# PROPOSED UPINGTON ILANGA SOLAR PARK – 100MW PHOTOVOLTAIC 2 POWER PLANT, NORTHERN CAPE PROVINCE

## VISUAL IMPACT ASSESSMENT

**Produced for:**

**Emvelo Capital Projects**

**On behalf of:**


Savannah Environmental (Pty) Ltd
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**Produced by:**


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**- July 2020 -**

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# 1. STUDY APPROACH

## 1.1. Qualification and experience of the practitioner

Lourens du Plessis (t/a LOGIS) is a *Professional Geographical Information Sciences (GISc) Practitioner* registered with The South African Geomatics Council (SAGC), and specialises in Environmental GIS and Visual Impact Assessments (VIA).

Lourens has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His GIS expertise are often utilised in Environmental Impact Assessments, Environmental Management Frameworks, State of the Environment Reports, Environmental Management Plans, tourism development and environmental awareness projects.

He holds a BA degree in Geography and Anthropology from the University of Pretoria and worked at the GisLAB (Department of Landscape Architecture) from 1990 to 1997. He later became a member of the GisLAB and in 1997, when Q-Data Consulting acquired the GisLAB, worked for GIS Business Solutions for two years as project manager and senior consultant. In 1999 he joined MetroGIS (Pty) Ltd as director and equal partner until December 2015. From January 2016 he worked for SMEC South Africa (Pty) Ltd as a technical specialist until he went independent and began trading as LOGIS in April 2017.

Lourens has received various awards for his work over the past two decades, including EPPIC Awards for ENPAT, a Q-Data Consulting Performance Award and two ESRI (Environmental Systems Research Institute) awards for *Most Analytical* and *Best Cartographic Maps*, at Annual International ESRI User Conferences. He is a co-author of the ENPAT book and has had several of his maps published in various tourism, educational and environmental publications.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, the core elements are more widely applicable (i.e. within the Northern Cape Province).

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed Ilanga Solar Park 100MW Photovoltaic (PV) 2 Plant. He will not benefit from the outcome of the project decision-making.

## 1.2. Assumptions and limitations

This assessment was undertaken during the planning stage of the project and is based on information available at that time.

## 1.3. Level of confidence

Level of confidence[1] is determined as a function of:

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[1] Adapted from Oberholzer (2005).

- The information available, and understanding of the study area by the practitioner:

  - o 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - o 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - o 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

- The information available, understanding of the study area and experience of this type of project by the practitioner:

  - o 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - o 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - o 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

**Table 1:** Level of confidence.

| | **Information on the project & experience of the practitioner** | | | |
|---|---|---|---|---|
| **Information on the study area** | | **3** | **2** | **1** |
| | **3** | 9 | 6 | 3 |
| | **2** | 6 | 4 | 2 |
| | **1** | 3 | 2 | 1 |

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

## 1.4. Methodology

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed facility. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by NASA in the form of a 30m SRTM (Shuttle Radar Topography Mission) elevation model.

### Visual Impact Assessment (VIA)

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs, and may include recommendations related to the solar energy facility layout.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

The following VIA-specific tasks were undertaken:

- **Determine potential visual exposure**

The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if (or where) the proposed facility and associated infrastructure were not visible, no impact would occur.

The viewshed analyses of the proposed facility and the related infrastructure are based on a 30m SRTM digital terrain model of the study area.

The first step in determining the visual impact of the proposed facility is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

- **Determine visual distance/observer proximity to the facility**

In order to refine the visual exposure of the facility on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for this type of structure.

Proximity radii for the proposed infrastructure are created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly (anticipated) negative visual perception of the proposed facility.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

The next layer of information is the identification of areas of high viewer incidence (i.e. main roads, residential areas, settlements, etc.) that may be exposed to the project infrastructure.

This is done in order to focus attention on areas where the perceived visual impact of the facility will be the highest and where the perception of affected observers will be negative.

Related to this data set, is a land use character map, that further aids in identifying sensitive areas and possible critical features (i.e. tourist facilities, protected areas, etc.), that should be addressed.

- **Determine the visual absorption capacity of the landscape**

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed facility. The VAC is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing, sparse and patchy vegetation will have a low VAC.

The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernable detail in visual characteristics of both environment and structure decreases.

- **Calculate the visual impact index**

The results of the above analyses are merged in order to determine the areas of likely visual impact and where the viewer perception would be negative. An area with short distance visual exposure to the proposed infrastructure, a high viewer incidence and a predominantly negative perception would therefore have a higher value (greater impact) on the index. This focusses the attention to the critical areas of potential impact and determines the potential **magnitude** of the visual impact.

Geographical Information Systems (GIS) software is used to perform all the analyses and to overlay relevant geographical data sets in order to generate a visual impact index.

- **Determine impact significance**

The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section are displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

The preferred alternative (or a possible permutation of the alternatives) will be based on its potential to reduce the visual impact. Additional general mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in this VIA report.

- **Site visit**

A site visit was undertaken in order to verify the results of the spatial analyses and to identify any additional site specific issues that may need to be addressed in the VIA report.

## 2. BACKGROUND

**Emvelo Capital Projects (Pty) Ltd**, an independent power developer of solar power plants in South Africa proposes the development of Ilanga PV2, 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. The project and associated infrastructure is proposed within Lot 944 and Portion 3 of the farm Matjesrivier 41 and will form part of the Upington Ilanga Solar Park located approximately 30 km east of Upington. The site falls within the jurisdiction of the Dawid Kruiper and the greater ZF Mgcawu District Municipality.

The proposed project will have a contracted capacity of up to 100MW, and will make use of PV solar technology for the generation of electricity. The project will comprise the following key infrastructure and components:

- Solar PV panels with a maximum height of 2.2m utilising Single axis tracking; Fixed axis tracking; Dual axis tracking or Fixed Tilt mounting structures.
- 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 the authorised site with underground cables to connect to the on-site substations at authorised site 1.3 and authorised grid connection (DEA Ref:. 14/12/16/3/3/2/294) to the Ilanga substation for PV facilities located at site 2.
- A step-up facility (inverter) to step up the electricity current from 33kV to 132kV.
- A temporary laydown area.
- Cabling between the panels, to be laid underground where practical.
- 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.

**Grid Connection Alternatives:**

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 1.3 via underground cables. The electricity will be evacuated via the authorised grid connection (DEA Ref: 14/12/16/3/3/2/294) 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 1.3 connects to the Ilanga substation).
3) Loop in and loop out the 132kV lines connecting the existing Ilanga Substation to Gordonia Substation

The 100MW PV Plant will take approximately 2-3 years to construct and the operational lifespan of the facility is estimated at 40 years.

The proposed position of the 100MW PV Plant and the overall layout of the Ilanga Solar Park are indicated on the maps within this report. Sample images of similar PV technology plants are provided below.

**Figure 1:** Photovoltaic (PV) solar panels. (Photo: *SunPower Solar Power Plant – Prieska*).

**Figure 2:** Aerial view of PV arrays. (Photo: *Scatec Solar South Africa*).

## 3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed 100MW PV Plant as mentioned above.

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual assessment encompasses a geographical area of 926km² (the extent of the maps displayed in this report) and includes a minimum 6km buffer zone (area of potential visual influence) from the development footprint of the solar energy facility.

The broader study area includes a number of settlements and homesteads, mainly concentrated along the banks of the Orange River or the N10 national road to the north. Existing industrial infrastructure within the study area include a number of distribution power lines, a railway line and the Ilanga 1 CSP facility (solar trough technology).

Anticipated issues related to the potential visual impact of the proposed PV Solar Energy Facility include the following:

- The visibility of the facility to, and potential visual impact on, observers travelling along the national (N10) and secondary roads within the study area.
- The visibility of the facility to, and visual impact on settlements and homesteads within the study area.
- The potential visual impact of the facility on the visual character or sense of place of the region.
- The potential visual impact of the facility on tourist routes (N10 and N14) and potential tourist activities and destinations (i.e. along the Orange River).
- The potential visual impact of the construction of ancillary infrastructure (i.e. the substation at the facility, internal access roads etc.) on observers in close proximity of the facility.
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), specifically in the context of the possible construction of up to 15 solar energy facilities within the Ilanga Solar Park.
- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may constitute a significant visual impact at a local and/or regional scale.

## 4. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).

## 5. THE AFFECTED ENVIRONMENT

The proposed site for the construction of the 100MW PV Solar Plant is located on Lot 944, one of three farms identified for the Ilanga Solar Park. This farm comprises a total area of approximately 8,400ha, but the actual development footprint will be limited to a total area of 300ha.

Regionally, the site is located approximately 26km east-south-east of Upington within the Northern Cape Province at a distance of 13km from the N10 national road. A single secondary road (between the N10 national road and Marydale) traverses west of the proposed Ilanga Solar Park at a distance of 4.7km at the closest. Refer to **Map 2**.

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 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.

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 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.

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.

Tourism is not well developed within the study area, but some destinations exist along the river and in Upington.

The population distribution is primarily concentrated in and around small towns along the Orange River. Additional farming homesteads dot the countryside at irregular intervals.

The study area has a rural character with little development outside of Upington. Exceptions occur where powerlines 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.

Vegetation cover in this semi-desert region is primarily *low shrubland, bare rock and sand* (depending on the season)*, thicket,* and *bushland* with isolated pockets of *grassland*, and *agricultural fields* occurring along the Orange River. Refer to **Map 3.**

There are no formally protected areas within the study area.[2]

The entire Ilanga Solar Park is located within the Upington Renewable Energy Development Zone (REDZ). Refer to **Map 1** for the regional locality of the site in relation to the Upington REDZ. REDZ are described as:

*"areas where large scale wind and solar PV 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."*

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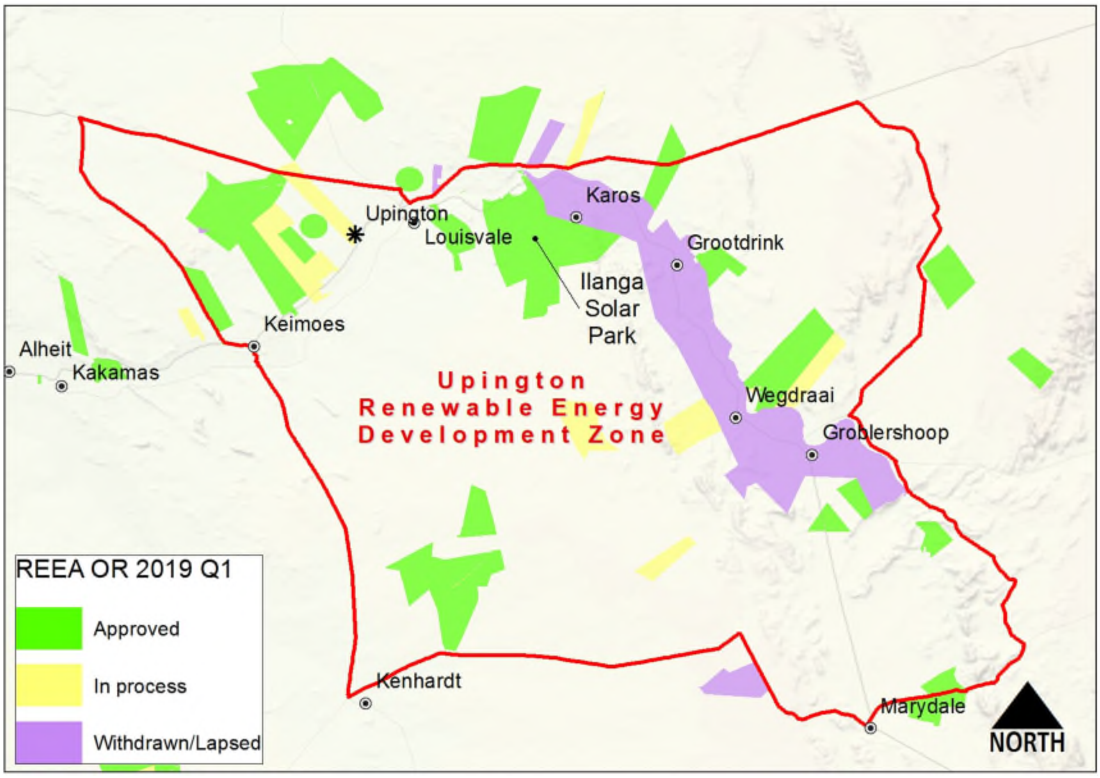
[2] Sources: DEAT (ENPAT Northern Cape), NBI (Vegetation Map of South Africa, Lesotho and Swaziland) and NLC2013-14 (ARC/CSIR).

Source: https://redzs.csir.co.za

**Map 3** also indicates the status of Renewable Energy Environmental Applications (REEA) within and around this REDZ (as at 2019 1st quarter). Applications that have been approved within the Ilanga Solar Park include Ilanga 1 CSP (operational), CSP Site 1.3, CSP Site 1.4, CSP Tower Site 4 and CSP Tower Site 5.




**Map 1:** Regional locality of the Ilanga Solar Park in relation to the Upington Renewable Energy Development Zone (REDZ).

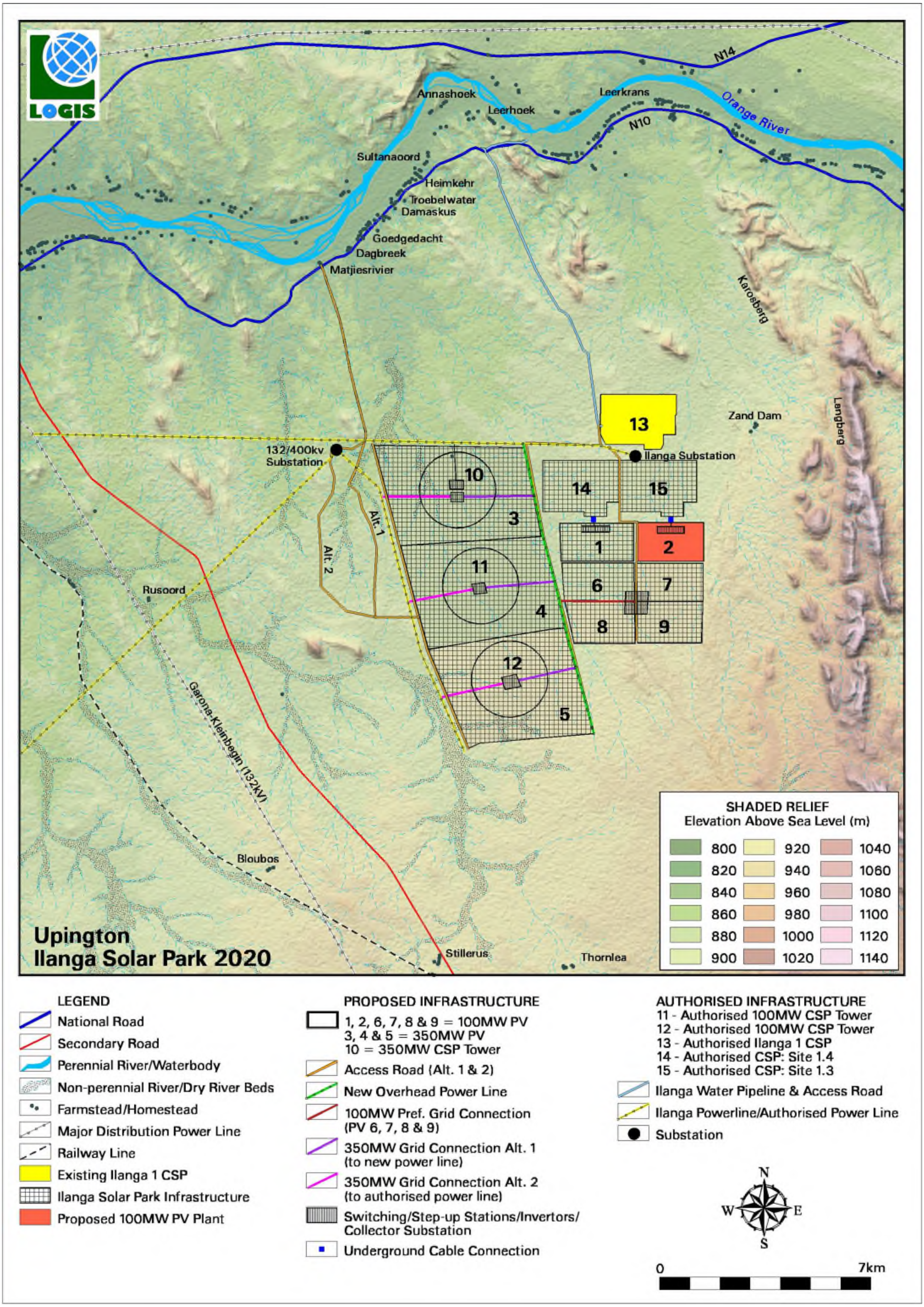
The photographs below aid in describing the general environment within the study area and surrounding the proposed Ilanga Solar Park.

**Figure 3:** Typical natural vegetation cover of the area north of the proposed site.

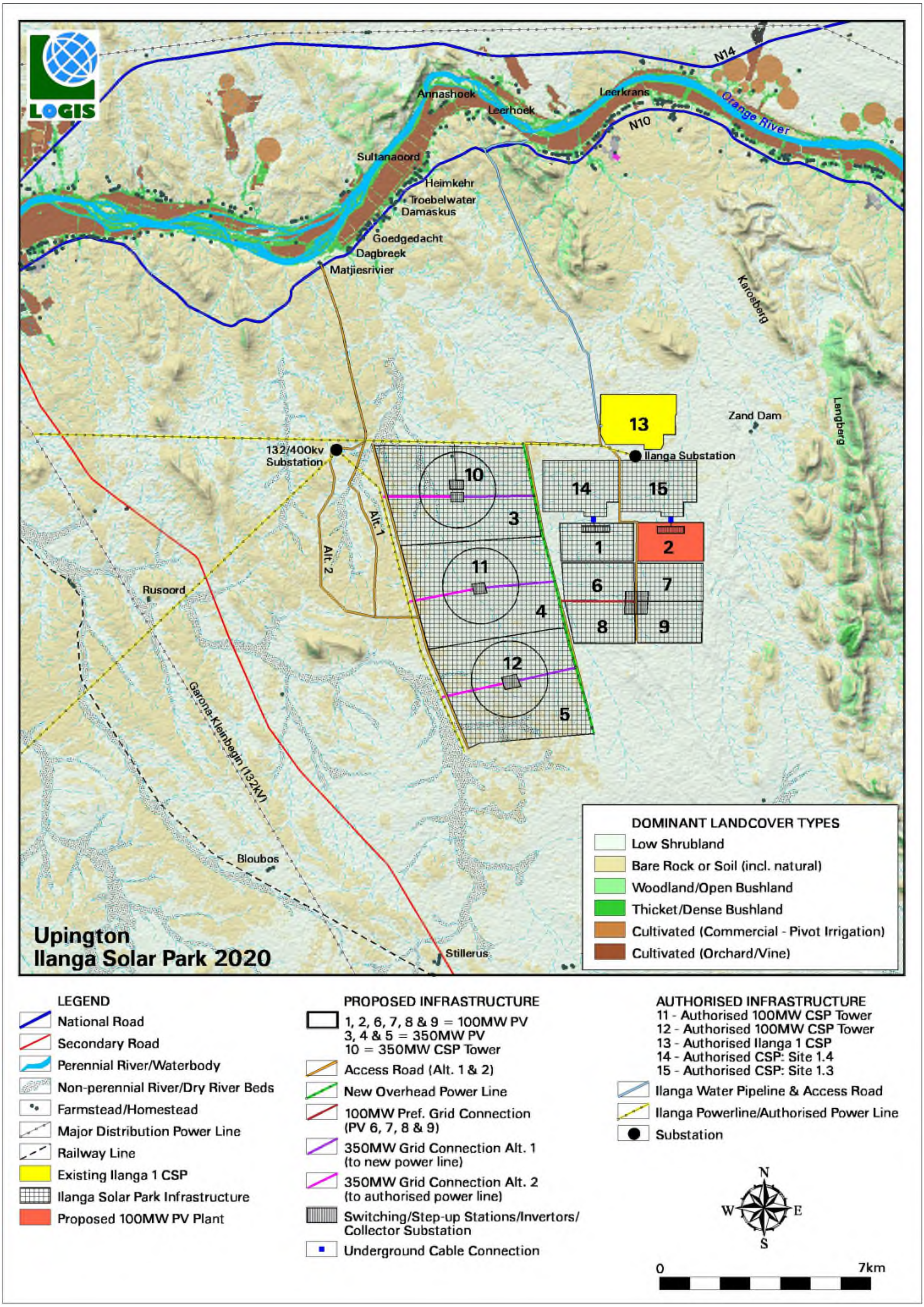
**Figure 4:** Agricultural land to the north of the proposed solar development.

**Figure 5:** Typical homestead in the area south of the proposed development.

**Figure 6:** Photograph showing the predominantly flat topography of the region.




**Map 2:** Shaded relief map of the study area.




**Map 3:** Land cover and broad land use patterns.

# 6. RESULTS

## 6.1. Potential visual exposure – PV facility

The result of the viewshed analysis for the proposed facility is shown on the map below (**Map 4**). The viewshed analysis was undertaken from 77 vantage points within the proposed development footprint at an offset of 2.5m above ground level. This was done in order to determine the general visual exposure (visibility) of the area under investigation, simulating the maximum height of the proposed structures (PV panels and inverters) associated with the facility.

The viewshed analysis includes the effect of vegetation cover or existing structures on the exposure of the proposed PV Plant.

### Results

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 Ilanga Solar Park and there are no potentially sensitive visual receptors located within a 1 - 3km radius of the proposed development.

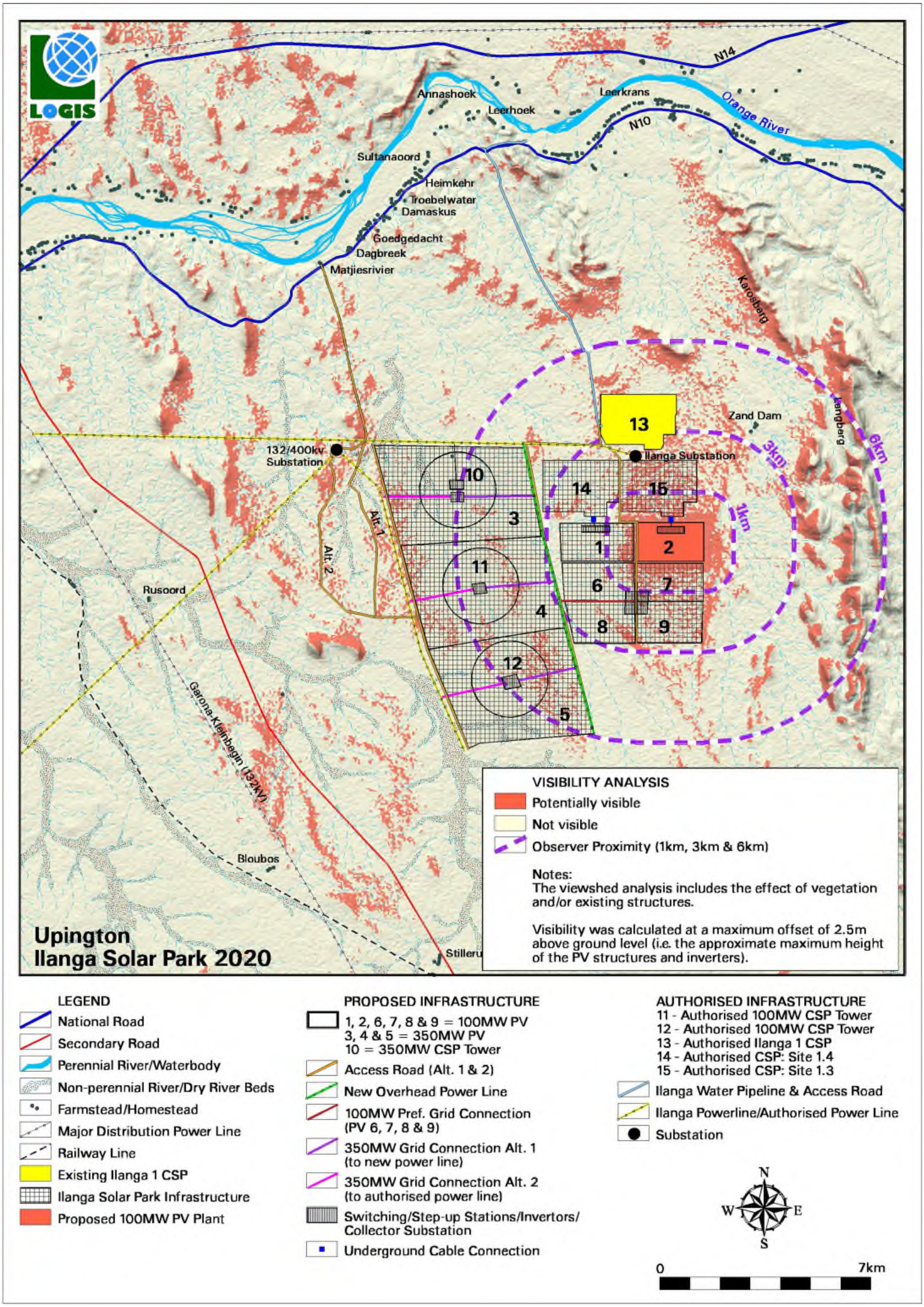
Visibility within 3 - 6km is more scattered and interrupted due to the undulating nature of the topography. There are similarly no potentially sensitive visual receptors located within this zone.

Visibility beyond 6km is generally restricted to the elevated slopes of the hills (e.g. Karosberg and Langberg) facing the Ilanga 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 or major roads within the region.

### Conclusion

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 is expected to be associated with the Ilanga Solar Park, and therefore not sensitive to these developments and associated structures.




**Map 4:** Viewshed analysis of the proposed 100MW PV Plant.

### 6.2. Potential cumulative visual exposure

The Ilanga Solar Park may ultimately comprise of 15 solar energy facilities. The proposed power plants are all indicated and numbered on the maps displayed in this report. Some of the facilities have already been authorised or even constructed (e.g. Ilanga 1 CSP). A comprehensive list of the proposed and authorised Ilanga Solar Park infrastructure follows below.

Proposed infrastructure (as numbered on the maps):

1. 100MW PV
2. 100MW PV
6. 100MW PV
7. 100MW PV
8. 100MW PV
9. 100MW PV
3. 350MW PV
4. 350MW PV
5. 350MW PV
10. 350MW CSP Tower

Authorised infrastructure (as numbered on the maps):

11. 100MW CSP Tower
12. 100MW CSP Tower
13. Ilanga 1 CSP
14. CSP: Site 1.4
15. CSP: Site 1.3

**Map 4** indicates the potential cumulative visual exposure of these 15 solar energy facilities. A visibility analysis of the each of the power plants was undertaken individually from a representative number of vantage points per development footprint. The vertical dimensions of the structures (used for the viewshed analyses) vary per proposed technology and are displayed below:

- PV Structures: 2.5m (sites 1 - 9)
- CSP Tower: 270m (site 10)
- CSP Towers 200m (site 11 and 12)
- CSP Troughs: 5m (sites 13 to 15)

The 15 results of these analyses were merged in order to calculate the combined visual exposure, indicated as an index displaying the frequency of overall visual exposure. Red areas indicate higher levels of cumulative exposure (where all 15 facilities may potentially be visible) whilst dark green areas represent areas where only one facility may be visible.

**Results**

It is clear that the combined area of visual exposure of all the Ilanga Solar Park components will increase dramatically when compared to the exposure of the individual 100MW PV Plant (**Map 4**). This is to be expected as the addition of the three CSP Towers (sites 10, 11 and 12) at heights of over 200m above ground level far exceeds the constrained vertical proportions of the PV Plant. The addition of the other PV and CSP plants will similarly increase the overall development footprint to over 7,500ha, a relatively expansive surface area with a correspondingly larger area of visual exposure.

As far as the frequency of exposure is concerned, it is clear from the index on **Map 5** that the more exposed areas are generally located on terrain that is more elevated than its surrounds. The hills surrounding the proposed Ilanga Solar Park form the skyline, or visual catchment boundary, that quite effectively contains the core area of highest cumulative visual exposure within a radius of roughly 6km from the infrastructure. This area is largely devoid of potentially sensitive visual receptors and comprises mainly vacant natural land.

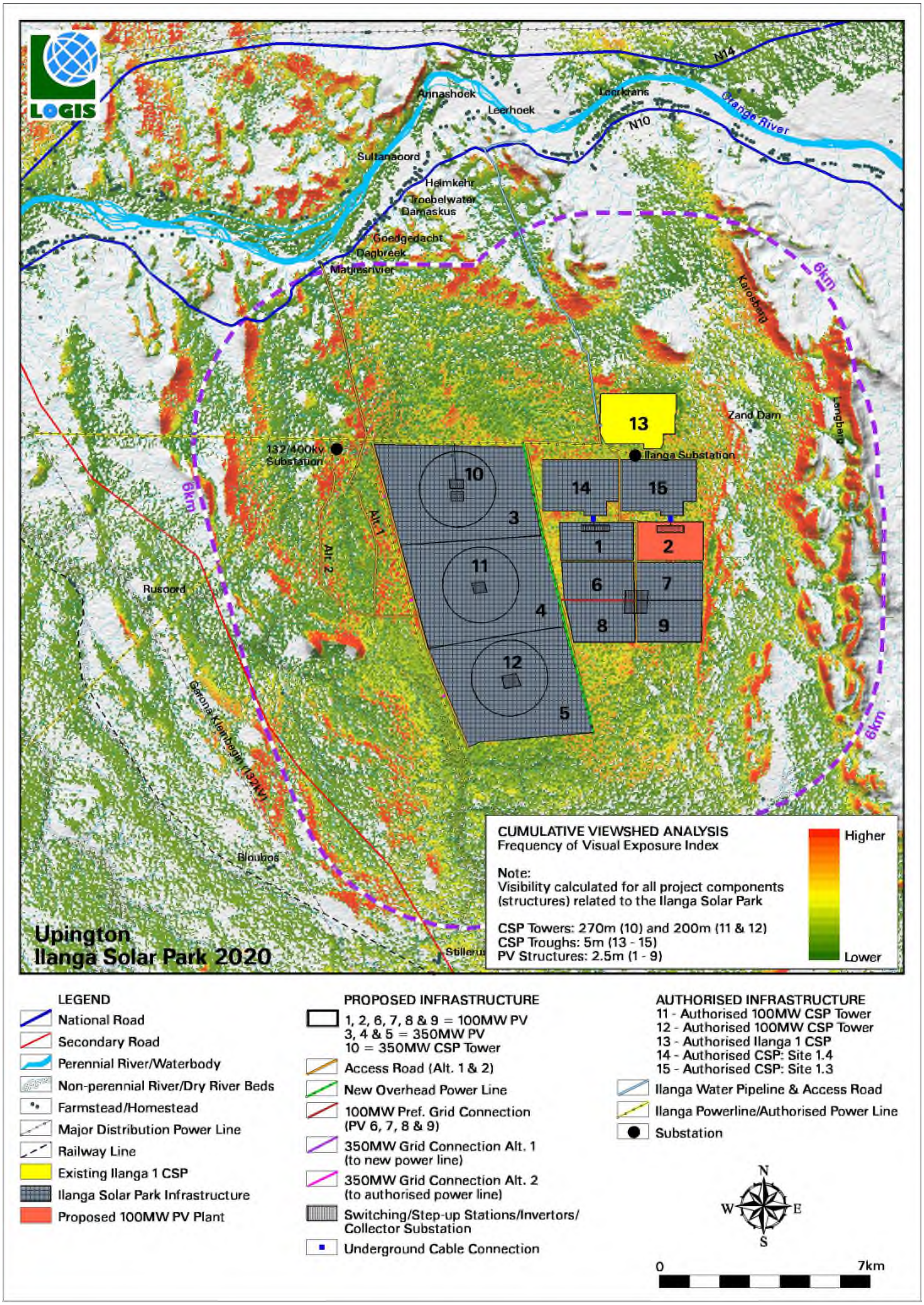
Cumulative visual exposure will furthermore, occur at varying distances from the respective power generating infrastructure, with some structures appearing in the foreground, and others further away in the distance. It is also possible that solar panel structures from a PV Plant closer to the observer may obstruct views of structures located further away, thereby negating the potential cumulative visual impact.

**Conclusion**

The above statements should however not distract from the fact that there will be a large amount of solar energy generation structures and ancillary infrastructure within this area that currently have very little built structures besides the existing Ilanga 1 CSP Troughs, and the railway line and power line west of the solar park.

Alternately, it is preferable to concentrate future solar energy infrastructure within this area, considering the fact that there are already a number of approved (or constructed) CSP Plants within the solar park. This will largely help to prevent the scattered proliferation of solar energy generation infrastructure throughout the greater region.

**Figure 7:** Solar Troughs at Ilanga 1 CSP. (Photo: Google Earth | Andrew Griffiths).




**Map 5:** Cumulative viewshed analysis.

## 6.3. Visual distance / observer proximity to the 100MW PV Plant

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger solar plants (e.g. more than 100MW capacity) and downwards for smaller plants (e.g. less than 100MW capacity). This methodology was developed in the absence of any known and/or accepted standards for South African solar energy facilities.

The principle of reduced impact over distance is applied in order to determine the core area of visual influence for these types of structures. It is envisaged that the nature of the structures and the rural character of the study area would create a significant contrast that would make the facility visible and recognisable from greater distances.

The proximity radii for the PV Plant were created in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

The proximity radii, based on the dimensions of the proposed development area (footprint) are indicated on **Map 7**, and include the following:

- 0 - 1km. Very short distance view where the PV Plant would dominate the frame of vision and constitute a very high visual prominence.

- 1 – 3km. Short distance view where the structures would be easily and comfortably visible and constitute a high visual prominence.

- 3 - 6km. Medium to longer distance view where the facility would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.

- > 6km. Long distance view of the facility where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The visual distance theory and the observer's proximity to the facility are closely related, and especially relevant, when considered from areas with a high viewer incidence and a potentially negative visual perception of the proposed facility.

## 6.4. Viewer incidence / viewer perception

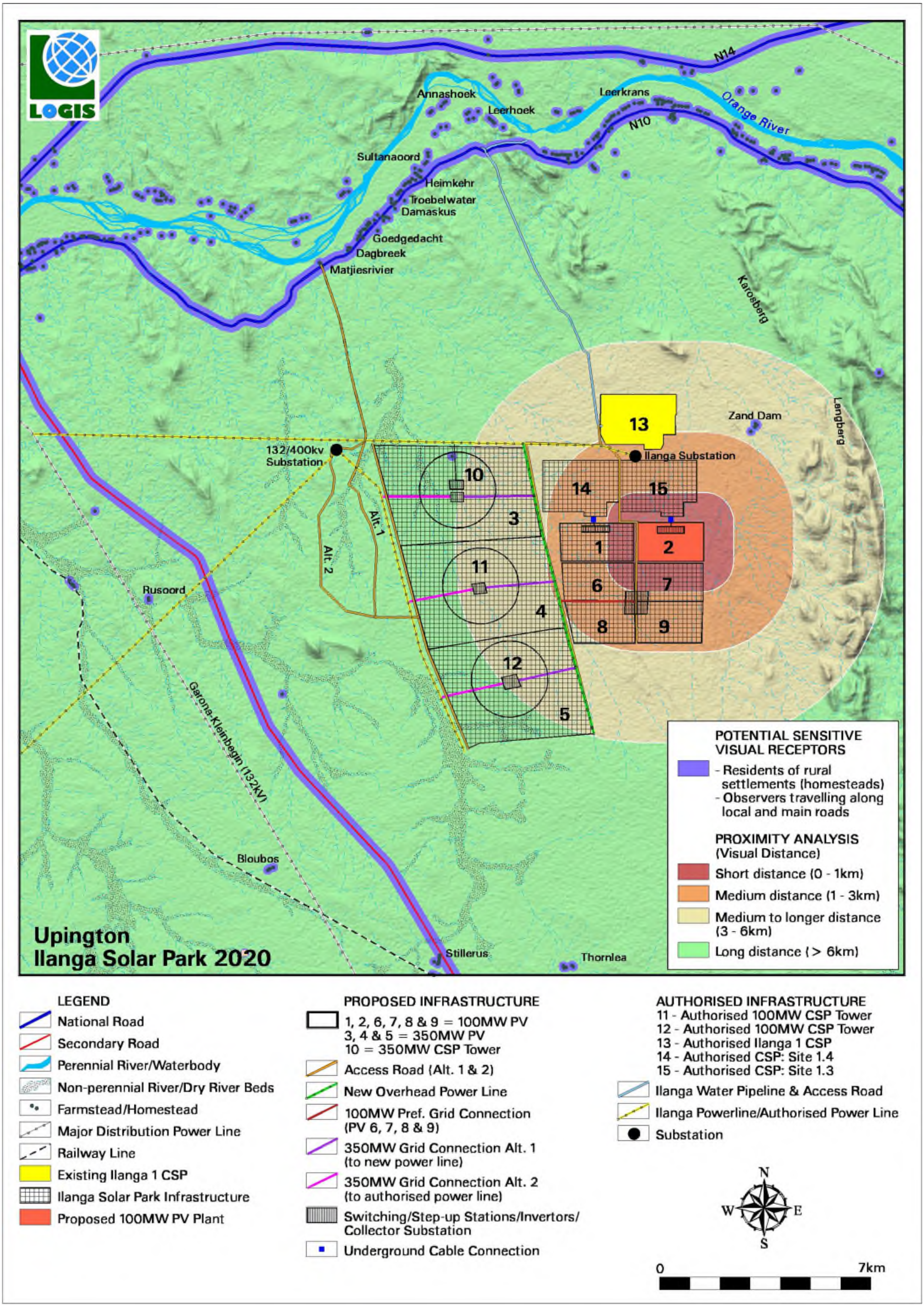
The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed solar energy facility and its related infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer: regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is calculated to be the highest along the national and secondary roads within the study area. Commuters and tourists using these roads may be negatively impacted upon by visual exposure to the PV Plant.

Additional sensitive visual receptors are located at the farm residences (homesteads) and settlements throughout the study area, but primarily concentrated along the N10 national road. It is expected that the viewer's perception, unless the observer is associated with (or supportive of) the solar energy facility, would generally be negative.

Due to the remote location of the proposed PV Plant, there is only a single potential sensitive visual receptor located within a 6km radius of the proposed plant. This is observers residing at *Zand Dam*, located 5km north-east of the development on Lot 944, the same property earmarked for the development. There are no major roads traversing within a 6km radius of the proposed PV Plant. Refer to **Map 7** below.




**Map 6:** Proximity analysis and potential sensitive visual receptors.

## 6.5. Visual absorption capacity

The broader study area is located within the Savanna and Nama Karoo biomes characterised by large open grassy plains, low *shrubland* and bare soil in places (**Figure 9**).

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed low by virtue of the nature of the vegetation and the low occurrence of urban development. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the facility). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

**Figure 9:** Grassland and low *shrubland* within the study area – low VAC.

## 6.6. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed 100MW PV Plant are displayed on **Map 7**. 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.

**General**

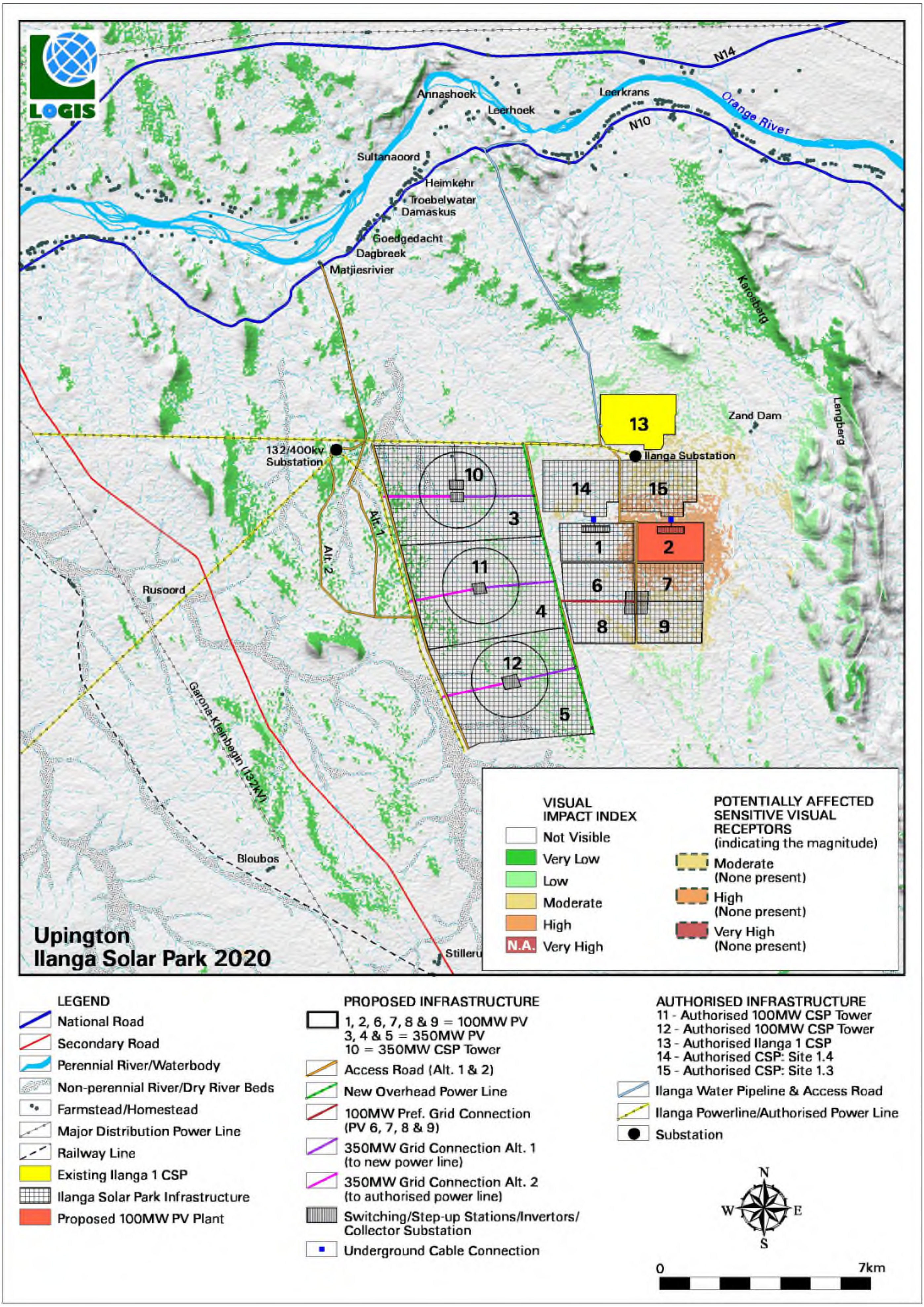
The index indicates that potentially sensitive visual receptors (if present) within a 1km radius of the 100MW PV Plant may experience a **high** visual impact. The magnitude of visual impact on sensitive visual receptors subsides with distance to:

- **Moderate** within a 1 – 3km radius
- **Low** within a 3 – 6km radius
- **Very low** beyond 6km.

**Conclusion**

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 Ilanga Solar Park as a whole.




**Map 7:** Visual impact index and potentially affected sensitive visual receptors.

## 6.7. Visual impact assessment: impact rating methodology

The previous section of the report identified specific areas where likely visual impacts would occur and indicate the expected **magnitude** of potential impact. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see **Section 3:** SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed PV Plant) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very low = 1), local (low = 2), regional (medium = 3), national (high = 4) or international (very high = 5)[3].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[4].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

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[3] Local = within 3km of the development site. Regional = between 3-6km from the development site.

[4] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

### 6.8. Visual impact assessment

The primary visual impacts of the proposed 100MW PV Plant are assessed below.

#### 6.8.1. Construction impacts

**Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV Plant and ancillary infrastructure.**

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.

Construction activities may potentially result in a **moderate** (significance rating = 40), temporary visual impact, that may be mitigated to **low** (significance rating = 24)

**Table 2:** Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV Plant.

| ***Nature of Impact:*** Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed PV Plant. | | |
|---|---|---|
| | ***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:***<br>Planning:<br>➢ Retain and maintain natural vegetation immediately adjacent to the development footprint.<br>Construction:<br>➢ Ensure that vegetation is not unnecessarily removed during the construction phase.<br>➢ 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.<br>➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.<br>➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.<br>➢ Reduce and control construction dust using approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent).<br>➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts.<br>➢ Rehabilitate all disturbed areas immediately after the completion of construction works. |
| ***Residual impacts:***<br>None, provided rehabilitation works are carried out as specified. |

### 6.8.2. Potential visual impact on sensitive visual receptors located within a 3km radius of the PV Plant structures.

The operational 100MW PV Plant is expected to have a **moderate** to **low** visual impact (significance rating = 30) on observers traveling 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.

**Mitigation of this impact is possible** and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact to **low**. The table below illustrates this impact assessment.

**Table 3:** Visual impact on observers in close proximity to the proposed PV Plant structures.

| ***Nature of Impact:***<br>Visual impact on observers travelling along the roads and residents at homesteads within a 3km radius of the PV Plant structures | | |
|---|---|---|
| | ***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, neutral or negative)*** | Negative | Negative |
| ***Reversibility*** | Reversible **(1)** | Reversible **(1)** |
| ***Irreplaceable loss of resources?*** | No | No |
| ***Can impacts be*** | Yes | |

| | |
|---|---|
| ***mitigated?*** | |

***Mitigation / Management:***

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 impacts:***

The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.

### 6.9.3. Potential visual impact on sensitive visual receptors within the region (3 – 6km radius)

The operational PV Plant could have a **low** visual impact (significance rating = 20) on observers located between a 3 – 6km radius of the PV Plant structures, both before and after the implementation of mitigation measures.

**Table 4:** Visual impact of the proposed PV Plant structures within the region.

***Nature of Impact:***

Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the PV Plant structures

| | ***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, neutral 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 / Management:***

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 impacts:***

The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain.

### 6.8.4. Lighting impacts

**Potential visual impact of operational, safety and security lighting of the facility at night on observers in close proximity to the proposed PV Plant.**

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.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the amount of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the PV Plant may contribute to the effect of sky glow within the environment which is currently undeveloped.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the PV Plant and the ancillary infrastructure (e.g. workshop and storage facilities) will go far to contain rather than spread the light.

The following table summarises the assessment of this anticipated impact, which is likely to be of **moderate** to **low** significance, and may be mitigated to **low**.

**Table 5**: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close proximity to the proposed PV Plant.

| ***Nature of Impact:*** Visual impact of lighting at night on sensitive visual receptors in close proximity to the proposed facility. | | |
|---|---|---|
| | ***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:*** <br> <u>Planning & operation</u>: <br> ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). <br> ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. <br> ➢ Make use of minimum lumen or wattage in fixtures. <br> ➢ Make use of down-lighters, or shielded fixtures. <br> ➢ Make use of Low Pressure Sodium lighting or other types of low impact lighting. <br> ➢ 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 impacts:*** The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain. |

### 6.8.5. Solar glint and glare impacts

**Potential 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. Examples of these include glass windows, water bodies and potentially some solar energy generation technologies (e.g. parabolic troughs and CSP heliostats). Glint is generally of shorter duration and is described as "a momentary flash of bright light", whilst glare is the reflection of bright light for a longer duration.

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 Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and may prescribe specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, military airbases, etc.). It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure.

PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials, and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels (i.e. such as those proposed for the 100MW PV Plant).

*Sources: Blue Oak Energy, FAA and Meister Consultants Group.*

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 (significance rating = 20).

**Table 6**: Impact table summarising the significance of the visual impact of solar glint and glare as a visual distraction and possible air travel hazard.

| ***Nature of Impact:*** The visual impact of solar glint and glare as a visual distraction and possible air travel hazard | | |
|---|---|---|
| | ***Without mitigation*** | ***With mitigation*** |
| ***Extent*** | Local **(2)** | N.A. |
| ***Duration*** | Long term **(4)** | N.A. |
| ***Magnitude*** | Low **(4)** | N.A. |
| ***Probability*** | Improbable **(2)** | N.A. |
| ***Significance*** | Low **(20)** | N.A. |
| ***Status (positive or negative)*** | Negative | N.A. |
| ***Reversibility*** | Reversible **(1)** | N.A. |
| ***Irreplaceable loss of resources?*** | No | N.A. |

| | |
|---|---|
| ***Can impacts be mitigated?*** | N.A. |
| ***Mitigation:*** N.A. | |
| ***Residual impacts:*** N.A. | |

### 6.8.6. Ancillary infrastructure

On-site ancillary infrastructure associated with the PV Plant includes smaller substations (inverters), invertor underground cable connection, 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.

**Table 7:** Visual impact of the ancillary infrastructure.

| | | |
|---|---|---|
| ***Nature of Impact:*** Visual impact of the ancillary infrastructure during the operation phase on observers in close proximity to the structures. | | |
| | ***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, neutral 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 | |
| ***Generic best practise mitigation/management measures:*** <br>Planning: <br>➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. <br>Operations: <br>➢ Maintain the general appearance of the infrastructure. <br>Decommissioning: <br>➢ Remove infrastructure not required for the post-decommissioning use. <br>➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications. | | |
| ***Residual impacts:*** The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed. Failing this, the visual impact will remain. | | |

## 6.9. Visual impact assessment: secondary impacts

**The potential visual impact of the proposed PV Plant on the sense of place of the region.**

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

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 greater 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 disturbances.

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.

**Table 8:** The potential impact on the sense of place of the region.

| ***Nature of Impact:*** The potential impact on the sense of place of the region. | | |
|---|---|---|
| | ***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, neutral 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 | |
| ***Generic best practise mitigation/management measures:***<br>Planning:<br>➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.<br>Operations:<br>➢ Maintain the general appearance of the facility as a whole.<br>Decommissioning:<br>➢ Remove infrastructure not required for the post-decommissioning use.<br>➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications. | | |
| ***Residual impacts:***<br>The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain. | | |

**The potential cumulative visual impact of the solar energy facilities on the visual quality of the landscape.**

The Ilanga 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 Ilanga 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.

**Table 9:** Applications for Renewable Energy Developments within the region.

| Project Name | DEA Reference Number(s) | Location | Approximate distance from Ilanga Solar Park | Project Status |
|---|---|---|---|---|
| Site 1 100MW PV | | Portions 2 and 3 of the farms Matjes Rivier 41 and Lot 944 | Within the project site | EIA in process |
| Site 2 100MW PV | | As above | Within the project site | EIA in process |
| Site 6 100MW PV | | As above | Within the project site | EIA in process |
| Site 7 100MW PV | | As above | Within the project site | EIA in process |
| Site 8 100MW PV | | As above | Within the project site | EIA in process |
| Site 9 100MW PV | | As above | Within the project site | EIA in process |
| Site 3 350MW PV | | As above | Within the project site | EIA in process |
| Site 4 350MW PV | | As above | Within the project site | EIA in process |
| Site 5 350MW PV | | As above | Within the project site | EIA in process |
| Site 10 350MW CSP Tower | | As above | Within the project site | EIA in process |
| Site 11 100MW CSP Tower | | As above | Within the project site | Approved |
| Site 12 100MW CSP Tower | | As above | Within the project site | Approved |
| Site 13 Ilanga 1 CSP | | As above | Within the project site | Operational |
| Site 14 CSP: Site 1.4 | DEA Ref: 14/12/16/3/3/2/299 | As above | Within the project site | Approved |
| Site 15 CSP: Site 1.3 | DEA Ref: 14/12/16/3/3/2/294 | As above | Within the project site | Approved |

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. See **Table 11** below.

**Table 10:** The potential cumulative visual impact of the solar energy facilities on the visual quality of the landscape.

| **_Nature of Impact:_** The potential cumulative visual impact of the solar energy facilities on the visual quality of the landscape. | | |
|---|---|---|
| | **_Overall impact of the proposed project considered in isolation (with mitigation)_** | **_Cumulative impact of the project and other projects within the area (with mitigation)_** |
| **_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, neutral 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 | |
| **_Generic best practise mitigation/management measures:_** <br>Planning: <br>➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. <br>Operations: <br>➢ Maintain the general appearance of the facility as a whole. <br>Decommissioning: <br>➢ Remove infrastructure not required for the post-decommissioning use. <br>➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications. | | |
| **_Residual impacts:_** <br>The visual impact will be removed after decommissioning, provided the PV Plant infrastructure is removed. Failing this, the visual impact will remain. | | |

### 6.10. The potential to mitigate visual impacts

The primary visual impact, namely the layout and appearance of the PV panels is not possible to mitigate. The functional design of the PV panels cannot be changed in order to reduce visual impacts.

The following mitigation is however possible:

- It is recommended that vegetation cover (i.e. either natural or cultivated) immediately adjacent to the development footprint be maintained, both during construction and operation of the proposed facility. This will minimise visual impact as a result of cleared areas and areas denuded of vegetation.

- Existing roads should be utilised wherever possible. New roads should be planned taking due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

- In terms of onsite ancillary buildings and structures, it is recommended that it be planned so that clearing of vegetation is minimised. This implies consolidating this infrastructure as much as possible and making use of already disturbed areas rather than undisturbed sites wherever possible.

- Mitigation of lighting impacts includes the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the proposed PV Plant and ancillary infrastructure will go far to contain rather than spread the light. Mitigation measures include the following:

    - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
    - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
    - Making use of minimum lumen or wattage in fixtures;
    - Making use of down-lighters, or shielded fixtures;
    - Making use of Low Pressure Sodium lighting or other types of low impact lighting.
    - Making 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.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Reduce the construction period through careful logistical planning and productive implementation of resources.
    - Plan the placement of laydown areas and any potential temporary construction 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 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, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the PV Arrays and ancillary structures and infrastructure will ensure that the facility does not degrade, therefore avoiding aggravating the visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as and when required.

- Once the facility has exhausted its life span, the main facility and all associated infrastructure not required for the post rehabilitation use of the site should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

- Secondary impacts anticipated as a result of the proposed PV Plant (i.e. visual character and sense of place) are not possible to mitigate.

- Where sensitive visual receptors (if present), are likely to be affected it is recommended that the developer enter into negotiations with the property owners regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation, trees or the construction of screens. Ultimately, visual screening is most effective when placed at the receptor itself.

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

## 7. CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed 100MW PV Plant and its associated infrastructure, may have a visual impact on the study area, especially within (but not restricted to) a 3km radius of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility.

The combined visual impact or cumulative visual impact of up to 15 solar energy facilities (i.e. the Ilanga Solar Park) is expected to increase the area of potential visual impact within the region. The intensity of visual impact to exposed receptors, especially those located within a 6km radius, is expected to be greater than it would be for a single solar energy facility. It is however still more preferable that these solar energy developments are all concentrated within this area than being spread further afield.

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. There are a very limited number of potentially sensitive visual receptors within a 6km radius of the Ilanga Solar Park, although the possibility does exist for visitors to the region to venture in to closer proximity to the solar power generating structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

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.

A number of mitigation measures have been proposed (**Section 6.11.**). Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed facility.

If mitigation is undertaken as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the 100MW PV Plant would be considered to be acceptable from a visual impact perspective and can therefore be authorised.

## 8. IMPACT STATEMENT

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).

This impact is applicable to the individual PV Plant and to the potential cumulative visual impact of the facility in relation to the other 14 facilities (proposed or existing) within the Ilanga Solar Park, where the combined frequency of visual impact may be greater. The potential area of cumulative visual exposure is however still deemed to be within acceptable limits.

The following is a summary of impacts remaining, assuming mitigation as recommended, is exercised:

- 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. Construction activities may potentially result in a **moderate**, temporary visual impact that may be mitigated to **low**.

- The 100MW PV Plant is expected to have a **moderate** to **low** visual impact on observers traveling 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.

- The PV Plant is expected to 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.

- The anticipated impact of lighting at the PV Plant is likely to be of **moderate** to **low** significance, and may be mitigated to **low**.

- The potential visual impact related to solar glint and glare is expected to be of **low** significance.

- The anticipated visual impact resulting from the construction of on-site ancillary infrastructure is likely to be of **low** significance both before and after mitigation.

- 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.

- 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 developments.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **moderate** to **low** significance. Anticipated visual impacts on sensitive visual receptors (if and where present) in close proximity to the proposed facility are not considered to be fatal flaws for the proposed PV Plant.

Considering all factors, it is recommended that the development of the facility as proposed be supported; subject to the implementation of the recommended mitigation measures (**Section 6.11.**) and management programme (**Section 9.**).

## 9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and suggest possible management actions in order to mitigate the potential visual impacts. Refer to tables overleaf.

**Table 11**: Management programme – Planning.

| **OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed 100MW PV Plant.** | | |
|---|---|---|
| **Project Component/s** | The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, transformers, substation, meteorological metering station, security lighting and workshop). | |
| **Potential Impact** | Primary visual impact of the facility due to the presence of the PV panels and associated infrastructure as well as the visual impact of lighting at night. | |
| **Activity/Risk Source** | The viewing of the above mentioned by observers on or near the site (i.e. within 3km of the site) as well as within the region. | |
| **Mitigation: Target/Objective** | Optimal planning of infrastructure to minimise the visual impact. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| 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. | Project proponent / contractor | Early in the planning phase. |
| Retain and maintain natural vegetation immediately adjacent to the development footprint. | Project proponent/ design consultant | Early in the planning phase. |
| 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. | Project proponent/ design consultant | Early in the planning phase. |
| Plan all roads, ancillary buildings and ancillary infrastructure in such a way that clearing of vegetation is minimised.<br><br>Consolidate infrastructure and make use of already disturbed sites rather than undisturbed areas. | Project proponent/ design consultant | Early in the planning phase. |
| 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:<br>o Shield the sources of light by physical barriers (walls, vegetation, or the structure itself).<br>o Limit mounting heights of fixtures, or use foot-lights or bollard lights.<br>o Make use of minimum lumen or wattage in fixtures.<br>o Making use of down-lighters or shielded fixtures.<br>o Make use of Low Pressure Sodium lighting or other low impact lighting.<br>o 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. | Project proponent / design consultant | Early in the planning phase. |
| **Performance Indicator** | Minimal exposure (limited or no complaints from I&APs) of ancillary infrastructure and lighting at night to observers on or near the site (i.e. within 3km) and within the region. | |
| **Monitoring** | Not applicable. | |

**Table 12**: Management programme – Construction.

| OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed 100MW PV Plant. | | |
|---|---|---|
| **Project Component/s** | Construction site and activities | |
| **Potential Impact** | Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing and resulting erosion. | |
| **Activity/Risk Source** | The viewing of the above mentioned by observers on or near the site. | |
| **Mitigation: Target/Objective** | Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate construction work areas. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| Ensure that vegetation is not unnecessarily cleared or removed during the construction phase. | Project proponent / contractor | Early in the construction phase. |
| Reduce the construction phase through careful logistical planning and productive implementation of resources. | Project proponent / contractor | Early in the construction phase. |
| Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. | Project proponent / contractor | Throughout the construction phase. |
| Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities. | Project proponent / contractor | Throughout the construction phase. |
| Reduce and control construction dust through the use of approved dust suppression techniques as and when required (i.e. whenever dust becomes apparent). | Project proponent / contractor | Throughout the construction phase. |
| Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting. | Project proponent / contractor | Throughout the construction phase. |
| 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. | Project proponent / contractor | Throughout and at the end of the construction phase. |
| **Performance Indicator** | Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion. | |
| **Monitoring** | Monitoring of vegetation clearing during construction (by contractor as part of construction contract).<br>Monitoring of rehabilitated areas quarterly for at least a year following the end of construction (by contractor as part of construction contract). | |

**Table 13**: Management programme – Operation.

| **OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed 100MW PV Plant.** | | |
|---|---|---|
| **Project Component/s** | The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, substation, meteorological metering station and workshop). | |
| **Potential Impact** | Visual impact of facility degradation and vegetation rehabilitation failure. | |
| **Activity/Risk Source** | The viewing of the above mentioned by observers on or near the site. | |
| **Mitigation: Target/Objective** | Well maintained and neat facility. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| Maintain the general appearance of the facility as a whole, including the PV panels, servitudes and the ancillary structures. | Project proponent / operator | Throughout the operation phase. |
| Maintain roads and servitudes to forego erosion and to suppress dust. | Project proponent / operator | Throughout the operation phase. |
| Monitor rehabilitated areas, and implement remedial action as and when required. | Project proponent / operator | Throughout the operation phase. |
| Investigate and implement (should it be required) the potential to screen visual impacts at affected receptor sites. | Project proponent / operator | Throughout the operation phase. |
| **Performance Indicator** | Well maintained and neat facility with intact vegetation on and in the vicinity of the facility. | |
| **Monitoring** | Monitoring of the entire site on an ongoing basis (by operator). | |

**Table 14**: Management programme – Decommissioning.

| **OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed 100MW PV Plant.** | | |
|---|---|---|
| **Project Component/s** | The solar energy facility and ancillary infrastructure (i.e. PV panels, access roads, substation, workshop and transformers). | |
| **Potential Impact** | Visual impact of residual visual scarring and vegetation rehabilitation failure. | |
| **Activity/Risk Source** | The viewing of the above mentioned by observers on or near the site. | |
| **Mitigation: Target/Objective** | Only the infrastructure required for post decommissioning use of the site retained and rehabilitated vegetation in all disturbed areas. | |
| **Mitigation: Action/control** | **Responsibility** | **Timeframe** |
| Remove infrastructure not required for the post-decommissioning use of the site. | Project proponent / operator | During the decommissioning phase. |
| 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. | Project proponent / operator | During the decommissioning phase. |
| Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required. | Project proponent / operator | Post decommissioning. |
| **Performance Indicator** | Vegetation cover on and in the vicinity of the site is intact (i.e. full cover as per natural vegetation within the environment) with no evidence of degradation or erosion. | |
| **Monitoring** | Monitoring of rehabilitated areas quarterly for at least a year following decommissioning. | |

## 10. REFERENCES / DATA SOURCES


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