AGV PROJECTS (PTY) LTD

PROPOSED RED SANDS PV 2 SOLAR FACILITY AND ASSOCIATED INFRASTRUCTURE LOCATED IN THE ZF MGCAWU DISTRICT MUNICIPALITY IN THE NORTHERN CAPE PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT

December 2021

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1 INTRODUCTION

1.1 GENERAL

This Landscape and Visual Impact Assessment (LVIA) study forms part of the Basic Assessment process that is being undertaken for the proposed 75MWac Red Sands PV2 Project by Savannah Environmental (Pty) Ltd on behalf of AGV Projects (Pty) Ltd.

In terms of the amended National Environmental Management Act (NEMA) Act No. 107 of 1998, the proposed development requires environmental authorisation. A key impact to be assessed comprises the visual impact that the facility will have on surrounding areas.

This LVIA Report has been prepared for inclusion in the project Basic Assessment Report.

1.2 PROJECT LOCATION

Red Sands PV1 facility and associated infrastructure on a site located approximately 26km north-east of Groblershoop, within the Tsantsabane Local Municipality and the ZF Mgcawu District Municipality in the Northern Cape Province.

Red Sands PV 2 is one of three solar projects that are proposed in the vicinity.

The development area for the PV facility is located on Portion 2 of the Farm Tities Poort 386.

Refer to Map 1: Site Location.

No site alternatives are under consideration.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He also has extensive experience of Environmental Impact Assessment. Jon has been involved in Visual Impact Assessment over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis and three dimensional modelling to illustrate impact assessments. He has undertaken visual impact assessments for tourism development, major buildings, mining projects, industrial development, infrastructure and renewable energy projects.

A brief Curriculum Vitae outlining relevant projects is included as **Appendix I.**

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to assess the landscape and visual impact of the proposed project.

Landscape and Visual impact assessment work will be undertaken in accordance with the following guideline documents;

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline), which is the only local relevant guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (UK Guidelines).

Refer to **Appendix II** for the Western Cape Guideline.

Together these documents provide a basis for the level and approach of a LVIA as well as the necessary tools for assessment and making an assessment legible to stakeholders.

1.5 LIMITATIONS AND ASSUMPTIONS

The following limitations and assumptions should be noted:

In the assessment tables the subjective judgement as to whether an impact is negative or positive is based on the assumption that the majority of people are likely to prefer to view a natural or a rural landscape than an industrial landscape.

A site visit was undertaken over a single day period (3rd November 2021) to verify the likely visibility of the proposed development, the nature of the affected landscape and affected receptors.

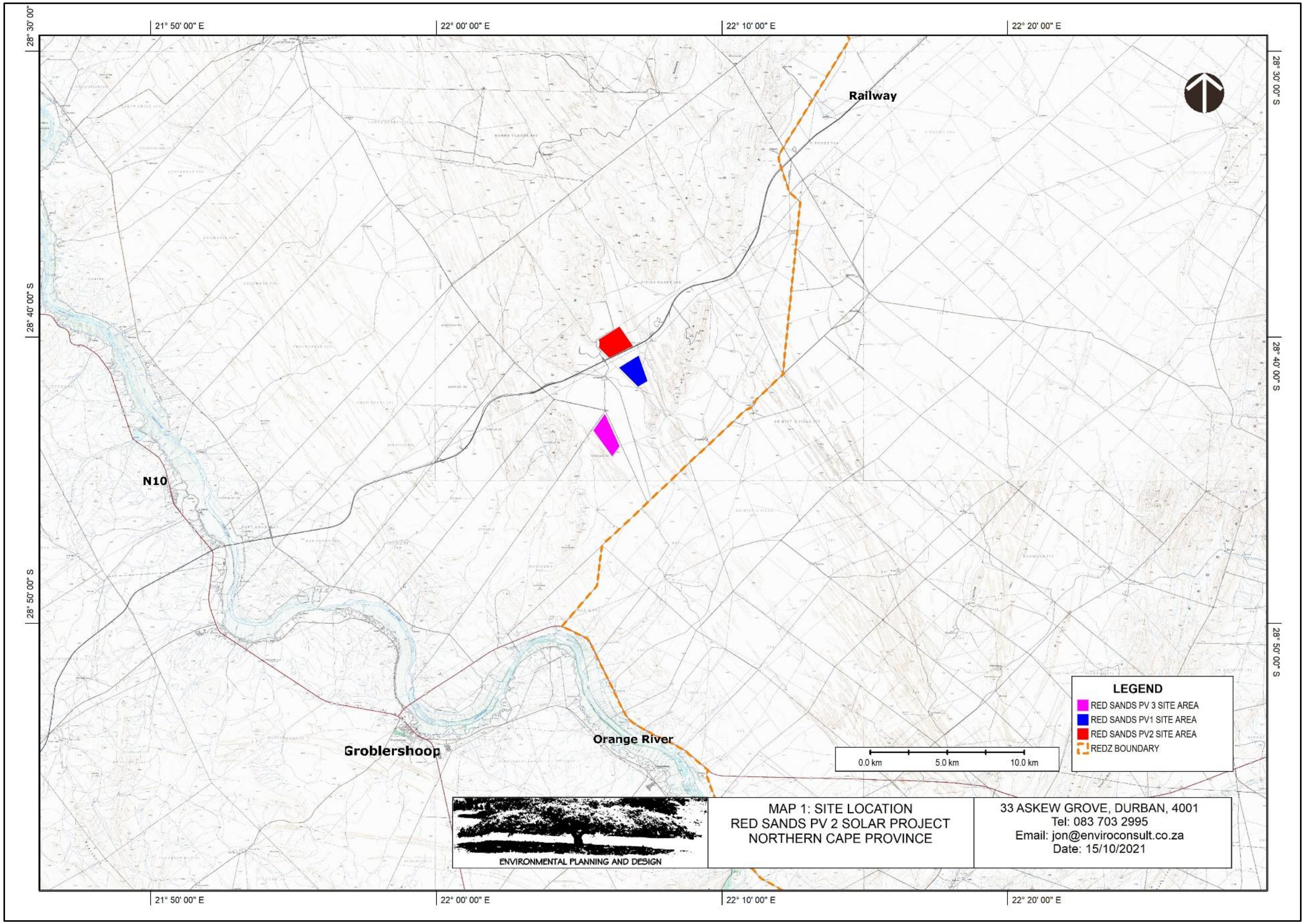
The site visit was planned to ensure that weather conditions were clear ensuring reasonable visibility.

The timing of photography was planned to ensure that the sun was as far as possible behind the photographer. This was to ensure that as much detail as possible was recorded in the photographs.

Visibility of the proposed facility has been assessed using the Global Mapper Viewshed tool.

The visibility assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping.

Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation or other development.



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Railway
N10
Groblershoop
Orange River
LEGEND
RED SANDS PV 3 SITE AREA
RED SANDS PV1 SITE AREA
RED SANDS PV2 SITE AREA
REDZ BOUNDARY
0.0 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 1: SITE LOCATION
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2. PROJECT DESCRIPTION AND CONTEXT

The proposed project is one of three (3) Red Sands PV Solar Energy Projects that are proposed in the vicinity.

The solar PV facility is proposed in response to the identified objectives of the national and provincial government and local and district municipalities to develop renewable energy facilities for power generation purposes. It is the developer's intention to bid the Red Sands PV2 Facility under the Department of Mineral Resources and Energy's (DMRE's) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme (or a similar programme), with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP) with the Red Sands PV2 Facility set to inject up to 75MW into the national grid.

2.1 OVERVIEW OF SOLAR 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:

Photovoltaic Modules

PV cells are made of crystalline silicon, the commercially predominant PV technology, that includes materials such as polycrystalline and monocrystalline silicon or thin film modules manufactured from a chemical ink compound. PV cells are arranged in multiples / arrays and placed behind a protective glass sheet to form a PV module (Solar Panel). 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. Direct Current (DC)). When sunlight hits the PV panels free electrons are released and flow through the panels to produce direct electrical (DC) current. DC then needs to be converted to alternating current (AC) using an inverter before it can be directly fed into the electrical grid.

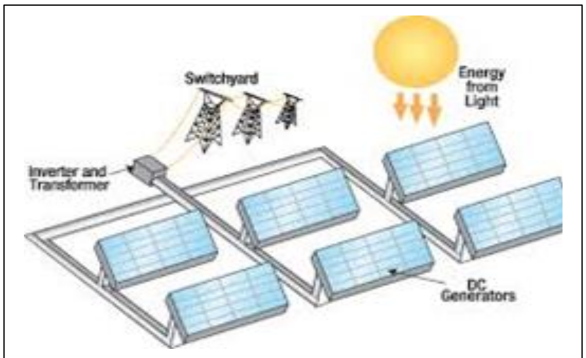


Figure 1: Overview of a PV cell, module and array / panel (Source: pveducation.com).

Inverters

Inverters are used to convert electricity produced by the PV panels from DC into Alternating Current (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.

Support Structures
PV panels will be fixed to a support structure. PV panels can either utilise fixed / static support structures, or alternatively they can utilise single or double axis tracking support structures. 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.

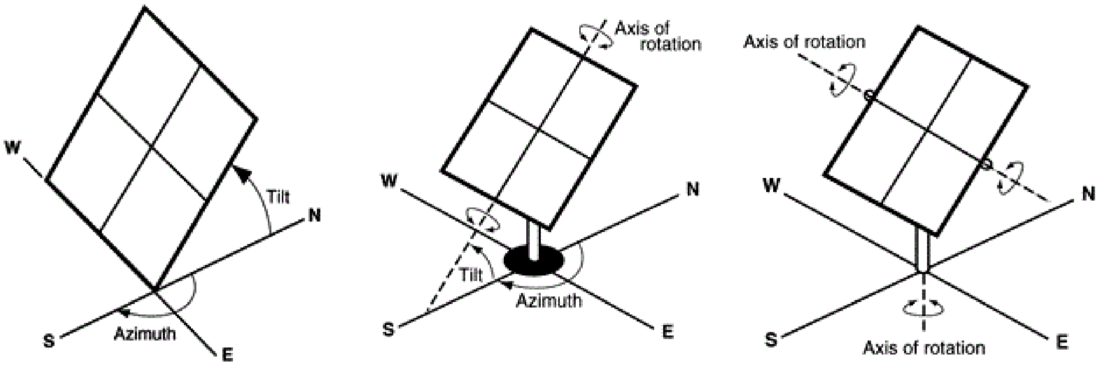


Figure 2: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

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

Battery Energy Storage System (BESS):
The potential need for a BESS stems from the fact that electricity is only produced by the Renewable Energy Facility while the sun is shining, while the peak demand may not necessarily occur during the daytime. Therefore, the storage of electricity and supply thereof during peak-demand will mean that the facility is more efficient, reliable and electricity supply more constant. The need for a BESS is under investigation. It is however included as part of this study.

The BESS will:

- Store and integrate a greater amount of renewable energy from the Solar PV Facilities into the electricity grid;

- This will assist with the objective to generate electricity by means of renewable energy to feed into the National Grid which will be procured under either the Renewable Energy Independent Power Producer Procurement Program (REIPPPP) other government run procurement programmes or for sale to private entities if required.

2.2 RED SANDS PV 2 PROJECT

The Red Sands PV2 project site is proposed to accommodate the following infrastructure, which will enable the PV facility to supply a contracted capacity of up to 75MWac:

- Solar PV array comprising PV modules and mounting structures;
- Inverters and transformers;
- Low voltage cabling between the PV modules to the inverters;
- Fence around the project development area;
- Camera surveillance;
- Internet connection
- 33kV cabling between the project components and the facility substation
- 33/132kV onsite facility substation[1];
- Battery Energy Storage System (BESS);
- Site offices and maintenance buildings, including workshop areas for maintenance and storage;
- Laydown areas and
- Access roads (up to 6m) and internal distribution roads (up to 4m).

The project site is accessible via an existing gravel farm road from an existing main gravel road off the N8 which is located southeast of the project site. These roads will be upgraded for site access.

The applicant has confirmed the following heights of the various elements:

- Final Height of installed panels from ground level (maximum height of panel when tilted if using tracking systems) +/- 2.2 m;
- On site substation distribution transformers, +/- 5m;
- On site substation bus bars, +/- 17m;
- Maintenance building/Site office, +/- 4m;
- Control Building, +/-4m;
- Guard House +/- 3m; and
- Parking, Fence (+/-3m).

It is possible that the facility could either be developed as a static fixed mounted PV system or a tracking PV system.

Tracking systems can utilise single axis of dual access trackers. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight.

[1] A 132kV powerline will be assessed through a separate Basic Assessment Process

The project layout is indicated on **Figure 3**.

PLATE 1, VIEW OF TRACKING ARRAY WITH CENTRALISED INVERTER STATION IN THE FOREGROUND

Note: inverters are generally a similar height as the surrounding array

PLATE 2, BUS BARS (TALL STRUCTURES CENTRE AND LEFT OF IMAGE) ARE THE HIGHEST SUBSTATION ELEMENTS IN PICTURE.

2.3 BATTERY ENERGY STORAGE SYSTEM

Key details of the BESS include;

- Proposed footprint of battery storage area: Up to 2 ha within the facility substation footprint;
- Proposed capacity of battery storage: 100MWh;
- Proposed technology to be used: Lithium Ion or similar;
- Battery types to be considered: Solid State Batteries and Redox Flow Batteries; and
- The BESS will appear as a series of structures that house battery facilities. The structures may be up to 3m high.

The BESS will be located within the facility substation footprint.

PLATE 3 - TYPICAL BATTERY ENERGY STORAGE SYSTEM

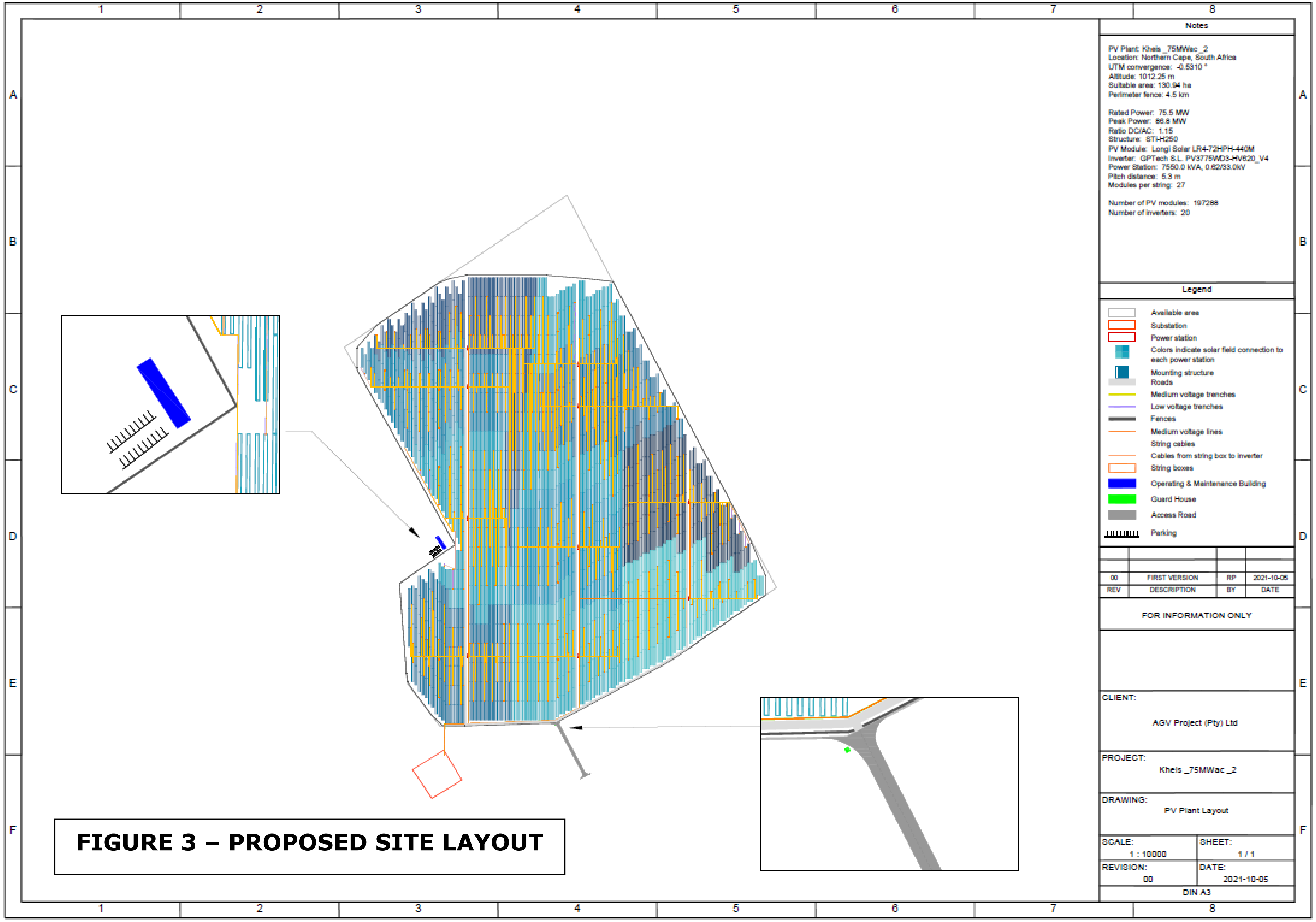


FIGURE 3 – PROPOSED SITE LAYOUT

3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

3.1 REGIONAL CONTEXT

The region has a strong agricultural character, interspersed with human settlements. The town of Upington has a population of approximately 47000 people *(Stats SA, 2007)*, and lies 40km south-west of the proposed site. Key tourism features in the area include the Augrabies Falls National Park (approximately 170km west), the Kalahari Gemsbok National Park (approximately 280km north-west) and the Orange River to the south.

Infrastructure includes a number of power lines distributed throughout the study area, substations, roads and the Kathu to Saldanha Bay railway line which passes close to the proposed project.

In addition, the National Government has prioritised the delivery of electrical infrastructure to the Upington area to encourage development of solar power facilities. The proposed site is also located within the Upington Renewable Energy Development Zone (REDZ). The identification of REDZ throughout the country is an initiative which is intended to encourage renewable energy projects to be developed in the most appropriate areas.

3.2 LANDSCAPE CHARACTER

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another".

Landscape Character is a composite of a number of influencing factors including;

- Landform and drainage
- Nature and density of development
- Vegetation patterns

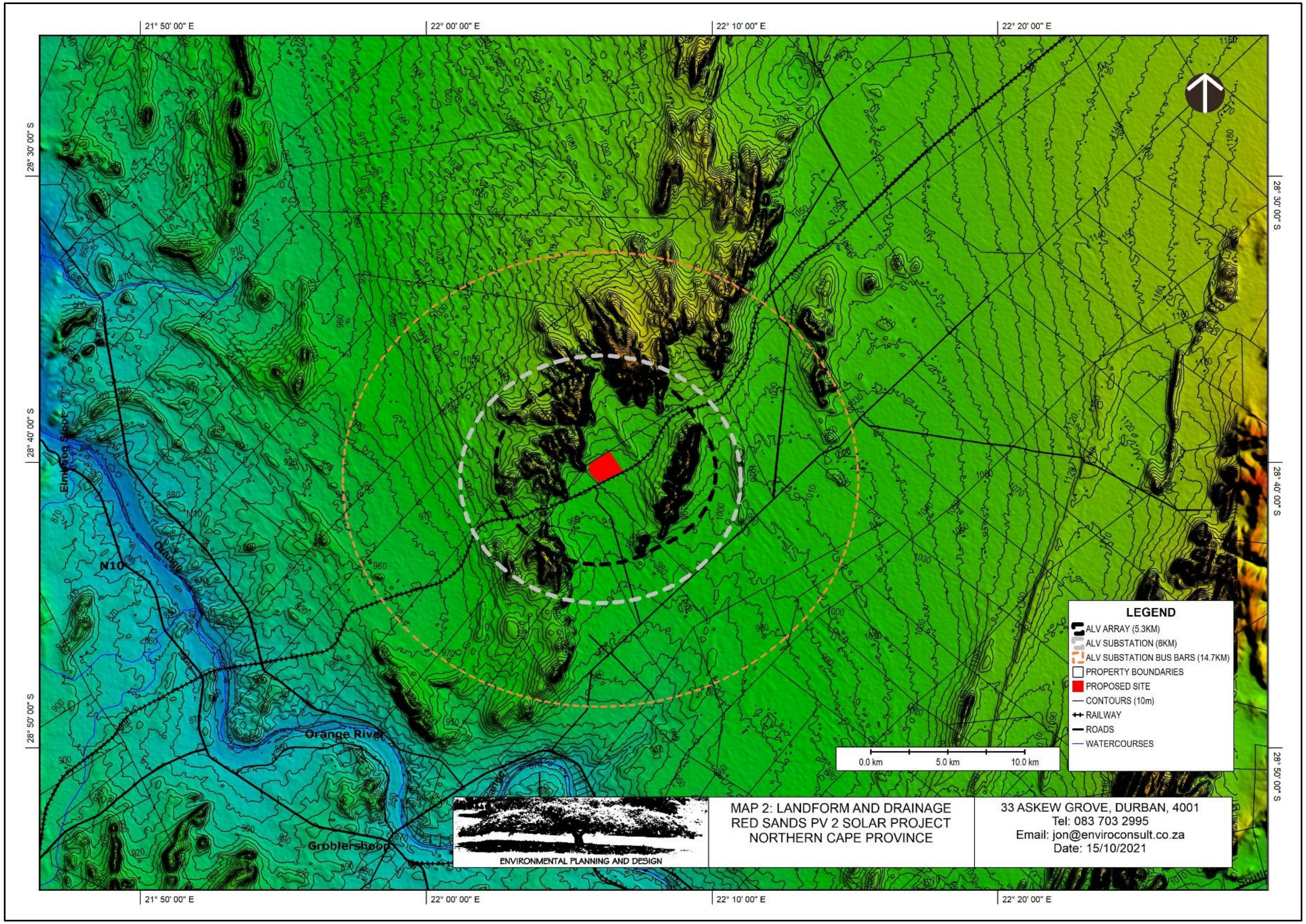
3.2.1 Landform and Drainage

The study area is located on the southern edge of the Kalahari Basin and ranges in elevation from approximately 970m amsl to about 1500m amsl at the top of local hills. The dominant topographical unit or terrain type is flat undulating plains which slope gently towards the Orange River.

The landscape is covered predominantly by pale red sands of Aeolian origin underlain by calcite. This is further underlain by granite.

Granite outcrops approximately occur within the flat plain close to the proposed site as well as immediately to the south of the Orange River forming a series of minor ridgelines that run roughly in a north to south and east west direction respectively.

The property on which the development is proposed has relatively tall ridgelines to the east and west. These ridgelines largely enclose the area on which the three Red Sands Solar Projects are located.



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Orange River
Groblershoop
N10
LEGEND
ALV ARRAY (5.3KM)
ALV SUBSTATION (8KM)
ALV SUBSTATION BUS BARS (14.7KM)
PROPERTY BOUNDARIES
PROPOSED SITE
CONTOURS (10m)
RAILWAY
ROADS
WATERCOURSES
0.0 km
5.0 km
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ENVIRONMENTAL PLANNING AND DESIGN
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The local climate is characterised by summer/autumn rainfalls with no rainfall events in winter. This means that apart from the Orange river, all water courses are non-perennial.

The Orange River flows from the south of the proposed development site and is the primary drainage feature. The Orange River is a major regional river system that has its source in the mountains on the western edge of Lesotho. This is then joined by the Vaal and flows into the sea on the West Coast where it forms the border between South Africa and Namibia.

The plain surrounding the site is incised by a number of shallow water courses that drain towards the Orange River. These water courses only run for short periods of time during and after summer and autumn rains.

Refer to **Map 2, Landform and Drainage**.

3.2.2 Nature and Density of Development

Development within the study area can be divided into the following types;

- **Occasional farmsteads** that are scattered thinly throughout the surrounding plain. The low density of development is no doubt a product of the low agricultural potential / carrying capacity of the area. It should be noted that a number of farm properties in the vicinity of the proposed development including an adjacent property appears to be used as eco-tourism facilities (Safric Safaris / La Gratitude Farm Stay).

- **Relatively dense agricultural development** that is located close to the banks of the Orange River. This is the main development type close to the proposed site and is comprised largely of vineyards and pivot irrigated crops. The field pattern is relatively dense and is interspersed with residential and agricultural buildings. Throughout this area there are extensive irrigation schemes that are fed by an irrigation channel that runs parallel to the river. A number of homesteads within this valley also have tourism use including padstals and river-side lodges.

- **Major electrical infrastructure** which includes the Garona / Lewensaar 275kV and the Ferrum /Nieuwehoop 1 400kV overhead power lines that passes close to and through the property.

- **Railway Infrastructure** which is comprised of the Transnet Iron Ore Line that connects mining operations in the Northern Cape to the port of Saldanha in the Western Cape. This line runs through the enclosed valley within which the three Red Sands Projects are located.

- **Road infrastructure** that includes:
    - The N8 which runs close to the Orange River, in approximately 18km to the south;
    - An unsurfaced road approximately 8km to the south-east that links Groblershoop to Olifantshoek, also linking the N8 to the N14 approximately 45km to the north-west. This road provides access to the Witsand Reserve.

It is the closest public road to the proposed project as it passes to the eastern side of the enclosed valley within which the development is proposed. There is also an unsurfaced road approximately 14km to the north east that also links to the N14 to the west of Olifantshoek.

    - A private Transnet road that runs beside the Iron Ore Line. Apart from access roads to private properties, this is the only road that runs through the valley within which the development is proposed. This road runs immediately adjacent to the south-eastern site boundary.

- **The urban area of Groblershoop** which is located on the opposite side of the Orange River and approximately 26km to the south-east of the site.

- **Protected areas** including the Witsand and the Glen Lyon Nature Reserves. These reserves are located approximately 35.0km to the north-east and 14.5km to the south-east of the valley in which the proposed project is located respectively.

- **Solar Energy Projects** are planned in the area due to it being included within the Upington Renewable Energy Development Zone. There are two additional solar PV projects proposed as part of the Red Sands development and one CSP project (Bok Poort II) has been developed approximately 11km to the south-west of the proposed site.

Refer to **Map 3, Landcover**.

3.2.3 Vegetation Patterns

With the exception of the Orange River Corridor, the area is relatively arid.

The predominant land use of the arid areas is low intensity grazing and game farming this has resulted in the maintenance of a relatively natural vegetation cover.

The majority the arid plain and ridgelines are covered by low sparse grass and herbaceous vegetation. Vegetation types within and close to the site are classified as:

- **Gordonia Duneveld** which is described as *parallel dunes about 3–8 m above the plains. Open shrubland with ridges of grassland;*
- **Koranna-Langeberg Mountain Bushveld** which is described as *generally supporting open shrubland with moderately open grass cover;* and
- **Olifantshoek Plains Thornveld** which is described as *a very wide and diverse unit on plains with usually open tree and shrub layers.*

The level of VAC that is provided by this vegetation is therefore generally low.

During much of the year most of this vegetation lies dormant and is brown due to lack of water. However, during summer and autumn rains, the landscape rapidly becomes green and colourful as plants use this period to regenerate and reproduce.

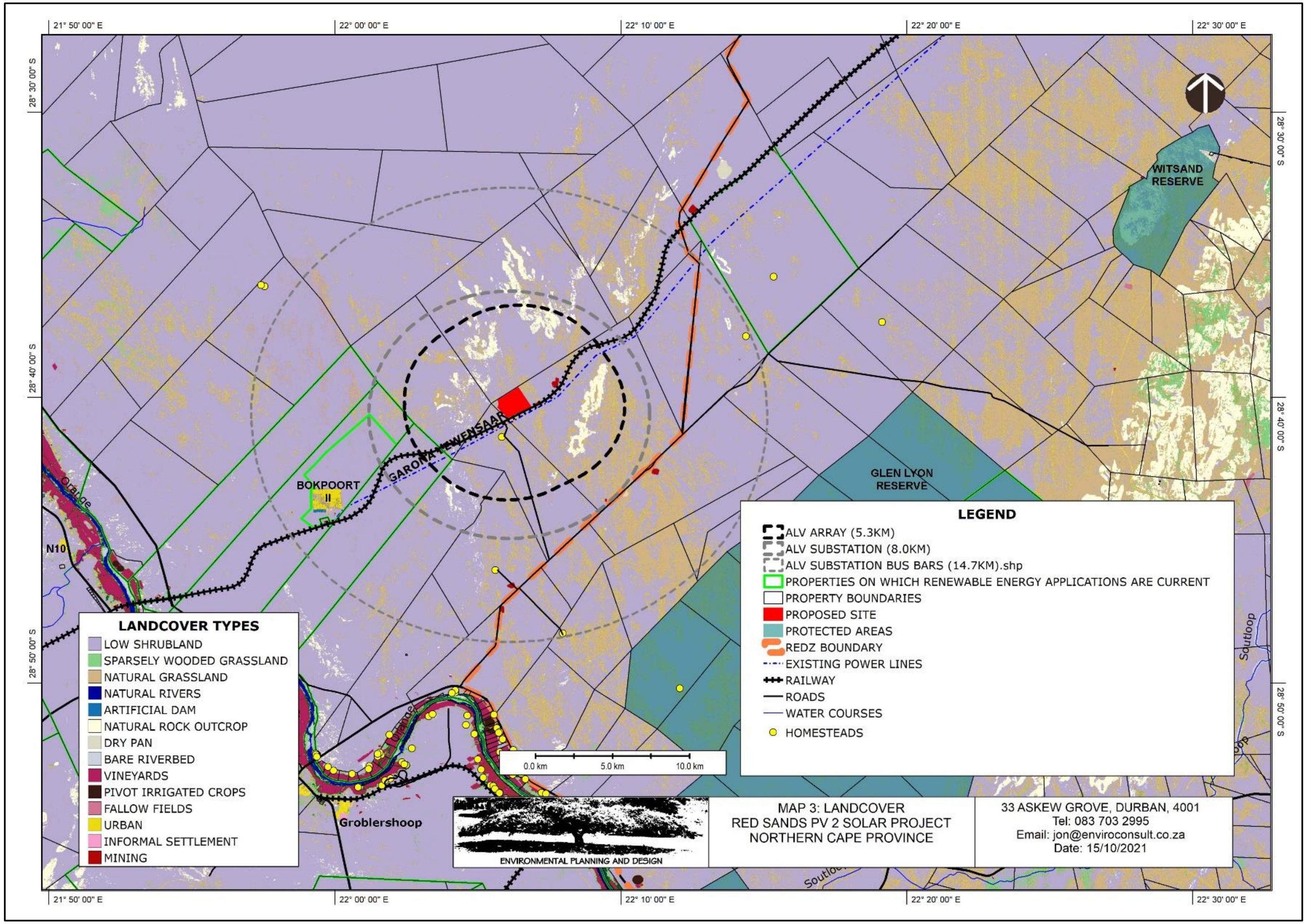
The density and height of vegetation varies considerably subject to location.

Within the river valley natural vegetation is generally comprised of:

Lower Gariep Alluvial Vegetation which is described as *flat alluvial terraces and riverine islands supporting a complex of riparian thickets.*

The Orange River is a major and permanent water course that transforms the landscape through which it flows. In arid areas, such as in the vicinity of the site, it creates a ribbon of riverine vegetation. Due to the abundance of water throughout the year, colonising species rapidly develop in uncultivated areas of the river corridor. This has led to alien infestations which include tree species. Much of the river corridor is cultivated and vineyards for wine production cover much of the flat floodplain areas.

Refer to **Map 4, Natural Vegetation**.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WITSAND RESERVE
GLEN LYON RESERVE
BOKPOORT II
GARONA KEWENSAAR
N10
Orange
Groblershoop
Soutloop
LANDCOVER TYPES
LOW SHRUBLAND
SPARSELY WOODED GRASSLAND
NATURAL GRASSLAND
NATURAL RIVERS
ARTIFICIAL DAM
NATURAL ROCK OUTCROP
DRY PAN
BARE RIVERBED
VINEYARDS
PIVOT IRRIGATED CROPS
FALLOW FIELDS
URBAN
INFORMAL SETTLEMENT
MINING
LEGEND
ALV ARRAY (5.3KM)
ALV SUBSTATION (8.0KM)
ALV SUBSTATION BUS BARS (14.7KM).shp
PROPERTIES ON WHICH RENEWABLE ENERGY APPLICATIONS ARE CURRENT
PROPERTY BOUNDARIES
PROPOSED SITE
PROTECTED AREAS
REDZ BOUNDARY
EXISTING POWER LINES
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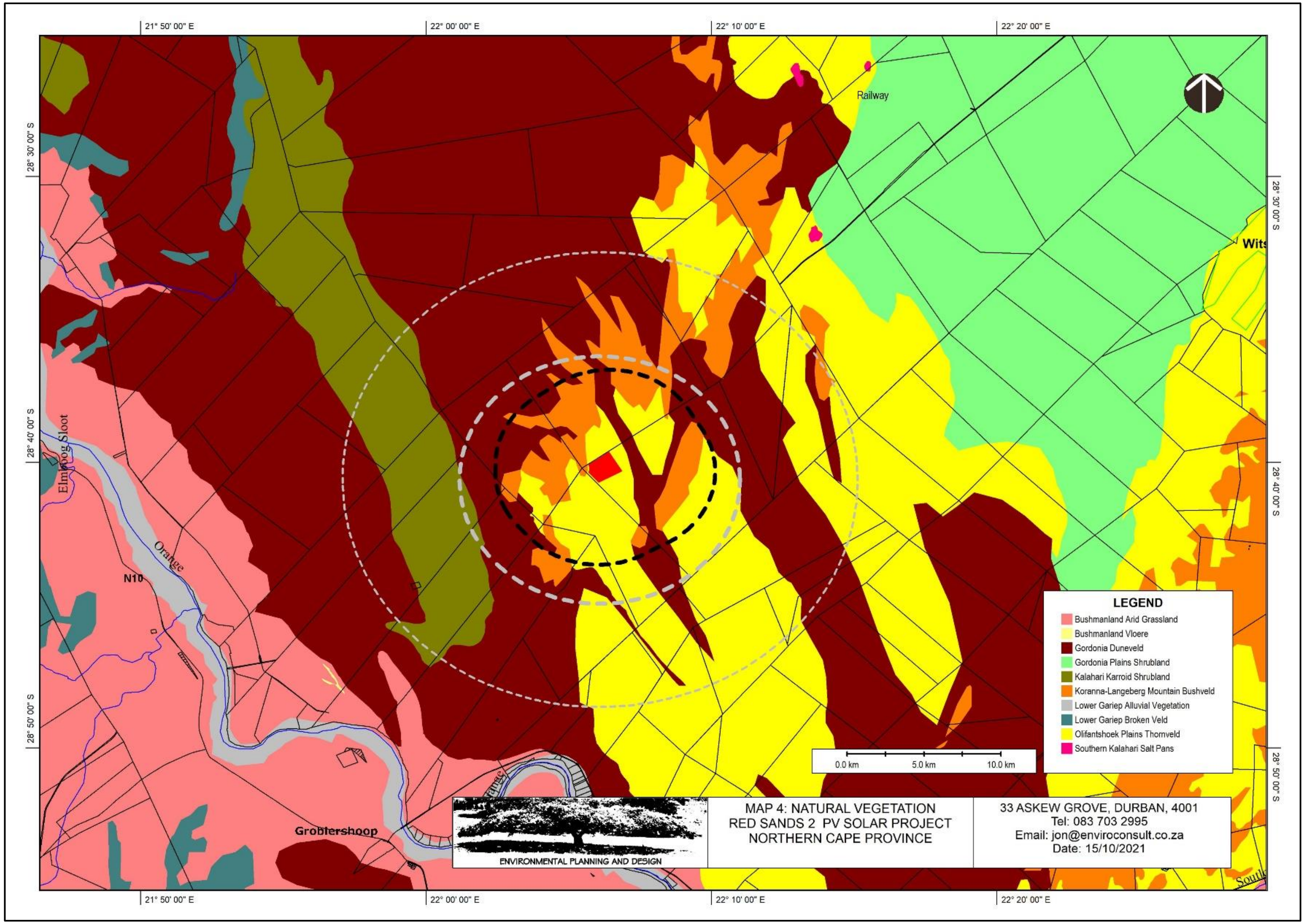
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Railway
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Groblershoop
LEGEND
Bushmanland Arid Grassland
Bushmanland Vloere
Gordonia Duneveld
Gordonia Plains Shrubland
Kalahari Karroid Shrubland
Koranna-Langeberg Mountain Bushveld
Lower Gariep Alluvial Vegetation
Lower Gariep Broken Veld
Olifantshoek Plains Thornveld
Southern Kalahari Salt Pans
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MAP 4: NATURAL VEGETATION
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3.3 LANDSCAPE CHARACTER AREAS

Landscape Character Areas (LCAs) are defined as "single unique areas which are the discrete geographical areas of a particular landscape type".

The affected landscape can be broadly divided into the following LCAs that are largely defined by landform and vegetation.

- **Low Undulating plain.** Gently undulating topography with low intensity grazing / game farming, low level grassland / shrub land, occasional non perennial streams, occasional farmstead. This LCA is characteristic of the Nama Karoo. It is important as both an agricultural and a tourism resource.
- **The Orange River Corridor** which is generally lower than the proposed development area and is comprised of open cultivated land with numerous agricultural buildings. The fringes of the LCA and areas around farm structures are also largely covered with taller woody vegetation. This LCA provides a marked contrast to the arid plain that surrounds it. Its primary importance is as an agricultural resource. It also has significant importance for tourism and recreation.
- **Ridgelines** consisting of low north south running ridgelines in the vicinity of the site and slightly taller east west running ridgelines to the south of the Orange River. These areas have little direct agricultural or tourism significance. In visual terms, they provide dramatic contrast with the flat plain that surrounds them.
- **Urban Area of Roblershoop** which is important as a living and working area. This is a relatively dense urban area that has probably grown due to its location as a bridging on the Orange River. It is also important as an agricultural service centre.

The two protected areas (Witsand and Glen Lyon) in the vicinity of the proposed project are part of the low Undulating Plain LCA. Because these areas are likely to be important for tourism and visitors might expect to experience a natural environment, this elevates their significance.

These LCAs have been ground truthed and mapped, **refer to Map 5**.

3.4 VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) is *defined* as the landscape's ability to absorb physical changes without transformation in its visual character and quality. Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element. The scale and texture of a landscape is also critical in providing VAC, for example; a new large scale industrial development located within a rural small scale field pattern is likely to be all the more obvious due to its scale.

Visual Absorption Capacity (VAC) of the landscape varies between the LCAs ;

- **Low Undulating Plain -** VAC is provided by gentle undulations and low vegetation. VAC is sufficient to have a significant effect in screening the majority of the proposed development from surrounding areas with the exception of areas that are elevated relative to the proposed development site.

- **The Orange River Corridor** is depressed below the level of the adjacent plain. On the river bank opposite Groblershoop there are also a series of minor ridgelines that rise above the plain to the north providing an elevated viewpoint over the area to the north and screening views from the southern bank. Because of the level difference and the extent of tall vegetation particularly on the margins of the corridor views from within the corridor are generally restricted to the immediate area of the corridor and higher adjacent ridgelines to the south. The taller vegetation on the fringes of the corridor also provide screening from the lower areas immediately beside the corridor making it difficult to obtain clear views across and into the river corridor.
- **Ridgelines** have an important screening effect. The ridgelines to the east and west of the proposed project are likely to largely limit views of the proposed development to the enclosed valley in which it is located.
- **Urban area of Groblershoop** which is a relatively dense settlement. Views from within the settlement are generally screened by vegetation and surrounding buildings. Views over the surrounding landscape are only likely to be possible from the urban edges.

3.5 FUTURE LANDSCAPE CHANGE

Future landscape change appears to be inevitable due to the potential development of solar power projects in the area. This development is exacerbated by the fact that the area falls within a Renewable Energy Development Zone.

Properties on which solar power projects are likely are highlighted on Map 5.

One project, the Bokpoort Solar CSP facility, has been constructed.

There are also two additional Solar PV projects (Red Sands PV 1 and 3) that are located and within close proximity and within the same valley as Red Sands PV 2 project.

These projects could add a number of industrial elements to the local landscape.

PLATE 4, THE BOKPOORT CSP SOLAR PROJECT

3.6 VISUAL RECEPTORS

3.6.1 Definition.

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal".

It is also possible that an area might be sensitive due to an existing use. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

3.6.2 Possible visual receptors.

This section is intended to highlight possible Receptors within the landscape which due to use could be sensitive to landscape change. They include:

- **Area Receptors** which include activity areas that could be sensitive to their outlook as sporting or tourism areas. Area receptor identified include;
    - The Witsand Nature Reserve;
    - The Glen Lyon Nature Reserve; and
    - The Groblershoop Urban Area.
- **Linear Receptors** which include the N10, the N8 as well as the two local unsurfaced routes that run to the east and north of the proposed development.
- **Point Receptors** include isolated and small groups of homesteads that are generally associated with and located within the low undulating plain as well as the homesteads on the agricultural land in the Orange River Corridor.

Due to the surrounding ridgelines and the relatively low nature of the proposed facility, affected receptors are likely to be limited to local homesteads as well as an unsurfaced local road that is located to the south and east of the proposed project.

Possible visual receptors or areas, places and routes that may be sensitive to landscape change are indicated on **Map 5 indicating the Landscape Character Areas.**

LANDSCAPE CHARACTER AREAS

PLATE 5, LOW UNDULATING PLAIN

PLATE 6, ORANGE RIVER CORRIDOR
The river is the main regional drainage feature.

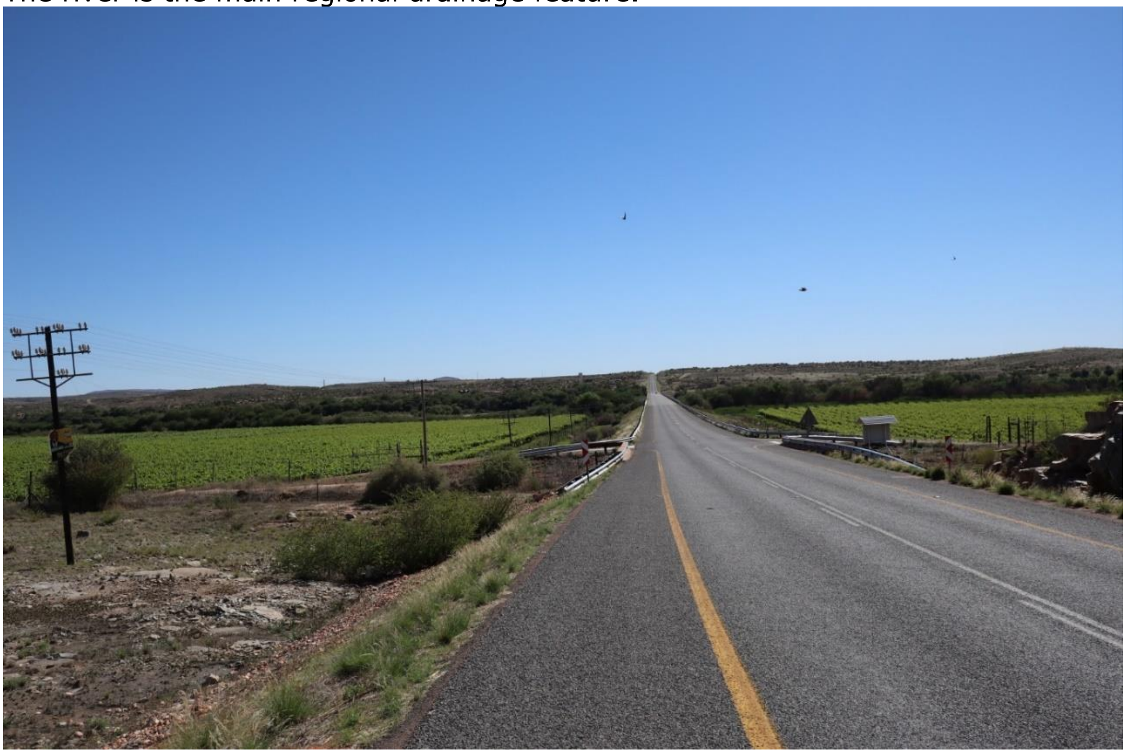


PLATE 7, ORANGE RIVER CORRIDOR
The river corridor including irrigates agriculture is relatively deeply depressed below the level of surrounding plains which means that views from the corridor towards the proposed development are screened.

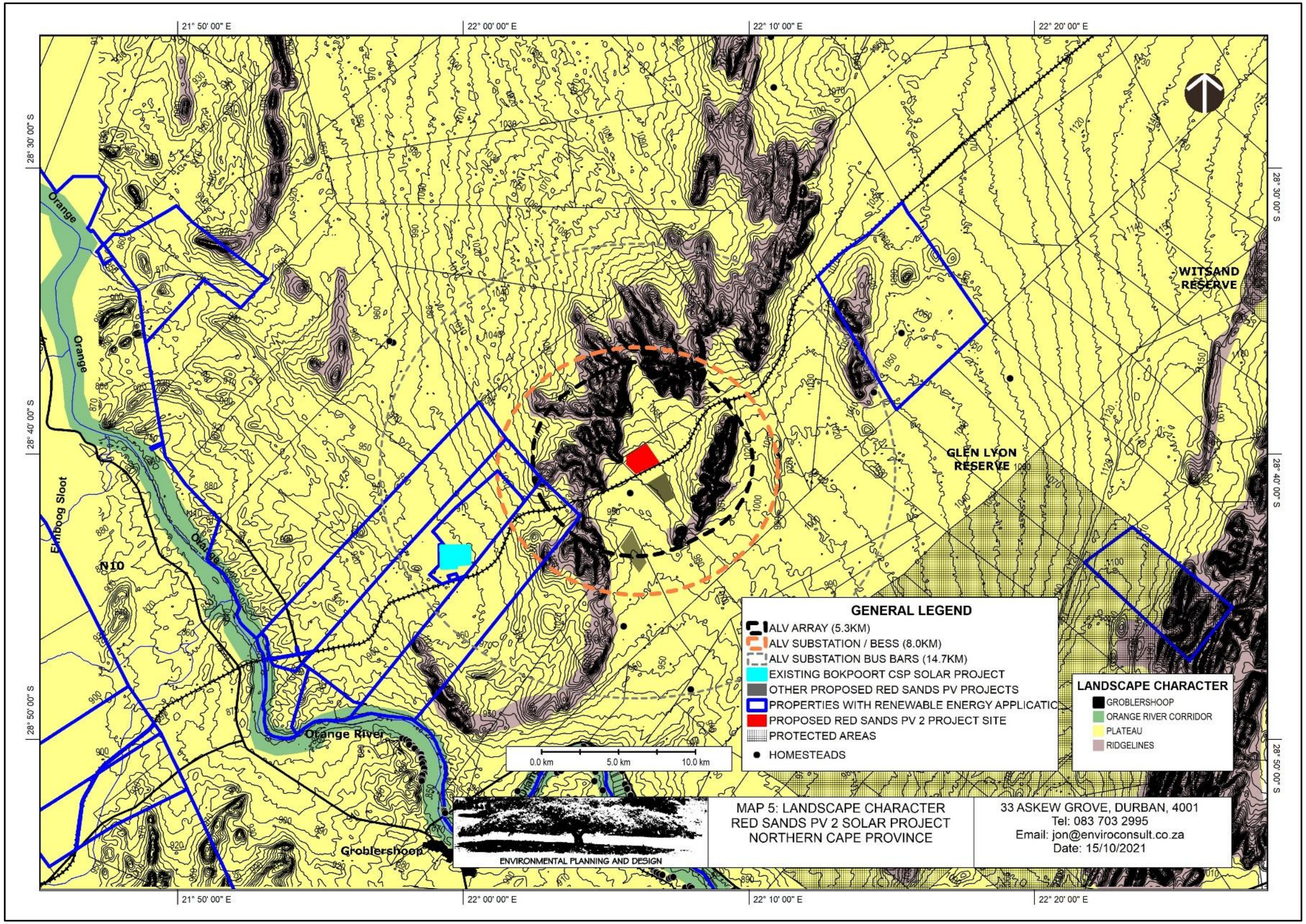
PLATE 8, UPLAND AREAS

PLATE 9, URBAN AREA OF GROBLERSHOOP

VISUAL RECEPTORS

PLATE 10, UNSURFACED LOCAL ROAD TO THE SOUTH AND EAST OF THE PROPOSED PROJECT

PLATE 11, HOMESTEADS



GENERAL LEGEND
ALV ARRAY (5.3KM)
ALV SUBSTATION / BESS (8.0KM)
ALV SUBSTATION BUS BARS (14.7KM)
EXISTING BOKPOORT CSP SOLAR PROJECT
OTHER PROPOSED RED SANDS PV PROJECTS
PROPERTIES WITH RENEWABLE ENERGY APPLICATIC
PROPOSED RED SANDS PV 2 PROJECT SITE
PROTECTED AREAS
HOMESTEADS
LANDSCAPE CHARACTER
GROBLERSHOOP
ORANGE RIVER CORRIDOR
PLATEAU
RIDGELINES
WITSAND RESERVE
GLEN LYON RESERVE
Orange River
Groblershoop
Eimboog Sloot
N10
0.0 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 5: LANDSCAPE CHARACTER
RED SANDS PV 2 SOLAR PROJECT
NORTHERN CAPE PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/10/2021
21° 50' 00" E
22° 00' 00" E
22° 10' 00" E
22° 20' 00" E
28° 30' 00" S
28° 40' 00" S
28° 50' 00" S

3.7 LANDSCAPE IMPORTANCE AND SENSITIVITY OF VISUAL RECEPTORS

It is difficult to define hard and fast criteria for assessment of subjective issues. In order to provide both consistency and transparency to the assessment process, the table below defines the criteria that have been used to guide the judgement as to the sensitivity of the various visual receptors in their interaction with the identified LCAs.

SIGNIFICANCE	LCA	RECEPTORS
Low	Areas not recognised as having specific landscape value **The Urban LCA;**	Viewers' attention not focused on landscape. These include: • **Residential, commercial and industrial areas within Groblershoop.**
Medium	Landscape value is recognised locally, but is not protected; the landscape is relatively intact, with a distinctive character; and the landscape is reasonably tolerant of change. These areas include: • **The Orange River Corridor LCA;** • **The Low Undulating Plain LCA; and** • **The Ridgeline LCA.**	Viewers' attention may be focused on landscape. These include: • **Homesteads; and** • **Users of main and local roads.**
High	The qualities for which the landscape is valued are in a good condition, with a clearly apparent distinctive character. This distinctive character is susceptible to relatively small changes. These areas include: • **The protected sections of the Low Undulating Plain LCA (Witsand and Glen Lyon Reserves).**	Viewers' attention very likely to be focused on landscape, e.g. people experiencing views from important landscape features of local physical, cultural or historic interest and beauty spots. Large number of viewers and/or location in a highly valued landscape could elevate viewer sensitivity to the highest level. These include: • **Visitors to the protected areas of Witsand and Glen Lyon Reserves.**

4 THE GENERAL NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general degradation of the relatively natural landscape in which the development is proposed as well as change of view for affected people and / or activities;

a. Generally landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements that are visible. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements.
b. Change in specific views for specific receptors for which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has however been removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, the judgement is based on the level of dependency of the use in question on existing landscape characteristics.
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

Due to the nature of the proposed development, visual impacts for receptors are expected to relate largely to intrusion. This however is likely to be moderated by the fact that the existing and authorised solar facilities have and will alter the natural character of the landscape.

4.2 THE NATURE OF LIKELY VIEWS OF THE DEVELOPMENT

4.2.1 General

During the construction phase, it is expected that traffic will slightly increase as trucks will be required to transport materials and equipment such as PV panels and frames to the site.

Site preparation will generally include the following activities:

- vegetation clearance – removal or cutting of any vegetation if present (bush cutting);

- levelling and grading of areas where the array will be sited would normally occur, the assessment indicates that the land is relatively flat so only minor grading should be required;
- levelling of hard-standing areas, e.g. for temporary laydown and storage areas, as indicated above only minor grading is likely to be necessary;
- erection of site fencing;
- construction of a temporary construction camp which will occur within a lay down area within the overall site.

These activities are only likely to be visible from the immediate vicinity of the site.

These activities are only likely to be visible from the immediate vicinity of the site.

As the site is developed, the support structures will be assembled and PV panels attached, ancillary structures and minor buildings for electrical equipment and monitoring of the operation will also be constructed.

The development will therefore appear on a progressive basis in the landscape.

The construction of the proposed IPP section of the on-site substation will follow a similar pattern.

Construction of the PV solar plant is likely to take approximately 6 to 12 months from commencement and 12 to 18 month for the electrical infrastructure i.e. connection to Eskom's main grid.

By the end of the construction process, the array will be assembled and minor buildings for electrical equipment and monitoring of the operation constructed and the full visual impact of the project will be experienced.

The operational phase is highly unlikely to result in any significant additional impact. It is likely however, that work crews will be visible from time to time undertaking maintenance within the facility.

The main visible elements therefore are likely to include:

1. The solar array including minor buildings and structures located within a fence line with an associated on-site substation that is slightly taller than surrounding elements; and
2. The proposed on-site substation.
3. Operational and security lighting at night.

4.2.2 The likely Nature of Views of the Proposed Solar Array

The proposed project layout is indicated on **Figure 3**. If a fixed array is used, the PV panels will be mounted on supports and orientated to face north.

Continuous supports aligned in rows are generally used when the PV panels are fixed and are set at an angle and direction to maximise the average efficiency during the day or have a basic tracking set up that varies the angle of tilt of the unit in order to improve efficiency.

From areas to the north a solar array, whether constructed on individual supports or continuous rows, is likely to appear as a continuous structure in the landscape.

The nature of the impact is also likely to vary with location and elevation;

- If the array is located on a hillside or if it is viewed from a higher level, the rows of PV units are likely to visually combine and will be read as a single unit. From a distance this results in a PV array having a similar appearance as a large industrial structure when viewed from above. It should be noted that the proposed project will not be viewed from a higher elevation and so this type of view will not apply;
- From the north and if the project is viewed from a similar level, the front row of PV units will be seen in elevation. This is likely to result in the project being seen as a continuous dark line in the landscape possibly with slightly higher elements such as the on-site substation extending above the line. How prominent the dark line is, is likely to be dependent on the distance of the viewer from the project as well as the extent to which the view of the elevation is broken by other elements such as vegetation and landform.
- From the south, east and west the dark face of the PV units is not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. With distance however, the shadow cast by the structures is likely to be more obvious and the facility will probably appear much as the northern face, a long dark structure.
- If the landscape does not have significant Visual Absorption Capacity (VAC), because of the contrast in colour with the surrounding landscape, the array could be visible to the limit of visibility. Subject to the colour and reflectivity of the underside of the PV units and supporting structure, it is possible that a similar level of impact could also be experienced from the south, east and west. It should be noted that the VAC of the landscape surrounding the proposed development is largely dependent on minor ridgelines.
- Mitigation or screening of views is possible at least from close views. This can be achieved either by earthworks berms by planting or by a combination of both. From a distance and particularly from elevated viewpoints, mitigation is likely to be less feasible as the height of any screen is likely to cast shadow over the PV units.
- In addition to the way that a solar array may change a landscape, the nuisance factor associated with resulting glare is often raised by stakeholders on similar projects. PV units, however, are designed to absorb as much energy as possible and are designed not to reflect light. This issue is generally more likely to be associated with a focussed array which tracks the sun's path during the day and uses reflective surfaces to focus energy onto receptors. It is therefore not expected that this will be a significant issue with a PV array such as the one proposed.

PLATE 12 - PV ARRAY VIEWED FROM ABOVE
Note: The array rows are read as one and have a similar impact as the roof of a large industrial building.

PLATE 13 - PV ARRAY VIEWED FROM BEHIND AND THE SIDE
Note: The dark face of the PV units are not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. This might appear as a long industrial structure from close quarters. From a distance

however, the shadow cast by the structure will be read and will probably appear similar in nature to the front view of the array.

The site and immediate surrounding area within which stakeholders are likely to see the proposed facility from is relatively flat. This means that the array is likely to be viewed either in elevation or as an acute elevated view.

A new solar array has been developed adjacent to Upington Airport. This array has been developed in two sections on either side of the airport runway. It is somewhat smaller than the subject project, covering approximately 25ha and the longest edge of the array being approximately 500m long. The PV panels are mounted on fixed frames approximately 2m high. Despite obvious differences compared with the proposed project, it does illustrate the effect of distance in mitigating the visibility of the solid line of solar panels.

Plate 14 indicates the location of the existing array at Upington Airport. **Plates 15, 16 and 17**, illustrate how the array is seen from distances of approximately 700m, 1500m and 5000m respectively.

The following effects are noted;

- From 700m the array is clearly visible.
- From 1500m, the array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is visible but might be missed by a casual viewer.
- From 5000m, the line of panels is indistinguishable from the horizon.

The proposed array has a similar height as the illustrated array, therefore it is likely to have a similar level of impact.

A single axis tracking system could slightly increase the height of structures particularly during late afternoon and early morning when the units are tilted to their fullest extent. During the day as the sun is higher in the sky, the height of a tracking system reduces as the panels align to maximise exposure to solar radiation.

PLATE 14, EXISTING SOLAR ARRAYS AT UPINGTON AIRPORT AS SEEN FROM THE AIR

PLATE 15, EXISTING ARRAY SEEN IN A FLAT LANDSCAPE FROM APPROXIMATELY 700M. THE ARRAY IS CLEARLY VISIBLE.

PLATE 16, EXISTING ARRAY SEEN IN A FLAT LANDSCAPE FROM APPROXIMATELY 1500M

The array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is clearly visible but might be missed by a casual viewer who was not aware of its existence.

PLATE 17, EXISTING ARRAY SEEN IN A FLAT LANDSCAPE FROM APPROXIMATELY 5000M.

The line of panels is barely distinguishable. The viewer would have to know where to look to be able to differentiate the array from surrounding landscape features.

4.2.3 The likely Nature of Views of the Proposed On-Site Substation and BESS

The proposed on-site substation is reported to have solid elements up to 5m high. These are likely to be comprised of transformers, minor buildings and a security fence and will appear as relatively solid elements over the height of the adjacent array. It should be noted that the Battery Energy Storage System, if installed, will be located within and will be viewed as part of the substation. These elements will be viewed as an isolated higher section of the development. It is likely that other taller elements within the substation will largely be comprised of steel lattice structures such as bus bars that will facilitate the connection to the Eskom section of the substation. Whilst they may be visible over a wider area they are likely to be relatively transparent.

4.2.4 Glare from the PV array

A common misconception about solar photovoltaic (PV) panels is that they inherently cause or create glare, posing a nuisance to neighbours. While in certain situations the glass surfaces of solar PV systems can produce glint (a momentary flash of bright light) and glare (a reflection of bright light for a longer duration). Light absorption, rather than reflection, is central to the function of a solar PV panel - to absorb solar radiation and convert it to electricity. Solar PV panels are constructed of dark-coloured (usually blue or black) materials and are covered with anti-reflective coatings. As long as they are aligned to absorb maximum energy, modern PV panels reflect as little as two percent of incoming sunlight, about the same as water and less than soil. This means that glare is less likely to be associated with tracking systems than fixed systems.

Some of the concern and misconception is likely due to the confusion between solar PV systems and concentrated solar power (CSP) systems. CSP systems typically use an array of mirrors to reflect sunlight to heat water or other fluids to create steam that turns an electric generator[2].

Glare generally occurs when the sun is low in the sky and the angle of incidence is such that light is reflected rather than refracted through the panel surface. The risk of this occurring is therefore highest during early morning and late afternoon.

Affected areas during the early morning will generally vary from the west of the array during summer months to the north west of the array during winter months when the rising sun is further north.

Affected areas during the late afternoon will generally vary from the east of the array during summer months to the north east of the array during winter months when the setting sun is further north.

Because glare is reflected light from an inclined panel, it will generally affect areas above the level of the panel surface.

[2] US Department of Energy

PLATE 18 - GLARE EXPERIENCED IN THE CONTROL TOWER AT BOSTON REGIONAL AIRPORT FROM A PV ARRAY

4.2.5 Security Lighting

The facility will be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This could result in the array being obvious at night from surrounding areas.

4.2.6 Site Access Road

The proposed access road alignment is likely to cause relatively low levels of visual impact.

In a flat landscape, road construction is likely to only have an impact on the area immediately surrounding it. Whilst a busy road might be visible from a distance due to vehicles being obvious, for much of the time a road that is lightly used where disturbance of surrounding vegetation has been minimised is unlikely to be obvious past 100m from the road edge.

5 VISIBILITY AND THE LIKELY NATURE OF VIEWS OF THE PROPOSED DEVELOPMENT

5.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map usually digitally produced showing areas of land within which a development is theoretically visible"[3].

ZVTs of the proposed development have been assessed using the viewshed tool in Global Mapper GIS.

The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping.

The ZTV has been calculated from terrain data only, existing vegetation and / or other development could have a modifying effect on the areas indicated.

5.2 THE EXTENT OF POSSIBLE IMPACTS

The bulk of the proposed project is comprised of the array of PV panels. The majority of other elements including the inverters and buildings will be located amongst the array and will be a similar or lower height as the array.

The tallest elements are likely to be the transformers associated with the on-site substation and the BESS. These will be solid elements and could be in the order of 5m high. Other electrical infrastructure such as the bus bars to which the power lines will connect may be taller up to 17m high, but these will be largely comprised of lattice structures that are likely to be relatively transparent.

The development can therefore be described as mainly being comprised of elements of a similar height but with isolated taller elements.

In order to provide an indication of the likely limit of visibility, a universally accepted navigational formula has been used to calculate the likely distance that the proposed structures might be visible over (**Appendix III**). This indicates that in a flat landscape the proposed structures may be visible for the following distances;

Approximate limit of Visibility (ALV)

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Solar PV panels, up to 2.2m	5.3 kilometres
Substation solid structures and BESS, up to 5m high	8.0 kilometres
Substation bus bars, up to 17m high	14.7 kilometres

[3] UK Guidelines

In reality these distances are likely to be reduced by:

- Weather conditions that limit visibility. This could include hazy conditions during fine weather as well as mist and rain;
- Scale and colour of individual elements making it difficult to differentiate structures from background; and
- The fact that as the viewer gets further away, the apparent height of visible elements reduces. At the limit of visibility it will only be possible that the very tip of an object may be visible. This reducing scale means that an object will become increasingly more difficult to see as the distance from it increases.

It is also possible that should the viewer be elevated significantly above the level of the proposed project, this could increase the limit of visibility. However, given that the proposed project is surrounded by relatively tall ridgelines that are generally located within the approximate limit of visibility and the relative flatness of the general landscape, it seems unlikely that elevated areas outside the ALV are likely to be significant in this respect.

The identified ALVs have been used to define an initial study area and they are indicated on mapping.

The extent of views of the Laydown areas are difficult to assess. It is likely that equipment stored in this area will be of similar height or lower than the proposed substation. For this reason it is assumed that equipment stockpiled will be visible or will be incorporated into views of the substation. It is possible however that from time to time the use of larger equipment such a cranes could make lay down areas more obvious.

5.3 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map usually digitally produced showing areas of land within which a development is theoretically visible"[4].

ZTVs of the proposed development have been assessed using the Global Mapper Viewshed Tool.

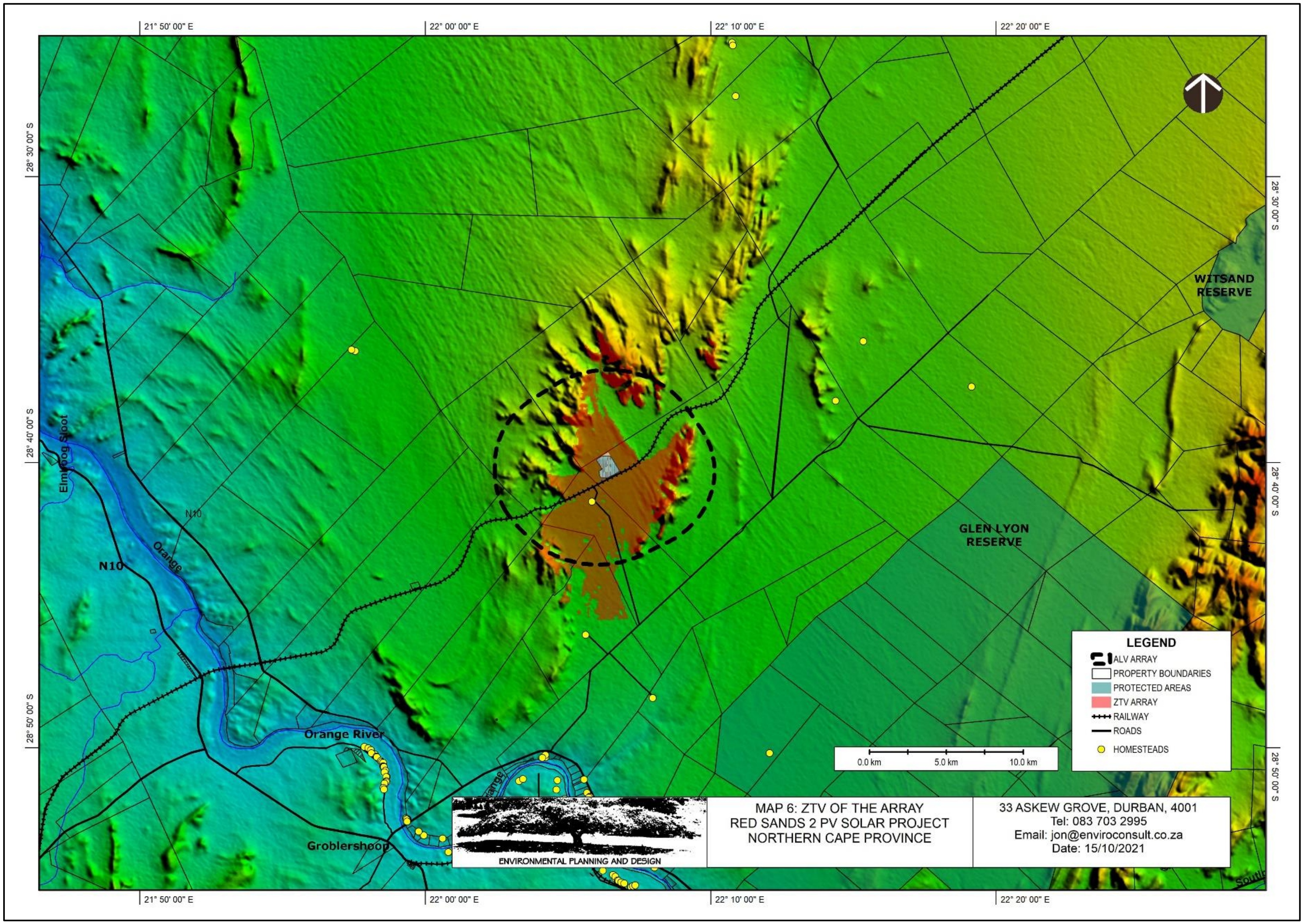
The detailed location of the proposed array has been provided by the developer **(Figure 1)**. In order to generate the ZTV for the proposed array, it has been assumed that entire area of the array will be set at a uniform maximum height of up to 2.2m for the Solar PV plant and 3 meters for single units within the BESS plant, if installed. Points have been set at each change in direction of the array boundary, an additional point at the centre of the array and a high points in the development footprint all with 2.2m offsets for generation of the ZTV using the Viewshed tool in Global Mapper GIS.

Similar methodology was adopted for the solid structures including transformers and BESS substation locations using a 5m offset and Bus Bars using a 17m offset..

[4] UK Guidelines

The ZTV analysis is indicated on the following maps:

- **Map 6** indicates the ZTV for the proposed PV array and internal infrastructure; and
- **Map 7** provides a ZTV assessment of the likely visibility of the solid structures and Bus Bars.
- **Map 8** provides a ZTV assessment of the cumulative visibility of all three proposed Red Sands Solar Projects. It should be noted that because the bus bars are relatively transparent, this assessment only includes the solid elements associated with the array, substation and BESS.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22° 20' 00" E
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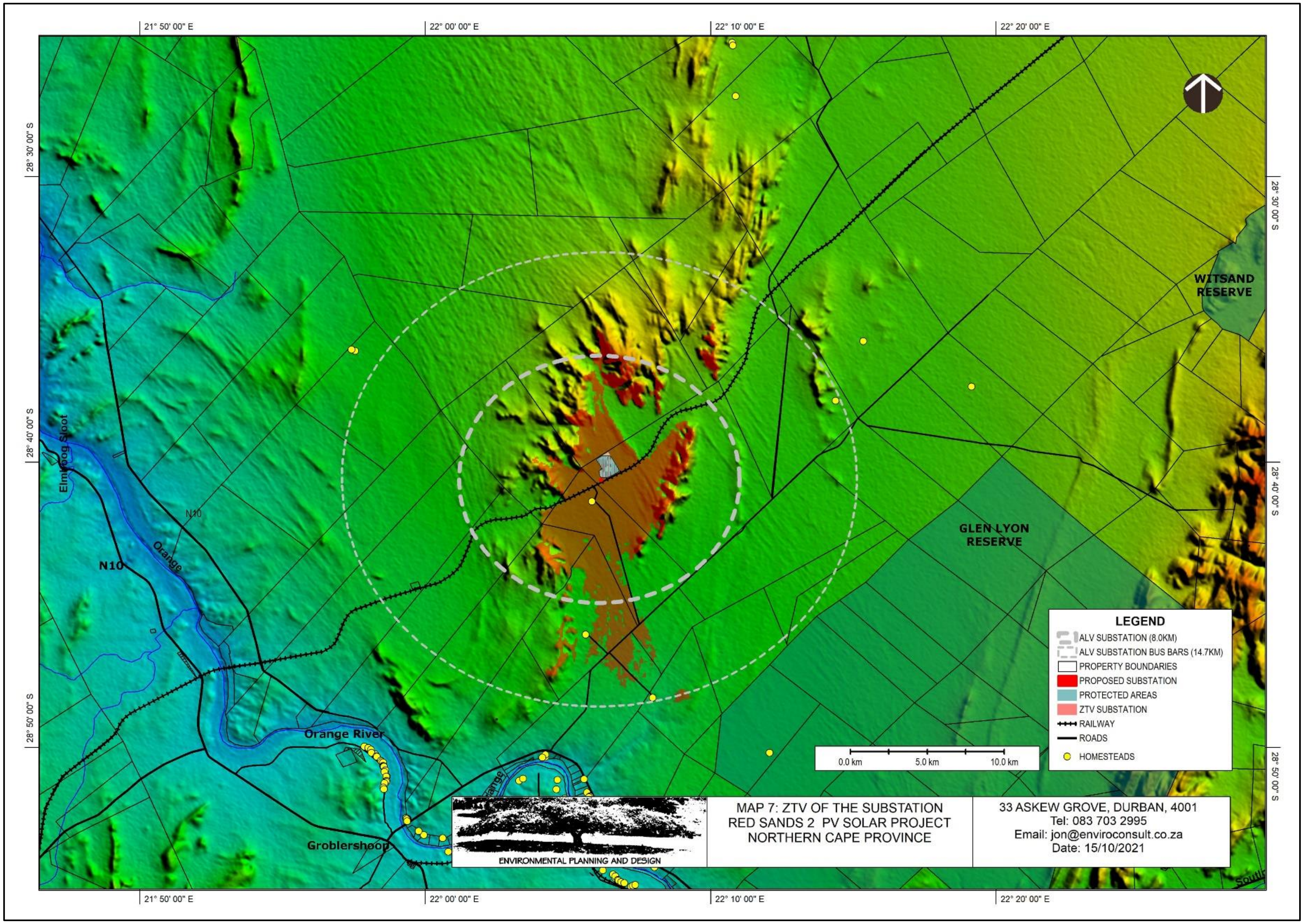
28° 50' 00" S
WITSAND RESERVE
GLEN LYON RESERVE
Elmboog Sloot
N10
Orange
Orange River
Groblershoop
LEGEND
ALV ARRAY
PROPERTY BOUNDARIES
PROTECTED AREAS
ZTV ARRAY
RAILWAY
ROADS
HOMESTEADS
0.0 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 6: ZTV OF THE ARRAY
RED SANDS 2 PV SOLAR PROJECT
NORTHERN CAPE PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/10/2021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ALV SUBSTATION (8.0KM)
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PROPERTY BOUNDARIES
PROPOSED SUBSTATION
PROTECTED AREAS
ZTV SUBSTATION
RAILWAY
ROADS
HOMESTEADS
0.0 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 7: ZTV OF THE SUBSTATION
RED SANDS 2 PV SOLAR PROJECT
NORTHERN CAPE PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
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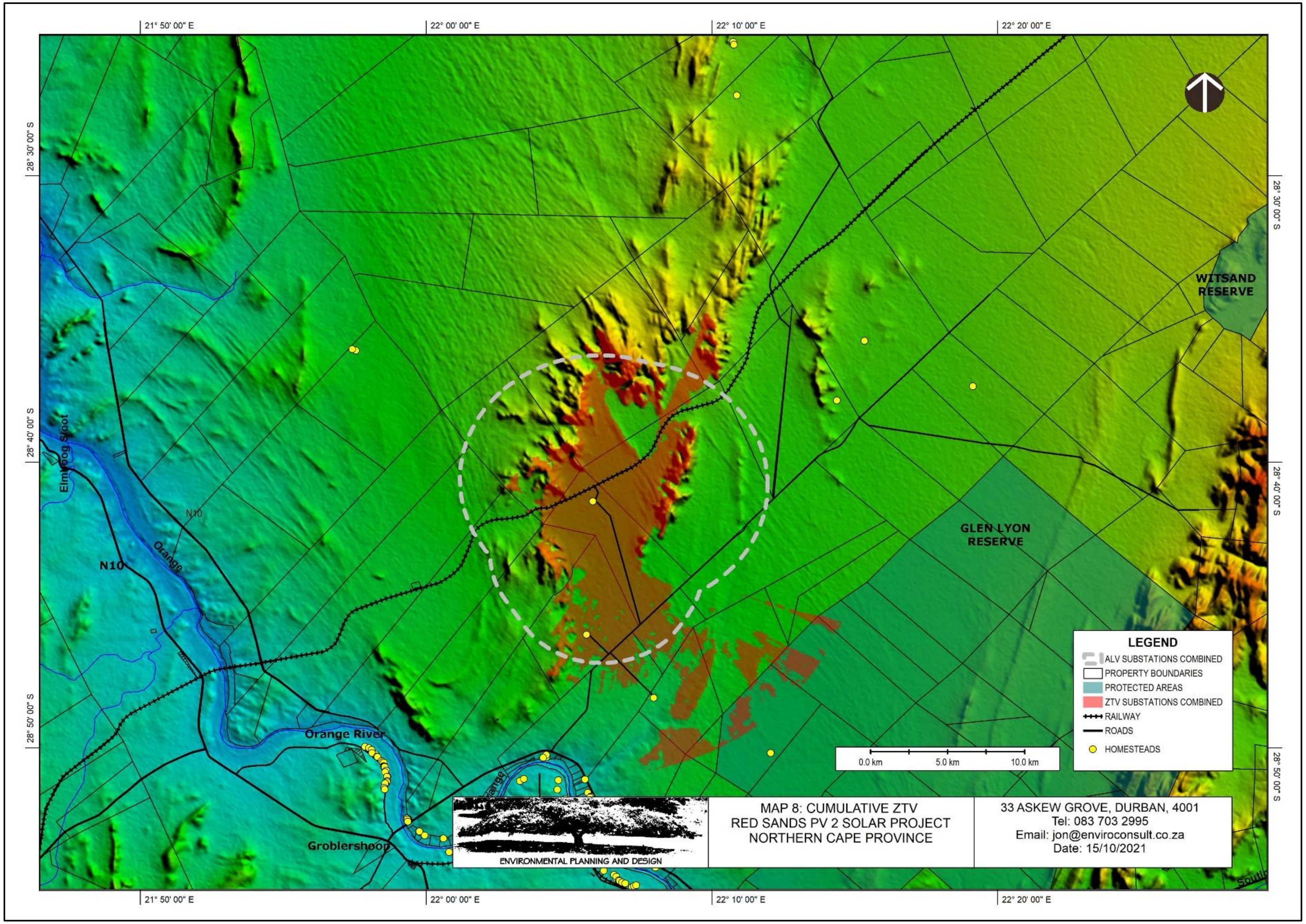
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PROPERTY BOUNDARIES
PROTECTED AREAS
ZTV SUBSTATIONS COMBINED
RAILWAY
ROADS
HOMESTEADS
0.0 km
5.0 km
10.0 km
ENVIRONMENTAL PLANNING AND DESIGN
MAP 8: CUMULATIVE ZTV
RED SANDS PV 2 SOLAR PROJECT
NORTHERN CAPE PROVINCE
33 ASKEW GROVE, DURBAN, 4001
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 15/10/2021

5.3.1 Visibility

The assessment indicates that the proposed project may be visible to the following areas:

i. The proposed array and substation are likely to be visible over similar areas;
ii. Views of the proposed array and the substation will be significantly constrained to the north, east and west by a series of ridgelines that are located well within the ALVs of the proposed elements;
iii. The surrounding ridgelines are likely to constrain views to the extent that views of the proposed project are only likely to be obvious from within the valley in which it is located. Possible views will only extend as far as the ALVs from areas to the south. From the site visit, natural vegetation that occurs in this area is likely to screen the array from the unsurfaced local road that runs to the south and east of the project. It is possible that taller elements could be visible over this vegetation, however, this too is likely to be largely screened;
iv. Due to topography, existing vegetation and distance, the proposed project is highly unlikely to be visible from protected areas and urban areas;
v. Due to topography and existing vegetation, the proposed project is unlikely to be highly obvious from the unsurfaced local road to the south and east of the proposed project. If it is visible it will only be visible from a short section (approximately 2.8km) of the road to the south of the proposed project. Only the higher sections including substation, BESS and Bus Bars may be visible.
vi. One homesteads could be affected including:
    - The project is likely to be visible from a homestead that is located approximately 1.8km to the south of the proposed solar plant. This homestead appears to have tourism importance (Safric Safaris / La Gratitude Farmstay).
vii. The proposed project is unlikely to be visible to any other sensitive receptors.

5.3.2 Glare

The closest receptors that could be affected by glare are travellers on the unsurfaced local road to the south and east of the project. The only section of this road that could be affected is approximately 10.9km directly to the south of the proposed array and only approximately 1.6km of the road is indicated by the ZTV from which views of the array could be possible. Due to distance, existing vegetation and the orientation of the proposed array, this section of the road is highly unlikely to be affected by glare.

6 VISUAL IMPACT ASSESSMENT

The previous section of the report identified specific areas where visual impacts may occur as well as their likely nature. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues.

6.1 ISSUES TO BE ADDRESSED

The following list of possible impacts have been identified;

a) The proposed development could change the character and sense of place of the landscape setting;
b) The proposed development could change the character of the landscape as seen from the local roads;
c) The proposed development could change the character of the landscape as seen from local homesteads;
d) The proposed development could change the character of the landscape as seen from nature reserves;
e) Glare impacts; and
f) Lighting impacts.

These impacts have to be addressed in terms of the proposed solar array and associated infrastructure, the alternative substation locations and the temporary lay down areas.

It should be noted that the impacts identified will all gradually increase from the current situation to the impact level indicated during the construction phase, be consistent at the impact levels indicated during the operational phase and decrease again from the levels indicated to close to the current situation during the decommissioning phase.

6.2 ASSESSMENT METHODOLOGY

The methodology for the assessment of potential visual impacts includes:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
    - ∗ local extending only as far as the development site area – assigned a score of 1;
    - ∗ limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - ∗ will have an impact on the region – assigned a score of 3;
    - ∗ will have an impact on a national scale – assigned a score of 4; or
    - ∗ will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be 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; or

* 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); and
  * 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be 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); and
  * Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be 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).

6.3 VISUAL IMPACT ASSESSMENT

6.3.1 The proposed development could change the character and sense of place of the landscape setting (Landscape Change)

Nature of impact: The proposed solar project is located within an arid landscape area with an overriding natural character.

The visual influence of the proposed project will be largely limited to the valley in which it is located.

This natural character of this area has been eroded by the development of major high voltage overhead power lines and the Iron Ore railway line and associated road access.

The proposed project will be viewed in the vicinity of these existing elements. Due to the low height of the proposed array and associated infrastructure, it is unlikely that it will extend the area from which industrialisation of the natural landscape is obvious. It will however intensify the landscape impact. From outside the valley, the impact is unlikely to be visually obvious.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Low, **(4)**	Minor, **(2)**
Probability	Probable, **(3)**	Probable, **(3)**
Significance	Medium, **(30)**	Low, **(24)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is likely that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:

Planning:

- Plan site levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site; • Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions.
Cumulative Impacts: The proposed project will intensify the current industrialisation of the natural landscape. There are also two other solar PV projects proposed in close proximity. Due to limited visibility and because the landform constrains views, the proposed projects will not extend the area over which this industrialisation is apparent. The overall cumulative impact is assessed as having a medium significance. The contribution of the proposed project to this cumulative impact is also assessed as medium. **See appendix IV.**
Residual Impacts: The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

6.3.2 The proposed development could change the character of the landscape as seen from local roads.

Nature of impact: The proposed project may only be visible from the unsurfaced local road to the south and east. No other roads will be affected. If it is visible it will only be visible from a short section of the road. Only the higher sections including substation, BESS and Bus Bars may be visible. These elements could be visible over approximately 2.8km of the road. They will be viewed at a distance of approximately 8.0km. They are therefore unlikely to be visually obvious.		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small, **(0)**	Small, **(0)**
Probability	Very improbable, **(1)**	Very improbable, **(1)**
Significance	Low, **(6)**	Low, **(6)**
Status	**Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes** but it is unlikely to result in a change in the significance rating.	
Mitigation / Management: Planning: • Design /modify layout to keep PV panels off the higher sections of the site;		

• Plan site levels to minimise earthworks to ensure that levels are not elevated; • Plan to maintain the height of structures as low as possible; • Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development; Operations: • Reinstate any areas of vegetation that have been disturbed during construction; • Remove all temporary works; • Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions; • Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. Decommissioning: • Remove infrastructure not required for the post-decommissioning use of the site; • Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions
Cumulative Impacts: No solar projects are currently visible from local roads that are accessible to the public. However, existing major infrastructure is highly obvious. The proposed project is unlikely to change this situation. The overall cumulative impact is assessed as having a medium significance, the contribution of the proposed project to this cumulative impact is assessed as negligible. **See Appendix IV.**
Residual Impacts: No residual risks.

6.3.3 The proposed development could change the character of the landscape as seen from homesteads.

Nature of impact: The ZTV analysis indicates that the array could be visible from one homestead within the 1.8km. This farmstead appears to have tourism importance (Safric Safaris / La Gratitude Farm Stay) Existing landform and vegetation is likely to at largely screen views.		
	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Minor, **(2)**	Small to Minor, **(1)**
Probability	Probable, **(3)**	Improbable, **(2)**
Significance	Low, **(24)**	Low, **(14)**
Status	The homestead within 1.8km appears to a have tourism use. Views of the project are	**Neutral to Negative**

	therefore anticipated to be **Negative**.	
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes**	

Mitigation / Management:

Planning:

- Design /modify layout to keep development off higher sections of the site;
- Plan site levels to minimise earthworks to ensure that levels are not elevated;
- Plan a 1m high planted berm on the southern edge of the project;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas for vegetation cover post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
- Rehabilitate and monitor areas for vegetation cover post-decommissioning and implement remedial actions

Cumulative Impacts:

The proposed project could intensify the current industrialisation of views from homesteads.

The proposed additional Red Sands Projects could further intensify industrialisation of the valley

The overall cumulative impact is assessed as having a medium significance, however, the contribution of the proposed project to this cumulative impact is assessed as low.
See Appendix IV.

Residual Impacts:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

6.3.4 The proposed development could change the character of the landscape as seen from Nature Reserves.

The proposed development is highly unlikely to be visible from either the Witsand or the Glen Lyon Nature Reserves.

	Without mitigation	With mitigation
Extent	Region, **(3)**	NA
Duration	Long term, **(4)**	NA
Magnitude	Small, **(0)**	NA
Probability	Very Improbable, **(1)**	NA
Significance	Low, **(7)**	NA
Status	**Neutral**	NA
Reversibility	High	NA
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	NA
Can impacts be mitigated?	**No mitigation is necessary**	

Cumulative Impacts:

No detailed assessment of the nature of views from these reserves has been undertaken, however, it is understood that there is little or no solar or industrial developments visible.

The proposed project will not add to views of solar or industrial development that may be seen from these reserves.

The overall cumulative impact is assessed as having a low significance. The contribution of the proposed project to this cumulative impact is assessed as having a negligible significance.
See Appendix IV.

Residual Impacts:

No residual impacts.

6.3.5 Glare Impacts.

Nature of impact:

The only area where glare could be problematic is on the unsurfaced local road approximately 10.9km to the south of the proposed array. Due to the fact that the array is unlikely to be visible due to vegetation, the rail track and adjacent service road and because an area due south of the array is unlikely to be affected by glare, this impact is highly unlikely.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**

Duration	Long term, **(4)**	Long term, **(4)**
Magnitude	Small, **(0)**	Small, **(0)**
Probability	Very Improbable, **(1)**	Very Improbable, **(1)**
Significance	Low, **(6)**	Low, **(6)**
Status	**Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss	**no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	Yes	
Mitigation / Management: Operations: Should glare prove problematic screening might be utilised or should a tracking system be utilised, the trackers can be programmed to prevent reflection towards affected sections of roads.		
Cumulative Impacts: The impact of glare arising from the proposed project is highly unlikely. It is possible that glare associated with other proposed projects could impact on the roads. Given that mitigation of possible impacts should be relatively simple to achieve, it is assumed that levels of impact from other projects will also be minor. The overall cumulative impact is assessed as having a low significance. The contribution of the proposed project to this cumulative impact is assessed as negligible. **See appendix IV.**		
Residual Impacts: There are no residual risks.		

6.3.6 The potential visual impact of operational, safety and security lighting of the facility at night on observers.

Nature of impact: The facility could be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas. The immediate area is relatively dark during the night. There is potential therefore for lighting to make the project obvious in the landscape at night. The most sensitive receptors to this effect are likely to be the Private Nature Reserves. The adjacent property to the south may also be sensitive as it is understood to include tourism accommodation.		
	Without mitigation	**With mitigation**
Extent	Region **(3)**	Site **(1)**

Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Small to minor **(1)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Medium **(33)**	Low **(12)**
Status	**Negative**	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**
Irreplaceable loss	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Reversibility	High	High
Can impacts be mitigated?	Yes	

Mitigation / Management:

- Use low key lighting around buildings and operational areas that is triggered only when people are present.
- Utilise infra-red security systems or motion sensor triggered security lighting;
- Ensure that lighting is focused on the development with no light spillage outside the site; and
- No tall mast lighting should be used.

Cumulative Impact:

There is potential for security lighting and operational lighting associated with other solar energy projects to further impact on the area but with mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.

See appendix IV.

Residual Impacts:

No residual risk has been identified.

7 IMPACT STATEMENT

7.1 VISIBILITY

The limited height of the bulk of the proposed development as well as the fact that it is located in a small valley with tall landform to the east and west will limit visibility of the proposed project.

The ZTV analysis indicates that:

- The proposed array and substation are likely to be visible over similar areas;
- Views of the proposed array and the substation will be significantly constrained to the north, east and west by a series of ridgelines that are located well within the ALVs of the proposed elements;
- The surrounding ridgelines are likely to constrain views to the extent that views of the proposed project are only likely to be obvious from within the valley in which it is located. Possible views will only extend as far as the ALVs from areas to the south. From the site visit, natural vegetation that occurs in this area is likely to screen the array from the unsurfaced local road that runs to the south and east of the project. It is possible that taller elements could be visible over this vegetation, however, this too is likely to be largely screened;
- Due to topography, existing vegetation and distance, the proposed project is highly unlikely to be visible from protected areas and urban areas;
- Due to topography and existing vegetation, the proposed project is unlikely to be highly obvious from the unsurfaced local road to the south and east of the proposed project. If it is visible it will only be visible from a short section of the road to the south of the proposed project. Only the higher sections including substation, BESS and Bus Bars may be visible.
- One homesteads could be affected including:
    - The project is likely to be visible from a homestead that is located approximately 1.8km to the south of the proposed solar plant. This homestead appears to have tourism importance (Safric Safaris / La Gratitude Farm Stays)
- The proposed project is unlikely to be visible to any other sensitive receptors.

7.2 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY

The affected landscape can generally be divided into the following LCAs that are largely defined by topography. The landform divides the landscape into three discrete areas including:

- **Low Undulating Plain -** VAC is provided by gentle undulations and low vegetation. VAC is sufficient to have a significant effect in screening the majority of the proposed development from surrounding areas with the exception of areas that are elevated relative to the proposed development site.
- **The Orange River Corridor** is depressed below the level of the adjacent plain. On the river bank opposite Groblershoop there are also a series of minor ridgelines that rise above the plain to the north providing an elevated viewpoint over the area to the north and screening views from the southern bank. Because of the level difference and the extent of tall vegetation particularly on the margins of the corridor views from within the corridor are generally restricted to the immediate

area of the corridor and higher adjacent ridgelines to the south. The taller vegetation on the fringes of the corridor also provide screening from the lower areas immediately beside the corridor making it difficult to obtain clear views across and into the river corridor.

- **Ridgeline Areas** that have an important screening effect. The ridgelines to the east and west of the proposed project are likely to largely limit views of the proposed development to the enclosed valley in which it is located.
- **Urban area of Groblershoop** which is a relatively dense settlement. Views from within the settlement are generally screened by vegetation and surrounding buildings. Views over the surrounding landscape are only likely to be possible from the urban edges.

Future landscape change appears to be inevitable due to the potential development of solar power projects in the area. This development is exacerbated by the fact that the area falls within a Renewable Energy Development Zone.

One project, the Bokpoort Solar CSP facility, has been constructed.

There are also two additional Solar PV projects (Red Sands PV 1 and 3) that are located and within close proximity and within the same valley as Red Sands PV 1 project.

These projects could add a number of industrial elements to the local landscape.

7.3 SENSITIVE RECEPTORS

Identified possible visual receptors include:

- **Area Receptors** which include activity areas that could be sensitive to their outlook as sporting or tourism areas. Area receptor identified include;
    - The Witsand Nature Reserve;
    - The Glen Lyon Nature Reserve; and
    - The Groblershoop Urban Area.
- **Linear Receptors** which include the N10, the N8 as well as the two local unsurfaced routes that run to the east and north of the proposed development.
- **Point Receptors** include isolated and small groups of homesteads that are generally associated with and located within the low undulating plain as well as the homesteads on the agricultural land in the Orange River Corridor.

Due to the surrounding ridgelines and the relatively low nature of the proposed facility, affected receptors are likely to be limited to local homesteads as well as an unsurfaced local road that is located to the south and east of the proposed project.

7.4 VISUAL IMPACT

Due to the surrounding ridgelines and the relatively low nature of the proposed facility, affected receptors are likely to be limited to local homesteads as well as an unsurfaced local road that is located to the south and east of the proposed project.

Possible landscape change was assessed as having an impact of medium negative significance with and without mitigation.

Visual Impact on views from local roads was assessed as having a low neutral significance with and without mitigation.

Visual Impact on views from local homesteads was assessed as having a low to medium negative significance with and without mitigation. Only one homestead is likely to be affected but it appears to have tourism significance (Safric Safaris /La Gratitude Farm Stay).

Visual Impact on views from nature reserves was assessed as being very improbable and a low neutral significance without mitigation. No mitigation was deemed necessary.

The impact of glare was assessed as being very improbable and a low neutral significance with and without mitigation.

The impact of light pollution was assessed as being probable and having medium negative significance without mitigation and allow improbably significance with mitigation.

7.5 CUMULATIVE IMPACTS

In terms of general landscape change the cumulative impact associated with other renewable energy and infrastructure projects was assessed as having a medium significance. The proposed project was also assessed as likely to have an impact of medium significance.

Cumulative visual impacts on local roads and homesteads were also assessed as having a medium negative significance.

Cumulative visual impacts on Protected Areas were assessed as having a low negative significance.

Cumulative glare and lighting impacts were also assessed as having a low significance.

7.6 CONCLUSION

The proposed project will generally result in a relatively limited level of visual impact within an area that is already impacted by a major electrical and railway infrastructure.

In general terms visual impacts will be largely limited by the relatively low height of the majority of the project and by landform.

Subject to mitigation measures being undertaken, from a Landscape and Visual Impact perspective, there is no reason why the proposed project cannot be authorised.

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APPENDIX I

SPECIALIST'S BRIEF CV

ENVIRONMENTAL PLANNING AND DESIGN

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.
Qualifications	
Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa
Languages	English - Speaking - Excellent - Reading - Excellent - Writing - Excellent
Contact Details	Post: 13 Askew Grove Glenwood Durban 4001 Cell: +27 83 7032995

General

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect and has had extensive experience as an Environmental Assessment Practitioner within South Africa.

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Act (1993).

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last twelve months includes wind energy projects, numerous solar plant projects (CSP and PV) and electrical infrastructure.

Select List of Visual Impact Assessment Projects

- **Geelkop Solar PV projects –** Landscape and Visual Impact Assessment for seven proposed solar PV projects near Upington in the Northern Cape Province for Atlantic Renewable Energy Partners.
- **Makapanstad Agri- Hub –** Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble -** Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near Mo0rreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension -** Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads –** VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton –** VIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project -** VIA for a solar project near Vrybury in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km

powerline, Northern Cape Province, for Eskom.

- **Noupoort Concentrating Solar Plants -** Scoping and Visual Impact Assessments for two proposed parabolic trough projects.
- **Drakensberg Cable Car –** Preliminary Visual Impact Assessment and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – Visual Impact Assessment for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and Visual Impact Assessments for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** –Visual Impact Assessment for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and Visual Impact Assessments for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and Visual Impact Assessments for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and Visual Impact Assessment for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreeesburg Wind Energy Facility** – Visual Impact Assessment for a proposed WEF near Moorreeesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - Visual Impact Assessment for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and Visual Impact Assessment for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and Visual Impact Assessment for the upgrading of strategic Eskom infrastructure near Saldanha in the Western Cape.
- **Eskom Lethabo PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Lethabo Power Station in the Free State.
- **Eskom Tuthuka PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Thutuka Power Station in Mpumalanga.
- **Eskom Majuba PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Majuba Power Station in Mpumalanga.
- **Golden Valley Power Line** - Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Cookhouse in the Eastern Cape.
- **Mpophomeni Shopping Centre** – Visual impact assessment for a proposed new shopping centre close to the southern shore of Midmar Dam in KwaZulu Natal.
- **Rheeboksfontein Power Line** - Addendum report to the Visual Impact Assessment Report for amendment to this authorised power line alignment located near Darling in the Western Cape.
- **Woodhouse Solar Plants** – Scoping and Visual Impact Assessment for two proposed solar PV projects near Vryburg in the North West Province.

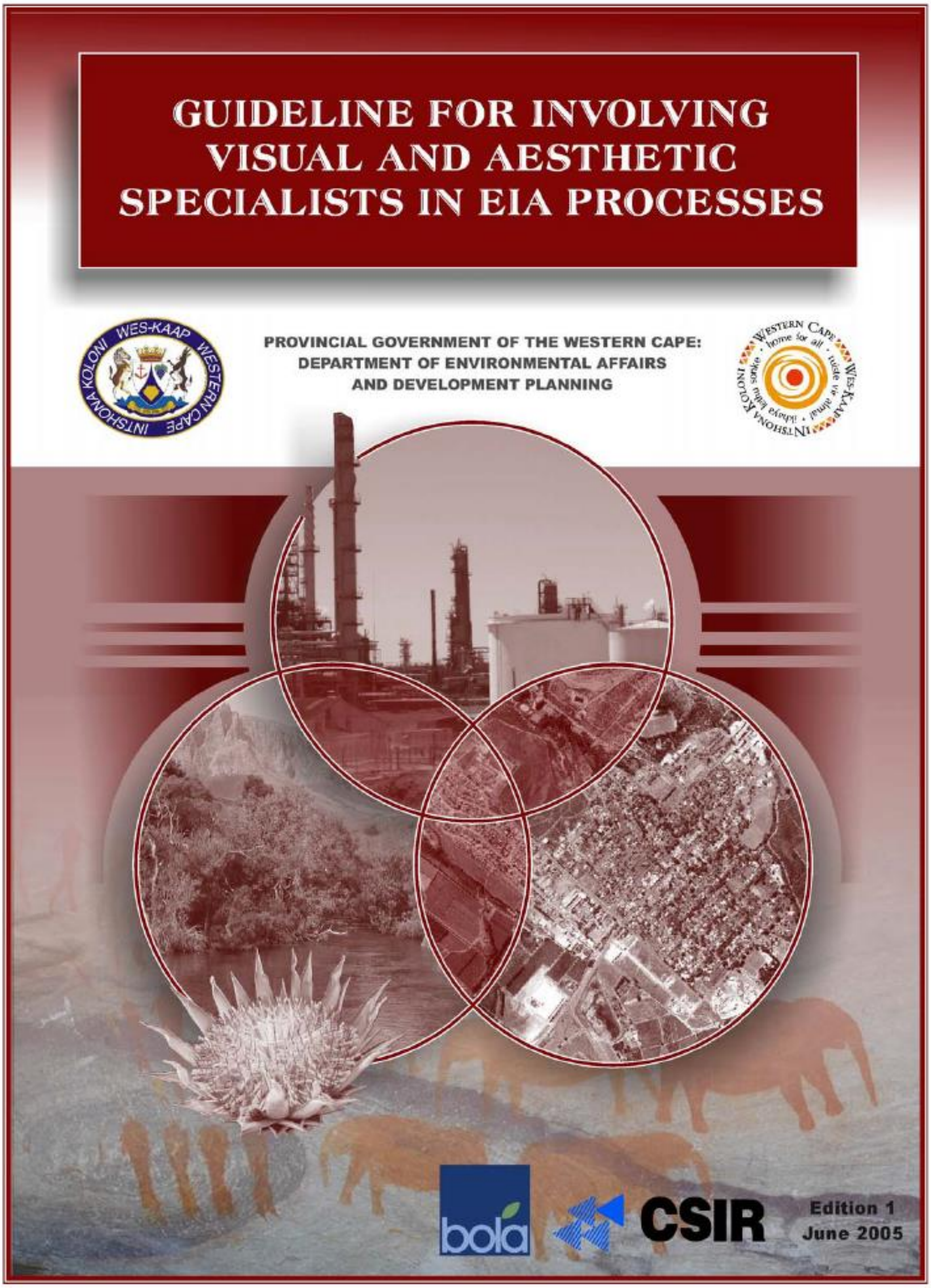
- **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
- **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.
- **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
- **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
- **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal.
- **Eskom Isundu Substation** – Visual Impact Assessment for a proposed major new Eskom substation near Pietermaritzburg in KwaZulu Natal.
- **Eskom St Faiths Power Line and Substation** – Visual Impact Assessment for a major new substation and associated power lines near Port Shepstone in KwaZulu Natal.
- **Eskom Ficksburg Power Line** – Visual Impact Assessment for a proposed new power line between Ficksburg and Cocolan in the Free State.
- **Eskom Matubatuba to St Lucia Power Line** – Visual Impact Assessment for a proposed new power line between Mtubatuba and St Lucia in KwaZulu Natal.
- **Dube Trade Port, Durban International Airport** – Visual Impact Assessment
- **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
- **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- **Estuaries of KwaZulu Natal Phase 1 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
- **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - Computer aided visual impact assessment. EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
- **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.

- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.
- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)



GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING

bola

CSIR

Edition 1
June 2005

GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

These guidelines were developed through a consultative process and have benefited from the inputs and comments provided by a wide range of individuals and organizations actively working to improve EIA practice. Thanks are due to all who took the time to engage in the guideline development process.

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Finalisation of report figures and formatting:

Magdel van der Merwe and Elna Logie, DTP Solutions

PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:
Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

CONTENTS

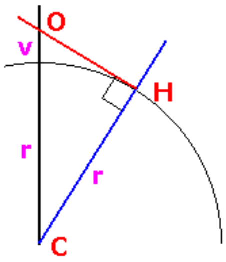
APPENDIX III

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius (r) and CO is the earth's radius (r) plus observer's height (v) above sea level.

Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.



APPENDIX IV

CUMULATIVE IMPACT ASSESSMENT

CUMULATIVE IMPACTS

Cumulative visual impacts have considered the current impacts of renewable energy and electrical infrastructure projects as well as the future proposed development of other planned renewable energy projects and infrastructure development.

Proposed mitigation measures relate to mitigation necessary to minimise the cumulative contribution of the project under consideration only.

Note: where alternative viewpoint locations result in differing levels of impact, the worst case is indicated.

1) General cumulative change the in the character and sense of place of the landscape setting (Landscape Change).

<table>
<tr><td colspan="3">Nature:
In terms of the cumulative landscape change impacts, two major developments currently affect the natural character of the valley in which the development is proposed, these include:
• The Transnet's Iron Ore Rail Line that runs through to Saldanha. From a distance and when there are no trains, the rail line is not highly obvious. However, trains are regular and are long; and
• HV power lines that run through the length of the valley.

In addition there are two additional solar energy projects that are proposed in close proximity (Red Sands 2 and 3)

The landscape is therefore already affected by large scale infrastructure, its character is however still dominated by natural aspects. This is possibly due to the natural ridgelines that provide enclosure and are the dominant visual elements.

The proposed solar developments are likely to further transform the landscape. The relatively low height of the project and because of this the relative ease with which the main impacts can be mitigated is likely to mean that from outside the immediate vicinity of the projects, it is likely that the viewer will discern and significant change.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects in the area</td></tr>
<tr><td>Extent</td><td>Site and immediate surroundings, (2)</td><td>Site and immediate surroundings, (2)</td></tr>
<tr><td>Duration</td><td>Long term, (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>Low (4)</td><td>Moderate (6)</td></tr>
<tr><td>Probability</td><td>Probable, (3)</td><td>Definite (5)</td></tr>
<tr><td>Significance</td><td>Medium, (30)</td><td>Medium (60)</td></tr>
<tr><td>Status (positive or negative)</td><td>Negative</td><td>Negative</td></tr>
<tr><td>Reversibility</td><td>Medium</td><td>Low</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No</td><td>No</td></tr>
<tr><td>Can impacts be mitigated?</td><td>Yes,</td><td>Unknown</td></tr>
</table>

	Possible mitigation will not change the level of significance	

Mitigation:
Planning:
» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;
Operations:
» Reinstate any areas of vegetation that have been disturbed during construction;
» Remove all temporary works;
» Monitor rehabilitated areas post-construction and implement remedial actions;
» Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
Decommissioning:
» Remove infrastructure not required for the post-decommissioning use of the site;
» Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

2) The cumulative impact on views from local roads.

Nature:
Currently, views of major infrastructure including Transnet's Iron Ore Rail Link and HV overhead power lines are obvious from roads in the vicinity but there are no other solar projects that are visible from public roads.

Neither the Red Sands 1 project nor the other two proposed Red Sands 2 and 3 solar projects will change this situation as they are all likely to be largely screened from public roads by landform and vegetation.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Small to minor **(1)**	Low to moderate, **(5)**
Probability	Very improbable **(1)**	Definite, **(5)**
Significance	Low **(7)**	Medium, **(60)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	Unknown

Mitigation:
Planning:
» Plan levels to minimise earthworks to ensure that levels are not elevated;
» Plan to maintain the height of structures as low as possible;
» Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations: » Reinstate any areas of vegetation that have been disturbed during construction; » Remove all temporary works; » Monitor rehabilitated areas post-construction and implement remedial actions; » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area. » Control the height of stored materials and the use of large equipment particularly within Laydown Area 3. Decommissioning: » Remove infrastructure not required for the post-decommissioning use of the site; » Rehabilitate and monitor areas post-decommissioning and implement remedial actions

3 Cumulative impact on local homesteads

Nature:

Generally there are few homesteads in the area. From the site visit, it appears that views from the majority of homesteads are unaffected by solar projects. It is likely however that some are affected by views of major infrastructure.

The proposed project as well as the two additional Red Sands solar projects could impact on views from two homesteads. From one of these the project could be highly visible but views may be largely mitigated. From the other, the proposed projects are unlikely to be obvious.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	**Homestead within 1.1km** Minor with mitigation **(2)** **Homestead within 8.5km** Small, **(0)**	Low to moderate **(5)**
Probability	**Homestead within 1.1km** Improbable with mitigation **(2)** **Homestead within 8.5km** Very improbable, **(1)**	Definite **(5)**
Significance	**Homestead within 1.1km** Low with mitigation **(12)** **Homestead within 8.5km**	Medium **(60)**

	Low, **(6)**	
Status (positive or negative)	Neutral to Negative	Negative
Reversibility	High	Low
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.
- Control the height of stored materials and the use of large equipment particularly within Laydown Area 3.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site;
  Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

4 Cumulative impact on Nature Reserves

Nature:

Views of major electrical infrastructure, are likely to be obvious from some sections of reserves the area the cumulative impact is assessed as medium.

Visual impacts of the proposed project on private reserves were assessed as having a low significance. The proposed project is therefore unlikely to contribute significantly to cumulative visual impacts on homesteads.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Region **(3)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small **(0)**	Minor **(2)**
Probability	Very improbable **(1)**	Probable **(3)**
Significance	Low **(7)**	Low **(27)**

Status (positive or negative)	neutral	negative
Reversibility	High	Low
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	No mitigation necessary	Unknown

5 Glare Impacts

Nature:

The impact of glare arising from the proposed project is highly unlikely.

It is possible that glare associated with other proposed projects could impact on the roads. Given that mitigation of possible impacts should be relatively simple to achieve, it is assumed that levels of impact from other projects will also be minor.

The overall cumulative impact is assessed as having a low significance. The contribution of the proposed project to this cumulative impact is assessed as low.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings, **(2)**	Region **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small, **(0)**	Small **(0)**
Probability	Very Improbable, **(1)**	Improbable **(2)**
Significance	Low **(6)**	Low **(14)**
Status (positive or negative)	neutral	negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Should glare prove problematic screening might be utilised or should a tracking system, the trackers can be programmed to prevent reflection towards affected sections of roads.

5 Lighting Impacts

Nature:

<table>
<tr><td colspan="3">There is potential for security lighting and operational lighting associated with other solar energy projects to impact significantly on the area but with mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.</td></tr>
<tr><td></td><td>Overall impact of the proposed project considered in isolation</td><td>Cumulative impact of the project and other projects in the area</td></tr>
<tr><td>Extent</td><td>Site (1)</td><td>Region (3)</td></tr>
<tr><td>Duration</td><td>Long term (4)</td><td>Long term (4)</td></tr>
<tr><td>Magnitude</td><td>Small to minor (1)</td><td>Minor (2)</td></tr>
<tr><td>Probability</td><td>Improbable (2)</td><td>Probable (3)</td></tr>
<tr><td>Significance</td><td>Low (12)</td><td>Low (27)</td></tr>
<tr><td>Status (positive or negative)</td><td>Neutral</td><td>negative</td></tr>
<tr><td>Reversibility</td><td>High</td><td>High</td></tr>
<tr><td>Irreplaceable loss of resources?</td><td>No irreplaceable loss</td><td>No irreplaceable loss</td></tr>
<tr><td>Can impacts be mitigated?</td><td>Yes</td><td>Unknown</td></tr>
<tr><td colspan="3">Mitigation:
Use low key lighting around buildings and operational areas that is triggered only when people are present.
Plan to utilise infra-red security systems or motion sensor triggered security lighting;
Ensure that lighting is focused on the development with no light spillage outside the site; and
No tall mast lighting should be used.</td></tr>
</table>

APPENDIX V

ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Red Sands PV 2, Construction, Operation and Decommissioning
Potential Impact	Change in Landscape Character and the nature of stakeholder views: • Change in character and sense of place of the landscape setting; • Changing the nature of views from agricultural homesteads; and • Lighting impacts.
Activity/risk source	• The proposed array and substation may be obvious from local local homesteads; • Engineered change in landform being obvious against natural contours; • Vegetation clearance and lack of rehabilitation during construction and decommissioning making the development more obvious particularly from a distance; • The development industrialising the outlook for stakeholders; and • Security lighting exacerbating light pollution;
Mitigation: Target/Objective	• Plan platforms and earthworks to blend into surrounding natural contours. • Construct and plant 1m high earth berm along southern edge of project in order to screen the array from homestead to the south. • Minimise and reinstate vegetation loss. • Maintain and augment exiting surrounding natural vegetation in order to soften views of the development and maintain continuity with the surrounding natural landscape. • Remove structures and rehabilitate site to its natural condition on decommissioning. • Ensuring that under normal conditions, lighting appears similar to existing agricultural homesteads.

Mitigation: Action/control	**Responsibility** Contractor (C) Environmental Officer (EO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Construct and plant 1m high earth bund along southern edge of array.	C, EO	C
Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.	C, EO	C
Reinstate any areas of vegetation that have been disturbed during construction.	C, EO	C
	C, EO	D

Maintain and augment vegetation within the area surrounding the development.	C, EO	C, D
Rehabilitate disturbed areas to their natural state on decommissioning.	C, EO	D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, EO	D
Remove all temporary works.	C, EO	D
Remove infrastructure not required for the post-decommissioning use of the site.	C, EO	C, EO
Plan lighting to utilise infra-red security systems or motion sensor triggered security lighting	EO	EO
Design / modify layout to keep PV panels as low as possible	EO	EO

Performance Indicators	Visibility of the PV array from the R356 and the Matjiesfontein Road. Natural contours rather than rigid engineered land form. Vegetation presence and density. Visibility of the development from surrounding areas. Presence of unnecessary infrastructure. Lighting appearing similar to existing farmsteads under normal conditions
Monitoring	Evaluate visibility from the R356 and the Matjiesfontein Road. Evaluate vegetation before, during and after construction. Evaluate vegetation growth and reinstatement during decommissioning and for a year thereafter. Evaluate lighting impacts. Evaluate glare impacts on the R356. Take regular time-line photographic evidence. Responsibility: EO and ELO. Prepare regular reports.