GEEL KOP (PTY) LTD

GRID CONNECTION INFRASTRUCTURE FOR THE GEEL KOP SOLAR PV FACILITIES, NORTHERN CAPE PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT

December 2020

Prepared by:
Environmental Planning and Design
P.O. Box 50910,
Musgrave Road,
4062

Tel: 083 703 2995
Email: jon@enviroconsult.co.za

Prepared for:
Geel Kop (Pty) Ltd 1st Floor, West Quay Building
7 West Quay Road,
Waterfront
Cape Town,
8000

Tel: + 27 (21) 418 2596
Fax: + 27 (0) 86 514 8184
Email: david@atlanticep.com

PO BOX 50910, MUSGRAVE ROAD, 4062, SOUTH AFRICA

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1 INTRODUCTION

1.1 GENERAL

Geel Kop (Pty) Ltd is proposing the development of grid connection infrastructure, near the town of Upington in the Northern Cape. The proposed grid connection infrastructure will be used to transmit electrical energy generated by several potential Solar PV Facilities (which are currently being assessed in separate BA processes) to the existing 400/132kV Upington MTS for distribution via the national electrical grid network.

In terms of the National Environmental Management Act (NEMA) Act No. 107 of 1998, as amended, the proposed development requires environmental authorisation. Cape EAPrac (Pty) Ltd has been appointed by Geel Kop (Pty) Ltd as the independent environmental assessment practitioner to undertake the necessary Basic Assessment (BA).

One on the significant potential environmental issues identified during the planning phase of the BA was the visual impact that the facility will have on surrounding areas. This Landscape and Visual Impact (LVIA) Report will therefore provide specialist visual input into the BA Process.

The proposed grid infrastructure includes 132kV above-ground sub-transmission line to connect the onsite 33/132kV substations to the national grid. The pylons for this line will have an average spacing of approximately 250m and will require a servitude width of 31m buffered by 150 m (i.e. a 300 m corridor) in order to allow for micro-siting.

The proposed grid infrastructure falls within the Northern and Western Strategic Transmission Corridors which are areas identified and set aside by Government for the development of grid infrastructure projects.

1.2 PROJECT LOCATION AND PROPERTY DESCRIPTION

Three proposed facility switching stations and a collector switching station will be located the Remaining Extent of Farm Geel Kop 456.

The grid connection crosses the following properties:

- Remaining Extent Farm Geel Kop 456;
- Portion 5 of Farm Bloemsmond 455;
- Portion 14 of Farm Bloemsmond 455;
- Remainder of Farm Dyasonsklip 454;
- Remainder of Farm 638 Tungsten Lodge;
- Remaining Extent of Portion 35 of the Farm Mctaggarts Camp 453;
- Remaining Extent (Portion 0) of the Farm 636; and
- Olyvenhouts Drift Settlement Agricultural Holding, Holding Number 1080, Portion 0.

The Geel Kop grid infrastructure will connect seven authorised Solar PV Facilities to the existing 400/132kV Upington Main Transmission Substation (MTS) located on Remaining Extent of the Farm Olyvenhouts Drift 1080, for distribution via the national electrical grid network.

(Map 1: Site Location Map).

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He also has extensive experience of Environmental Impact Assessment in South Africa. He 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 CAD 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. He has also been involved in the preparation of visual guidelines for large scale developments.

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

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to assess the potential visual impact that the proposed development will have on the character of the surrounding landscape and the views of potential sensitive receptors.

The assessment has been 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[1], 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.

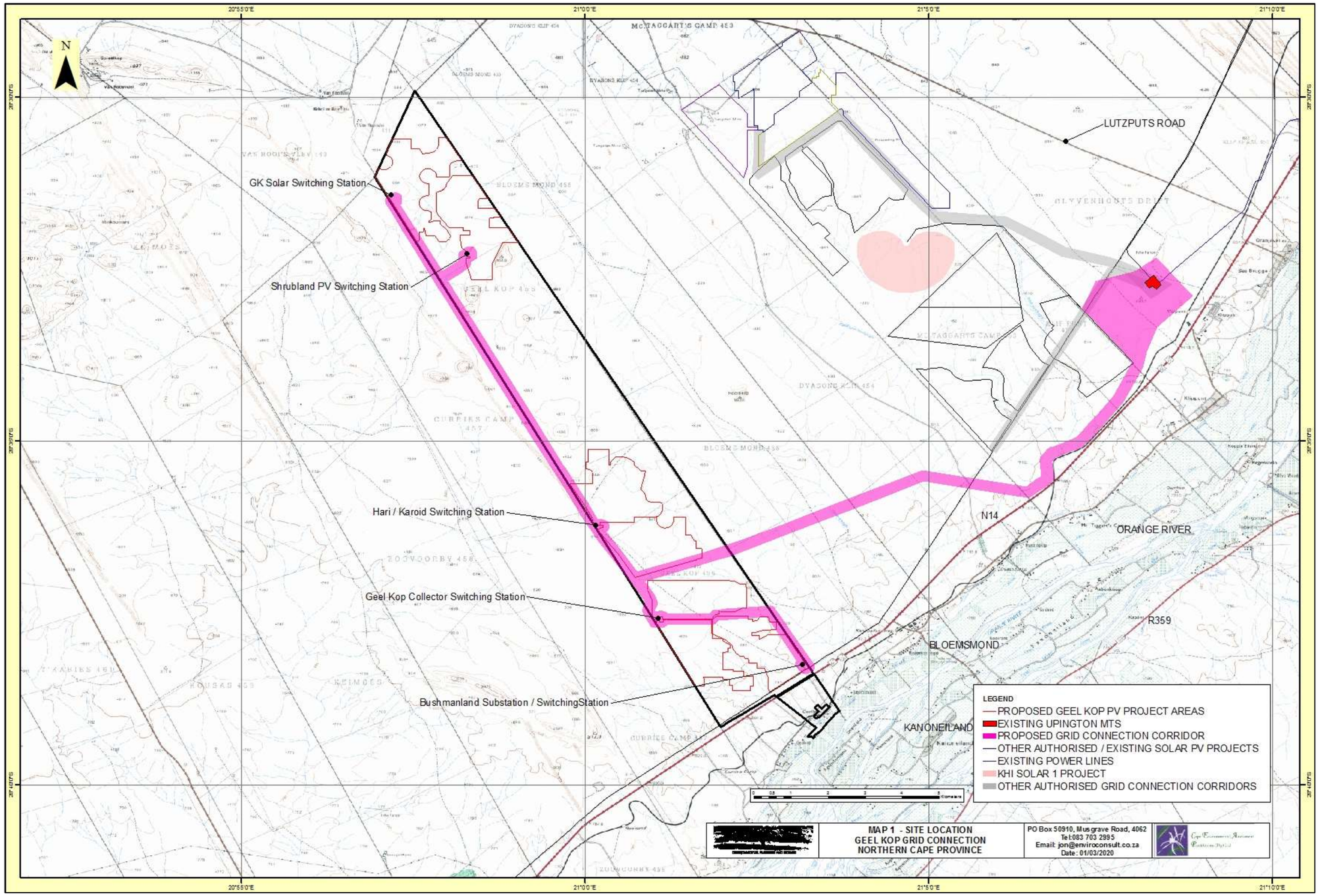
1.5 LIMITATIONS AND ASSUMPTIONS

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 most people are likely to prefer views of a natural or rural landscape rather than an industrial landscape;
- A site visit was undertaken over a two day period (27th – 28th February 2020) 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 enabling maximum visibility;
- The timing of photography was planned to ensure that the sun was as far as possible behind the photographer to ensure that as much detail as possible was recorded in the photographs;

[1] the Western Cape Guidelines are used as the National or Northern Cape Departments do not have guidelines in place

- Visibility of the proposed elements has been assessed using Arcview Spatial Aanalyst. 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; and
- Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation.


20°55'0"E
21°0'0"E
21°5'0"E
21°10'0"E
28°30'0"S
N
GK Solar Switching Station
Shrubland PV Switching Station
Hari / Karoid Switching Station
Geel Kop Collector Switching Station
Bushmanland Substation / SwitchingStation
LUTZPUTS ROAD
N14
ORANGE RIVER
R359
BLOEMSMOND
KANONEILAND
LEGEND
PROPOSED GEEL KOP PV PROJECT AREAS
EXISTING UPINGTON MTS
PROPOSED GRID CONNECTION CORRIDOR
OTHER AUTHORISED / EXISTING SOLAR PV PROJECTS
EXISTING POWER LINES
KHI SOLAR 1 PROJECT
OTHER AUTHORISED GRID CONNECTION CORRIDORS
MAP 1 - SITE LOCATION
GEEL KOP GRID CONNECTION
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date: 01/03/2020

2. PROJECT DESCRIPTION

2.1 PROJECT MOTIVATION

In response to the Department of Energy's requirement for new generation capacity, seven Solar PV Facilities have been authorised on the Remaining Extent of Farm Geel Kop 456. Geel Kop (Pty) Ltd. is proposing grid connection infrastructure that will used to transmit electrical energy generated by the facilities to the existing 400/132kV Upington MTS for distribution via the national electrical grid network.

The project is proposed to be part of the Department of Energy's (DoE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme.

The area within which the project is proposed has been identified as a key area for renewable energy generation by the Department of Environmental Affairs (DEA) in their strategic assessment which identifies eight Renewable Energy Development Zones (REDZ). The area in which this project is located is the Upington REDZ 7.

2.2 PROJECT DESCRIPTION

Refer to Map 1, Site Location

A number of alternatives have been considered as part of this environmental process. These include

1) Corridor Alignments between the facility switching stations[1] and the proposed collector switching station;
2) Alternative positions of the collector switching station.
3) Corridor alignments between the collector switching station and the national grid (via either direct connection or a loop in loop out connection).

For ease of reference, the alternatives associated with the above points are discussed

2.2.1 Powerline corridor alignments between the facility switching stations and the collector switching station

Powerline corridor alignments between the facility switching stations and the collector switching station.

There are 4 assessment corridors that will connect each of the facility switching stations to one another and/or to the collector switching station. The final configuration of the overhead powerlines within each of the corridors described below will depend on the final number of projects that proceed to the construction phase. Notwithstanding the final configuration, all powerline infrastructure will fall within the corridors described below[2]

a) Powerline corridor between GK Solar PV switching station and Shrubland PV switching station

This will include a single or double circuit 33kV or 132kV overhead powerline as shown below. This line will connect the GK Solar PV switching station to the Shrubland PV

[1] This Basic Assessment process includes application and assessment of the Eskom portion of the on-site substation (i.e. the switching station component), the IPP portion of the on-site substation was applied for and assessed as part of the BAR's for the individual PV facilities.

[2] All corridors have been considered and assessed as 300m wide corridors.

switching station (the footprint of each of these switching stations will be 100m x 50m).

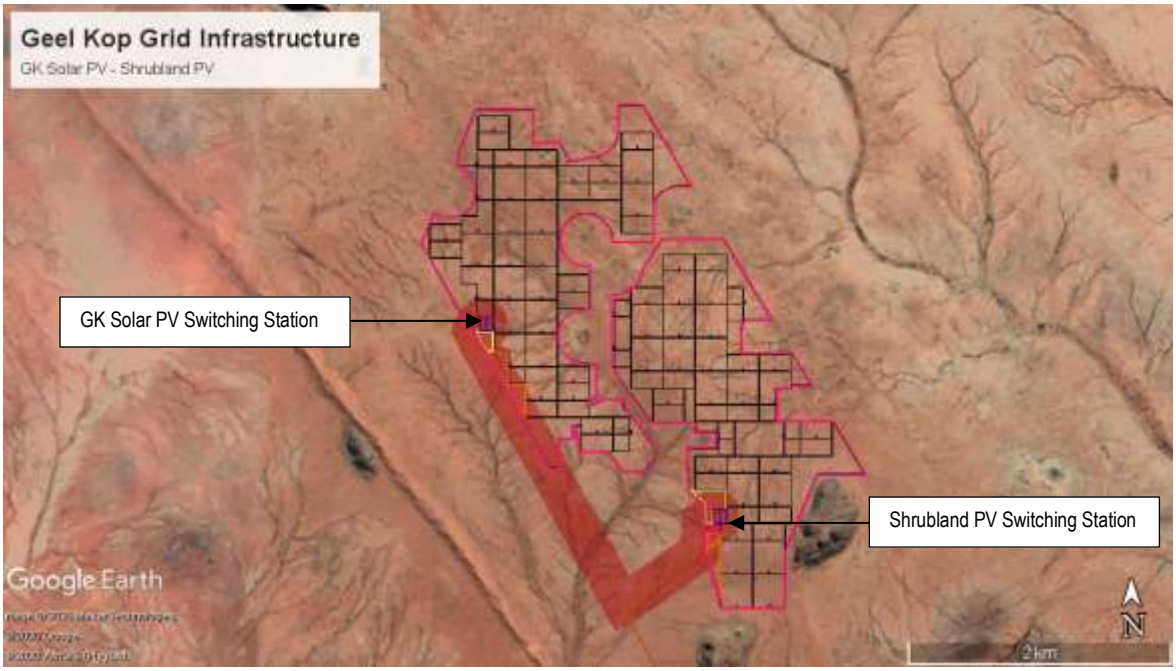


Figure 1: Powerline corridor between GK Solar PV switching station and Shrubland PV switching station

b) Powerline corridor between Shrubland PV switching station and Karroid PV switching station/ Hari PV facility substation

This will include either a single or double circuit 33kV or 132kV OHL within the corridor as shown in the image below. This line will connect the Shrubland PV switching station to the Karroid PV Switching Station/Hari PV facility substation (the footprint of the shrubland switching stations will be 100m x 50m and the Karroid PV switching station will be 75m x 75m).

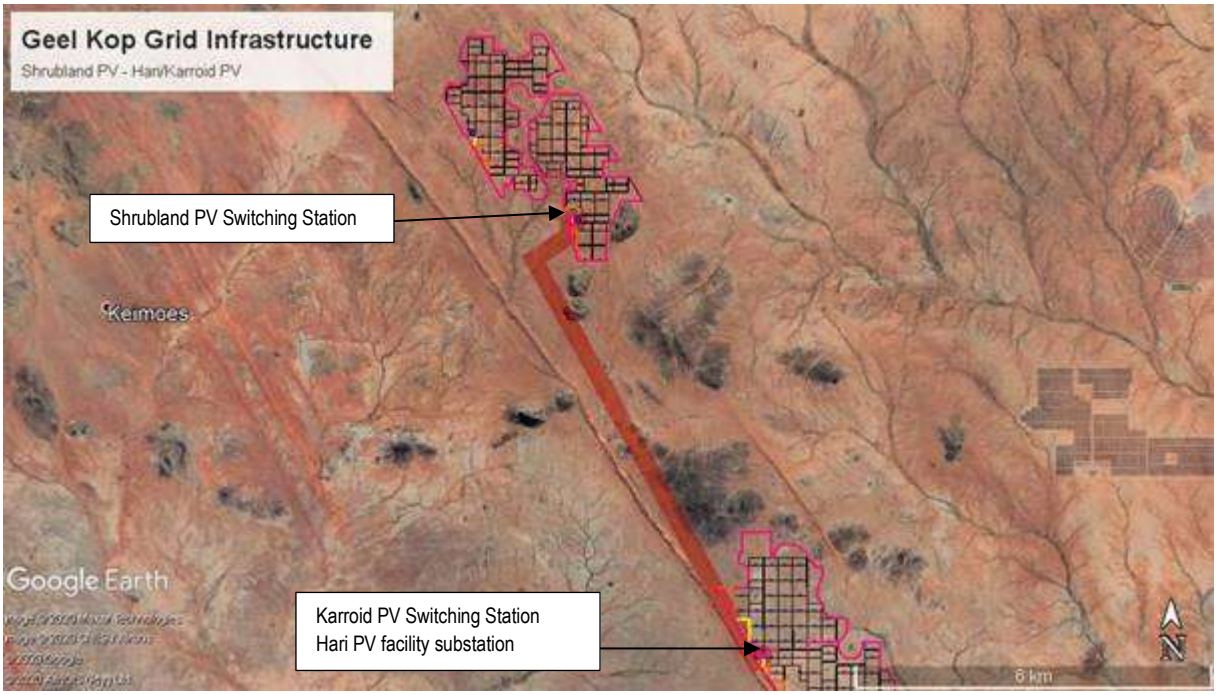


Figure 2: Powerline corridor between Shrubland PV switching station and Karroid PV switching station/ Hari PV facility substation

c) Powerline corridor between Karroid PV Switching Station / Hari PV facility substation and the Geel Kop collector switching station.

This will include a double circuit 33kV or 132kV power line linking the Karroid PV switching station / Hari PV facility substation and Geel Kop collector switching station as shown in the image below. The footprint of both the Geel Kop collector switching station will be approximately 150m x 75m.

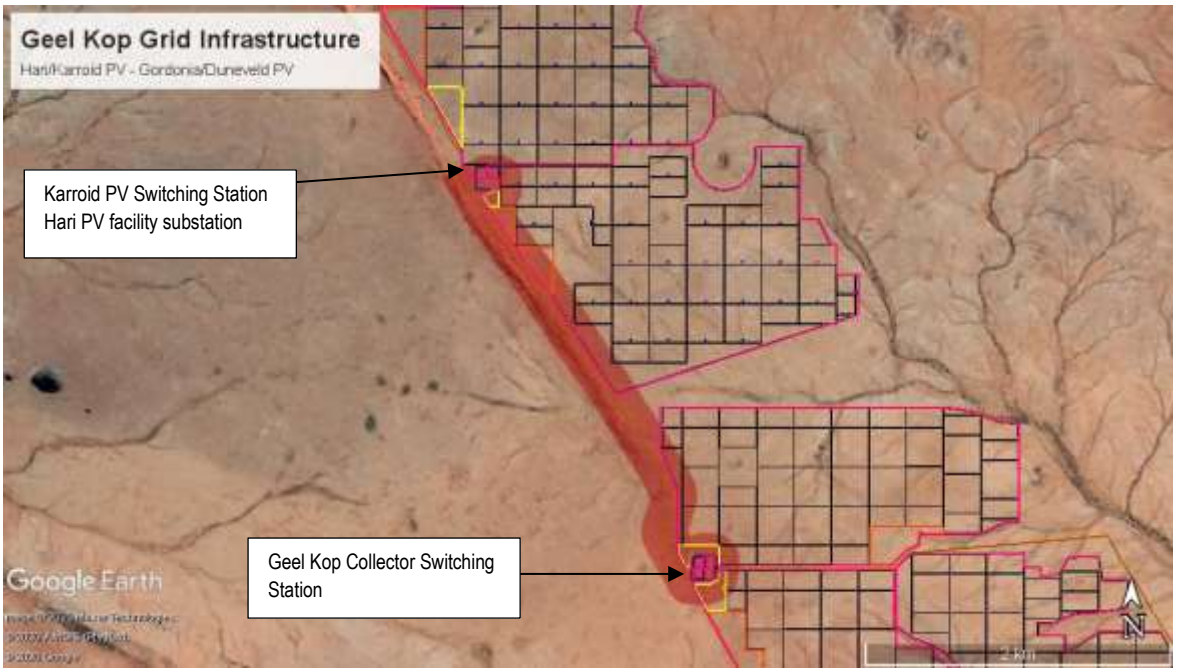


Figure 3: Powerline corridor between Karroid PV switching station/ Hari PV facility substation and Geel Kop collector switching station.

d) Power line corridor Geel Kop collector switching station and Bushmanland PV facility substation/ collector switching station

It must be noted that the Geel Kop collector switching station is the preferred collector as discussed in section 2.2.2 below.

This corridor will include a single or double circuit 33kV or 132kV powerline connecting Geel Kop collector switching station and Bushmanland PV facility substation/ collector switching station as shown in the image below. The Bushmanland collector switching station would have a footprint 150m x 75m.[2]

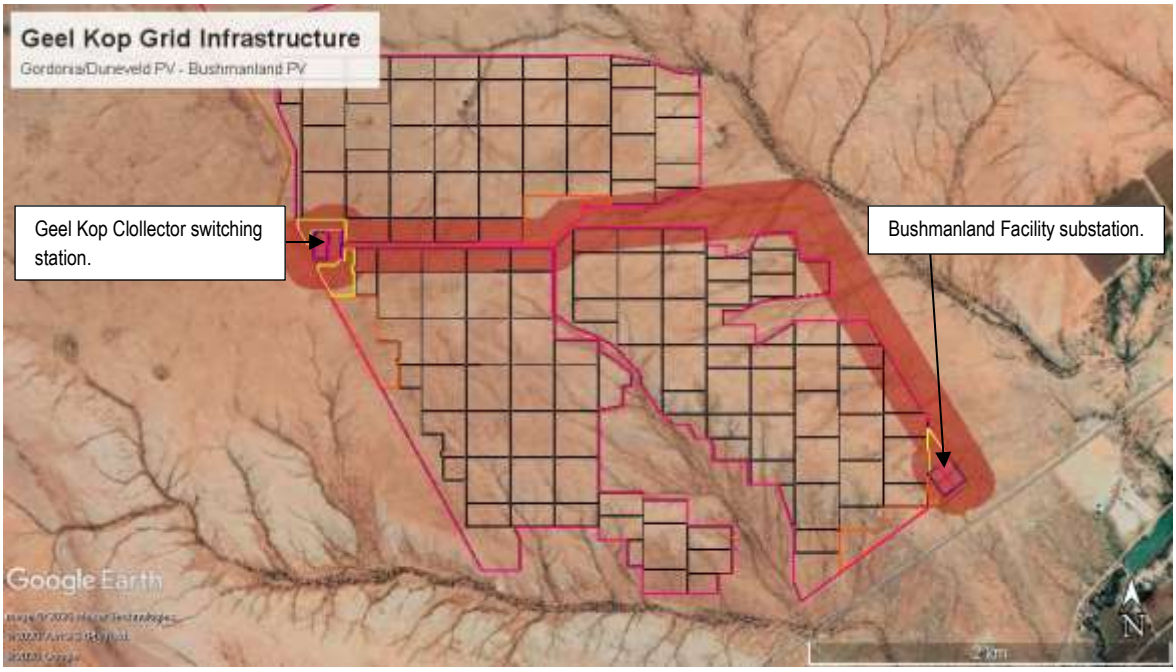


Figure 4: Power line corridor between Geel Kop collector switching station and Bushmanland PV facility substation/ collector switching station.

2.2.2 Alternative positions of the collector switching stations.

As shown above, there are two alternative positions for the collector switching station, depending on which connection to the MTS is developed. These are described as follows and discussed separately below:

- Geel Kop collector switching station (preferred)
- Bushmanland PV collector switching station

a) Geel Kop collector switching station (preferred)

The Geel kop collector switching station is positioned to support the preferred connection route to the Upington MTS. It is positioned on the South West Corner of Gordonia Solar PV and North West Corner of Duneveld PV as shown below.

[2] It is unliklely that the Bushmanland collector substation would be constructed, as the Geel Kop Collector is preferred as it is centrally located. However, the overhead line between the Geel Kop Collector switching station and the approved Bushmanland facility substation would be constructed.

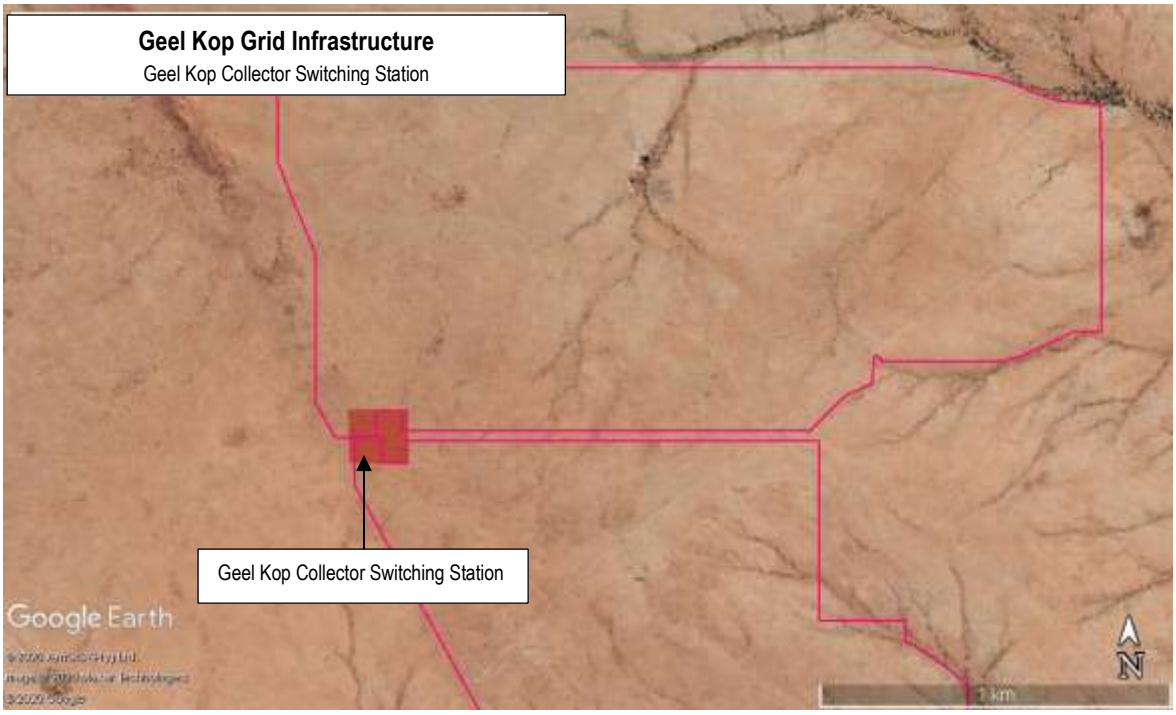


Figure 5: Proposed position of the preferred Geel Kop collector switching station

The Geel Kop collector switching station has a footprint of 150m x 75m

b) Bushmanland PV collector substation/ switching station

The alternative collector switching station position is situated on the South Eastern Corner of Bushmanland PV as shown in the image below.

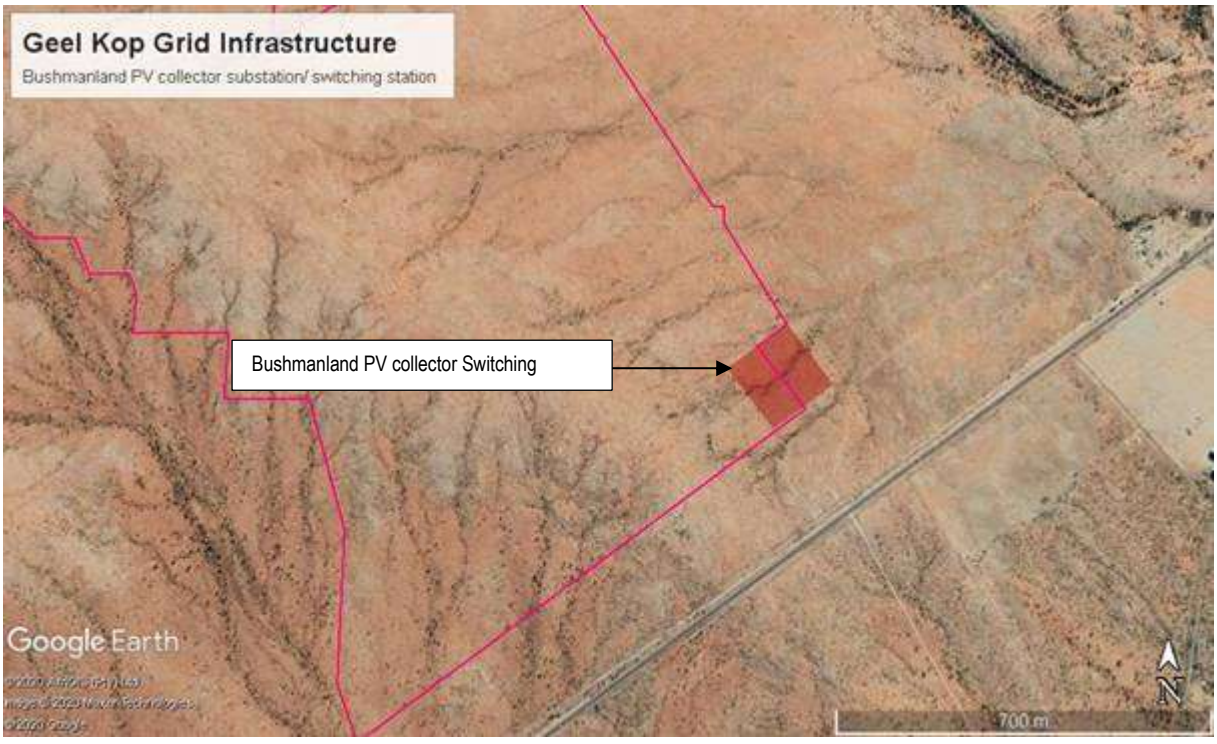


Figure 6: Position of Bushmanland PV collector substation/ switching station

The Bushmanland PV collector substation/ switching station would have a footprint of 150m x 75m

2.2.3 Corridor alignments between the collector switching stations and the national grid

Two alternatives have been considered in this regard, namely:

a) Alternative 1[3] : a double circuit 132kV line from the Geel Kop collector switching station to the Upington MTS, running parallel to the Eskom Aries-Upington 400kV 110m servitude to the Upington MTS.

b) **Updated Alternative 1 (preferred)**: a double circuit 132kV line from the Geel Kop collector switching station to the Upington MTS, running parallel to the Eskom Aries-Upington 400kV 110m servitude for approximately 7.2km, before turning towards the N14 and running along the N14 to the Upington MTS.

c) Alternative 2: a loop in loop out (LILO) from the Bushmanland PV collector switching station into the McTaggerts / Oasis 132kV powerline, and reconductored as a double circuit 132kV line back to the Upington MTS.

These two[4] alternatives are discussed in the section below:

a) Alternative 1 – 132kV line from Geel Kop collector switching station to the Upington MTS

This alternative includes a double circuit 132 kV powerline from Geel Kop collector switching station to the Upington MTS which is approx. 15km in length. This powerline will be aligned with the Aries-Upington 400kV Powerline (Authorised but not yet constructed) to the Upington MTS.

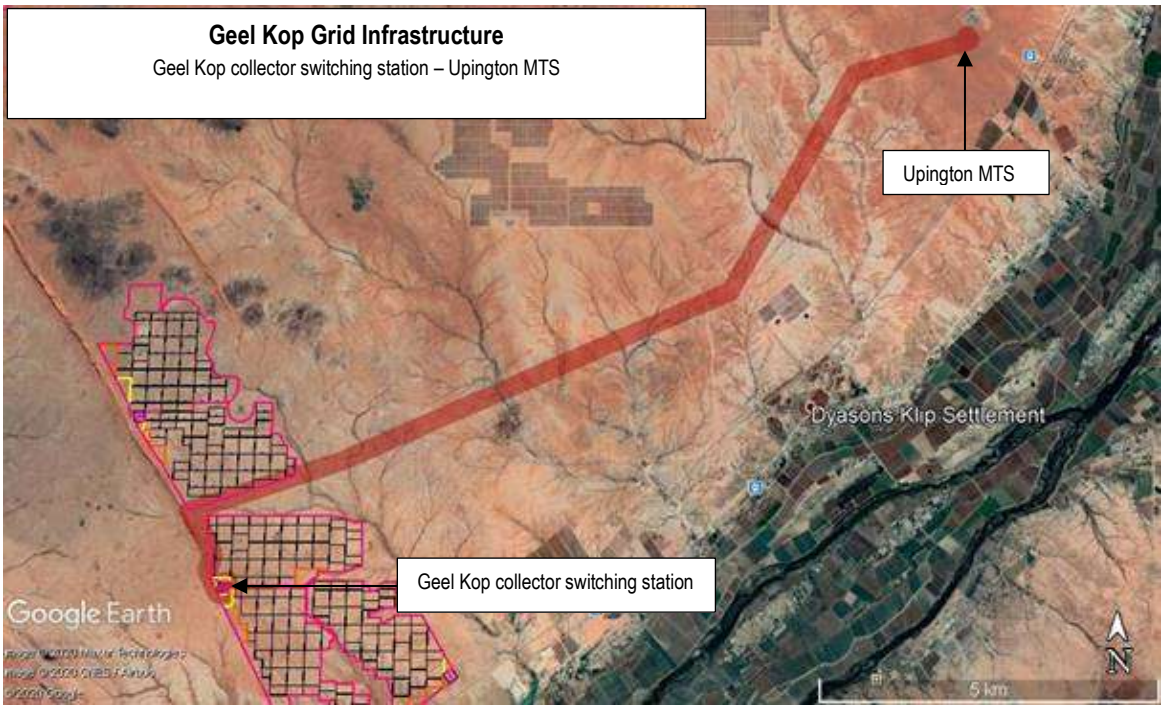


Figure 7: 132kV line from the Geel Kop collector switching station to the Upington MTS

[3] This was the preferred alternative as considered during the Draft BAR. This Revised Draft BAR proposes an update to this previously preferred alternative, namely "Updated Alternative 1" as described in this section.
[4] Alternative 1 and Updated Alternative 1 are deemed to be the same alternative, as the original alternative 1 is no longer feasible.

Due to conflicting land use activities on the RE Farm 628, the previously preferred alternative 1 as indicated above has been eliminated from further consideration in the environmental process and has been replaced with a new alternative, Updated Alternative 1, as described in the section below.

b) Updated Alternative 1 – 132kV line from the Geel Kop collector switching station to the Upington MTS

During the servitude option negotiations for the previously preferred alternative (Alternative 1), conflicting land uses on the RE Farm 628 were identified. This required that the previously preferred alternative be updated to avoid these conflicting land uses.

This updated preferred alternative includes a double circuit 132 KV powerline from Geel Kop collector switching station to the Upington MTS which is approx. 16km in length. This powerline will be aligned with the Aries-Upington 400kV Powerline (Authorised but not yet constructed) for approximately 7.2km before turning towards and along the N14 to the Upington MTS

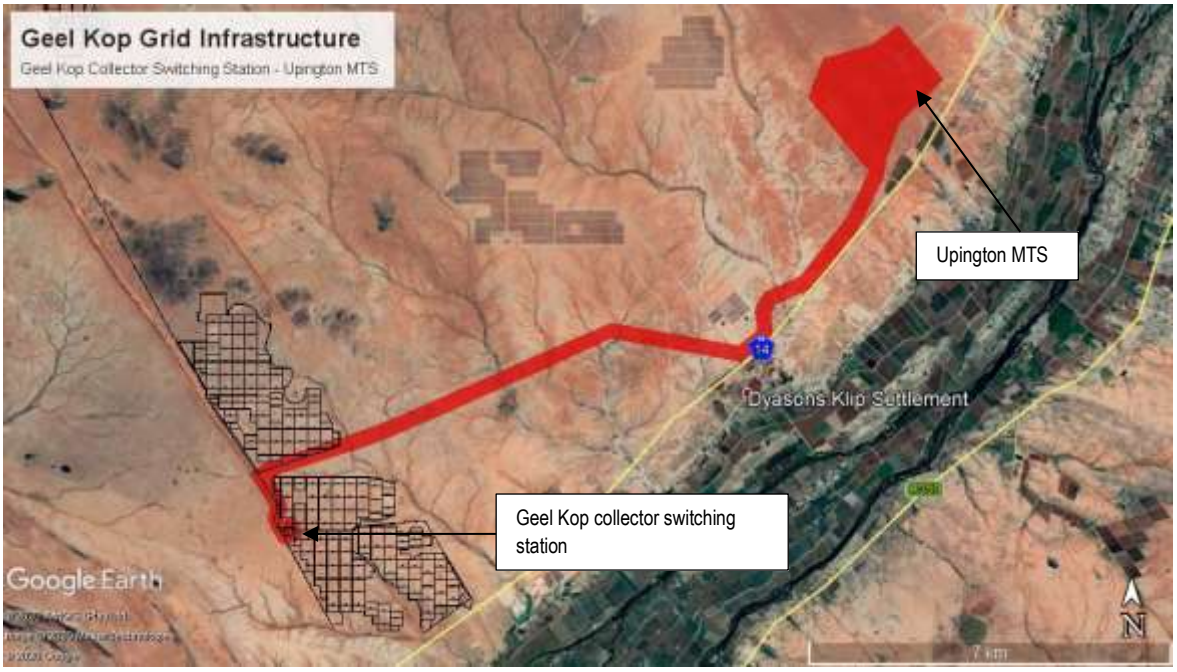


Figure 8: PREFERRED ALTERNATIVE (Updated Alternative 1):132kV line from the Geel Kop collector switching station to the Upington MTS

c) Alternative 2 - loop in loop out (LILO) from the Bushmanland PV collector switching station into the McTaggerts / Oasis 132kV powerline.

The alternative connection is a loop in loop out (LILO) from the Bushmanland PV collector switching station into the McTaggerts / Oasis 132kV powerline, and reconductored as a double circuit 132kV line back to the Upington MTS.

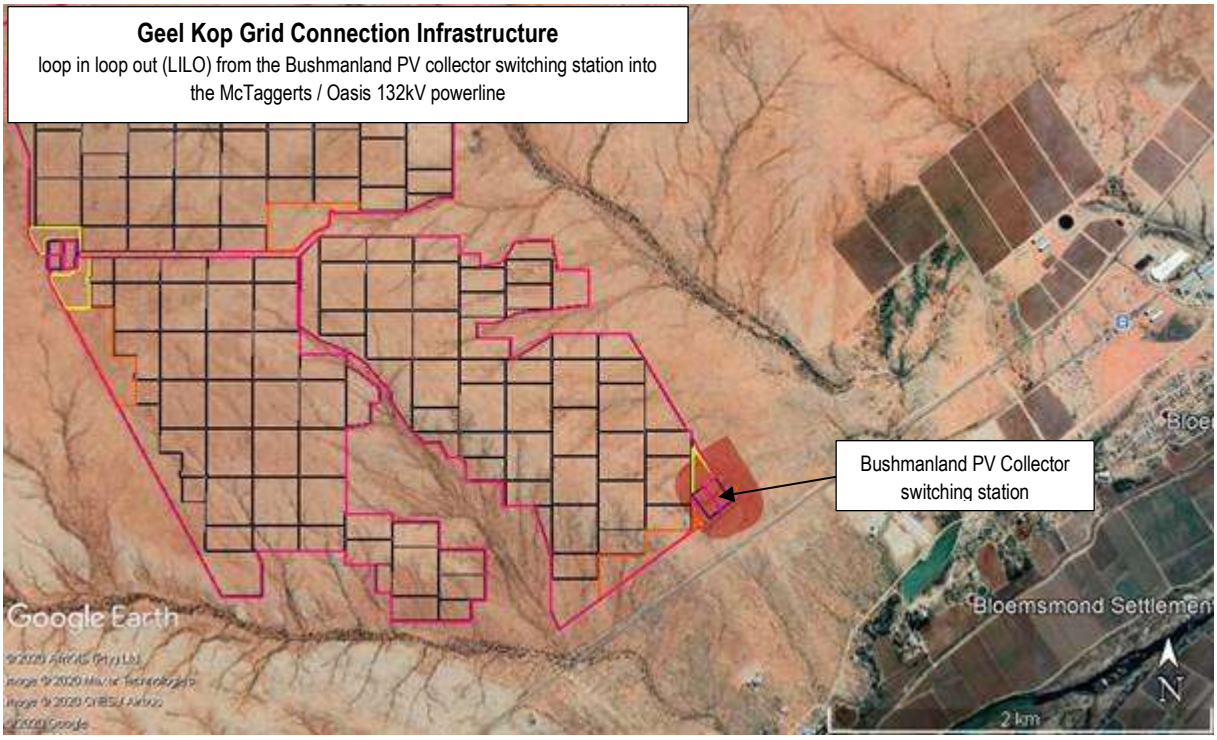


Figure 9: Position of loop in loop out (LILO) from the Bushmanland PV collector switching station into the McTaggerts / Oasis 132kV powerline

The Applicant has engaged with Eskom Grid Access Unit with regards the grid connection alternatives into the national grid. From a technical standpoint, the loop in loop out (LILO) alternative into the McTaggerts/Oasis 1 132kV powerline, with reconductored portion back to the Upington MTS along the existing servitude, is the least preferred technical solution for the primary reason that this is an existing powerline that services an existing generator (50 MW Khi CSP plant) as well as load customers in the area. Whilst Eskom has not objected to this connection alternative, they have stated that any connection to the McTaggerts / Oasis 1 132kV powerline will require very careful consideration and planning at Preferred Bidder stage to ensure least disruptions to all existing clients on this network. The risk of disruptions along this powerline therefore compels the Applicant to consider the preferred solution of a double circuit 132 kV powerline from the Geel Kop collector switching station to the Upington MTS.

The formal cost estimate letter CEL from Eskom has confirmed that the direct connection (as described as the updated alternative 1 above) is the most viable connection option.

Powerline Alternative 2 has been eliminated from further consideration in this environmental process.

Monopole or lattice towers could be used for the power line.

2.4 PROJECT CONTEXT

The project is proposed within the Upington REDZ (REDZ 7), which is a focus area for large scale solar photovoltaic (PV) energy facilities.

The proposed grid infrastructure is required to evacuate electrical energy generated by seven authorised Solar PV facilities, located on the Remaining Extent of Farm Geel Kop 456, to the existing 400/132kV Upington MTS for distribution via the national electrical grid network.

There is one existing CSP project (Khi Solar 1) approximately 8km to the east of the Remaining Extent of Farm Geel Kop 456. The proposed power line passes to the south of this project.

There are four solar PV projects (Sirius 1, 2, 3 and 4) to the south east of Khi Solar 1 and relatively close to the N14. These projects have all been authorised and one project (Sirius 1 PV) has been commissioned. The grid connection for these projects also runs roughly parallel with the N14 for approximately 6km. This grid connection is however slightly further from the road than the proposed Geel Kop connection.

There are also four solar PV projects to the north-west and west of Khi Solar 1 including: McTaggarts PV1; McTaggarts PV2; McTaggarts PV3; and Klip Punt PV1. These projects have also all been authorised. The grid connection for these projects will run at approximately ninety degrees to the road as they approach the Upington MTS.

Refer to Map 1, Site Location for the location of the Proposed Corridor Alignment in relation to these other projects.

All of these developments and associated infrastructure are located within a REDZ and Strategic Transmission Corridor areas. These are areas identified and set aside by Government for the development of grid infrastructure and renewable energy projects. The focus for REDZ 7 is large scale solar PV energy projects. As a result, there have been numerous other proposed developments, some of which have received environmental authorisation from the DEA and others that are anticipated to receive environmental authorisation in the near future.

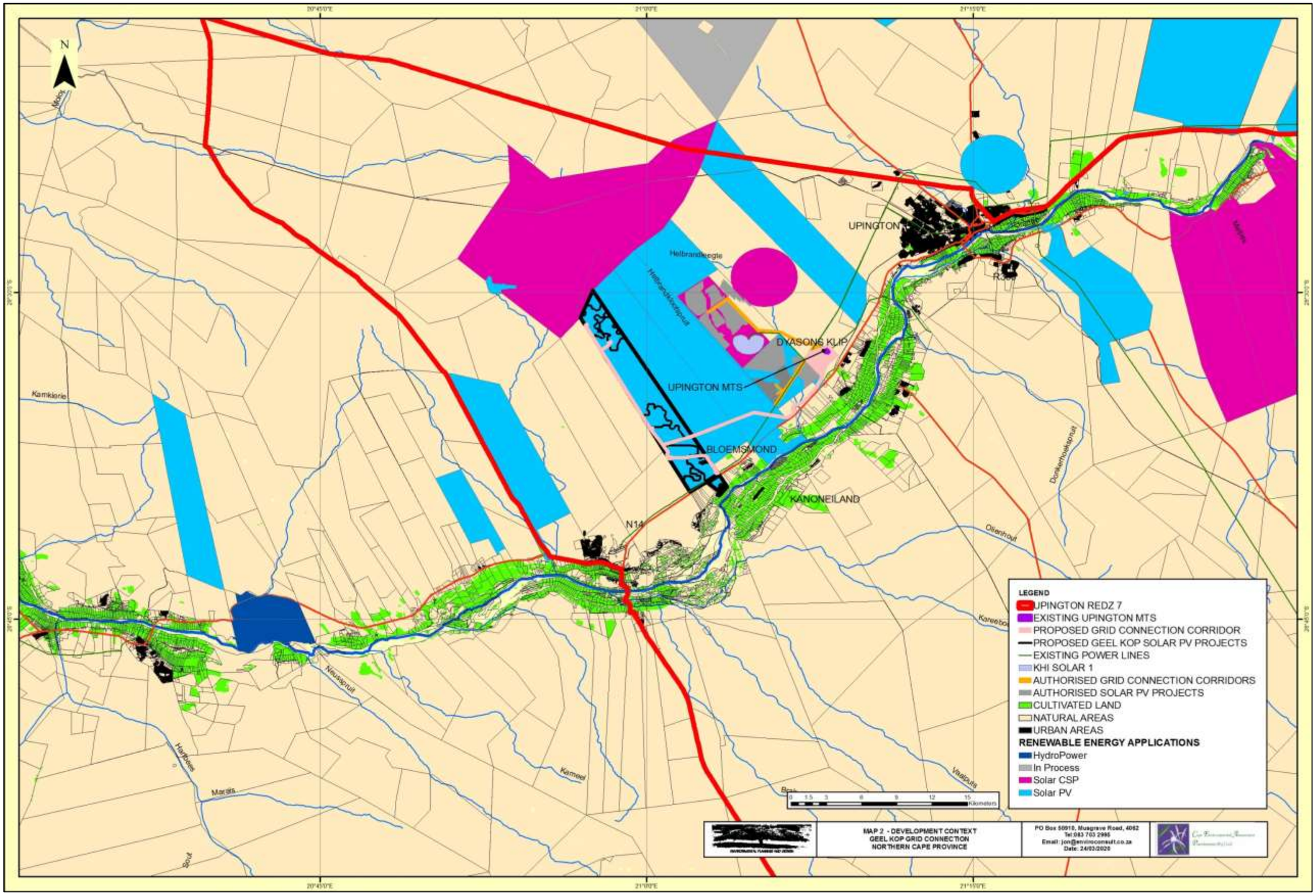
Map 2, Broad Development Context, indicates properties near the proposed site on which other renewable energy projects have been authorised, as well as proposed future Eskom power lines.

Currently within a 30km radius of the proposed project, there are fourteen other properties on which renewable energy projects are proposed. These consist of both Concentrated Solar Projects (CSP) as well as Solar PV projects.

The number of renewable energy projects in the vicinity of the proposed project has resulted in the development of strategic high voltage electrical infrastructure, including the Upington MTS, as well as power line connections to individual renewable energy projects.

Plate 1, Existing Upington Main Transformer Substation (MTS). Note strategic power line connections linking to the MTS

Plate 2, Eskom Monopole, 32m high.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Helbrandkoppie
Helbrandkoppie
D'KASONS KLIP
UPINGTON MTS
Kamkloria
BLOEMSMOND
KANONEILAND
N14
Olienhout
Donkerhoekspruit
Kareeboo
Nausaspruit
Hartbees
Marais
Kameel
Vaalpoort
Bos
0 1.5 3 6 9 12 15 Kilometers
LEGEND
UPINGTON REDZ 7
EXISTING UPINGTON MTS
PROPOSED GRID CONNECTION CORRIDOR
PROPOSED GEEL KOP SOLAR PV PROJECTS
EXISTING POWER LINES
KHI SOLAR 1
AUTHORISED GRID CONNECTION CORRIDORS
AUTHORISED SOLAR PV PROJECTS
CULTIVATED LAND
NATURAL AREAS
URBAN AREAS
RENEWABLE ENERGY APPLICATIONS
HydroPower
In Process
Solar CSP
Solar PV
MAP 2 - DEVELOPMENT CONTEXT
GEEL KOP GRID CONNECTION
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel 083 703 2995
Email: jon@enviroconsult.co.za
Date: 24/03/2020

3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

3.1 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 influencing factors including;

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

3.1.1 Landform and Drainage

The topography of the region is relatively homogenous and is described pre-dominantly as lowlands with hills and dune hills to the north. Relatively prominent small hills occur towards the west and south-west of the study area.

Whilst the region surrounding the site is relatively flat, a degree of relief is provided by minor ridgelines that were formed by an historic dune field that runs in a general northwest to southeast direction at regular intervals. From the air, these minor ridgelines appear as a series of waves in the arid landscape. These ridgelines rise between three and five metres above the valley floor. Whilst they are minor they are likely to have a visual influence in that they will provide a degree of screening.

The terrain surrounding the proposed power line corridor is predominantly flat with an even south-eastern slope towards the Orange River valley that forms a distinct hydrological feature in the region. The proposed corridor is located between approximately 2.4km and 17.0km to the northwest of the Orange River Valley.

There is also a series of non-perennial water courses that flow into the Orange River at intervals. As these fall from the undulating plain into the shallow river valley they have created larger and slightly deeper valleys. This is particularly obvious driving along the N14 which is located on the edge of the river valley. This section of road runs through valleys that are approximately 15m deep from floor to the crest of the ridgelines. These valley lines are likely to have significant influence over the visibility of the project from the road.

There are a number of non-perennial water courses that cross the proposed corridor before they flow into the Orange River Valley.

Refer to Map 3, Landform & Drainage.

Plate 3, View from the N14 approximately 8.5km to the southeast of the project site looking along the road.

The gently undulating nature of the landform on the edge of the Orange River Valley is clear from the road profile. When in one of the valleys, visibility over the surrounding landscape is restricted.

Plate 4, View from close to the N14 looking down into the Orange River Valley.

The shallow valley sides slope gently down to the river.

3.1.2 Landcover

The Orange River has, to a large degree, dictated the settlement pattern in this arid region by providing a source of perennial water for the cultivation of grapes and cotton. This and the associated production of wine and dried fruit (raisins and sultanas) are the primary agricultural activity of this district.

The majority of cultivation and settlement in the region occurs around the Orange River.

Upington is a major regional centre that lies approximately 10km to the northeast of the Upington MTS and the closest point of the proposed grid corridor. Due to distance and the relatively flat terrain, it is highly unlikely that the proposed project will have any visual impact on this area.

In the vicinity of the proposed project there are extensive vineyards within the Orange River Valley.

Settlement in the form of small townships and groups of farm buildings are located on the edges of the river valley and within the cultivated areas. This cultivation and settlement generally extends to the N14 which runs along the upper edge of the River Valley. Because the majority of settlement is within the River Valley and at a lower level than the project site, it is likely that the proposed development will be largely screened, particularly from settlement located on the northern side of the Orange River.

Other than areas located around the Orange River, settlement in the region is sparse.

From the site visit only one tourism landuse was obvious. This was the Bezalel Wine Farm (Plate 5), the entrance to which is located on the N14 approximately 13km to the south of the property on which the project is proposed. The farm itself including accommodation, restaurant and wine tasting area is located within the valley. Views of the proposed project will not be possible from this operation.

As can be seen from **Map 2 (Project Context)**, there are a significant number of solar power projects planned for the region in the vicinity of the proposed project. These have been described in Section 2.4.

Refer to Map 4, Landcover.

Plate 5, View of the Bezalel Wine Farm within the Orange River Valley
Because of its location within the River Valley, this tourism operation is unlikely to have a view of proposed infrastructure.

Plate 6, View of Khi Solar One from the Lutzputs Road to the north east
Other planned solar power projects are likely to change the landscape surrounding the proposed project site.

Plate 7, View of Sirius Solar PV project during construction (centre picture) from the Lutzputs Road.

3.1.3 Vegetation Patterns

The following vegetation types are evident within the study area;

a) Natural vegetation that is generally associated with the rural landscape; and
b) Vegetation within the Orange River Valley that is generally associated with agricultural operations.

These vegetation types are indicated on **Map 5, Vegetation Types**.

a) Natural Vegetation

Mucina and Rutherford[5] indicate that the natural vegetation of the area includes:

- Bushmanland Arid Grassland;
- Kalahari Karroid Shrubland; and
- Gordonia Dunveld.

Mucina and Rutherford's description of Bushmanland Arid Grassland includes;

Extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (Stipagrostis species) giving this vegetation type the character of semidesert 'steppe'. In places low shrubs of Salsola change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

[5] The Vegetation of South Africa, Lesotho and Swaziland

Mucina and Rutherford's description of Kalahari Karroid Shrubland includes;

Low karroid shrubland on flat, gravel plains. Karoo-related elements (shrubs) meet here with northern floristic elements, indicating a transition to the Kalahari region and sandy soils.

Mucina and Rutherford's description of Gordonia Dunveld includes;

Parallel dunes about 3–8 m above the plains. Open shrubland with ridges of grassland dominated by Stipagrostis amabilis on the dune crests and Acacia haematoxylon on the dune slopes, also with A. mellifera on lower slopes and Rhigozum trichotomum in the interdune straaten.

Whilst botanically these vegetation types may be very different, in visual terms the most important characteristics include:

- They are key components of the natural, semi-desert, landscape of the region;
- The description of Gordonia Duneveld picks up on the regular, wave like, dunes that are a dominant feature of the landscape surrounding Upington; and
- All the descriptions highlight the fact that vegetation in the area is low and provides little screening potential for development.

b) Vegetation within the Orange River Valley

Vegetation within this area is comprised of a matrix of:

- Crop vegetation that is largely comprised of grapes for wine making and fruit;
- Patches of low natural vegetation particularly on the upper valley slopes;
- Ornamental vegetation including large trees around homesteads and small settlements; and
- Patches of largely alien vegetation particularly on the edges of cultivation.

3.2 LANDSCAPE CHARACTER AREAS

3.2.1 Landscape Character Area and Visual Absorption Capacity

Landscape Character Areas (LCAs) are defined as "single unique areas which are discrete geographical areas of a particular landscape type"[6].

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 small scale rural field pattern is likely to be all the more obvious due to its scale.

The affected landscape can generally be divided into the following LCAs that are largely defined by vegetation and drainage patterns.

[6] UK Guidelines.

- **Plateau LCA** which includes the gently undulating, arid plateau above the Orange River Valley. This area is generally natural in character with very little settlement. It is obvious from **Map 2 (Project Context)** that the character of this area is in transition in that solar projects are likely to create an industrial aesthetic within a matrix of natural vegetation. VAC within this area is only provided by the regular, low, dune formation as well as slopes of the slightly larger minor valleys that are associated with the non-perennial water courses that flow into the Orange River Valley.
- **The River Corridor LCA** which is comprised of the shallow valley area surrounding the Orange River. This area is generally inward looking drawing little character influence from the surrounding plateau. Landform, vegetation and development all play a role in screening views of surrounding areas and contribute to significant VAC.

These LCAs are indicated on **Map 6, Landscape Character Areas**.

3.3 VISUAL RECEPTORS

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal"[7].

3.3.1 Identified visual receptors

It is 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.

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

- Area Receptors which include the minor urban settlement areas that are located within the Orange River Corridor LCA. From the site visit it appears that the majority of settlement areas relate to agricultural use of the River Valley. It is likely that the residents of these minor settlements are predominantly focused on agricultural production of the area. As these settlements are located within the River Valley LCA, it is likely that views of the proposed development particularly from the northern side of the valley will be difficult. It is also likely that vegetation within the River Valley will help screen views of the proposed development that may be possible from the valley;
- Linear Receptors or routes through the area which include the N14, the R359, the Lutzputs road and the Upington to Kakamas Spur Railway Line. Both the N14 and the R359 roads have tourism significance, although the N14 is possibly the most important in this regard. The Lutzputs road is an un-surfaced road that at its closest runs approximately 2.4km to the north of the proposed corridor, this road is likely to be mainly used by local people. The Upington to Kakamas Spur Railway Line is used for transporting goods and so is not considered further;

[7] UK Guidelines

- Point Receptors that include individual homesteads that are located both within the River Valley LCA and the Plateau LCA. From the site visit, it is unlikely that settlements on the northern side of the Orange River will have views over the proposed development. It is possible that settlements on the higher sections on the southern side of the valley could have views of the proposed development. These however will be distance views which are likely to be softened / screened by vegetation on the fringes of the River Valley.

Visual receptors that include places and routes that may be sensitive to landscape change are indicated on **Map 6.**

LANDSCAPE CHARACTER AREAS

Plate 8, Plateau LCA

Plate 9, River Corridor LCA

SENSITIVE RECEIVERS

Plate 10, View from the R359 across the River Valley LCA.

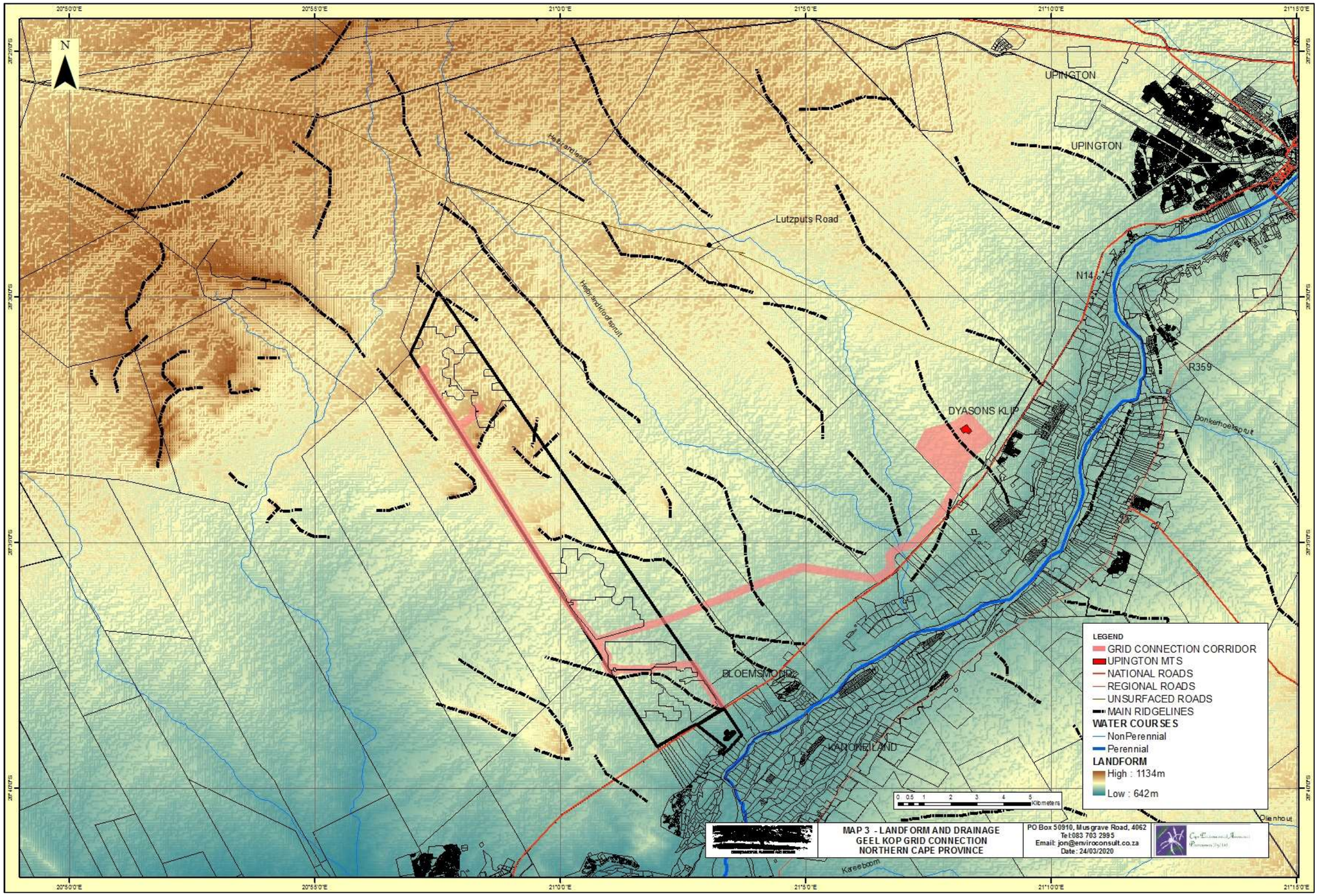
Plate 11, Settlement and homesteads within the River Valley LCA

Plate 12, The N14. This is a major regional route that runs close to the southern edge of the proposed development and is important for tourism.

Plate 13, Homesteads within the Plateau LCA.

Plate 14, The Lutzputs Road. This is an un-surfaced local road that runs to the north and east of the proposed project. It is likely to be largely used by local people.

Plate 15, The Upington to Kakamas Branch Line. This line is used for the transport of fruit and goods from Kakamas.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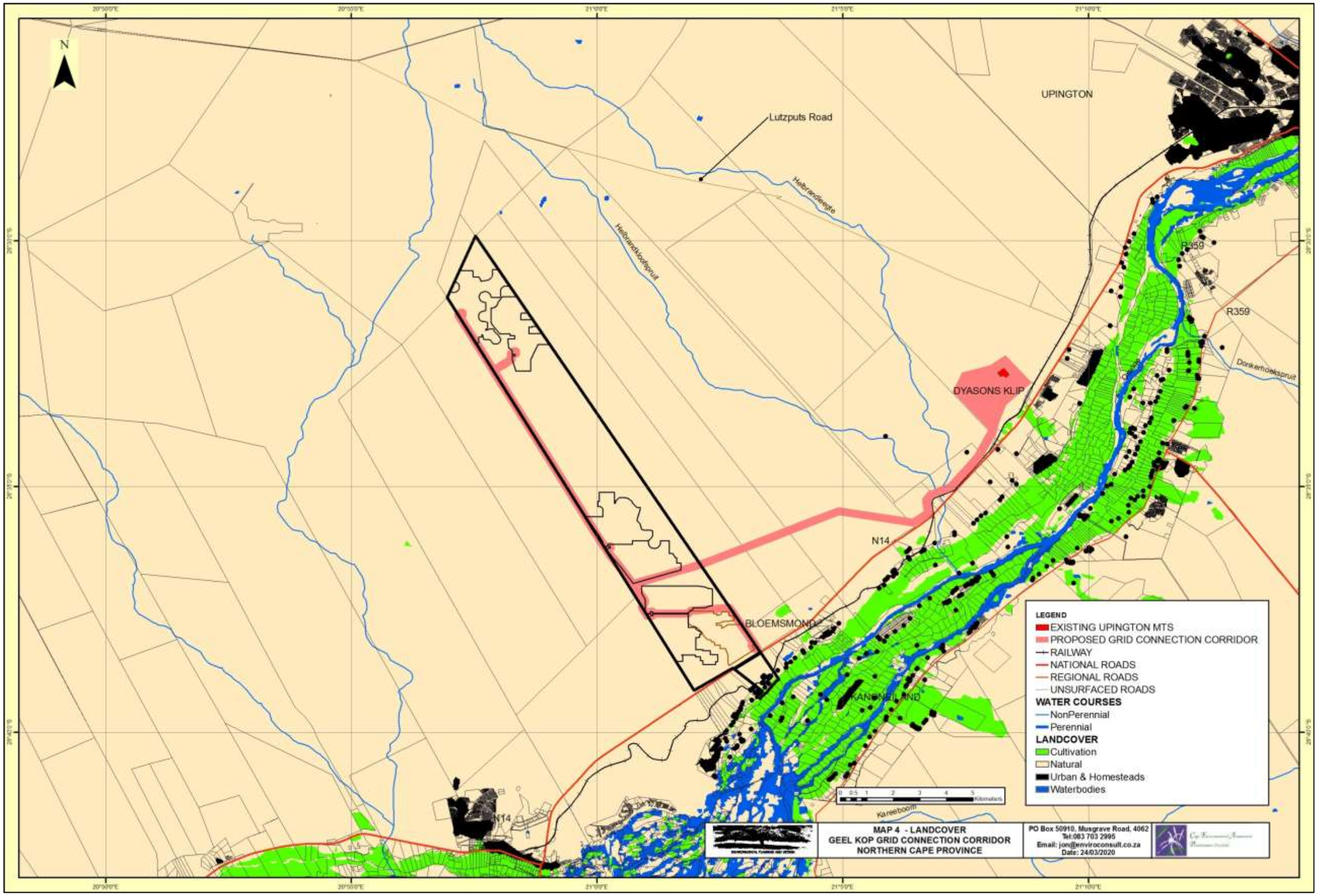
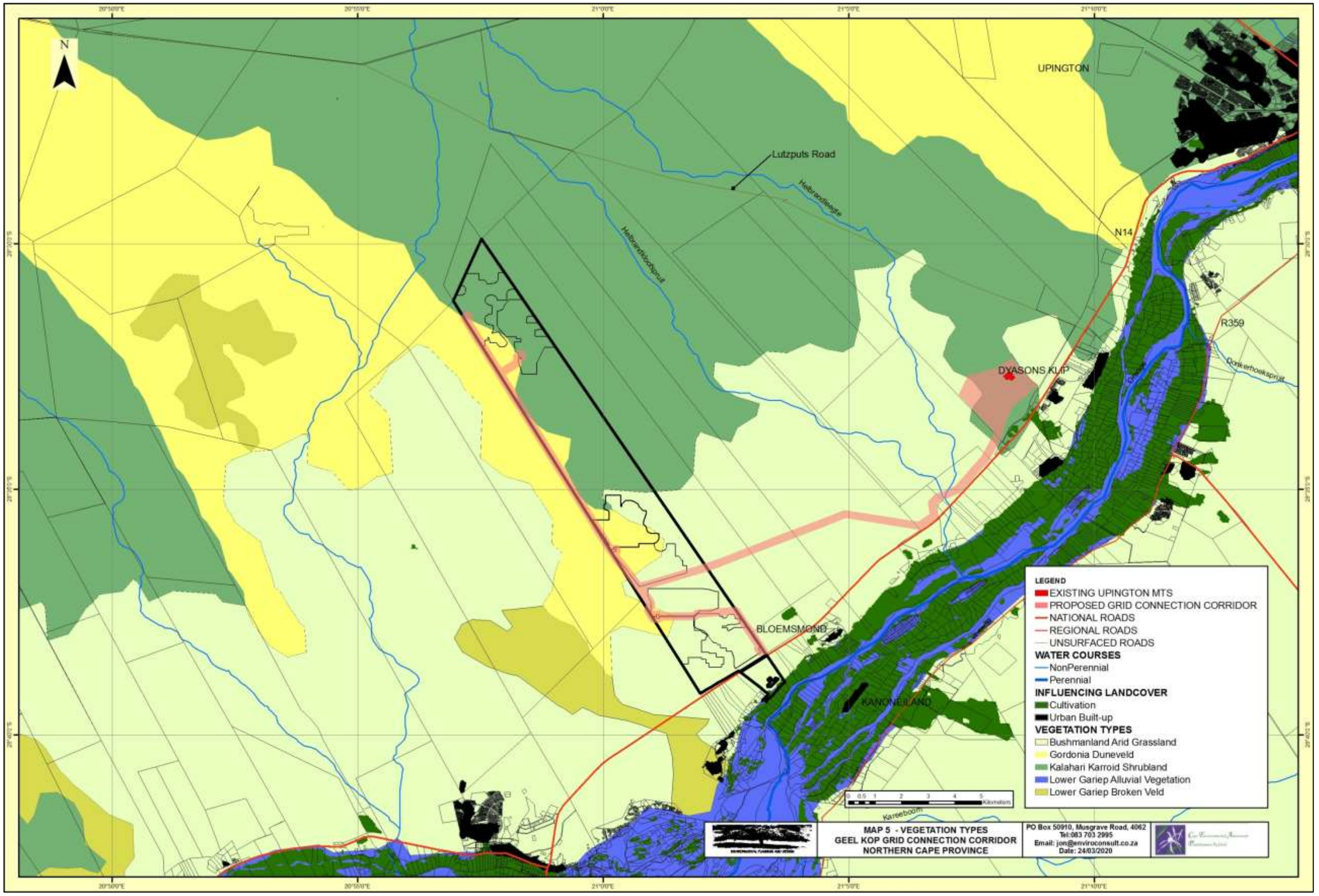
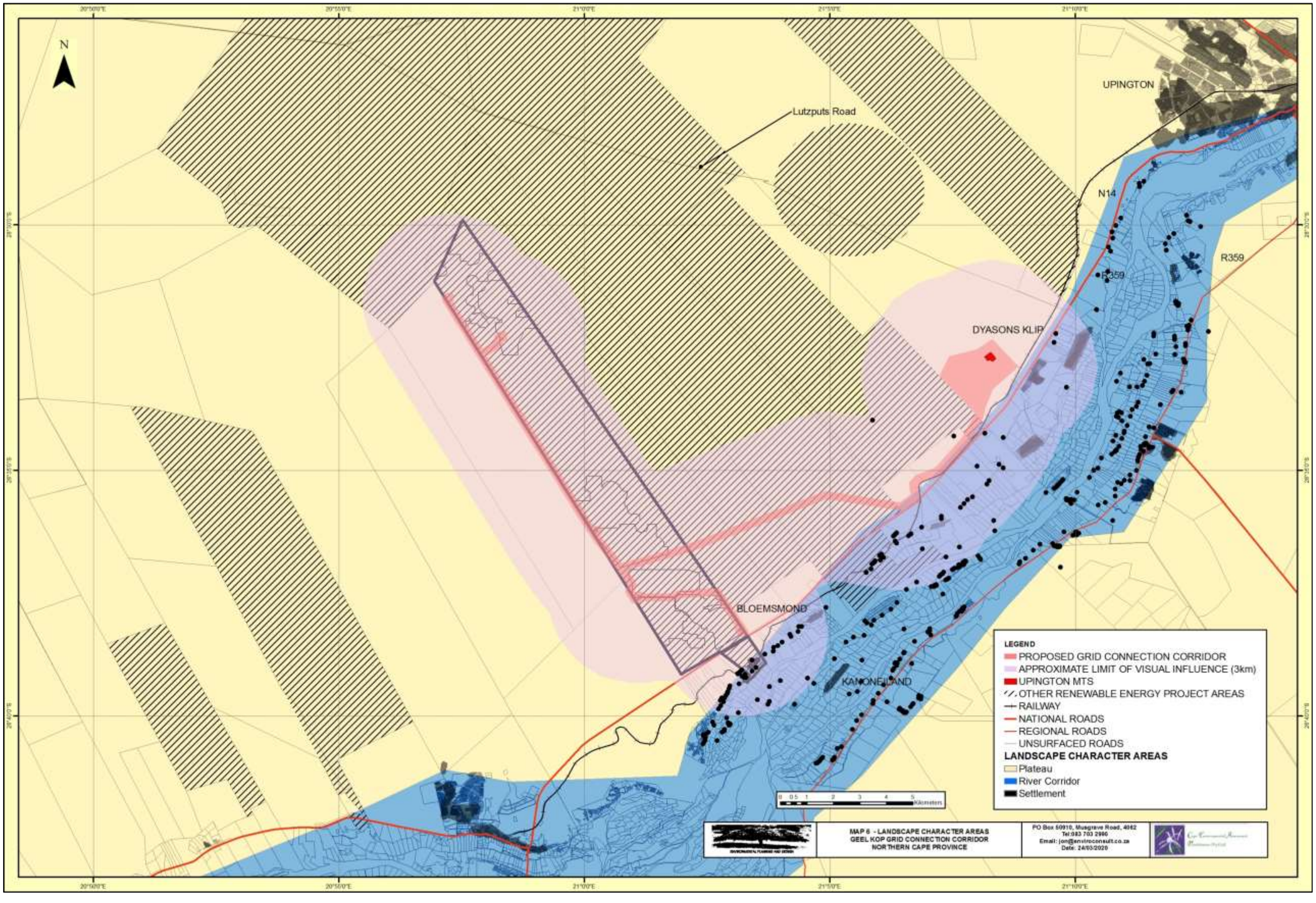
21°5'0"E
21°10'0"E
21°15'0"E
28°20'0"S
28°25'0"S
28°30'0"S
N
UPINGTON
UPINGTON
Lutzputs Road
N14
R359
DYASONS KLIP
BLOEMSMOND
KARONEILAND
Kareeboom
Dienhout
LEGEND
GRID CONNECTION CORRIDOR
UPINGTON MTS
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
MAIN RIDGELINES
WATER COURSES
NonPerennial
Perennial
LANDFORM
High : 1134m
Low : 642m
0 0.5 1 2 3 4 5
Kilometers
MAP 3 - LANDFORM AND DRAINAGE
GEEL KOP GRID CONNECTION
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel 083 703 2985
Email: jon@enviroconsult.co.za
Date: 24/03/2020


N
UPINGTON
Lutzputs Road
Hellerandlaagte
Hellerandkloofspruit
R359
R359
Dorkerhoekspruit
DYASONS KLIP
N14
BLOEMSMOND
KANONEILAND
N14
Kareeboom
LEGEND
EXISTING UPINGTON MTS
PROPOSED GRID CONNECTION CORRIDOR
RAILWAY
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
WATER COURSES
NonPerennial
Perennial
LANDCOVER
Cultivation
Natural
Urban & Homesteads
Waterbodies
0 0.5 1 2 3 4 5 Kilometers
MAP 4 - LANDCOVER
GEEL KOP GRID CONNECTION CORRIDOR
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date: 24/03/2020


N
UPINGTON
Lutzputs Road
Helbrandlaagte
Helbrandlaagte
N14
R359
Donkerhoekspruit
DYASONS KLIP
BLOEMSMOND
KANONEILAND
Kareeboom
LEGEND
EXISTING UPINGTON MTS
PROPOSED GRID CONNECTION CORRIDOR
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
WATER COURSES
NonPerennial
Perennial
INFLUENCING LANDCOVER
Cultivation
Urban Built-up
VEGETATION TYPES
Bushmanland Arid Grassland
Gordonia Duneveld
Kalahari Karroid Shrubland
Lower Gariep Alluvial Vegetation
Lower Gariep Broken Veld
0 0.5 1 2 3 4 5 Kilometers
MAP 5 - VEGETATION TYPES
GEEL KOP GRID CONNECTION CORRIDOR
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date: 24/03/2020


N
UPINGTON
Lutzputs Road
N14
R359
R359
DYASONS KLIP
BLOEMSMOND
KANONEILAND
LEGEND
PROPOSED GRID CONNECTION CORRIDOR
APPROXIMATE LIMIT OF VISUAL INFLUENCE (3km)
UPINGTON MTS
OTHER RENEWABLE ENERGY PROJECT AREAS
RAILWAY
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
LANDSCAPE CHARACTER AREAS
Plateau
River Corridor
Settlement
Kilometers
MAP 6 - LANDSCAPE CHARACTER AREAS
GEEL KOP GRID CONNECTION CORRIDOR
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2986
Email: jon@enviroconsult.co.za
Date: 24/03/2020

4 THE 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 likely to relate to visual intrusion.

Landscape and visual assessment can be a subjective judgement. However, it should relate to the importance of the landscape and the receptors involved.

In this case the landscape is not critical but the N14 has tourism importance. All other receptors have a relatively low importance.

The landscape is heavily affected by industry and particularly electrical infrastructure but not to the extent that it totally dominates views particularly from the N14 which are still relatively natural.

The assessment is therefore swayed towards minimising impacts on receptors and particularly the N14 rather than landscape protection.

4.2 LIMIT OF VISIBILITY

The proposed power line section of the development will consist of a single circuit overhead power line with a transmitting capacity of up to 132kV. The height of a 132kV power line is approximately 32m with a span between towers of approximately 250m.

The taller and slender elements within the proposed switching stations, such bus bars that are comprised of lattice structures, will be slightly lower than the proposed power line, the ALV of these elements will fall within the ALV of the proposed power line. These elements are likely to be of similar construction to the power line supports and thus they are likely to have a similar level of impact.

The lower (10m) sections of the switching stations are generally more solid elements such as electrical infrastructure, minor buildings and outdoor transformers. These elements may have an ALV of up to 11.3km which also falls within the ALV of the proposed power line. Due to the solid nature of these elements, whilst they will not be visible to the same extent as the taller elements and the proposed power line, they are likely to be more noticeable over the distance that they can be seen from. They are therefore likely to have a localised impact when compared with other elements associated with the switching station.

The GIS based assessment of Zones of Theoretical Visibility does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect, a universally accepted navigational calculation (**Appendix V**) has been used to calculate the likely distance that the proposed structures might be visible over. This indicates that in a flat landscape the proposed infrastructure may be visible over the following approximate distances.

Approximate Limit of Visibility (ALV)

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
132kV Power line, up to 32m high	20.2 kilometres
Switching station infrastructure, up to 10m	11.3 kilometres

In reality the ALV distances noted will 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 the background; and
- The fact that as the viewer gets further away, the apparent height of visible elements reduces. At the ALV, only the very tip of an object may be visible. This reducing scale means that an object will become increasing more difficult to see as the distance increases.

Plates 16 and 17 are photographs of two existing overhead 132kV power lines. These are similar in scale to the proposed overhead power line. These images provide an indication of the impact that may be expected.

The relative slenderness and colouring (galvanised grey) of taller infrastructure have a major effect in reducing visibility to the human eye. This is likely to significantly modify the ALV of the various elements of the proposed project.

Plate 16 illustrates a 132kV overhead power line with pylon spacing of +/- 250m. The photo was taken during a period of good visibility. In total 9 towers are visible along the line before it connects to a line running at right angles. The last tower in the line which is a solid pole structure is just visible at +/-2.5km.

From this review it is obvious that whilst the calculated ALV for the 132kV power line is 20.2km, it reality it will likely only be visible at a maximum distance of approximately 3km.

It is possible that either lattice or mono pole towers could be used for the development. Due to the fact that from close views lattice towers tend to read as a more solid structure and the cross section of a monopole is significantly smaller than the cross section of a lattice tower, monopoles tend to be less imposing from close up. From a distance, however, lattice towers are more visually permeable and the more solid monopole structure is generally more obvious. Despite the observations above, the potential visibility of monopoles and lattice towers is likely to be similar.

The following visual limits have been drawn from these observations:

a) Due to the matt grey colour of the galvanised steel from which it is constructed, visibility of overhead power line structures reduces significantly with distance.

b) The visual mass of the overhead power line is unlikely to be obvious from distances greater than 3km.

Plates 18 and 19 are photographs of the existing Upington MTS taken from a distance of 2.5km and 5.0km respectively. The proposed switching stations are likely to be smaller than the pictured Upington MTS which is visually obvious at 2.5km but is difficult to see at 5km.

The following visual limits have been drawn from these observations:

a) The switching stations may be obvious in the landscape at a distance of up to 3km.

b) At distances between 3km and 5km the switching stations may be visible but is unlikely to be highly obvious.

c) At distances greater than 5km, the switching stations will not be obvious.

Plate 16 - A view along the line of a 132kv overhead power line with monopole towers

Plate 17 - A view along the line of an existing similar overhead power line with steel lattice towers

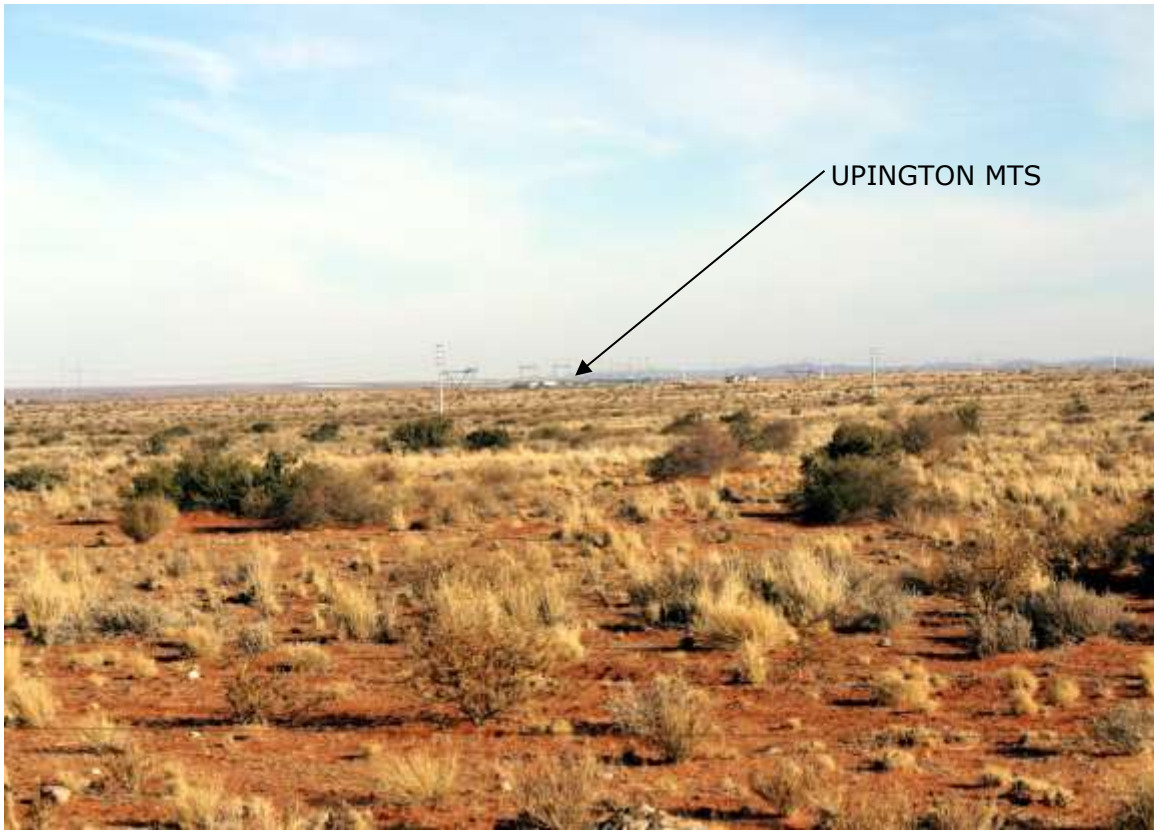


Plate 18 – (VP1) Existing Upington MTS viewed from approximately 2.5km.

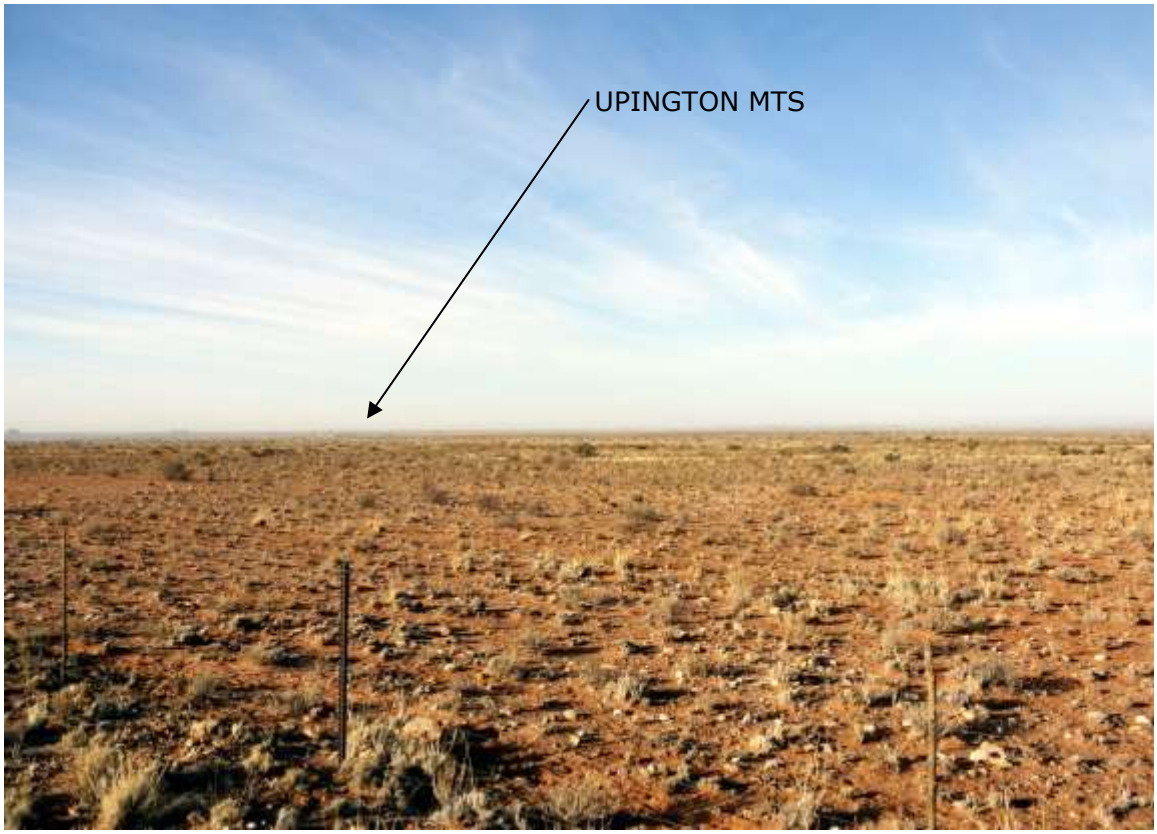


Plate 19 - Existing Upington MTS viewed from approximately 5.0km.

5 VISIBILITY OF THE PROPOSED DEVELOPMENT AND THE LIKELY NATURE OF VISUAL IMPACTS

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".

ZTVs of the proposed development have been assessed using Arc GIS Spatial Analyst toolbox.

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 an online mapping programme.

Whilst the ZTV has been calculated from terrain data only, existing vegetation could have a significant modifying effect on the areas indicated.

5.2 ASSESSMENT LIMIT

The GIS based assessment of Zones of Theoretical Visibility does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational calculation (**Appendix IV**) has been used to calculate the likely distance that the proposed structures might be visible over. This indicates that in a flat landscape a structure 32m high could be visible at a distance of approximately 20.2km. However, due to the slender nature of the structural elements, at this distance, the human eye will not be able to distinguish elements of the project from other landscape features.

As indicated in Section 4, from observations of similar overhead power lines, the proposed power line is unlikely to be obvious at a distance greater than 3km.

Section 4 also indicates that the proposed switching stations are unlikely to be obvious at a distance greater than 3km and is unlikely to be visible at a distance greater than 5km.

The assessment therefore focuses on an area within 3.0km of the power line and 5.0km of the switching stations.

5.3 APPROACH TO THE ASSESSMENT

The detailed location of the proposed infrastructure corridor and switching stations has been provided by the developer **(Map 1)**.

In order to generate the ZTV, it has been assumed that support towers will be spaced 250m apart and will be up to 32m high.

Points were set at each approximate tower and switching station locations, with appropriate height offsets, for the generation of the ZTV.

5.4 VISIBILITY OF THE PROPOSED GRID CONNECTION

From the ZTV analysis, the following conclusions can be drawn;

a) The power line is likely to be visible up to the ALV (Power Line 3km and switching station/collector switching station 5km);
b) Considering the likely sensitive receptors in relation to the ALV, the proposed development is only likely to be visible to receptors to the south east which include; a small area the Orange River Valley, a small area of the Bloemsmond settlement, the N14 and a limited number of isolated homesteads;
c) The proposed Power line component of the project is indicated as possibly being visible from approximately 2km of the eastern most section of the Lutzputs Road. However, this ALV only applies to the eastern most section of the proposed power line at its connection point into the Upington MTS. If the power line is visible, it will be seen close to the ALV and will be seen through infrastructure and other power line connections associated with the Upington MTS. It is therefore highly unlikely to be obvious from this road.

5.5 CUMULATIVE IMPACTS

The areas of visual impact associated with the proposed infrastructure are likely to fall within the impact area associated with other infrastructure associated with other projects and particularly the Sirius Grid Connection which also runs parallel to the N14.

Other grid connections including that associated with the Kha Solar 1 and McTaggarts / Klip Punt projects that approach the Upington MTS from approximately ninety degrees relative to the alignment of the Geel Kop Grid Connection are only likely to contribute to Cumulative effects in relatively close proximity to the Upington MTS.

Given the extent of visibility of Khi Solar 1, whilst the proposed Geel Kop Grid Connection may intensify local levels of impact it will not extend the impact area of renewable energy projects in general.

5.6 MODIFYING EFFECT DUE TO VAC OF THE LANDSCAPE AND THE NATURE OF THE DEVELOPMENT

The Visual Absorption Capacity (VAC) of the landscape is relatively low. Landform is the main element that limits the extent of views of the proposed development. This screening effect is taken into account in the ZTV analysis.

Within the Orange River Valley, in addition to landform, vegetation will also play a significant role in helping to screen the proposed infrastructure from the valley.

5.7 KEY VIEWPOINTS

The following key viewpoints have been selected to illustrate the nature of likely visual impacts associated with the proposed infrastructure development.

The locations of the viewpoints are indicated on the ZTV mapping.

VP1 (Plate 18), is a view from the section of the Lutzputs road from which the proposed power line is indicated as being visible. The proposed power line will approach and connect into the Upington MTS on the opposite / left side of the MTS as seen from the viewpoint. The proposed power line will therefore be partly seen through existing power lines and the MTS infrastructure. It is unlikely that the proposed power line will be highly obvious from this viewpoint.

VP2 (Plate 20), is a view from the N14 immediately to the east of the Upington MTS looking to the west. The proposed power line will be seen approaching the MTS

from left of picture at a distance of between 0.8km and 1.2km from the viewpoint. The proposed power line is likely to appear similar to the single power line towers that can be seen connecting into the MTS from right of picture. These towers are visible but are not highly obvious.

VP3 (Plate 21), is a view from the N14 approximately 2.5km south of the Upington MTS looking to the south-west. The minor ridgeline totally screens views further to the east. The proposed grid connection (updated alternative 1) will be seen in the context of existing MV power lines that run parallel with the road of the site. They will however be closer to the road.

Note that the Sirius PV Projects grid connection that has yet to be constructed will also be seen from this section of the road.

Three existing power lines are visible in this image including the roadside Low Voltage power line, a High Voltage power line that is approximately 0.7km from the road in the photograph and another Medium Voltage power line that is approximately 2.5km from the road in the photograph. The latter line runs parallel with the proposed power line for approximately 4.0km and converges to within 400m of the N14 close to the Geel Kop project site. The proposed power line (updated alternative 1) will be viewed running parallel and close to the road from this viewpoint.

VP4 (Plate 22), is a view looking to the south-west along the N14 from approximately 3km to the north-east of the development site. The existing MV overhead power line that is visible from this viewpoint is approximately 200m from the road. The proposed grid connection is likely to be a similar scale as this existing line but will be approximately 3.0km from the road at this point. It is therefore unlikely to be highly obvious.

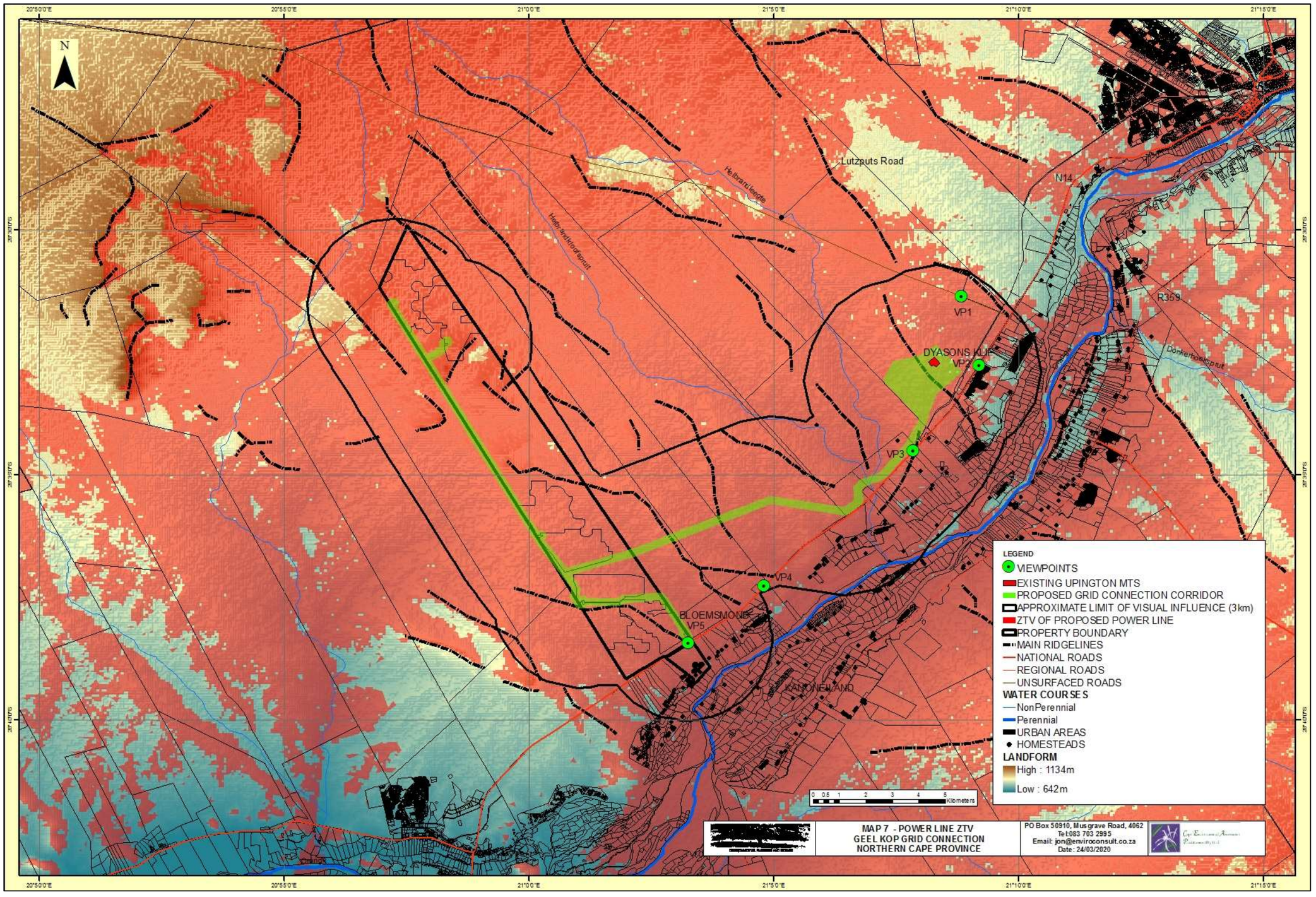
VP 5 (Plate 23), is a view looking to the north approximately along the line of the northern boundary of the proposed development site. The proposed Bushmanland Collector Switching would be visible mid picture at a distance of approximately 200m. It will therefore be highly obvious. The switching station will be viewed in the context of the Bushmanland PV project which will be also be visible immediately beside the switching station at a distance of approximately 200m. The loop in / loop out connection to the McTaggerts / Oasis 132kV powerline (alternative 2) will also be visible from this viewpoint. However, it is unlikely to significantly add to the impact of other proposed infrastructure.

Plate 20, VP2 – View looking to the west from the N14 looking towards the Upington MTS.

Plate 21, View from VP3 on the N14 approximately 2.5km to the south of the Upington MTS.

Plate 22, VP 4 – View looking to the south-west along the N14 from approximately 3km to the north-east of the Geel Kop development site.

Plate 23, VP 5 – View looking to the north approximately along the line of the northern boundary of the proposed development site.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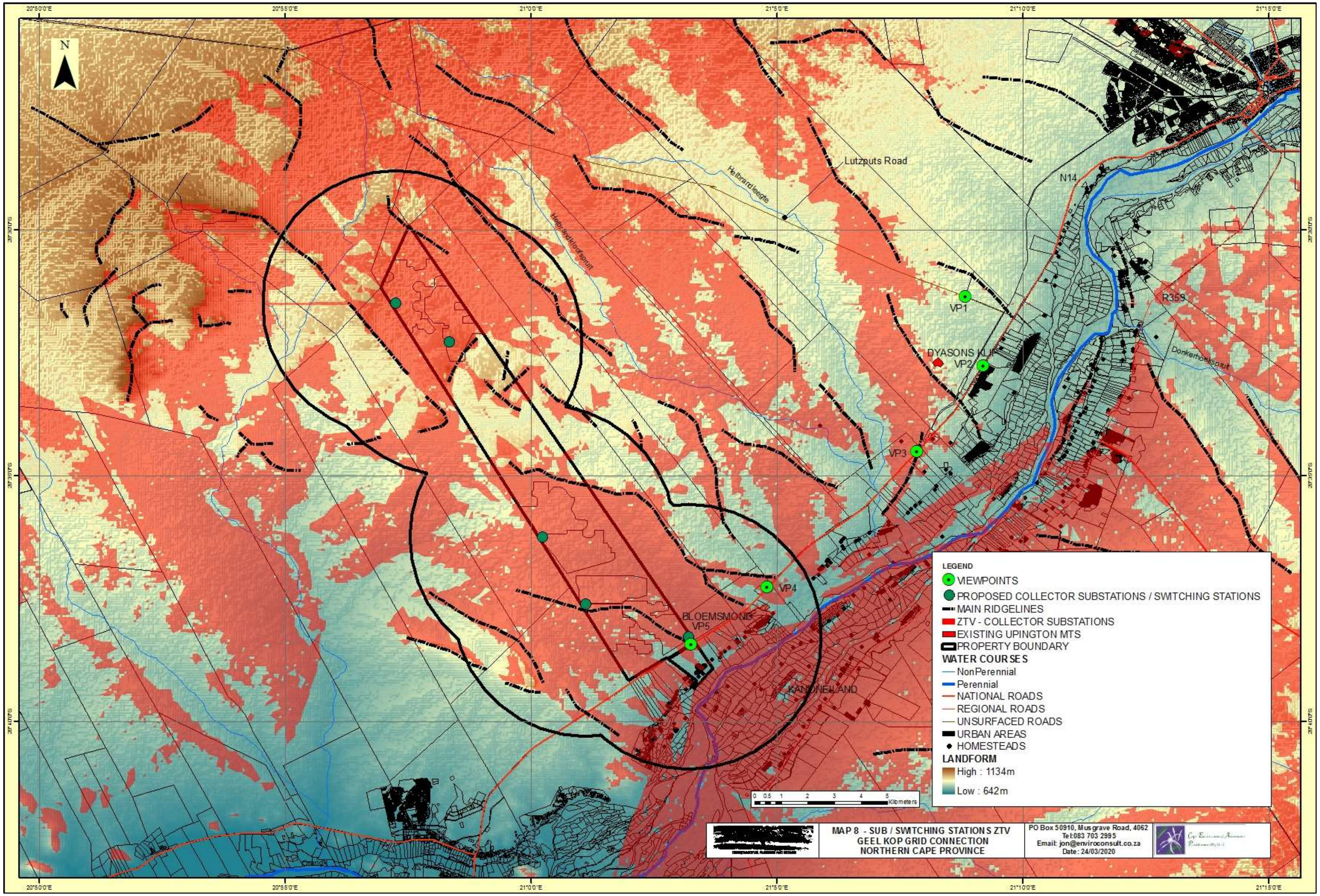
21°0'0"E
21°5'0"E
21°10'0"E
21°15'0"E
28°30'0"S
28°35'0"S
28°40'0"S
N
Lutzputs Road
N14
R359
Holtrandleegte
Hoëveldskloofspruit
Donkerhoekspruit
VP1
DYASONS KUIL
VP2
VP3
VP4
BLOEMSMOND
VP5
KANONEILAND
LEGEND
VIEWPOINTS
EXISTING UPINGTON MTS
PROPOSED GRID CONNECTION CORRIDOR
APPROXIMATE LIMIT OF VISUAL INFLUENCE (3km)
ZTV OF PROPOSED POWER LINE
PROPERTY BOUNDARY
MAIN RIDGELINES
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
WATER COURSES
NonPerennial
Perennial
URBAN AREAS
HOMESTEADS
LANDFORM
High : 1134m
Low : 642m
0 0.5 1 2 3 4 5
Kilometers
MAP 7 - POWER LINE ZTV
GEEL KOP GRID CONNECTION
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date : 24/03/2020


N
Lutzputs Road
N14
R359
VP1
DYASONS KLIP
VP2
VP3
VP4
BLOEMSMOND
VP5
KANONEILAND
LEGEND
VIEWPOINTS
PROPOSED COLLECTOR SUBSTATIONS / SWITCHING STATIONS
MAIN RIDGELINES
ZTV - COLLECTOR SUBSTATIONS
EXISTING UPINGTON MTS
PROPERTY BOUNDARY
WATER COURSES
NonPerennial
Perennial
NATIONAL ROADS
REGIONAL ROADS
UNSURFACED ROADS
URBAN AREAS
HOMESTEADS
LANDFORM
High : 1134m
Low : 642m
0 0.5 1 2 3 4 5 Kilometers
MAP 8 - SUB / SWITCHING STATIONS ZTV
GEEL KOP GRID CONNECTION
NORTHERN CAPE PROVINCE
PO Box 50910, Musgrave Road, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date: 24/03/2020
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20°55'0"E
21°0'0"E
21°5'0"E
21°10'0"E
21°15'0"E

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 N14;
c) The proposed development could change the character of the landscape as seen from the R359;
d) The proposed development could change the character of the landscape as seen from the un-surfaced Lutzputs Road to the north and east;
e) The proposed development could change the character of the landscape as seen from local homesteads and settlements;
f) Lighting impacts.

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 previous section of the report identified specific areas where visual impacts may occur. This section will quantify these impacts in their respective geographical locations and in terms of the identified issues (see Section 1.5).

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 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 ALV of the majority of the proposed power line corridor and switching stations indicate that they will largely affect a section of the Plateau LCA that are already largely impacted by solar projects and associated infrastructure.

The proposed power line and Bushmanland Collector Switching Station would be approximately 0.9km from the closest section of the verdant Orange River Corridor.

Because the ALV of the **Updated Alternative 1** power line is 3km, this section of the power line could be visible from the valley. The majority of this section of the proposed power line will be viewed behind the Bushmanland collector switching station when viewed from the N14 and the Orange River Valley to the south.

The western most section of the main west to east section of the power line, which will connect the Geel Kop collector switching station to the Upington MTS, is approximately 3km from the edge of the Orange River Valley. Therefore, this section is unlikely to be highly visible from the Orange River Valley.

The eastern most section of the main west to east section of the power line, which will connect the Geel Kop collector switching station to the Upington MTS, runs along the edge of the Orange River Valley. Therefore, this section has the potential to be visible from the Orange River Valley. However, this potential impact will be atleast partly mitigated by the extent of vegetation on the edge and within the Orange River Valley.

The Loop in / Loop Out into the McTaggerts / Oasis 132kV power line **Alternative 2** is likely to be read as part of the Bushmanland PV collector switching station. This alternative will mean that a new 132Kv power line will not be required. It is likely therefore that this alternative will result in a smaller impact particularly on the Plateau LCA.

The proposed Bushmanland Collector Switching Station on the south east corner of the Bushmanland PV project is also located close (approximately 0.9km) to the edge of the Orange River Corridor.

Therefore, only the southernmost section of the proposed grid infrastructure may potentially affect the landscape of the Orange River Valley. It is likely however, that vegetation within and on the edge of this LCA will help to screen views of the switching station.

As the proposed grid infrastructure will only impact areas of the Plateau LCA that are already industrialised, the project is unlikely to result in a significant degradation of the natural character of the area.

The eastern most section of the main west to east section of the Updated Alternative 1 power line corridor will be located close to and will impact on the Orange River Valley LCA, however, this will be part mitigated by existing vegetation.

	Without mitigation	**With mitigation**
Extent	**Orange River LCA** Site and immediate surroundings, **(2)** **Plateau LCA** Site and immediate surroundings, **(2)**	**Orange River LCA** Site and immediate surroundings, **(2)** **Plateau LCA** Site and immediate surroundings, **(2)**
Duration	**Orange River LCA** Long term, **(4)** **Plateau LCA** Long term, **(4)**	**Orange River LCA** Long term, **(4)** **Plateau LCA** Long term, **(4)**

Magnitude	**Alternative 1 - Orange River LCA** Small to minor, **(1)** **Alternative 2 - Orange River LCA** Small, **(0)** **Alternative 1 - Plateau LCA** Minor to Low, **(3)** **Alternative 2 - Plateau LCA** Minor, **(2)**	**Alternative 1 - Orange River LCA** Small to minor, **(1)** **Alternative 2 - Orange River LCA** Small, **(0)** **Alternative 1 - Plateau LCA** Minor to Low, **(3)** **Alternative 2 - Plateau LCA** Minor, **(2)**
Probability	**Alternative 1 - Orange River LCA** Probable, **(3)** **Alternative 2 - Orange River LCA** Improbable, **(2)** **Plateau LCA** Probable, **(3)**	**Alternative 1 - Orange River LCA** Probable, **(3)** **Alternative 2 - Orange River LCA** Improbable, **(2)** **Plateau LCA** Probable, **(3)**
Significance	**Alternative 1 - Orange River LCA** Low, **(21)** **Alternative 2 - Orange River LCA** Low, **(12)** **Alternative 1 - Plateau LCA** Low, **(18)** **Alternative 2 - Plateau LCA** Low, **(16)**	**Alternative 1 - Orange River LCA** Low, **(21)** **Alternative 2 - Orange River LCA** Low, **(12)** **Alternative 1 - Plateau LCA** Low, **(18)** **Alternative 1 - Plateau LCA** Low, **(16)**
Status	Given the low level of impact on the Orange River Valley LCA and the fact that the Plateau LCA is currently impacted, it is unlikely that the majority of stakeholders will view the impact as negative. **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**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders may view the loss of view as irreplaceable.	**No irreplaceable loss**

Can impacts be mitigated?	**Yes,** Possible mitigation will not change the level of significance.	**N/A**

Mitigation / Management:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude;
» Ensure that vegetation is not unnecessarily removed during the construction period;
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities;
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources; and
» Align power line as far from identified receptors as possible within the identified corridors.

Cumulative Impacts:

The proposed project will intensify the general influence of development and specifically solar projects and associated infrastructure in the area.
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 Risks:

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 the N14.

Nature of impact:
The proposed power line corridor is located approximately 1.5km from the N14.

One of the proposed collector switching stations (Bushmanland [Alternative 2]) is located approximately 200m from the N14. The next closest switching is located approximately 3.4km from the road. Given the extent of proposed solar projects between the road and the other substations, only the Bushmanland collector switching station would likely to have any significant impact.

Should power line **Updated Alternative 1** be selected, approximately half of the main west to east running section of the power line corridor will run close and within approximately 300m of the road. A power line connection in this section of the corridor is likely to be highly obvious from the road. However, it must be borne in mind that this section will be viewed in the context of other solar projects and power lines. It will therefore be an industrialised context.

Due to distance the proposed power line is likely to be visible but not highly obvious. It will also be seen in the context of and through other power lines.

Should the Loop in / Loop Out into the McTaggerts / Oasis 132kV power line **Alternative 2** be selected it is likely to be read as part of the Bushmanland PV collector switching station. This alternative will mean that a new 132Kv power line will not be required. It is likely therefore that this alternative will result in a smaller impact on views from the N14.

	Without mitigation	**With mitigation**

Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	**Alternative 1 - Proposed Power Line** Minor to low **(3)** **Alternative 2 - Proposed Power Line** Small **(0)** **Switching stations** Low **(4)**	**Alternative 1 - Proposed Power Line** Minor to low **(3)** **Alternative 2 - Proposed Power Line** Small **(0)** **Switching stations** Low **(4)**
Probability	**Alternative 1 - Proposed Power Line** Probable **(3)** **Alternative 2 - Proposed Power Line** Improbable **(2)** **Switching stations** Probable **(3)**	**Alternative 1 - Proposed Power Line** Probable **(3)** **Alternative 2 - Proposed Power Line** Improbable **(2)** **Switching stations** Probable **(3)**
Significance	**Alternative 1 - Proposed Power Line** Low **(27)** **Alternative 2 – Proposed Power Line** Low **(12)** **Switching stations** Medium **(30)**	**Alternative 1 - Proposed Power Line** Low **(27)** **Alternative 2 – Proposed Power Line** Low **(12)** **Switching stations** Medium **(30)**
Status	**Proposed Power Line** Given the low level of impact of the proposed power line and the fact that the landscape is currently impacted, it is unlikely that the majority of stakeholders will view the impact as negative. **Neutral** **Switching stations** Due to the proximity from the road one switching station is likely to be highly obvious and is likely to be seen in a negative light. **Negative.**	**Proposed Power Line** **Neutral** **Switching stations** **Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase.	**No irreplaceable loss**

	There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders may view the loss of view as irreplaceable.	
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	
Mitigation / Management: » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. » Ensure that vegetation is not unnecessarily removed during the construction period. » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities. » Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources. » Align power line as far from identified receptors as possible within the identified		
Cumulative Impacts: The proposed project will extend the general influence of development and specifically solar projects in the area. The overall cumulative impact is assessed as having a medium significance. The contribution of the proposed project to this cumulative impact was also assessed as having a medium significance. **See appendix IV.**		
Residual Risks: 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.		

6.3.3 The proposed development could change the character of the landscape as seen from the R359.

Nature of impact:

The ALV of the switching stations and proposed power line indicate that they are highly unlikely to be visible from the R359.

There is unlikely to be a difference in the level of impact between Alternative power lines 1 and 2.

	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	Given that neither the switching stations nor the	**Neutral Impact**

	power line are likely to be visually obvious and because if small sections of the development should visible they will be seen in the context of other solar projects and associated infrastructure, the change in view is unlikely to be seen as a negative impact. **Neutral impact**.	
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** Possible mitigation will not change the level of significance.	

Mitigation / Management:

- » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
- » Ensure that vegetation is not unnecessarily removed during the construction period.
- » Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
- » Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
- » Align power line as far from identified receptors as possible within the identified

Cumulative Impacts:

The proposed project is likely to have negligible visual impact on the R359.

A detailed visual analysis of other solar projects in the area has not been undertaken, however, it is likely that only CSP projects in the area which have taller elements could have a significant impact on this road.

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

Residual Risks:

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 the Lutzputs Road.

Nature of impact:

The ZTV analysis indicates that the proposed power line could be visible over approximately 2km of the road. However, the affected section of road is located close to the ALV of the project. If it is visible it will be viewed through infrastructure associated with the Upington MTS. It is therefore highly unlikely to be visually obvious.

There is unlikely to be a difference in the level of impact between Alternative power lines 1 and 2.

	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	Given the very low level of impact that is anticipated and the fact that the landscape is currently impacted, it is unlikely that the majority of stakeholders will view the impact as negative. **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** Possible mitigation will not change the level of significance.	

Mitigation / Management:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from identified receptors as possible within the identified

Cumulative Impacts:

The proposed project will have a low level impact on the Lutzputs Road.

A detailed visual analysis of all other solar projects in the area has not been undertaken, however, from the site visit, it is obvious that the Khi Solar 1 CSP project has a more significant impact on the road. The Sirius PV project that is currently under construction will have a similar level of impact as the subject project

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

See Appendix IV.
Residual Risks: 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.

6.3.5 The proposed development could change the character of the landscape as seen from local homesteads and settlements.

Nature of impact:

The ZTV analysis indicates that the proposed power line and switching stations could be visible from three isolated homesteads within the Plateau LCA. The closest homesteads (x2) are approximately 0.3km from the proposed Updated Alternative 1 power line. One of these homestead is uninhabited. The inhabited homestead is located on the opposite side of the N14 from the proposed corridor.

The next closest homestead is approximately 2.6km from the proposed power line is also uninhabited. At this distance the power line is likely to be visible but not highly obvious.

The loop in / loop out grid connection (Alternative 2) and the proposed Switching Stations are located at a distance in excess of 8km from these homesteads. At this distance, they are unlikely to be visually obvious.

The ALV also indicates that the proposed power line and the southernmost collector switching station could be visible from a limited number of homesteads and small settlements on the northern edge of the Orange River Valley. However, it is likely that existing vegetation within and on the edge of the valley will help to screen and visually soften views of this infrastructure.

There is unlikely to be a difference in the level of impact between alternatives 1 and 2.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	**Alternative 1 – Proposed Power Line** Minor to Low **(3)** **Alternative 2 – Proposed Power Line & Switching Stations** Small **(0)**	**Alternative 1 – Proposed Power Line** Minor to Low **(3)** **Alternative 2 – Proposed Power Line & Switching Stations** Small **(0)**
Probability	**Alternative 1 – Proposed Power Line** Probable **(3)**	**Alternative 1 – Proposed Power Line** Probable **(3)**

	Alternative 2 – Proposed Power Line & Switching Stations Improbable **(2)**	**Alternative 2 – Proposed Power Line & Switching Stations** Improbable **(2)**
Significance	**Alternative 1 – Proposed Power Line** Low **(27)** **Alternative 2 – Proposed Power Line & Switching Stations** Low **(12)**	**Alternative 1 – Proposed Power Line** Low **(27)** **Alternative 2 – Proposed Power Line & Switching Stations** Low **(12)**
Status	Given the low level of impact and the fact that the landscape is currently impacted, it is unlikely that the majority of stakeholders will view the impact as negative. **Neutral to negative**	**Neutral to negative**
Reversibility	High	
Irreplaceable loss	**No irreplaceable loss**	
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	

Mitigation / Management:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from identified receptors as possible within the identified

Cumulative Impacts:

The cumulative impact of solar projects and associated infrastructure was assessed as low. The contribution of this project to cumulative impacts was also assessed as low.

See Appendix IV.

Residual Impacts:

The residual risk relates to the infrastructure being left in place on decommissioning of the solar project. It is therefore critical that effective rehabilitation is undertaken.

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

Nature of impact:
Only the switching stations will be lit. Lighting is likely to include:

- Security lights that will light the facility to a level sufficient to ensure that security cameras can operate at night.
- Low level operational lights around buildings; and
- Flood lighting may also be required for emergency work during the hours of darkness.

This is could result in the switching stations being obvious at night from surrounding areas.

The Khi 1 Solar project approximately 11.5km to the north of the closest collector switching station (Bushmanland) appears relatively dark at night.

There are obvious lights from Upington as well as from passing traffic and small settlements and homesteads particularly in the Orange River Valley.

Therefore the area is not totally dark during the night.

However, there is potential for the project to add to these existing lighting levels.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Small to minor **(1)**
Probability	Definite **(5)**	Improbable **(2)**
Significance	Medium **(50)**	Low **(12)**
Status	The appearance of a lit area may be accepted by most people. It is likely however that some people will see the expansion of lighting as a **negative** impact.	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.
- 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;
- Ensure that flood lighting for night time repair work is on a separate circuit and is turned off when not required; and
- Keep lighting low, no tall mast lighting should be used.

Cumulative Impact:
There is potential for security lighting and operational lighting associated with solar energy projects and associated infrastructure 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 Risks: No residual risk has been identified.

7 IMPACT STATEMENT

7.1 PROJECT DESCRIPTION

The proposed grid connection infrastructure is required for the transmission of electricity generated by several solar PV projects to the Upington MTS, which is located approximately 12.6km to the north east of the solar PV facilities.

The grid connection infrastructure will have a transmitting capacity of 132kV. The 132kV power line is anticipated to be up to 32m high and comprise of either monopole or lattice towers.

The solid infrastructure within the switching stations will comprise of transformers and small buildings up to approximately 10m in height.

7.2 VISIBILITY

The Visual Absorption Capacity of the landscape is relatively low considering the height of the structures associated with the proposed project, the relatively flat nature of the topography and low natural vegetation.

The visibility of the proposed project is largely limited by the relatively slender nature of the taller structures and the overhead power line and by the ability of the human eye to differentiate these elements over distance.

From observations of similar power lines, the following visual limits were set;

Element	Main area of visual influence	Approximate Limit of Visibility
132kV Power Line		3km
Switching Stations	3km	5km

The ZTV analysis indicates that the proposed power line and switching station are likely to be visible throughout the majority of the Approximate Limit of Visibility.

7.3 LANDSCAPE CHARACTER

The proposed project could impact on two distinct Landscape Character Areas (LCAs) including:

- **Plateau LCA** which includes the gently undulating, arid plateau above the Orange River Valley. This area is generally natural in character with very little settlement. It is obvious from **Map 2 (Project Context)** that the character of this area is in transition in that solar projects are likely to create an industrial aesthetic within a matrix of natural vegetation. VAC within this area is only provided by the regular, low, dune formation as well as slopes of the slightly larger minor valleys that are associated with the non-perennial water courses that flow into the Orange River Valley.
- **The River Corridor LCA** which is comprised of the shallow valley area surrounding the Orange River. This area is generally inward looking drawing little character influence from the surrounding plateau. Landform, vegetation and development all play a role in screening views of surrounding areas and contribute to significant VAC.

Views of the proposed power line and collector / switching stations will mainly influence the Plateau LCA and may have a small influence over views from the River Corridor LCA.

No protected areas are likely to be affected.

7.4 SENSITIVE RECEPTORS

Identified visual receptors include:

- Area Receptors which include the minor urban settlement areas that are located within the River Corridor LCA;
- Linear Receptors or routes through the area that include the N14, the R359, the Lutzputs road; and
- Point Receptors that include individual homesteads that are located both within the Orange River Valley LCA and the Plateau LCA.

7.5 VISUAL IMPACT AND MITIGATION POTENTIAL

7.5.1 General Landscape Character

The Approximate Limit of Visibility (ALV) of the switching stations indicate that they are largely likely to affect the arid plateau, however the southernmost collector switching station (Bushmanland) may also be visible from the Orange River Valley.

The development of a power line within the proposed corridor is also only likely to affect the Plateau LCA including sections of the landscape and sensitive receptors that are already affected by solar projects and their associated infrastructure.

The power line Updated Alternative 1 is likely to have a slightly higher impact on the N14 than the loop in loop out Alternative 2. However, the significance of both is assessed as low.

The proposed project will therefore not significantly impact negatively on landscape areas outside those that are already affected by existing renewable energy projects. Because of this the landscape impact is assessed as being likely to have a low significance and a neutral status.

7.5.2 The impact of the proposed project on views from the N14

The southernmost collector switching station (Bushmanland) and the eastern most section of the west – east running section of the updated alternative 1 power line connection to the Upington MTS is likely to be highly visible from the N14.

The ALV of the proposed power line corridor (updated alternative 1) indicates that a power line developed in the corridor could be visible for approximately 20km of the N14. The majority of the affected section of the road however is located close to the approximate limit of the ALV and the power line will be viewed in the context of other grid connections and solar PV projects. The proposed power line will however run close to approximately 7km of the road immediately south of the Upington MTS and from this section the proposed power line will be more obvious.

Whilst the impact of the proposed power line was assessed as likely to have a low significance, due to the proximity of the southernmost switching station (Bushmanland) to the N14, this is likely to have an impact with a medium significance.

The power line (Updated Alternative 1) is likely to have a slightly higher impact than the loop in loop out Alternative 2. This is largely due to the fact that the eastern most section of this alternative running close to the road. However, from the assessment neither alternative presents a fatal flaw.

7.5.3 The impact of the proposed project on views from the R359

The proposed switching stations and Power Line are unlikely to be visible from this road.

The visual impact of the development was therefore assessed as being very improbable, having a low significance and a neutral status.

7.5.4 The impact of the proposed project on views from the Lutzputs Road

The ZTV analysis indicates that the proposed switching stations will not be visible from this road.

The ZTV analysis also indicates that the proposed power line could be visible over approximately 2km of the road, however, it will be seen from close to the Approximate Limit of Visibility and if visible, it will be viewed through other electrical infrastructure including the Upington MTS.

The visual impact of the development was therefore assessed as being very improbable, having a low significance and a neutral status.

7.5.5 The proposed development could change the character of the landscape as seen from local homesteads and settlements.

The ZTV analysis indicates that the proposed power line and switching stations could be visible from three isolated homesteads within the Plateau LCA. The closest homesteads (x2) are approximately 0.3km from the proposed Updated Alternative 1 power line. One of these homestead is uninhabited. The inhabited homestead is located on the opposite side of the N14 from the proposed corridor.

The next closest homestead is approximately 2.6km from the proposed power line is also uninhabited. At this distance the power line is likely to be visible but not highly obvious.

The loop in / loop out grid connection (Alternative 2) and the proposed switching stations are located at a distance in excess of 8km from these homesteads. At this distance, they are unlikely to be visually obvious.

The ALV also indicates that the proposed power line and the southernmost collector switching station (Bushmanland [Alternative 2]) could be visible from a limited number of homesteads and small settlements on the northern edge of the Orange River Valley. However, it is likely that existing vegetation within and on the edge of the valley will help to screen and visually soften views of this infrastructure.

7.5.6 The impact of lighting associated with the project

Only the switching stations will be lit. Lighting is likely to include:

- Security lights that will light the facility to a level sufficient to ensure that security cameras can operate at night;
- Low level operational lights around buildings; and
- Flood lighting that may be required for emergency work during the hours of darkness.

This is could result in the switching stations being obvious at night from surrounding areas.

The Khi 1 Solar project approximately 11.5km to the north of the closest collector switching station (Bushmanland) appears relatively dark at night. There are obvious lights from Upington as well as from passing traffic and small settlements and homesteads particularly in the Orange River Valley.

The area therefore is not totally dark during the night.

There is potential therefore for the project to add to these existing lighting levels but with appropriate mitigation the level of lighting is likely to be similar to the existing situation.

With mitigation therefore lighting impacts are improbable with a low significance and neutral status.

7.6 CUMULATIVE IMPACTS

Whilst detailed assessments of all other projects has not been undertaken, due to the development of numerous renewable energy projects and their associated infrastructure in the area, cumulative visual impacts were generally assessed as having medium significance.

With the exception of visual impact associated with the southernmost collector switching station (Bushmanland [Alternative 2]) near the N14, the contribution of the proposed project to these cumulative impacts was assessed as having a low significance.

The contribution to cumulative visual impacts on the N14 due to the southernmost collector switching station (Bushmanland [Alternative 2]) is likely to have a medium significance.

7.7 CONCLUSION

Visual impacts associated with the proposed grid connection infrastructure are generally likely to be low.

The impact on motorists on the N14 associated with the southernmost collector switching station (Bushmanland [Alternative 2]) that is assessed as having a medium significance will be experienced with the visual impact of the Bushmanland PV project. This impact will extend over approximately 5km of the road. Given the transformed nature of the landscape due to its REDZ status, this impact is likely to be similar to that experienced on other sections of the road.

The eastern most section of the power line associated with updated alternative 1 will also run close to the N14. However due to the proximity of other overhead power cables and the Upington MTS, while the impact is greater than alternative 2, the significance is also assessed as low.

The power line Updated Alternative 1 is therefore likely to have a slightly higher impact on the Plateau LCA and the N14 than the loop in loop out Alternative 2. However, given the context, the additional level of impact is not considered significant.

Therefore from a landscape and visual impact perspective, there is no reason why the proposed project should not be authorised.

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APPENDIX I

SPECIALIST'S BRIEF CV

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: PO Box 2122
Westville
3630
Republic of South Africa
Phone: +27 31 2668241, 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 of Environmental Assessment Practitioner within South Africa (2009).

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 VIA input for wind energy projects, numerous solar plant projects (CSP and PV), a new coal fired power station as well as electrical infrastructure.

Select List of Visual Impact Assessment Projects

- **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 iSimangalisoWetlend 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.
- **NoupoortConcentrating 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, CefnCoed 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.

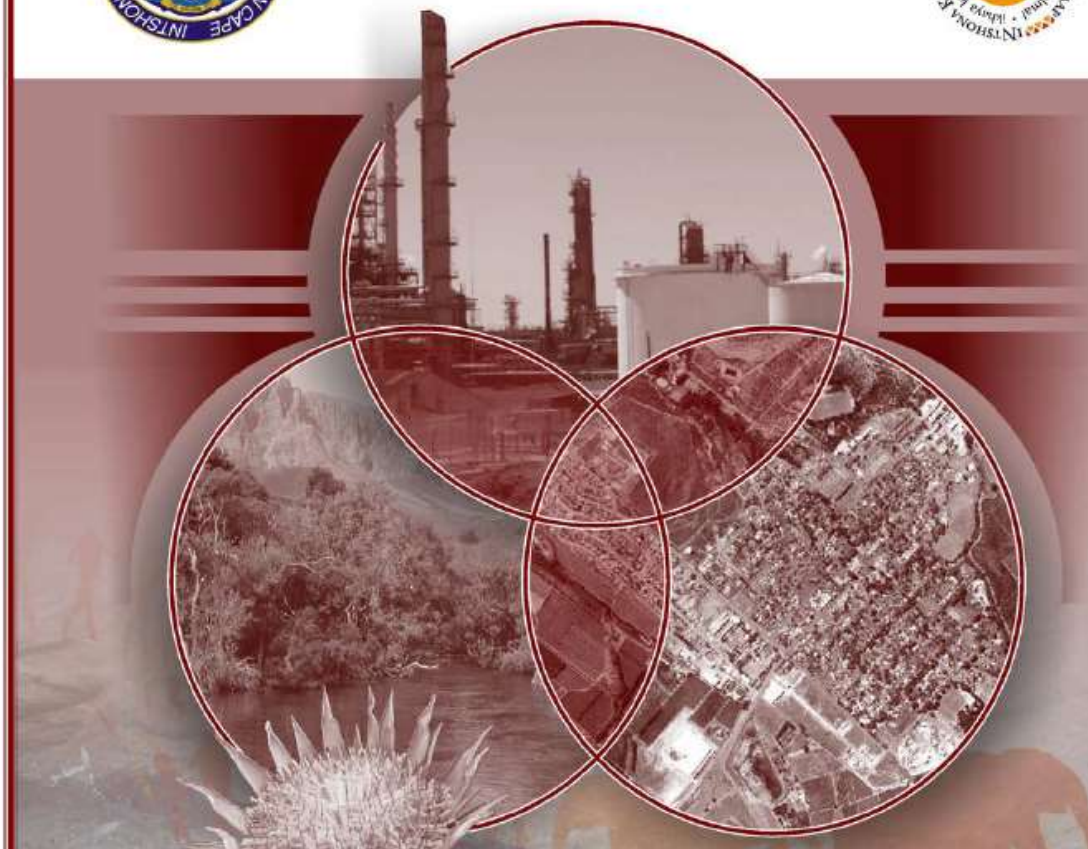
APPENDIX II

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



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CSIR

Edition 1
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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

Issued by:

Provincial Government of the Western Cape
Department of Environmental Affairs and Development Planning
Utilitas Building, 1 Dorp Street
Private Bag X9086
Cape Town 8000
South Africa

Prepared by:

Bernard Oberholzer Landscape Architect
PO Box 26643
Hout Bay, 7872, South Africa
email: bola@wol.co.za

Coordinated by:

CSIR Environmentek
P O Box 320
Stellenbosch 7599
South Africa

Contact person:

Frauke Münster
Tel: +27 21 888-2538
(fmunster@csir.co.za)

This guideline should be cited as:

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Steering committee:

Paul Hardcastle	-	DEA&DP
Ayub Mohammed	-	DEA&DP
Susie Brownlie	-	de Villiers Brownlie Associates
Keith Wiseman	-	City of Cape Town
Mike Burns	-	CSIR Environmentek
Paul Lochner	-	CSIR Environmentek
Pete Ashton	-	CSIR Environmentek

Focus group participants:

Paul Hardcastle	-	DEA&DP
Washiela Anthony	-	DEA&DP
Danie Smit	-	DEAT
Eileen Weinronk	-	City of Cape Town
Menno Klapwijk	-	Cave Klapwijk and Associates
Graham Young	-	Landscape Consultant
Bernard Oberholzer	-	Bernard Oberholzer Landscape Architect (BOLA)
Nicolas Baumann	-	Baumann & Winter Heritage Consultants
Sarah Winter	-	Baumann & Winter Heritage Consultants
Tanya de Villiers	-	Chittenden Nicks deVilliers Africa
Frauke Münster	-	CSIR Environmentek

Internal review:

Mike Burns	-	CSIR Environmentek
Eileen Weinronk	-	City of Cape Town
Paul Hardcastle	-	DEA&DP
Washiela Anthony	-	DEA&DP

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.*

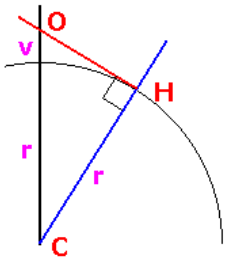
CONTENTS

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 infrastructure as well as the future proposed development of other renewable energy projects and planned infrastructure development.

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

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

Nature:
The proposed switching stations and overhead power line will impact an area that is currently impacted by one major solar project and around which a number of other solar projects are authorised / proposed.

The proposed project will therefore not extend the visual influence of industry, it will however intensify if within a relatively small area.

Whilst a detailed visual analysis of other solar projects and their grid connections in the area has not been undertaken, the combined effect of all proposed projects could be significant. Because the proposed project will affect an area within which there is already significant visual influence of solar projects and their grid connections, it is only likely to have a relatively small contribution to landscape change.

These facilities will have negligible impact on the Orange River Corridor. They will mainly impact on the arid Plateau LCA.

As the impact of the proposed project on the Orange River Corridor is minimal and because it is more difficult to predict the impact of other projects on this area without undertaking a detailed analysis, only the impact of projects on the Plateau LCA is considered.

	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	Minor to Low, **(3)**	High **(8)**
Probability	Probable, **(2)**	Probable **(3)**
Significance	**Low, (27)**	**Medium (45)**
Status (positive or negative)	**Neutral**	Negative
Reversibility	**High**	High
Irreplaceable loss of resources?	**No**	No
Can impacts be mitigated?	**Yes,** Possible mitigation will not change the level of significance	Unknown
Mitigation: » Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude. » Ensure that vegetation is not unnecessarily removed during the construction period.		

» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities. » Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources. » Align the power line as far from roads as possible within the identified corridor.

2) The cumulative impact of the proposed power line and switching stations on views from the N14.

Nature:
Whilst a detailed visual analysis of other solar projects and their grid connections in the area has not been undertaken, the combined effect of all proposed projects could be significant. Because the proposed project will affect an area within which there is already significant visual influence of solar projects and their grid connections, it is only likely to have a relatively small contribution to landscape change.

The ZTV analysis indicates that the proposed switching stations are likely to have a slightly higher impact when compared with the proposed power line alternatives. Combined they will both contribute an impact of medium significance to a cumulative impact also of medium significance.

	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	Low **(4)**	Moderate to low, **(5)**
Probability	Probable **(3)**	Probable, **(5)**
Significance	Medium **(30)**	**Medium, (60)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
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: Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from roads as possible within the identified corridor.

3 Change in the character of the landscape as seen from the R359.

Nature:

The assessment indicates that the proposed switching stations and overhead power line are highly unlikely to have any visual impact on this road.

Due to their limited height, the distance between other PV projects to the north of the Orange River and the fact that significant screening is likely to be provided by vegetation within the Orange River Valley, it is unlikely that any currently developed PV projects and the associated infrastructure will have a significant impact on this road. It should be noted however that from reference to Map 3 that it is possible that future development on the southern side of the Orange River Corridor could have a greater impact on this road.

Currently the only solar project that impacts in any way on this road is the Khi Solar 1 project.

	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)**	Regional **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Small **(0)**	Minor to Low, **(3)**
Probability	Very improbable **(1)**	Probable, **(3)**
Significance	**Low (6)**	**Medium (30)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	Unknown

Mitigation:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from identified receptors as possible within the identified

4 Change in the character of the landscape as seen from the Lutzputs Road.

Nature:

The assessment indicates that due to distance and the nature of the road the proposed power line may just be visible but the visual impact will have a low significance.

The majority of currently authorised and proposed PV projects will also have a low level of impact. This is due to the generally low height of the PV projects, distance and the screening effect provided by landform.

The projects that are likely to have the largest impact on the Lutzputs Road include:

- The existing Khi Solar 1 CSP project; and
- The Klip Punt PV project

The Khi Solar 1 project, at its closest, is located approximately 3.5km from the road. The project includes a 205m tower surrounded by a heliostat field. The heliostat field is visible over a short section of the road but the tower is visible over a broad area including the Upington area.

The proposed Klip Punt PV and McTaggarts PV3 projects are the projects that are located closest to the road (approximately 1000m and 100m respectively).

The overall cumulative impact could therefore have a medium significance. The proposed project is likely to result in a relatively low contribution to this overall impact.

	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)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small **(0)**	Moderate to low **(5)**
Probability	Very Improbable **(1)**	Definite **(5)**
Significance	**Low (6)**	**Medium (60)**
Status (positive or negative)	Given the low level of impact and the fact that the landscape is currently impacted, it is unlikely that the majority of stakeholders will view the impact as negative. **Neutral**	**Negative**
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	No
Can impacts be mitigated?	**Yes** Possible mitigation will not change the level of significance.	Unknown

Mitigation:

» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.

» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from identified receptors as possible within the identified

5 Cumulative impact on local homesteads and Settlements

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

Because the majority of homesteads are located within the Orange River Valley and are likely to be at least partially screened from PV projects to the north by landform and vegetation the cumulative visual impact of other solar PV projects and associated infrastructure is also anticipated to be low.

The Solar CSP Power Tower projects such as the Khi Solar 1 project are likely to be obvious however.

	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)**	Minor **(2)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Proposed Corridor** Low **(21)**	Low **(27)**
Status (positive or negative)	Neutral to negative	Neutral to negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	Unknown

Mitigation:
» Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude.
» Ensure that vegetation is not unnecessarily removed during the construction period.
» Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at appropriately licensed waste facilities.
» Reduce the construction period as far as possible through careful logistical planning and productive implementation of resources.
» Align power line as far from identified receptors as possible within the identified

6 Cumulative Night Time Lighting Impacts

Nature:
Currently lighting in the area is arises from the settlement areas and homesteads within the Orange River Valley and traffic on the N14. There is also a background lighting level from the urban area of Upington

There is a risk that the proposed switching stations will extend the influence of lighting however with appropriate mitigation lighting levels are anticipated to be low and in keeping with the current lighting pattern.

It is likely that the development of other solar projects in the area will increase lighting levels. However, with appropriate mitigation it is anticipated that this also will produce a low level of impact that is also in keeping with surrounding lighting levels.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site **(1)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to minor **(1)**	Small to minor **(1)**
Probability	Improbable **(2)**	Improbable **(3)**
Significance	**Low (12)**	**Low (24)**
Status (positive or negative)	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	

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;
- Ensure that flood lighting for night time repair work is on a separate circuit and is turned off when not required; and
- Keep lighting low, no tall mast lighting should be used.

APPENDIX VI

ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Grid Connection Infrastructure for the Geel Kop Solar Projects - Construction, Operation and Decommissioning
Potential Impact	Change in Landscape Character Visual Impact affecting the N14 Visual Impact affecting the R359 Visual Impact affecting the Lutzputs Road Visual Impact affecting Rural Homesteads and Settlements Lighting Impacts
Activity/risk source	Vegetation clearance and rehabilitation during construction and decommissioning resulting in degradation and further loss of character. Unnecessary impact due to lack of consideration of visual impacts on sensitive receivers Unnecessary impacts due to extended construction period Unnecessary impacts due to poor waste management Residual risk of un-necessary impact should infrastructure not be removed on decommissioning.
Mitigation: Target/Objective	Minimise and reinstate vegetation loss. Place structures as far from sensitive receivers as corridors will allow. Minimise the construction period. Ensure that appropriate waste management is undertaken. Remove structures and rehabilitate site on decommissioning.

Mitigation: Action/control	**Responsibility** Contractor (C) Environmental (EO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)
Plan construction to minimise impact period on identified receptors.	(C)	(C)

Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.	C, ECO, ELO	C
Reinstate any areas of vegetation that have been disturbed during construction.	C, ECO, ELO	C
Rehabilitate areas to their natural state on decommissioning.	C, ECO, ELO	C, D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, ECO, ELO	C, D
Remove all temporary works.	C, ECO, ELO	C, D
Remove infrastructure not required for the post-decommissioning use of the site.	C, ECO, ELO	C, D

Performance Indicators	Construction of specific sections of the infrastructure exceeding programme. Vegetation presence and density. Presence of unnecessary infrastructure. Location of structures closer to sensitive receivers than is necessary
Monitoring	Regular review of the programme. Review layout drawings to ensure that towers are placed as sensitively as possible with regard to the views of sensitive receivers. Evaluate vegetation before, during and after construction. Check to ensure that all structures are removed and rehabilitation is undertaken during decommissioning. Responsibility: ECO and ELO. Prepare regular reports.