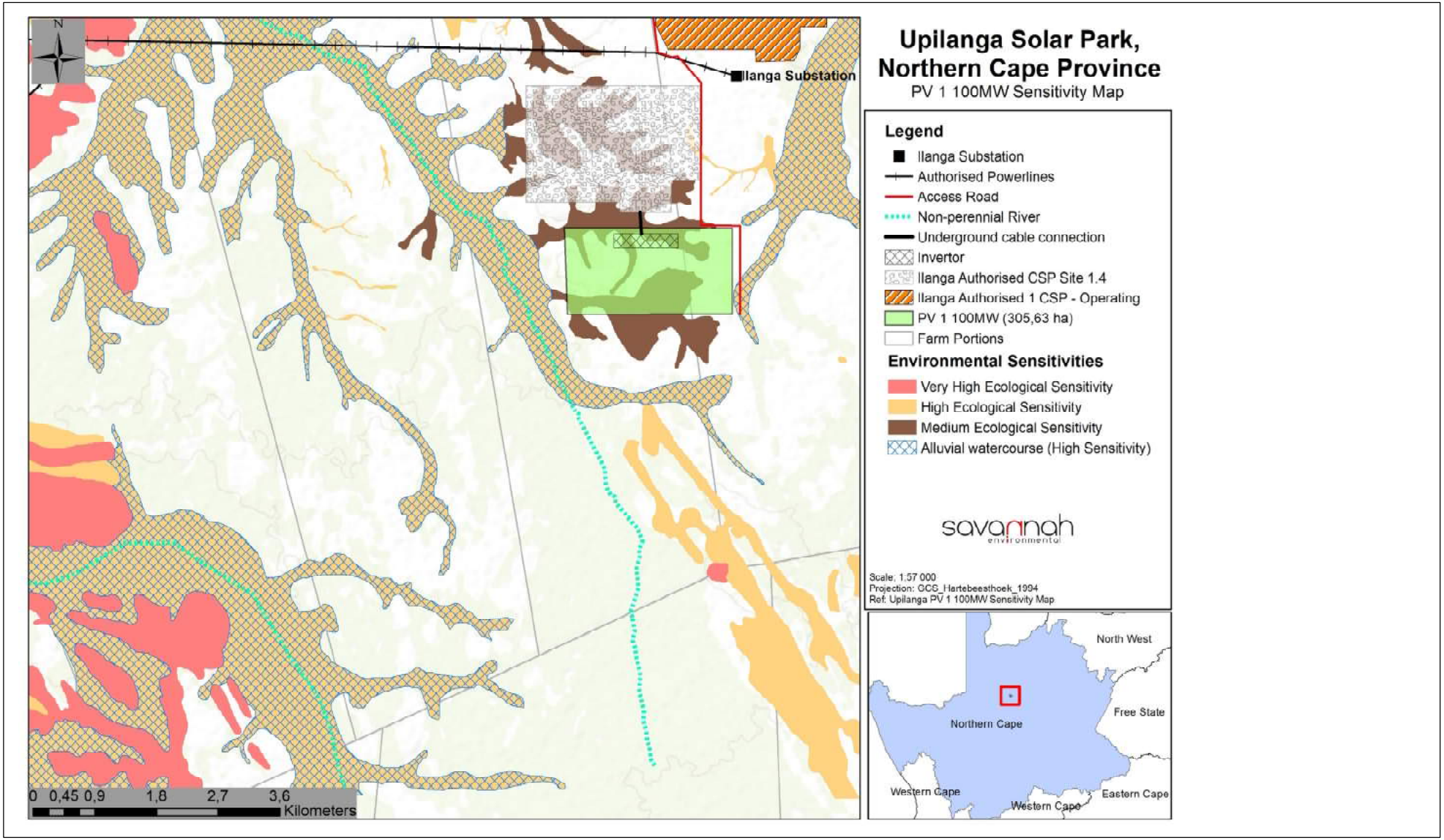


Figure 9.1: Environmental sensitivity and layout map of Upilanga PV1 development footprint (**A3 map is included in Appendix M**).

Benefits of Upilanga PV1 and associated infrastructure include the following:

- The project will result in important economic benefits at the local and regional scale through job creation, income and other associated downstream economic development. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
- The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
- The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy development.
- Contribution to the development and growth of the Upington REDZ and the associated benefits in terms of the concentration of solar facilities within a node.
- The water requirement for a solar PV facility is negligible compared to the levels of water used by coal-based technologies and Concentrated Solar Power (CSP). This generation technology is therefore supported in dry climatic areas.
- South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. Upilanga PV1 will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of Upilanga PV1 are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of infrastructure in the development area within areas considered to be acceptable for the proposed development, the benefits of the project are expected to outweigh the environmental costs of the solar PV facility.

9.5. Overall Conclusion (Impact Statement)

The construction and operation of a solar PV facility with a contracted capacity of up to 100MW on a study area located near Upington in the Dawid Kruiper Local Municipality, of the greater ZF Mgcawu District Municipality has been proposed by Emvelo Capital (Pty) Ltd. A technically viable development area and development footprint was proposed by the proponent and assessed as part of the BA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this BA Report.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Upilanga PV1 and it associated infrastructure within the development area. The facility layout assessed through this BA process is considered as the most appropriate development footprint for Upilanga PV1 and considered to be acceptable within all fields of specialist studies undertaken for the project. The acceptability of the development is based on the avoidance of environmental features considered to be of a very high sensitivity (i.e. no-go areas) and not appropriate for development and disturbance. All impacts associated with the preferred layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures.

Three (3) grid connection alternatives have been proposed by the proponent to evacuate electricity to the Ilanga Substation. . Alternative 1 consists of an on-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 33kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation. Alternative 2 consists of an onsite 11kV/22kV/33kV collector substation to receive, convert and step up electricity from the PV facility directly to the existing 132kV Ilanga Substation via underground cables (The on-site collector substation at authorised site 1.4 connects to the Ilanga substation) and Alternative 3 considers the loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation. . The table below provides a summary of the conclusion of the grid connections assessed by the specialists:

Specialist Study	Alternative 1	Alternative 2	Alternative 3
Ecology	Acceptable	Acceptable	Acceptable
Avifauna	Acceptable	Acceptable	Acceptable
Aquatic	Acceptable	Acceptable	Acceptable
Soils, Agricultural Potential & Land Type	Acceptable	Acceptable	Acceptable
Heritage (including archaeology & palaeontology)	Acceptable	Acceptable	Acceptable
Visual	Acceptable	Acceptable	Acceptable
Social	Acceptable	Acceptable	Acceptable

Alternative 1, based on the findings of the specialist studies undertaken and the technical feasibility of the grid connection has been selected as the preferred grid connection alternative for the development of Upilanga PV1. A preferred layout showing the preferred layout of Upilanga PV1 and including the details of the project is included as **Figure 9.5**. Through the assessment of the development of Upilanga PV1 within the study area and development area, it can be concluded that the development of the solar PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

9.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the proponent, the avoidance of the sensitive environmental features within the development area and development footprint, as well as, the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the Environmental Assessment Practitioner (EAP) that the development of Upilanga PV1 is acceptable within the landscape and can reasonably be authorised (**Figure 9.5**). The development of Upilanga PV1 within the Upington REDZ is also supported by the Strategic Environmental Assessment (SEA) undertaken by the CSIR on behalf of DEA for the determination of the REDZ focus areas.

The following infrastructure would be included within an authorisation issued for the project:

» Solar PV panels with a maximum height of 5m.

- Grid connection Alternative 1: On-site inverter (step up facility) to convert power from Direct Current (DC) to an Alternative (AC) and step up the electricity current from 33kV to 132kV that will connect to the on-site substation at authorised site 1.4 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref:. 14/12/16/3/3/2/299) to the existing Ilanga substation.
- A step-up facility (transformer) to step up the electricity current from 11kV/22kV/33kV to 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical, connecting the PV arrays to the inverter stations, O&M building and collector substation.
- An access road to the development area no more than 8m wide.
- Perimeter security fencing around the development area.
- Internal access roads within the PV panel array area with a maximum width of 4m.
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The following key conditions would be required to be included within the authorisation issued for Upilanga PV1 PV:

- Alternative 1 grid connection should be authorised for Upilanga PV1.
- All mitigation measures detailed within this BA Report, as well as the specialist reports contained within **Appendices D to J**, are to be implemented.
- The EMPr as contained within **Appendix L** of this BA Report should form part of the contract with the Contractors appointed to construct and maintain the solar PV facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of Upilanga PV1 is considered key in achieving the appropriate environmental management standards as detailed for this project.
- Following the final design of Upilanga PV1, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
- The implementation of an offset following the project being selected as Preferred Bidder and prior to commencement of construction as per the offset analysis undertaken for the protected species identified, to account for the loss of individuals from the current and other proposed Upilanga PV facilities. Refer to Appendix D1 for offset analysis.
- The recommendations of the offset analysis, way forward, potential alternative offset arrangements and the nature and duration of the offset must be discussed and agreed upon with the provincial and national authorities.
- The offset would require funds to manage the offset area into the future. Funds for the management of the area would need to be allocated for at least the operational period of the solar developments, but possibly longer. This will be determined following discussions with provincial and national authorities and selection of project as Preferred Bidder.
- The offset area would need to be entered into a formal conservation agreement that commits the property to long-term conservation and limits the kinds of land use that can be practiced in this area.
- A pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated must be undertaken prior to the commencement of the construction phase. Permits from the relevant national and provincial authorities, i.e. the Northern Cape

Department of Environment and Nature Conservation (DENC) and the Department of Agriculture, Forestry and Fisheries (DAFF), must be obtained before the individuals are disturbed.

- » It is recommended that where possible, buffer zones (50 to 100m width) be included around the largest and most significant washes and drainage lines (major drainage lines of high sensitivity). This will maintain connectivity of the landscape for smaller bird species and especially those that are associated with more dense riparian vegetation and which may be more reluctant to traverse large open areas.
- » The necessary water use authorisation must be obtained from the Department of Human Settlements, Water and Sanitation (DWS) for impacts to a watercourse prior to construction.
- » A comprehensive rehabilitation plan must be implemented from the project onset within watercourse areas to ensure a net benefit to the aquatic environment. This should from part of the suggested walk down as part of the Final EMPr preparation.
- » The project footprint must remain within the assessed development area.
- » A Chance Find Protocol (**Appendix L** of the EMPr) must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.
- » The environmental authorisation required for Upilanga PV1 is for a 10-year period as facility would need to be selected as Preferred Bidder by the Department of Mineral Resource and Energy (DMRE) in the REIPPP Programmes.

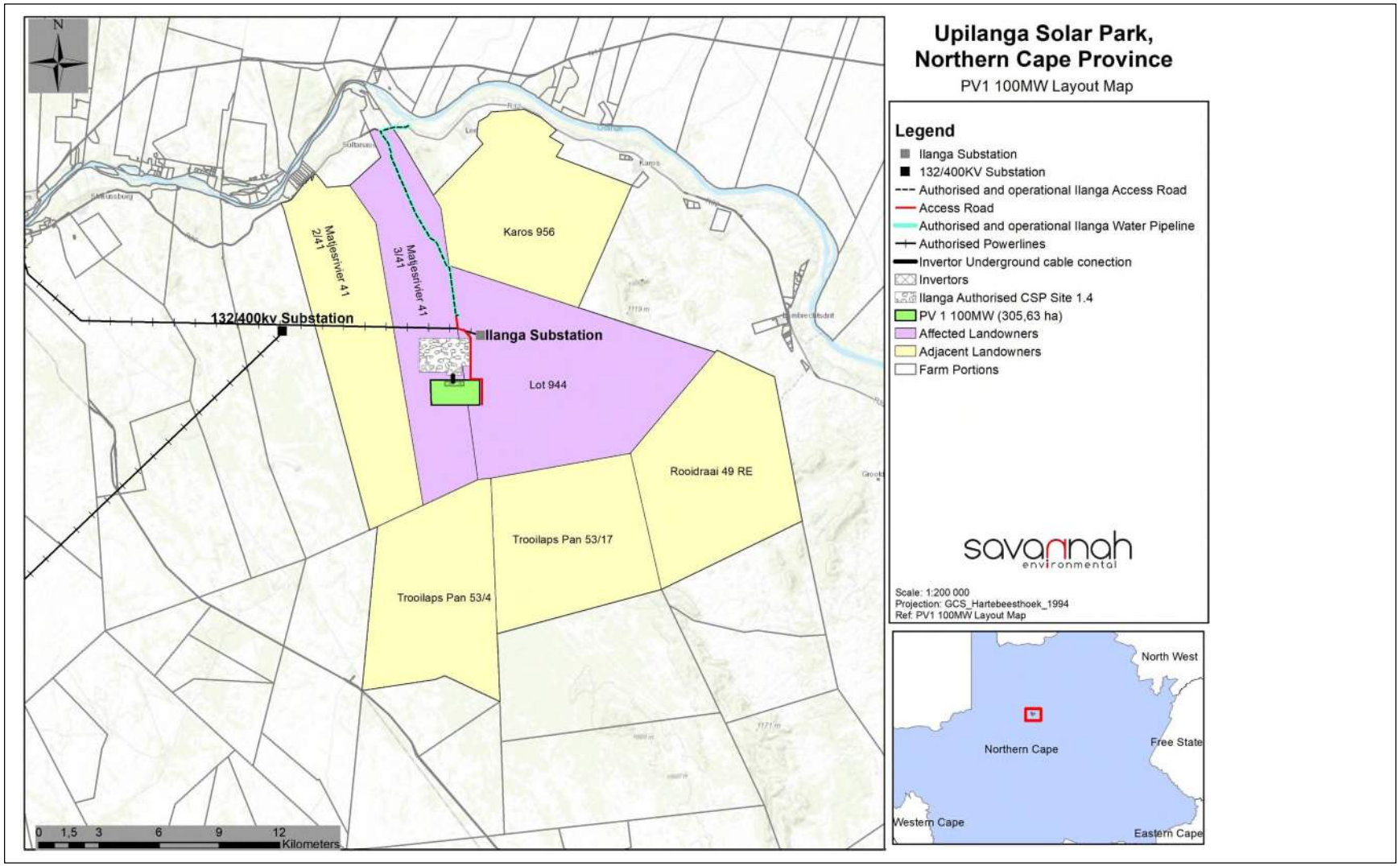


Figure 9.6: Final preferred layout map (as assessed as part of the BA process) of the preferred development footprint for Upilanga PV1, showing the option of the preferred grid connection alternative, Alternative 1 (A3 map included in **Appendix M)**

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