VISUAL IMPACT ASSESSMENT REPORT FOR THE PROPOSED 132kV GRID CONNECTION TRANSMISSION LINE NEAR GROBLERSHOOP, NORTHERN CAPE PROVINCE. OCTOBER 2022

PREPARED BY:
Skets Architects, Planning & Environmental Consulting cc.
Reg. no: 2010/034929/23

Fax: 086 520 4677
Tel: 076 169 1435
Email: mader@skets.co.za

LEAD CONSULTANT:
Environmental Management Group (Pty) Ltd

41 Laan Sonder Naam
Groenvlei
Bloemfontein
9301

Tel: 051 412 6350

EXECUTIVE SUMMARY

Skets Architects and Planning has been appointed by Environmental Management Group (Pty) Ltd to compile a Visual Impact Assessment Desktop Report for the proposed 132kV grid connection powerline near the town of Groblershoop in the Northern Cape Province.

The proponent (Orange River Solar Facility (Pty) Ltd) is in the process of developing renewable energy plants in the Groblershoop area. Environmental Management Group (Pty) Ltd was appointed to facilitate the environmental authorisation associated with the green energy developments. The proponent intends to develop a 132kV grid connection powerline that will connect the future Orange River Solar Facility, situated on portion 18 of Farm Rooisand 387, with the existing Groblershoop Substation. The powerline will be approximately 4 km in length.

A VIA is a specialist study which assesses the potential visual changes to an existing baseline setting resulting from the implementation of a proposed project. The associated visual changes could potentially impact on the character and value of the landscape and affect the views and perceptions of observers in the study area. The purpose is to determine the significance of the changes and to recommend mitigation measures where the impacts are considered negative.

The objectives will be to:

- Address the concerns that are raised during public participation events which relates to aesthetic or any visual aspects;
- Determine the impact on the observers, landscape character and/or landscape features in the study area due to the change in the visual characteristics of the environment; and
- Recommend mitigation measures to alleviate or reduce the anticipated impacts.

STUDY AREA

The scale of assessment is influenced by the extent of the potential impact and determines the size of the study area. The study area can be described as the area affected by visual impact and usually extends beyond the boundaries of the development footprint, especially when tall project structures are proposed. The proposed 132kV powerline stretches over approximately 4 km and will consist of steel pylons of between 20-25 m tall, spaced at 80 m apart. This is considered a relatively small-scale electrical infrastructure development project.

Based on the projected viewshed analysis, the appropriate scale of assessment is a regional area of up to 10 km from the alignment of the powerline. This is motivated by the proposed vertical scale of the pylons, and the relatively flat, but undulating topography associated with the site.

The natural topography is unevenly undulating with a general downwards slope towards the Orange River which forms the main drainage basin. The wide floodplain provides even and fertile land for the growing of crops. More elevated terrain is noticeable along the horizon, outside the study area. The study area has two main vegetation types namely the Bushmanland Arid Grassland and Lower Gariep Alluvial Vegetation.

The town of Groblershoop is situated approximately 80 km southeast of Upington on the southern bank of the Orange River. It is a small, rural town with its main industry revolving around grape and wine production, as well as livestock farming. The cultural heritage and thriving agriculture industry

contribute to a pleasant and tranquil experience. A few tourist attractions are present in the study area and typically include overnight accommodation and small retail outlets offering products from the local farm produce.

The agriculture industry is well established and has its history dating back to 1929 with the construction of the Boegoeberg Dam. Irrigated vineyards and other crops are predominantly grown on the alluvial terrace, next to the Orange River, which provides even, fertile soils.

The study area has a very strong connection with the Orange River due to its importance in sustaining the area's economy. It has been in development for nearly a century which enforces the synonymousness relation between the Orange River valley and the farming community. A great contrast exists between the expansive harsh and arid environment, and the lush green vein that traverses it. This contrast allows for picturesque scenes deriving inspiration off an oasis theme.

The sense of place is rooted in the presence of the Orange River and the developed floodplain that sustains the local community, but also contributes to a national economy. It speaks of an isolated community that overcame environmental adversity to develop a self-sustaining livelihood. Groblershoop was built on the agricultural successes and, although a small town with a small population, has a certain greatness about it.

The study area has a baseline of existing electrical infrastructure in the form of the Groblershoop Substation and a few existing medium voltage powerlines. 22kV powerlines distribute electricity to the farms and town and are typically recognisable by the timber pole structures. On such line follows a similar route as the proposed transmission line. The Gorana/Groblershoop 132kV powerline is another existing powerline following the same alignment as the proposed powerline.

PROJECT DESCRIPTION

The proposed 132kV powerline will extend over approximately 4 km from the existing Groblershoop Substation, across the Orange River to a location where a future substation and solar facility is planned. The solar facility is yet to be developed, as the environmental authorisation process for this development is still underway (DFFE ref 14/12/16/3/3/1/2558). The proposed 132kV powerline will run parallel, approximately 25 m from an the existing Gorana/Groblershoop 132kV overhead line, connecting the solar facility to the Groblershoop Substation.

The mono pylons proposed for this overhead powerline, are expected to have similar visual characteristics as the existing powerline. Pylon heights will range between 20 – 25 m depending on the topography, at an estimated spacing of 80 m along the powerline route. Bird-friendly additions may be attached to the pylons and powerline for example bird flappers.

VISUAL IMPACT ASSESSMENT

Within the study area observers experience and interact differently with their environment and therefore value it differently. They may be affected by the proposed project due to additions or alterations in the visual environment which may influence their experience and views of the visual environment. In this assessment, a distinction is made between impacts on the **observers** and impacts on the **landscape character**. The observers represent all people and their views that may be affected due to their exposure to a source of impact, while the impacts on the landscape character

strictly assess the changes to the landscape's character and the impact on its visual value, regardless of the presence of observers. Although impacts may be similar in nature, a highly significant impact on the observers will not necessarily be a highly significant impact on the landscape character and vice versa.

A VIA is a specialist study that assesses the potential visual changes/impacts to an existing baseline setting resulting from the implementation of a proposed project. This implies that, firstly, a baseline must be established and secondly, the visual change, resulting from the project, must be compared to the baseline. The quantification of the visual change is referred to as the severity of the impact and is a function of:

- The nature of the impact;
- The probability of the impact occurring;
- The duration of the impact;
- The extent of the impact; and
- The magnitude of the impact.

RECEPTOR SENSITIVITY

The following observer groups have been identified in the study area:

- Tourists visiting Groblershoop and surroundings;
- Residents in Groblershoop and surrounding farms; and
- Motorists utilising the local road network passing through the study area.

Tourists are generally classified as observers with a high sensitivity when their reason for visiting the area is focussed on enjoying the visual quality and engaging in outdoor activities that are offered by the study area's natural landscape. The viewer incidence associated with tourists, are considered relatively low as Groblershoop and surroundings offer few tourist attractions. The town is also not located along major recognised tourist routes, although the N10 and N8 converge at this point and connects to other towns such as Upington and Kenhardt.

Tourists that do visit Groblershoop may stay over at the lodgings provided and may stop at the Hedgehog Padstal northwest of the town. Some overnight accommodation is situated in town, but those inside the ZMVE are the Destiny Rock Inn, located on the northern bank of the Orange River, directly next to the powerline route. Grape Vine B&B are located next to the N8 on the southern bank of the river, approximately 800 m from the powerline alignment. Stokkiesdraai Gastehuis is approximately 1.1 km from the powerline route, east of the N8 on the north bank. The viewshed analysis indicates that these tourist attractions may experience high exposure to the proposed powerline due to their proximity to the alignment.

One can assume with certainty that one of the most attractive features in the study area is the Orange River and the adjacent vineyards. The river can be viewed from the N8 bridge crossing the river, but views from the town and farms are somewhat obscured by the riverine vegetation on its banks.

Residents in the study area are generally classified as visual receptors of high sensitivity owing to their sustained visual exposure and attentive interest towards their living environment. The highest concentration residents are present in Groblershoop approximately 2 km from the powerline route,

nearest to the Groblershoop Substation. A part of the town is inside the ZMVE and according to the viewshed analysis will experience a high visual exposure. However, due to the flat topography in the area, the houses nearest to the source of impact will block the views of residents living in the rows behind them. Houses are typically one and 2 storeys high, and garden trees increase the screening of views to the source of impact. Therefore, only the residents living on the perimeter of the town fronting the source of impact, is expected to experience high exposure, and those behind them will only experience partial or no views. In addition, the Agrimark building is located between some of the houses and the powerline, further blocking their view. At most, these residents are expected to see a portion of the powerline from the Groblershoop Substation to where it crosses the river. The viewer incidence is expected to be relatively low/medium.

Farmsteads can be seen along the outer edge of the farmlands in the area called rural/outlaying in Figure 5. A number of farmsteads are present along the Opwag Road on the south bank and Knyp road on the north bank, and will experience a high visual exposure due to their location inside the ZMVE. The farms further away from the river on the arid region, are sparsely populated and spread out with no farmsteads located inside the ZMVE. Their exposure to the potential visual impacts will be much reduced due to their distance from the source of impact and their sensitivity is expected to be medium.

Motorists are considered the least sensitive group of observers due to the speed at which they travel and their brief exposure to impacts. This group is mostly limited to road users on the N10 and N8. Intermitted views of the proposed powerline are expected as motorists travel through the study area. The highest visual exposure is expected to be experienced when travelling over the N8 bridge and along both the approaching sides. A brief view of the Orange River and the proposed powerline will be experienced. Their brief exposure to the source of impact lowers their sensitivity to very low.

The sensitivity of a landscape's character is a measure of its robustness and its ability to accommodate changes without detrimental impacts on its prevailing character. The landscape character sensitivity is considered high along the Orange River and the agricultural fields adjacent to it. This is accredited to the generally high scenic quality associated with the river landscape and the picturesque vineyards adjacent to it. The Orange River is considered a national scenic feature that also supports an aquatic ecology and the region's agricultural economy. The term "Green Kalahari" refers to the desolate, semidesert landscape, contrasting with the fertile agricultural fields adjacent to the meandering river. The sense of place is well rooted in the history of agricultural development, and the area is a world renowned table grape and white wine producer. Due to the flattish and low laying floodplain, the VAC is low, and the landscape is exposed.

The part of the study area referred to as farmland/undeveloped and rural/outlaying (Figure 5) has a medium sensitivity. This is attributed to the mundane landscape that portrays a homogenous, arid character. The topographical undulation with the backdrop of elevated terrain on the horizon, contributes to interesting scenery although not unique to the region. The farmland/undeveloped landscape is largely intact with the natural vegetation of Bushmanland Arid Grassland present. The rural/outlaying landscape experienced slight transformation as it is close to the town and farmlands. The association is with the Bushmanland Arid Grassland, but some human interventions altered the character slightly.

VISUAL IMPACTS DURING CONSTRUCTION PHASE

Nature of impact on observers: The construction activity will damage vegetation and disturb the surface at the pylon locations and where new access roads are required. Initially the construction activity will be on ground level and vegetation and topographic screening will limit visibility to some extent. As the pylons are erected, the ZVI will increase and more viewers will be affected, even outside the ZMVE. Construction sites and some construction activities are considered unsightly and will intrude on the views of observers inside the ZMVE.

Nature of impact on landscape character: The construction activity will damage vegetation and disturb the surface at the pylon locations and where new access roads are required. These activities will negatively impact on the attributes of the landscape as it will remove or damage elements that contribute to the prevailing character of the landscape. The construction equipment, construction camps and workforce will be elements that are uncharacteristic to the visual environment. It will impact on the visual value and quality of the landscape character especially in the areas that are considered part of the river and agricultural landscapes.

VISUAL IMPACTS DURING OPERATIONAL PHASE

Nature of impact on observers: The completed project will add a new 4km powerline to the visual environment. Although the baseline environment already has existing power infrastructure, it remains in contrast with the prevailing character and experience of the study area. Views of the Orange River and agricultural fields will be negatively affected by the addition of a new powerline. It will interfere with the scenic quality of the views and negatively affect the sense of place.

Nature of impact on landscape character: The completed project will introduce a new 4km powerline to a landscape that is valued for its natural beauty and picturesque agricultural land use. These features are central to the sense of place and the scenic quality of the study area. A new powerline will noticeably change the baseline environment, thereby detracting from the current values and qualities of the natural features and the scenic quality associated with the agricultural fields.

A very high risk of cumulative impacts is likely as the powerline route is also shared with other existing powerlines in the same corridor. The proposed powerline will increasing the visual dominance of power infrastructure, thereby compounding the negative affect on views towards valued landscape features and reducing scenic quality of the landscape character. Cumulative impacts can only be effectively reduced with the implementation of drastic design alterations as recommended mitigation.

Residual risks can be effectively reduced if a drastic design alteration is implemented, in particular the consolidation of existing powerlines or underground cabling. If this is not an option, residual risks will remain, as the powerline cannot be effectively mitigated with remediation or reduction strategies.

VISUAL IMPACTS SIGNIFICANCE SUMMARY

Receptor	Sensitivity of receptors	Severity of Impact without mitigation	Severity of Impact with mitigation	Significance of Impact without mitigation	Significance of Impact with mitigation
CONSTRUCTION PHASE					
Residents inside ZMVE	High	Medium 40	Low 27	Moderate	Moderate/Minor
Residents outside ZMVE	Medium	Medium 40	Low 27	Moderate/Minor	Minor
Tourists inside ZMVE	High	Medium 40	Low 27	Moderate	Moderate/Minor
Tourists outside ZMVE	Medium	Medium 40	Low 27	Moderate/Minor	Minor
Motorists	Low	Medium 40	Low 27	Minor	Minor/Negligible
Orange River & agricultural landscape	High	Medium 50	Medium 45	Moderate	Moderate
Farmland/undeveloped & Rural/outlaying landscape	Medium	Medium 50	Medium 45	Moderate/Minor	Moderate/Minor
OPERATIONAL PHASE					
Residents inside ZMVE	High	High 64	Very low 8	Major	Minor
Residents outside ZMVE	Medium	High 64	Very low 8	Moderate	Minor/Negligible
Tourists inside ZMVE	High	High 64	Very low 8	Major	Minor
Tourists outside ZMVE	Medium	High 64	Very low 8	Moderate	Minor/Negligible
Motorists	Low	High 64	Very low 8	Moderate/Minor	Negligible
Orange River & agricultural landscape	High	High 80	Low 12	Major	Minor/Negligible
Farmland/undeveloped & Rural/outlaying landscape	Medium	High 80	Low 12	Moderate	Minor

CONCLUSION

The significance of the visual impact is determined through separate assessments of impacts on the landscape character and impacts on observers in the study area. This has been done for the construction and operational phases as each phase presents different impacts. The landscape character and the observers are receptors in the study area and have different sensitivities. It is expected that each receptor will respond differently to the anticipated visual impacts.
The sources of visual impacts will originate from the construction activity and the presence of a workforce and machinery operating during the construction process. When this is complete, the newly constructed powerline will remain a source of impact as its presence will result in a change to the existing baseline environment. During both phases, inherent mitigating factors for example screening by the topography/vegetation and distance from the source of impact, will influence the VAC and ZVI. The inherent mitigation factors are not enough to completely eliminate the potential impacts, and additional mitigation measures should be considered.

Observers in the study area will be affected differently by the potential impacts, due to their distance away from the source of impact and their sensitivity towards their visual environment. Residents and tourists residing or entering the ZMVE are considered the most sensitive observers in the study area. These are limited to the residents of Groblershoop, the surrounding farmers and tourists seeking lodging at the accommodation facilities in the ZMVE. Their exposure to the impacts is expected high to medium and at least a portion of the powerline will be visible to viewers inside the ZMVE. The significance of impacts is the highest on residents and tourists inside the ZMVE if no mitigation is implemented.

The landscape character will experience a transformation as a result of the new powerline. The completed project will introduce a new 4km powerline to a landscape that is valued for its natural beauty and picturesque agricultural land use. These features are central to the sense of place and the scenic quality of the study area. A new powerline will noticeably change the baseline environment, thereby detracting from the current values and qualities of the natural features and the scenic quality associated with the agricultural fields. The significance of impacts is the highest on the Orange River and agricultural landscapes if no mitigation is implemented.

A very high risk of cumulative impacts is likely as the powerline route is also shared with other existing powerlines in the same corridor. The proposed powerline will increasing the visual dominance of power infrastructure, thereby compounding the negative affect on views towards valued landscape features and reducing scenic quality of the landscape character. Cumulative impacts can only be effectively reduced with the implementation of drastic design alterations as recommended mitigation.

Residual risks can be effectively reduced if a drastic design alteration is implemented, in particular the consolidation of existing powerlines or underground cabling. If this is not an option, residual risks will remain, as the powerline cannot be effectively mitigated with remediation or reduction strategies.

Impacts can be marginally mitigated during the construction phase, but little can be done to mitigate impacts during the operational phase unless major design changes are considered. One such consideration is the avoidance of a new powerline and the construction of an underground cable or the consolidation of parallel lines on a single powerline. This is subject to technical and cost-benefit

scrutiny. An alternative, but less preferred option, is the rerouting of the powerline to avoid areas of sensitive visual and landscape receptors. These are considered the most effective mitigation measure to address the potential impacts.

No fatally flawed impacts are identified, but the significance of impact on the highly sensitive landscapes, are considered major and require mitigation intervention to prevent further loss in scenic quality and visual value.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

BA	Basic Assessment
DEM	Digital Elevation Model
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
GIS	Geographical Information System
REDZ	Renewable Energy Development Zone
SRTM	Shuttle Radar Topography Mission
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
ZMVE	Zone of Maximum Visual Exposure
ZVI	Zone of Visual Influence

1 INTRODUCTION

Skets Architects and Planning has been appointed by Environmental Management Group (Pty) Ltd to compile a Visual Impact Assessment Desktop Report for the proposed 132kV grid connection powerline near the town of Groblershoop in the Northern Cape Province (Figure 1).

The proponent (Orange River Solar Facility (Pty) Ltd) is in the process of developing renewable energy plants in the Groblershoop area. Environmental Management Group (Pty) Ltd was appointed to facilitate the environmental authorisation associated with the green energy developments. The proponent intends to develop a 132kV grid connection powerline that will connect the future Orange River Solar Facility, situated on portion 18 of Farm Rooisand 387, with the existing Groblershoop Substation. The powerline will be approximately 4 km in length.

A Visual Impact Assessment (VIA) is a specialist study which assesses the potential visual changes to an existing baseline setting resulting from the implementation of a proposed project. The associated visual changes could potentially impact on the character and value of the landscape and affect the views and perceptions of observers in the study area. The purpose is to determine the significance of the changes and to recommend mitigation measures where the impacts are considered negative.

> The term "landscape" is "…an area, as perceived by people, whose character is the result of the action and interaction of natural and / or human factors."
> (Tudor, 2014)

2 OBJECTIVES AND METHODOLOGY

2.1 VIA OBJECTIVES

The objectives will be to:

- Address the concerns that are raised during public participation events which relates to aesthetic or any visual aspects;
- Determine the impact on the observers, landscape character and/or landscape features in the study area due to the change in the visual characteristics of the environment; and
- Recommend mitigation measures to alleviate or reduce the anticipated impacts.

The information base that are used include the studying of aerial photographs, such as those available to the public in the form of web-based maps etc., GIS data and site photographs provided by Environmental Management Group (Pty) Ltd. Information on the project is provided by the client and/or lead consultant and is presumed accurate.

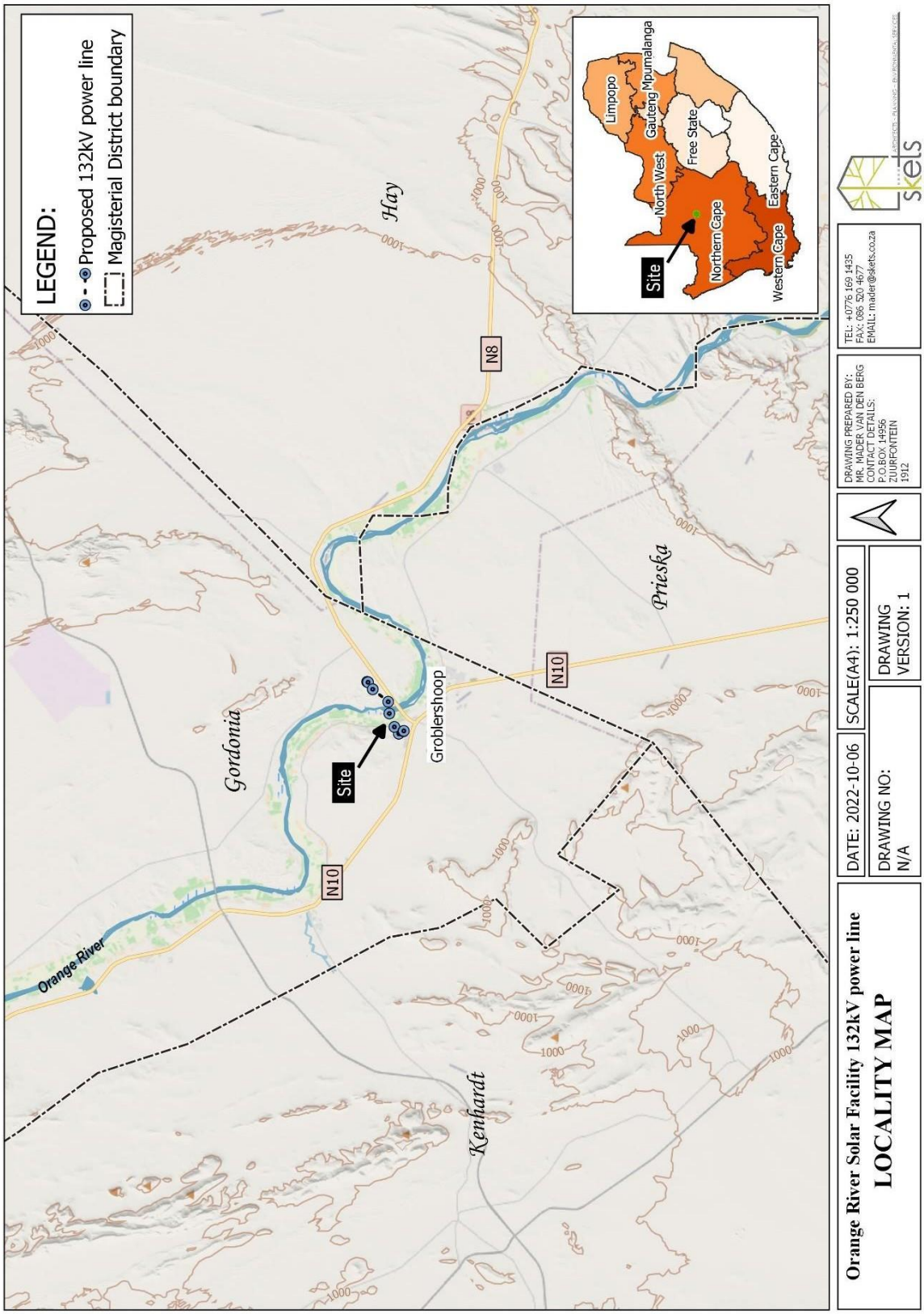

Figure 1: Locality map

3 LIMITATIONS AND ASSUMPTIONS

This section provides a clear understanding of the limitations and assumptions that negatively affect the accuracy of the assessment and influences the confidence of the visual specialist in his professional judgement. Normally the specialist's confidence is influenced by the inherent knowledge of the specific project and study area as well as by the level of detail provided on the project.

- A Visual Impact Assessment is not a purely objective science and often integrates qualitative evaluations based on human perceptions. It is the visual specialist's aim to utilise as much quantitative data and scientific research as possible, to substantiate professional judgement and to motivate subjective opinions;
- No comments or complaints have been received from the public prior to the writing of this report and could therefore not be incorporated. If, at any point, public responses highlights concern with regards to visual impacts, this report should best be revised;
- The viewshed analysis reflected in this report indicates the extent of the potential Zone of Visual Influence (ZVI) based on the topography alone, thereby not considering the screening effect of vegetation or other anthropogenic elements. It can therefore be considered a worst-case scenario assessment. This provides a first order impression of the ZVI and additional interpretations is required for a more accurate assessment;
- An accurate topographical survey of the study area is not available. As a substitute, a 30mx30m SRTM grid is used, but due to its course resolution, it does not reflect minor topographical variations. Therefore, a degree of inaccuracy may be encountered when processing data based on the SRTM grid. However, in terms of the scale of the assessment, these inaccuracies are considered minor, and the first order data is accepted as accurate enough to make the required assessments; and
- No detailed information was provided on the duration of the construction phase or the construction procedure. It is anticipated that the construction phase will be less than 12 months and a generic construction procedure is discussed in Section 5

3.1 VIA METHODOLOGY

The above objectives will be met by applying the following methodology:

1) **Delineation of study area and Landscape Character Assessment:** Determine the extent of the study area and describe its comprising features that establish the landscape character;
2) **Project Description:** Describe the type, scale and visual characteristics of the proposed project, with a focus on the visible elements as per the client's information;
3) **Visual Impact Assessment:** Determine the sensitivity of the receptors and assess the significance of the potential visual impacts; and
4) **Mitigation Measures:** Propose mitigation measures to alleviate or eliminate the potential impacts that are identified.

3.2 SCALE OF ASSESSMENT

Part of developing an appropriate study methodology is to understand a suitable scale of assessment. The scale of assessment may occur on one of four levels namely; site, local area, region or larger region (Figure 2).

- **Site** is the smallest level of assessment and stipulates the extent of the activities related to the project. This is limited to the footprint of the project or the area of disturbance;
- The **local area** is limited to the immediate surroundings and will often be defined by the properties on which the project is located and could include the surrounding properties;
- A **region** is described by area classifications such as cities/towns and municipalities/districts; and
- A **larger region** is measured by provincial, national or international borders being crossed or affected.

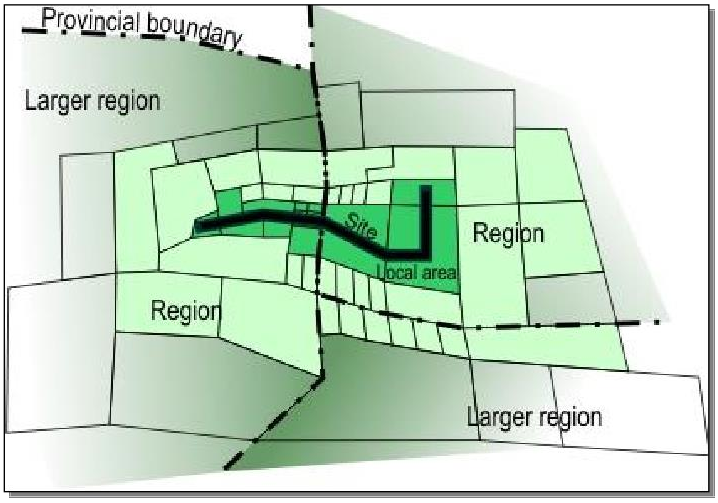

Figure 2: Scale of assessment

The scale of assessment is influenced by the extent of the potential impact and determines the size of the study area. The study area can be described as the area affected by visual impact and usually extends beyond the boundaries of the development footprint, especially when tall project structures are proposed. The proposed 132kV powerline stretches over approximately 4 km and will consist of steel pylons of between 20-25 m tall, spaced at 80 m apart. This is considered a relatively small-scale electrical infrastructure development project.

Based on the projected viewshed analysis, the appropriate scale of assessment is a regional area of up to 10 km from the alignment of the powerline. This is motivated by the proposed vertical scale of the pylons, and the relatively flat, but undulating topography associated with the site.

As a reference, the study by Hull & Bishop (1988) concluded that a powerline tower/pylon has its maximum impact on the visual resource when viewed from distances =< than 1 km. Beyond this distance, the impact decreases considerably to a point where it is virtually insignificant. The results of Hull & Bishop's research should not be confused with the concept of **visibility** as Hull & Bishop specifically assessed the **impact** of a powerline tower/pylon on the **visual resource**. It is often possible to visually detect a powerline tower/pylon over much greater distances, and empirical research has indicated that the background colour, atmospheric conditions, sun angle, tower/pylon size etc. could increase or decrease the visibility range.

In the case of the proposed powerline, the sky may form the backdrop, but may also be partially below the horizon line when viewed from certain locations. It has been proven through empirical

research that powerlines are increasingly more difficult to detect from distances greater than 5 km. At distances of 8-10 km, the atmospheric haze diminishes visual contrast, and a tower/pylon will be virtually undetectable to the naked eye.

To summarise, the Zone of Visual Influence (ZVI) is assessed up to 10 km as a matter of worst case scenario. 5 km from the powerline is considered a benchmark distance where a powerline and its pylons are detectible if atmospheric conditions are clear, but difficulty is typically experienced due to the minute scale of the pylons in the visual field of the observer. Referring to Hull & Bishop's research, a Zone of Maximum Visual Exposure (ZMVE) is limited to 2 km from the powerline and is considered the zone in which detectability is 100% possible if atmospheric conditions are clear and no screening occurs. (Refer to Section 6.1)

4 LANDSCAPE CHARACTER ASSESSMENT

"Landscape character may be defined as a distinct and recognisable pattern of elements, or characteristics, in the landscape that make one landscape different from another, rather than better or worse. **Landscape Character Assessment** (LCA) is the process of identifying and describing variation in the character of the landscape. It seeks to identify and explain the unique combination of elements and features (characteristics) that make landscapes distinctive." (Tudor, 2014)

A description of the current project environment establishes a baseline condition that serves as a measure to which the potential visual changes can be compared to. The goal is to describe the prominent features in the study area in terms of its physical appearance and highlight any exceptional or unique characteristics that contribute to the sensitivity of the visual environment.

4.1 TOPOGRAPHY

The natural topography is unevenly undulating with a general downwards slope towards the Orange River which forms the main drainage basin (Figure 3). A network of smaller drainage lines has carved shallow fissures through the undulating landscape before reaching a flattish floodplain along the banks of the Orange River. The wide floodplain provides even and fertile land for the growing of crops. More elevated terrain is noticeable along the horizon, outside the study area.

The Orange River is considered the most prominent natural feature in the study area, as it provides the proverbial lifeline for commercial agricultural practices in an otherwise arid environment. It is the largest river in South Africa which spans over 2400 km. Its aesthetic qualities are even more pronounced when traversing the arid Northern Cape province due to the irrigated fields on its banks, contrasting with the dry natural landscape beyond it (Figure 8 - Figure 12).

4.2 VEGETATION TYPES

The study area has two main vegetation types namely the Bushmanland Arid Grassland and Lower Gariep Alluvial Vegetation (Figure 4) (National vegetation types from Vegetation map for South Africa, Lesotho and Swaziland (2018)). The Bushmanland Arid Grassland is associated with the undulating topography and sloping plateaus further away from the Orange River. It typically consists of a sparsely vegetated grassland, interspersed with low shrubs. Denser vegetation can be found in the drainage lines with a slight variation of species. This vegetation type appears to be mostly intact with low levels of disturbance noticeable (Figure 11 & Figure 12).

The Lower Gariep Alluvial Vegetation type is associated with the Orange River including riverine islands and the adjacent alluvial terrace or floodplain. It consists of complex riparian thickets, reed beds and flooded grasslands that grow on the alluvial deposits (Figure 8). Species are adapted to the occasional flooding. In the study area it appears that the Orange River and its bordering banks are mostly intact and displays the natural vegetation composition. Limited disturbances are noticeable with the expectation of the N8 bridge and a few constructed drainage channels releasing excess water from the agricultural fields into the Orange River. The adjacent floodplain on the western bank as well as the floodplain on the eastern bank, south of the N8 crossing, have been transformed by agricultural practices and little to no natural vegetation exists in these areas. The Lower Gariep Alluvial Vegetation type is considered endangered.

4.3 LAND USES

4.3.1 TOWNS AND SETTLEMENTS

The town of Groblershoop is situated approximately 80 km southeast of Upington on the southern bank of the Orange River. With a population of ±4938 according to the 2011 census (Statistics South Africa), this is considered a very small settlement. It is a small, rural town with its main industry revolving around grape and wine production, as well as livestock farming. The cultural heritage and thriving agriculture industry contribute to a pleasant and tranquil experience. A few tourist attractions are present in the study area and typically include overnight accommodation and small retail outlets offering products from the local farm produce.

4.3.2 AGRICULTURE/RURAL

The agriculture industry is well established and has its history dating back to 1929 with the construction of the Boegoeberg Dam (±30km upstream) and channels distributing water to the farmlands. Irrigated vineyards and other crops are predominantly grown on the alluvial terrace, next to the Orange River, which provides even, fertile soils (Figure 8 & Figure 9). The climate is ideal for specific grapes and the Orange River valley is world renowned for quality table grapes and white wines. The fields are neatly spaced squares, flanking the meandering path of the Orange River (Figure 10).

Farmsteads, storage facilities and packing houses are distributed along the edge of the farmlands. These consist of simple houses and shed structures (Figure 11). Further inland, the arid landscape is dominated by the sparse grassland and shrubbery associated with the Bushmanland Arid Grassland vegetation type. The inland farms are sparsely developed, but game and cattle farming are mostly practiced (Figure 12).

4.4 EXISTING ELECTRICAL INFRASTRUCTURE

The study area has a baseline of existing electrical infrastructure in the form of the Groblershoop Substation and a few existing medium voltage powerlines. 22kV powerlines distribute electricity to the farms and town and are typically recognisable by the timber pole structures. On such line follows a similar route as the proposed transmission line. The Gorana/Groblershoop 132kV powerline is another existing powerline following the same alignment as the proposed powerline. Both the above mentioned existing powerlines, can be seen in Figure 9 where it crosses the agricultural fields and the Orange River.

It has to be mentioned that the study area falls within the Renewable Energy Development Zone (REDZ) namely Upington REDZ 7. Similar such areas have been identified across South Africa where large scale renewable energy facilities may occur. The proposed transmission line is motivated by the planning of a solar facility to the north of Groblershoop. Further detail is provided in Section 5.

4.5 SENSE OF PLACE

Sense of place refers to a distinct identity associated with a geographical area and requires the relation between people and spatial context to be able to characterise such an area. It describes "*…those characteristics that make a place special or unique, as well as to those that foster a sense of authentic human attachment and belonging*."[1]

The study area has a very strong connection with the Orange River due to its importance in sustaining the area's economy. It has been in development for nearly a century which enforces the synonymousness relation between the Orange River valley and the farming community. A great contrast exists between the expansive harsh and arid environment, and the lush green vein that traverses it. This contrast allows for picturesque scenes deriving inspiration off an oasis theme.

The sense of place is rooted in the presence of the Orange River and the developed floodplain that sustains the local community, but also contributes to a national economy. It speaks of an isolated community that overcame environmental adversity to develop a self-sustaining livelihood. Groblershoop was built on the agricultural successes and, although a small town with a small population, has a certain greatness about it.

4.6 VIEWSHED ANALYSIS

Visibility mapping through a Geographical Information System (GIS) software is done to determine a preliminary Zone of Visual Influence (ZVI). The mapping indicates the extent of the potential ZVI based on the topography alone, thereby not considering the screening effect of vegetation or other anthropogenic elements. It calculates a cumulative viewshed for a series of points distributed at 50 m intervals, along the powerline route set at a height of 25 m. It presents a coloured map ranging between dark and lighter colours. The dark purple represents areas that have the potential to view the greatest number of points, i.e., the largest portion of the powerline may be visible from these areas. As the colour grades towards the lighter purple, a lesser number of points may be visible from those areas. This technique provides understanding into areas that may experience a higher visual exposure, and sensitive visual receptors can therefore be identified (Figure 6 & Figure 7).

The conclusion is that the study area generally provides a low to medium degree of screening from certain locations, if only the topography is considered. The undulating landscape will screen parts of the powerline but is limited to the areas further away from the Orange River. The flat floodplain next to the river provides minimal to no topographical screening as illustrated in Figure 6. Figure 7 focuses in on the 2 km ZMVE.

[1] Casey, E.S. (2001). "Between geography and philosophy: what does it mean to be in place world?". Annals of the Association of American Geographers. 91 (4): 683–693. doi:10.1111/0004-5608.00266. S2CID 56055085.

Based on the site photographs provided by EMG, it is assumed that the vegetation cover will provide little to no screening due to the generally low height associated with the natural and farmland vegetation. The vegetation is usually only a few meters tall and does not have the capacity to screen the powerline that stands at ±25 m tall. Taller trees in the town of Groblershoop and around some farmsteads may provide localised screening. In addition, some of the buildings in the town and along the outskirts is also expected to provide localised screening. In general, the landscape is considered exposed and has very little capacity to screen a powerline of this scale.

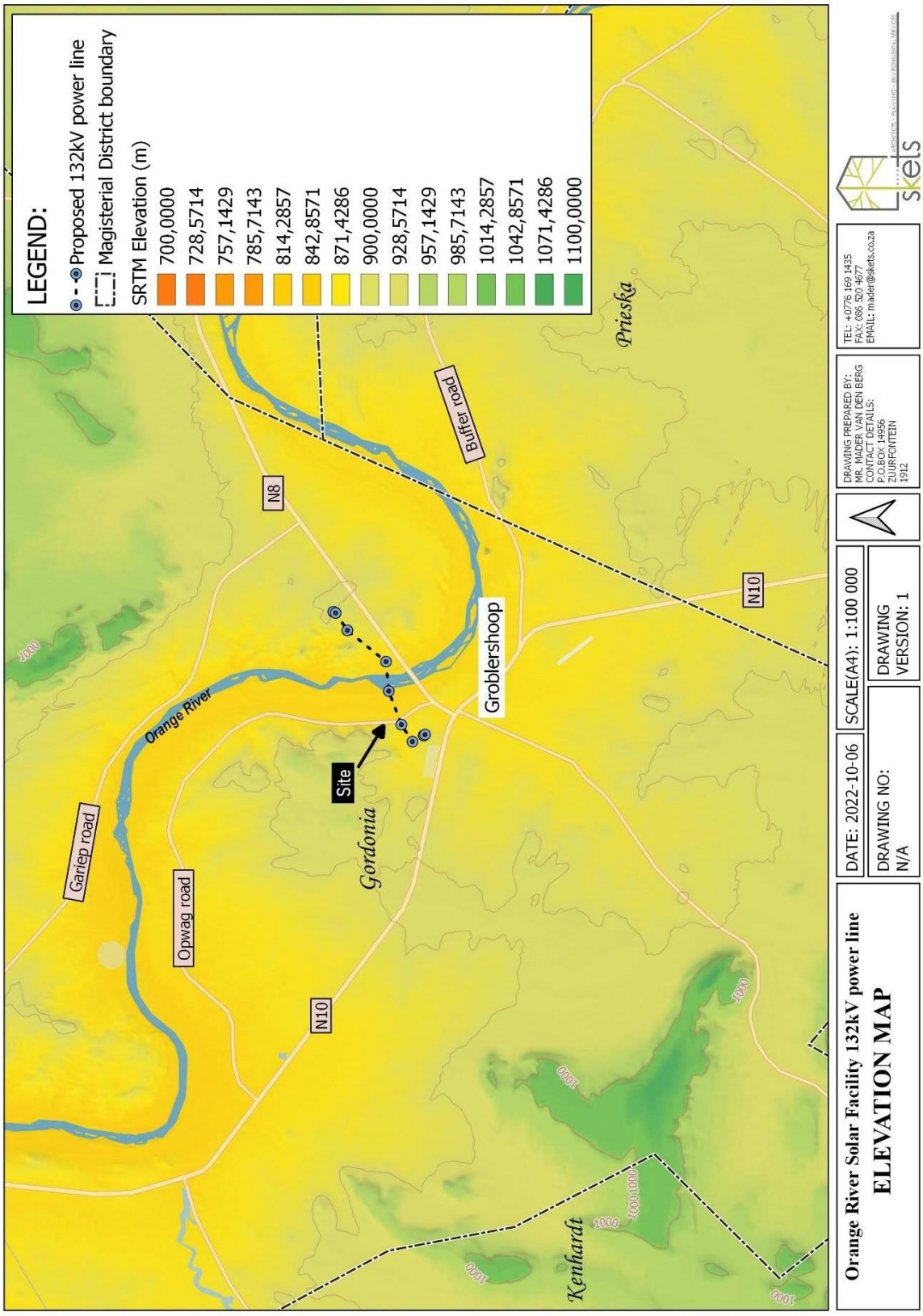

Figure 3: Regional elevation map

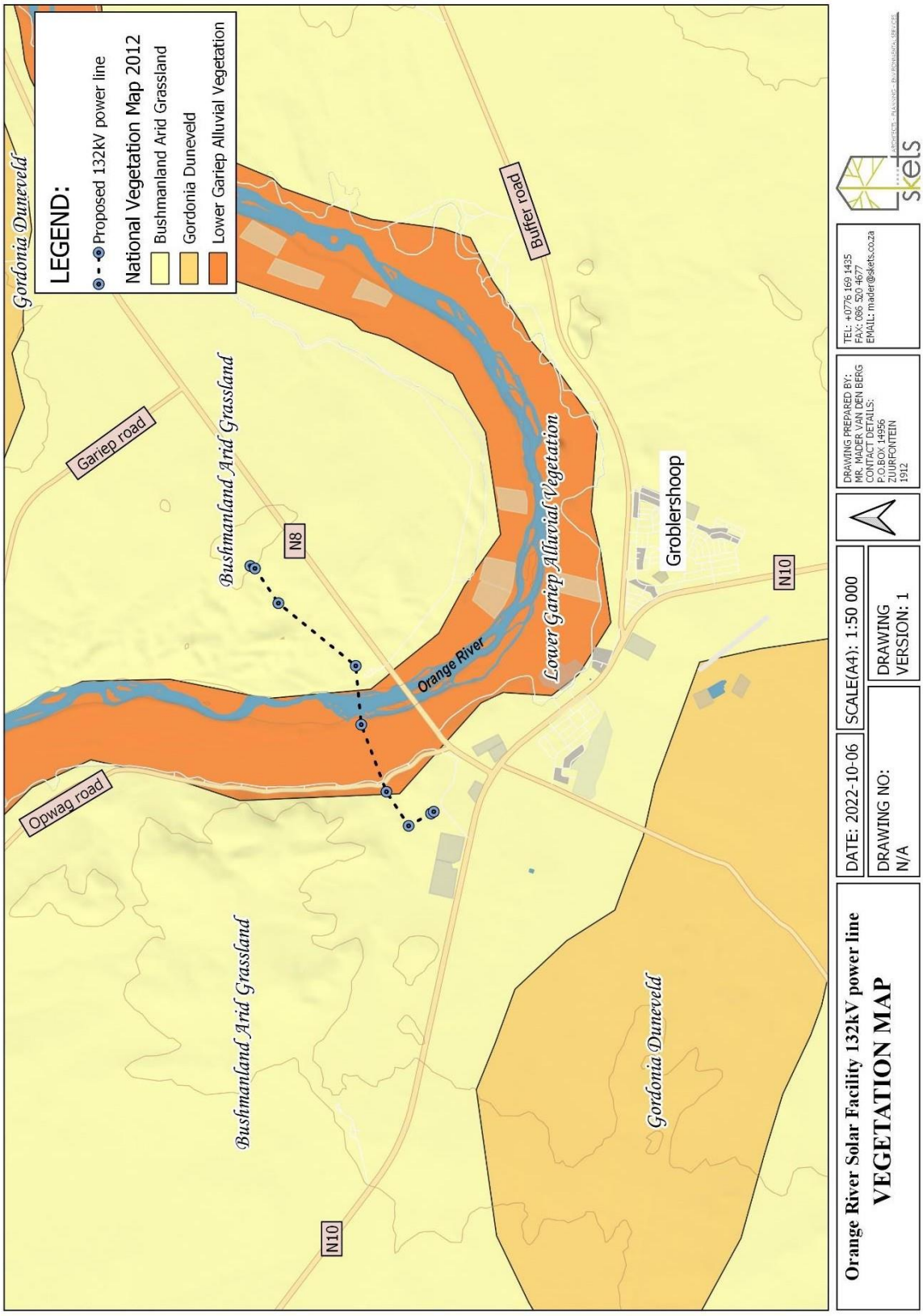

Figure 4: Vegetation type map

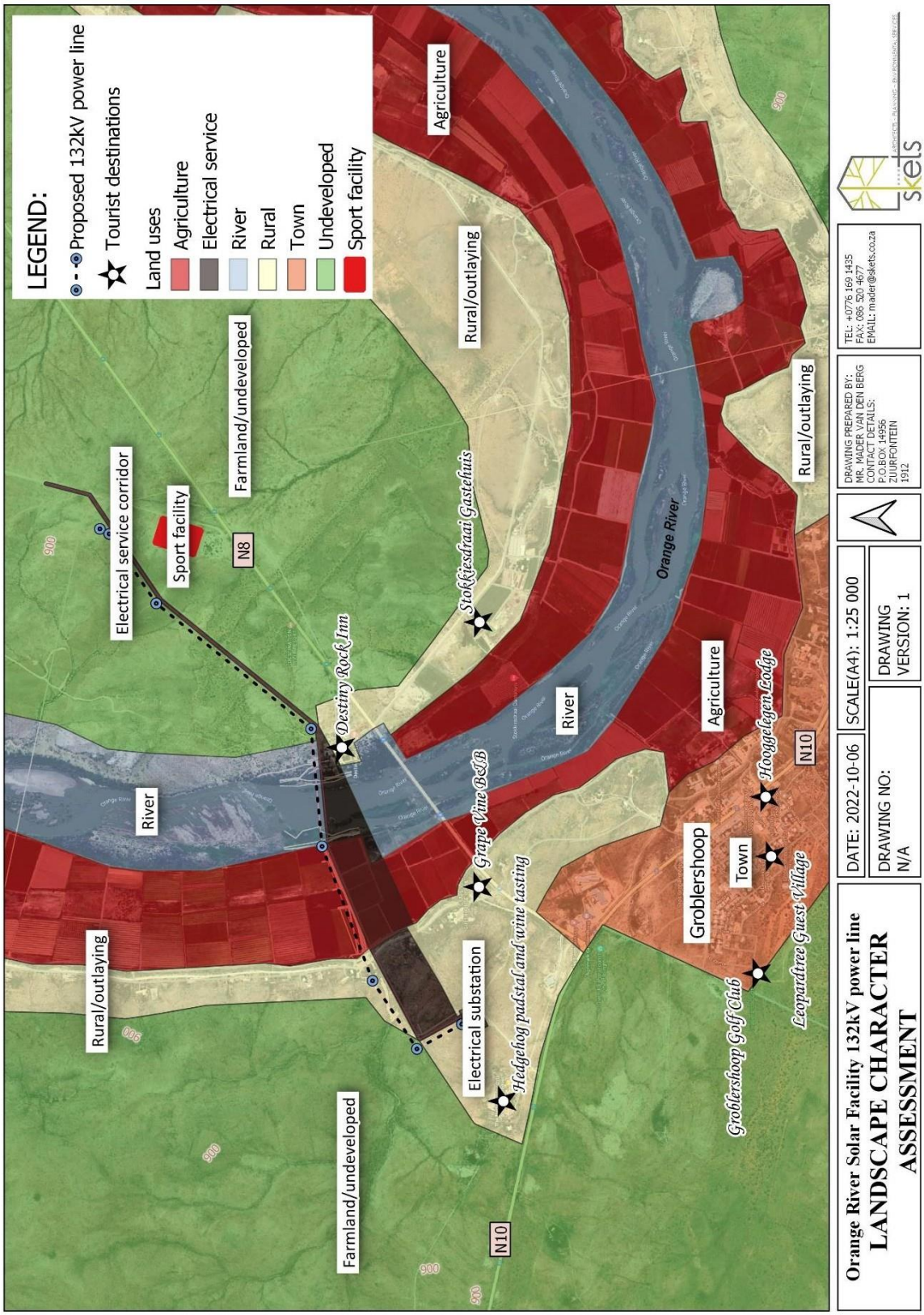

Figure 5: Landscape Character Assessment

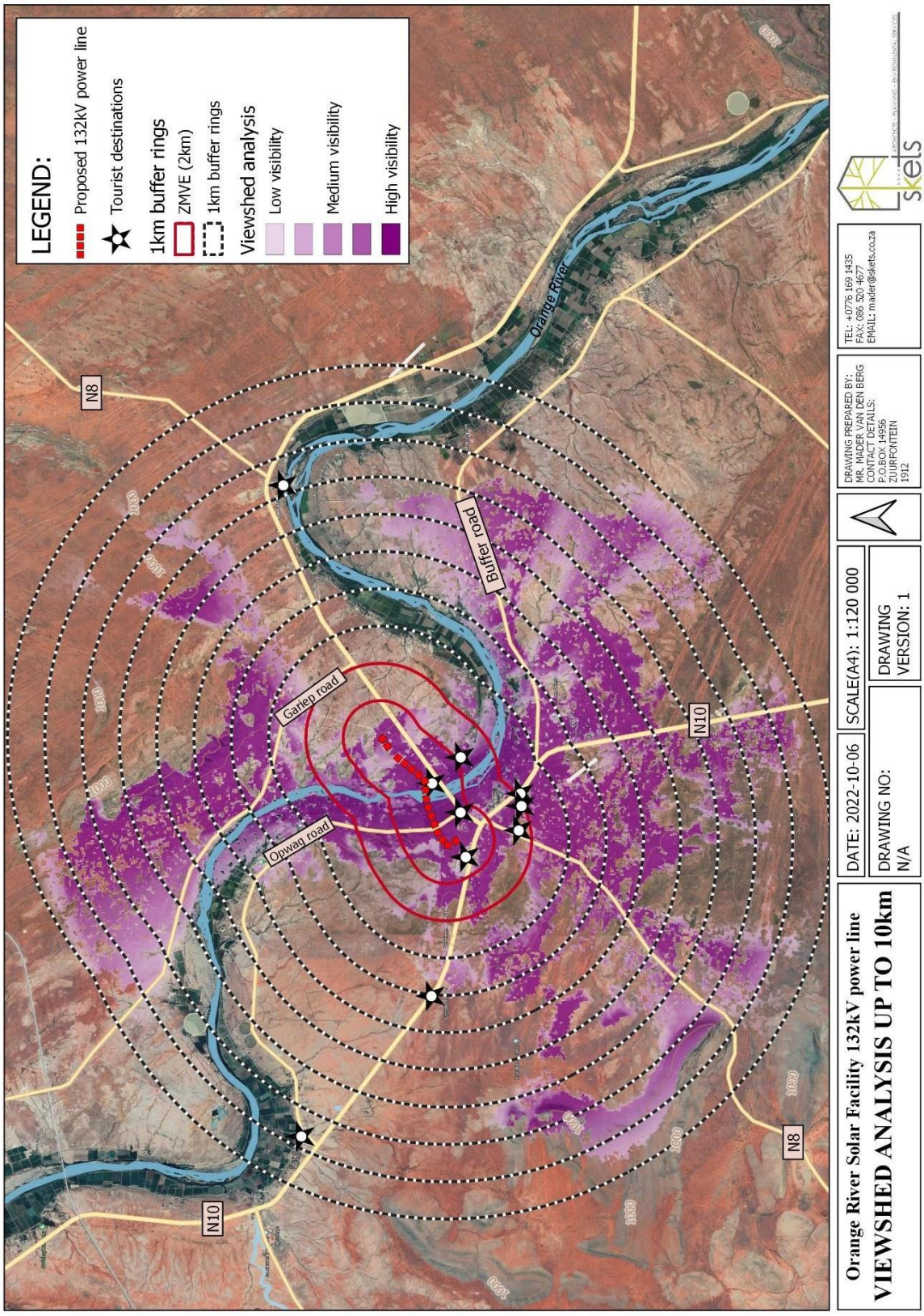

Figure 6: Viewshed analysis up to 10 km

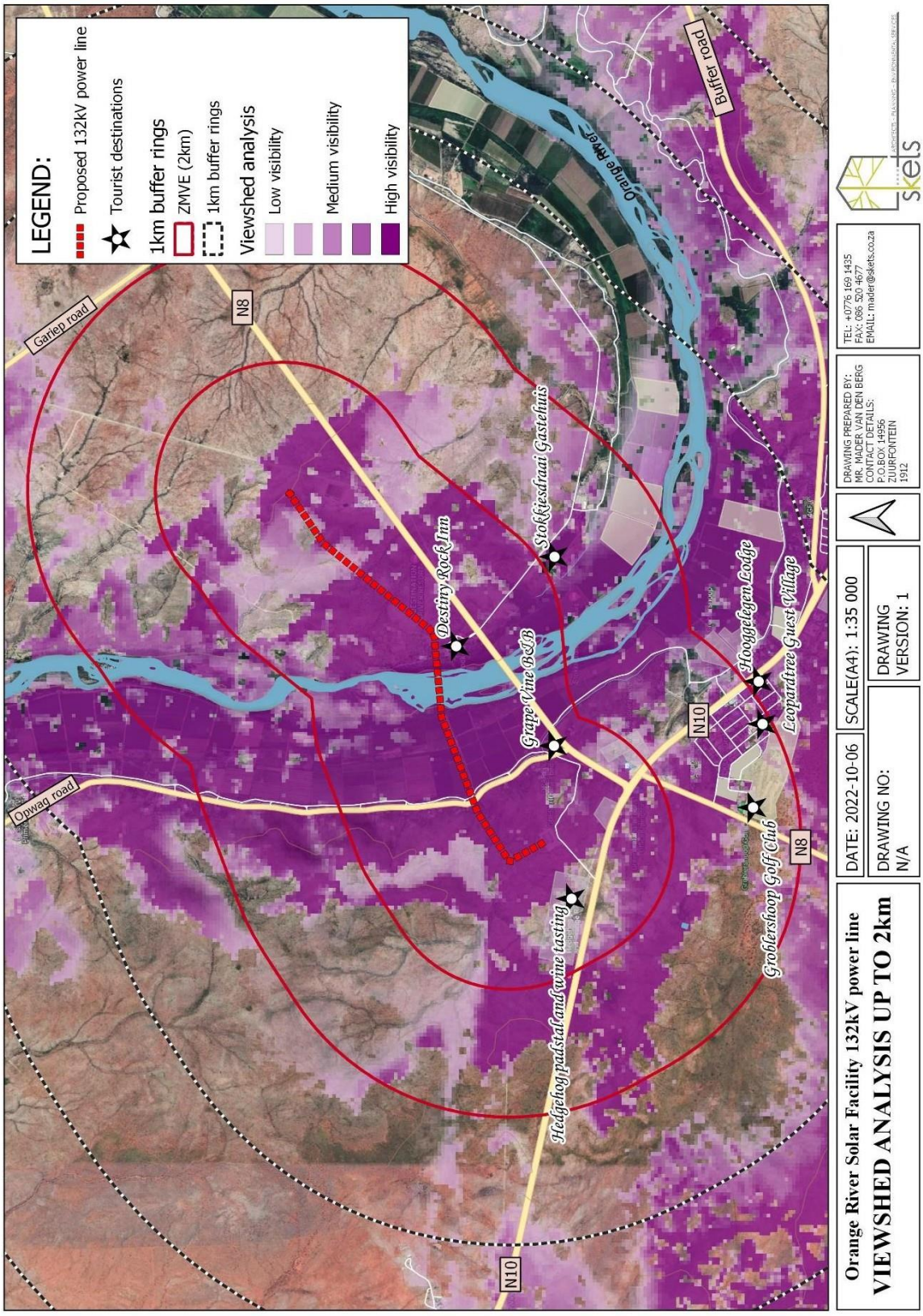

Figure 7: Viewshed analysis up to 2 km

Figure 8: Photo 1

Figure 9: Photo 2

Figure 10: Photo 3

Figure 11: Photo 4

Figure 12: Photo 5[2]

5 PROJECT DESCRIPTION

The proposed 132kV powerline will extend over approximately 4 km from the existing Groblershoop Substation, across the Orange River to a location where a future substation and solar facility is planned. The solar facility is yet to be developed, as the environmental authorisation process for this development is still underway (DFFE ref 14/12/16/3/3/1/2558). The proposed 132kV powerline will run parallel, approximately 25 m from an the existing Gorana/Groblershoop 132kV overhead line, connecting the solar facility to the Groblershoop Substation.

The mono pylons proposed for this overhead powerline, are expected to have similar visual characteristics as the existing powerline and is illustrated in Figure 13. Pylon heights will range between 20 – 25 m depending on the topography, at an estimated spacing of 80 m along the powerline route. Bird-friendly additions may be attached to the pylons and powerline for example bird flappers.

5.1 CONSTRUCTION PHASE

The construction of the powerline will consist of the following basic phases which will occur in no particular order:

- Survey and pegging of tower/pylon positions through aerial and/or ground survey teams;
- Construction of additional access roads and gates if required. Existing roads will be used as far as possible, but it can be expected that new roads will typically be established by means of driving over the vegetation continuously and creating a two-tread passage as opposed to a graded gravel road;
- Clearing or trimming of vegetation along the corridor that may interfere with the line;

[2] All site photographs provided by EMG

- Establishment of construction camp/s for the construction and stockyards. Size and location are unknown;
- Construction of foundations usually by means of earthmoving equipment;
- Tower/pylon assembly and erection;
- Conductor stringing and tensioning;
- Servitude rehabilitation;
- Testing and commissioning; and
- Continued maintenance.

The establishment of a construction camp is usually one of the first interventions on a construction site and is normally located on or near the site. Temporary site offices and ablution facilities may be required next to a material laydown yard. Due to its temporary nature and practical function, aesthetic considerations are less of a concern which could result in an unsightly terrain that may cause visual intrusion.

Earthworks for foundation purposes will be one of the most intrusive activities and will presumably consist of excavation via appropriate machinery followed by foundation casting. The erection of the tower/pylon could involve the use of a mobile crane or even helicopters, depending on site conditions.

No clear construction period has been determined. One can expect a relatively short construction period of less than 12 months.

Figure 13: Example of electrical tower

6 VISUAL IMPACT ASSESSMENT

6.1 METHODOLOGY

Within the study area observers experience and interact differently with their environment and therefore value it differently. They may be affected by the proposed project due to additions or alterations in the visual environment which may influence their experience and views of the visual environment. In this assessment, a distinction is made between impacts on the **observers** and impacts on the **landscape character**. The observers represent all people and their views that may be affected due to their exposure to a source of impact, while the impacts on the landscape character strictly assess the changes to the landscape's character and the impact on its visual value, regardless of the presence of observers. Although impacts may be similar in nature, a highly significant impact on the observers will not necessarily be a highly significant impact on the landscape character and vice versa.

The following typical impacts may be expected as a result of the construction and operation of the proposed project:

- The project activities and components noticeably change the existing features and qualities of the landscape which may include its scenic quality, sense of place or perceived character;
- The project introduces new features which are uncharacteristic or in contrast with the existing character of the landscape or may interfere with the views of the observers; and/or
- The project removes, blocks or interferes with aesthetic features in the landscape which subsequently contributes to the visual value and aesthetic quality of the visual resource.

A VIA is a specialist study that assesses the potential visual changes/impacts to an existing baseline setting resulting from the implementation of a proposed project. This implies that, firstly, a baseline must be established and secondly, the visual change, resulting from the project, must be compared to the baseline. The quantification of the visual change is referred to as the severity of the impact and is a function of:

- The nature of the impact;
- The probability of the impact occurring;
- The duration of the impact;
- The extent of the impact; and
- The magnitude of the impact. (Refer to APPENDIX 2)

The essence of determining the significance of a visual impact, centres on the severity of the potential impacts, and the sensitivity of the affected receptors. In simple terms, a low severity impact affecting receptors of low sensitivity, will result in a low significance. On the other end of the scale, a highly severe impact, affecting highly sensitive receptors, will result in a high significance.

Sensitivity of observers

The sensitivity of an observer is related to the value an observer has for the particular visual resource being impacted on. To determine viewer sensitivity a rating system is utilised (Table 1). This is a generic, discretional classification of observers and enables the visual impact specialist to establish a logical and consistent viewer sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

It should be noted that observer sensitivity can also be influenced by contextual factors such as the distance from the source of impact or the screening potential of the environment. This will be taken into account in the following section.

Table 1: Viewer Sensitivity

VIEWER SENSITIVITY	DEFINITION (BASED ON THE LANDSCAPE INSTITUTE, 2002 ED PP90-91)
High	Views from major tourist or recreational attractions, or viewpoints promoted for- or related to appreciation of the landscape, or from important landscape features. Users of all outdoor recreational facilities including public and local roads or tourist routes whose attention or interest may be focussed on the landscape; Communities where the development results in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development; People generating an income from the visual resource or pristine quality of the environment.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape); People commuting between workplace and home or other destinations.
Low	People at their place of work or focussed on other work or activity; Commuters or motorists travelling at high speed through an area; Views from highly urbanised areas, commercial buildings or industrial zones. Views from heavily industrialised or blighted areas

The following observer groups have been identified in the study area:

- Tourists visiting Groblershoop and surroundings;
- Residents in Groblershoop and surrounding farms; and
- Motorists utilising the local road network passing through the study area.

Tourists are generally classified as observers with a high sensitivity when their reason for visiting the area is focussed on enjoying the visual quality and engaging in outdoor activities that are offered by the study area's natural landscape. The viewer incidence associated with tourists, are considered relatively low as Groblershoop and surroundings offer few tourist attractions. The town is also not located along major recognised tourist routes, although the N10 and N8 converge at this point and connects to other towns such as Upington and Kenhardt.

Tourists that do visit Groblershoop may stay over at the lodgings provided and may stop at the Hedgehog Padstal northwest of the town. Some overnight accommodation is situated in town, but those inside the ZMVE are the Destiny Rock Inn, located on the northern bank of the Orange River, directly next to the powerline route. Grape Vine B&B are located next to the N8 on the southern bank of the river, approximately 800 m from the powerline alignment. Stokkiesdraai Gastehuis is approximately 1.1 km from the powerline route, east of the N8 on the north bank. The viewshed analysis indicates that these tourist attractions may experience high exposure to the proposed powerline due to their proximity to the alignment.

One can assume with certainty that one of the most attractive features in the study area is the Orange River and the adjacent vineyards. The river can be viewed from the N8 bridge crossing the river, but views from the town and farms are somewhat obscured by the riverine vegetation on its banks.

Residents in the study area are generally classified as visual receptors of high sensitivity owing to their sustained visual exposure and attentive interest towards their living environment. The highest concentration residents are present in Groblershoop approximately 2 km from the powerline route, nearest to the Groblershoop Substation. A part of the town is inside the ZMVE and according to the viewshed analysis will experience a high visual exposure. However, due to the flat topography in the area, the houses nearest to the source of impact will block the views of residents living in the rows behind them. Houses are typically one and 2 storeys high, and garden trees increase the screening of views to the source of impact. Therefore, only the residents living on the perimeter of the town fronting the source of impact, is expected to experience high exposure, and those behind them will only experience partial or no views. In addition, the Agrimark building is located between some of the houses and the powerline, further blocking their view. At most, these residents are expected to see a portion of the powerline from the Groblershoop Substation to where it crosses the river. The viewer incidence is expected to be relatively low/medium.

Farmsteads can be seen along the outer edge of the farmlands in the area called rural/outlaying in Figure 5. A number of farmsteads are present along the Opwag Road on the south bank and Knyp road on the north bank, and will experience a high visual exposure due to their location inside the ZMVE. The farms further away from the river on the arid region, are sparsely populated and spread out with no farmsteads located inside the ZMVE. Their exposure to the potential visual impacts will be much reduced due to their distance from the source of impact and their sensitivity is expected to be medium.

Motorists are considered the least sensitive group of observers due to the speed at which they travel and their brief exposure to impacts. This group is mostly limited to road users on the N10 and N8. Intermitted views of the proposed powerline are expected as motorists travel through the study area. The highest visual exposure is expected to be experienced when travelling over the N8 bridge and along both the approaching sides. A brief view of the Orange River and the proposed powerline will be experienced. Their brief exposure to the source of impact lowers their sensitivity to very low.

Sensitivity of the Landscape Character

The sensitivity of a landscape's character is a measure of its robustness and its ability to accommodate changes without detrimental impacts on its prevailing character. The magnitude of an impact is often mitigated by the inherent Visual Absorption Capacity (VAC) of the landscape to absorb changes or to screen the impacts. A landscape with a high VAC may have one or more of the following attributes:

- A high screening capacity which screens views from sensitive vantage points;
- Is often visually isolated and has a low degree of inter-visibility with adjacent landscapes; and/or
- Features land uses that are compatible with the proposed project;

On the other end of the scale, a landscape with a low VAC may:

- Be an open or exposed landscape with few topographic or surface features that can act as visual screens from sensitive vantage points;
- Has a high degree of inter-visibility with adjacent landscapes; and/or

- Comprises of land uses that are incompatible with the proposed project.

A landscape character with a high sensitivity will typically have one or a combination of the following attributes:

- Has a low VAC;
- Has a very high concentration of valued attributes or its attributes are of a high value.
- Has a well-established and distinct identity and sense of place; and/or
- Is often in a pristine natural condition with high ecological value that contributes to a valued aesthetic condition.

A landscape character with a low sensitivity will typically have one, or a combination of the following attributes:

- Has a high VAC;
- Has a poorly established identity and sense of place;
- Is often intensely developed or transformed by exploitive human activities and therefore has a low value and scenic quality as a baseline condition to start with; and/or
- Has a low concentration of valued attributes or its attributes are of a low value.

The landscape character sensitivity is considered high along the Orange River and the agricultural fields adjacent to it. This is accredited to the generally high scenic quality associated with the river landscape and the picturesque vineyards adjacent to it. The Orange River is considered a national scenic feature that also supports an aquatic ecology and the region's agricultural economy. The term "Green Kalahari" refers to the desolate, semidesert landscape, contrasting with the fertile agricultural fields adjacent to the meandering river. The sense of place is well rooted in the history of agricultural development, and the area is a world renowned table grape and white wine producer. Due to the flattish and low laying floodplain, the VAC is low, and the landscape is exposed.

The part of the study area referred to as farmland/undeveloped and rural/outlaying (Figure 5) has a medium sensitivity. This is attributed to the mundane landscape that portrays a homogenous, arid character. The topographical undulation with the backdrop of elevated terrain on the horizon, contributes to interesting scenery although not unique to the region. The farmland/undeveloped landscape is largely intact with the natural vegetation of Bushmanland Arid Grassland present. The rural/outlaying landscape experienced slight transformation as it is close to the town and farmlands. The association is with the Bushmanland Arid Grassland, but some human interventions altered the character slightly.

.

6.2 IMPACT SEVERITY ASSESSMENT

Table 2: Impact Severity

Severity of Powerline impacts on observers (OB) and *landscape character (LC)*					
Construction phase					
Nature of impact on observers: The construction activity will damage vegetation and disturb the surface at the pylon locations and where new access roads are required. Initially the construction activity will be on ground level and vegetation and topographic screening will limit visibility to some extent. As the pylons are erected, the ZVI will increase and more viewers will be affected, even outside the ZMVE. Construction sites and some construction activities are considered unsightly and will intrude on the views of observers inside the ZMVE. **Nature of impact on landscape character:** The construction activity will damage vegetation and disturb the surface at the pylon locations and where new access roads are required. These activities will negatively impact on the attributes of the landscape as it will remove or damage elements that contribute to the prevailing character of the landscape. The construction equipment, construction camps and workforce will be elements that are uncharacteristic to the visual environment. It will impact on the visual value and quality of the landscape character especially in the areas that are considered part of the river and agricultural landscapes.					
		Without mitigation		**With mitigation**	
Probability	OB	Highly probable	4	Probable	3
	LC	*Definite*	5	*Definite*	5
Duration	OB	Very short duration	1	Very short duration	1
	LC	*Very short duration*	1	*Very short duration*	1
Extent	OB	Regional	3	Local area	2
	LC	*Regional*	3	*Local area*	2
Magnitude	OB	Medium	6	Medium	6
	LC	*Medium*	6	*Medium*	6
Severity	OB	**Medium**	**40**	**Low**	**27**
	LC	***Medium***	**50**	***Medium***	**45**
Status	OB	Negative		Negative	
	LC	*Negative*		*Negative*	

Operational phase

Nature of impact on observers: The completed project will add a new 4km powerline to the visual environment. Although the baseline environment already has existing power infrastructure, it remains in contrast with the prevailing character and experience of the study area. Views of the Orange River and agricultural fields will be negatively affected by the addition of a new powerline. It will interfere with the scenic quality of the views and negatively affect the sense of place.

Nature of impact on landscape character: The completed project will introduce a new 4km powerline to a landscape that is valued for its natural beauty and picturesque agricultural land use. These features are central to the sense of place and the scenic quality of the study area. A new powerline will noticeably change the baseline environment, thereby detracting from the current values and qualities of the natural features and the scenic quality associated with the agricultural fields.

		Without mitigation		**With mitigation**	
Probability	OB	Highly probable	4	Improbable	2
	LC	*Definite*	5	*Improbable*	2
Duration	OB	Permanent	5	Very short duration	1
	LC	*Permanent*	5	*Very short duration*	1
Extent	OB	Regional	3	Contained on site	1
	LC	*Regional*	3	*Contained on site*	1
Magnitude	OB	High	8	Minor	2
	LC	*High*	8	*Low*	4
Severity	OB	**High**	**64**	**Very low**	**8**
	LC	***High***	**80**	***Low***	**12**
Status	OB	Negative		Neutral	
	LC	*Negative*		*Negative*	
Reversibility	OB	Medium		Medium	
	LC	*Medium*		*Medium*	
Irreplaceable loss of resources?					
	OB	Medium		High	
	LC	*Medium*		*High*	

C**an impacts be mitigated:** Yes, refer to Section 7. The most effective mitigation requires a drastic design alternation. This may include the reconsideration of the overhead powerline concept, to rather opt for an underground cable or consolidating other powerlines into a single, powerline in order to reduce the visual clutter and servitude size. Alternatively, the route has to be altered to avoid sensitive viewers and landscapes.

Cumulative impacts: A very high risk of cumulative impacts is likely as the powerline route is also shared with other existing powerlines in the same corridor. The proposed powerline will increasing the visual dominance of power infrastructure, thereby compounding the negative affect on views towards valued landscape features and reducing scenic quality of the landscape character. Cumulative impacts can only be effectively reduced with the implementation of drastic design alterations as recommended mitigation.
Residual Risks: Residual risks can be effectively reduced if a drastic design alteration is implemented, in particular the consolidation of existing powerlines or underground cabling. If this is not an option, residual risks will remain, as the powerline cannot be effectively mitigated with remediation or reduction strategies.

6.3 IMPACT SIGNIFICANCE SUMMARY

Table 3: Impact significance summary

Receptor	Sensitivity of receptors	Severity of Impact without mitigation	Severity of Impact with mitigation	Significance of Impact without mitigation	Significance of Impact with mitigation
CONSTRUCTION PHASE					
Residents inside ZMVE	High	Medium 40	Low 27	Moderate	Moderate/Minor
Residents outside ZMVE	Medium	Medium 40	Low 27	Moderate/Minor	Minor
Tourists inside ZMVE	High	Medium 40	Low 27	Moderate	Moderate/Minor
Tourists outside ZMVE	Medium	Medium 40	Low 27	Moderate/Minor	Minor
Motorists	Low	Medium 40	Low 27	Minor	Minor/Negligible
Orange River & agricultural landscape	High	Medium 50	Medium 45	Moderate	Moderate
Farmland/undeveloped & Rural/outlaying landscape	Medium	Medium 50	Medium 45	Moderate/Minor	Moderate/Minor
OPERATIONAL PHASE					
Residents inside ZMVE	High	High 64	Very low 8	Major	Minor
Residents outside ZMVE	Medium	High 64	Very low 8	Moderate	Minor/Negligible
Tourists inside ZMVE	High	High 64	Very low 8	Major	Minor
Tourists outside ZMVE	Medium	High 64	Very low 8	Moderate	Minor/Negligible
Motorists	Low	High 64	Very low 8	Moderate/Minor	Negligible
Orange River & agricultural landscape	High	High 80	Low 12	Major	Minor/Negligible
Farmland/undeveloped & Rural/outlaying landscape	Medium	High 80	Low 12	Moderate	Minor

7 MITIGATION

The aim of mitigation is to reduce or alleviate the anticipated impacts that are a consequence of the proposed project's components and/or activities. "Mitigation measures are generally more effective if they are designed as an integral part of an iterative process of project planning and design. Mitigation is thus used as a design approach that is, where possible, implemented from project inception when alternative designs or site options are being considered" (Institute of Environmental Assessment et al, 2002). This approach generates preventative measures that will influence design decisions instead of relying on cosmetic landscape remediation of a completed project.

The following five main mitigation strategies for visual impacts are described by the Institute of Environmental Assessment et al (2002):

- Avoidance: Complete avoidance of the impacts is a function of either not proceeding with the proposed project or relocating the project to an alternative site. This is often the most effective mitigation strategies but within the constraints of economics and available land it is not necessarily possible or feasible.
- Reduction/minimising: Where negative impacts cannot be avoided it should be considered how to reduce the impact as much as possible. Different projects require different solutions but scaling down or limiting disturbances is some of the options.
- Remediation: Remediation mitigation relies on add-on or cosmetic measures to "soften" the impact to a degree. This is often associated with screening or camouflage treatment to avoid or limit intrusive views.
- Compensation: Where a negative impact cannot be mitigated adequately, other compensatory measures may offset the residual effects. This requires a thorough understanding and assessment of the environment in order to provide equivalent compensation. This may require extensive public consultation especially if the impacts lean towards sentimental issues or personal values and perceptions.
- Enhancement: Enhancement aims to manage certain changes and impacts by enhancing the quality of the environment for local people. This requires the exploring of opportunities in the proposed project to contribute positively to the landscape and its experience. Enhancement may take many forms but could include preservation of ecosystems, proper land management, and restoration of habitats or historic landscapes.

The mitigation measures for the operational and decommissioning phases are discussed within a tabled format in which the following aspects will be addressed.

- The risk sources;
- The potential impacts/risks involved;
- Mitigation objectives; and
- Mitigation measures.

7.1 MITIGATION - CONSTRUCTION PHASE

CONSTRUCTION PHASE	
Risk sources	1.The presence of a construction team in the servitude. 2.Construction camps and stockpiles. 3.Excavations and earthworks.
Potential impacts	1. 1.1. Construction activities in the servitude site that could lead to visually intrusive views. 1.2. Introduction of construction equipment and ground staff that is not associated with the status quo environment. 2. 2.1. Visual intrusion relating to unsightly construction camps and their unorganised nature. 2.2. Unsightly stockpiling of construction material and storing of equipment. 3. 3.1. Exposed soil and scarring of the surface at each tower/pole location.
Mitigation objectives	1. Avoidance 2. Reduction 3. Remediation
Mitigation measures	**1. Avoidance** 1.1. Do not locate the construction camp or laydown yards within 1 km from any residential area, unless it can be completely screened from sensitive viewpoints. 1.2. Locate the construction camp and laydown yards in areas that is already disturbed for example at the Groblershoop Substation. **2.Reduction** 2.1. Clearly demarcate the construction sites to limit the footprint of disturbance. 2.2. Keep dust levels down by regularly wetting dirt roads and exposed soil areas during active construction. This is especially relevant where new dirt roads are to be constructed. 2.3. Remove rubble and other waste that is generated by the construction process as soon as possible and dispose at an appropriate dump site. 2.4. Implement rehabilitation of disturbed areas as soon as possible to limit the duration of exposed soil surfaces. Monitor the rehabilitated areas for at least 12 months to ensure a sufficient vegetation cover is established that will prevent erosion from occurring. 2.5. Avoid removal of any large trees or shrubs that may open views to the construction site and compromise the natural screening capacity of the study area.

	3. Remediation 3.1. Keep the construction camp neat and tidy at all times. Remove any waste from the site or contain it in an enclosed area out of sight from sensitive viewpoints. 3.2. Enhance the screening capacity of the construction sites by erecting a temporary fence with a 3m high shade cloth to avoid the unsightly construction processes.

7.2 MITIGATION - OPERATIONAL PHASE

OPERATIONAL PHASE	
Risk sources	1. The presence of a powerline near highly sensitive observers and landscape features.
Potential impacts	1. Visually intrusive views. 2. Visual clutter due to multiple powerlines in one corridor. 3. Interference with natural and rural landscape characters. 4. Cumulative visual and landscape impacts. 5. Residual visual and landscape impacts
Mitigation objectives	1. Avoidance 2. Reduction. 3. Remediation.
Mitigation measures	**1. Avoidance** 1.1. Consider an underground cable. This will cause the least visual and landscape impacts as well as dealing effectively with cumulative and residual impacts. **2. Reduction** 2.1. Consider consolidating multiple powerlines in one to avoid parallel running powerlines thereby dealing with visual clutter and cumulative impacts. **3. Remediation** 3.1. Reroute the powerline to avoid sensitive visual and landscape receptors. 3.2. Treat the steel members of the towers with a low gloss, galvanized paint to mitigate the initial shiny appearance of a new tower.

8 CONCLUSION

The significance of the visual impact is determined through separate assessments of impacts on the landscape character and impacts on observers in the study area. This has been done for the construction and operational phases as each phase presents different impacts. The landscape character and the observers are receptors in the study area and have different sensitivities. It is expected that each receptor will respond differently to the anticipated visual impacts.

The sources of visual impacts will originate from the construction activity and the presence of a workforce and machinery operating during the construction process. When this is complete, the newly constructed powerline will remain a source of impact as its presence will result in a change to the existing baseline environment. During both phases, inherent mitigating factors for example screening by the topography/vegetation and distance from the source of impact, will influence the VAC and ZVI. The inherent mitigation factors are not enough to completely eliminate the potential impacts, and additional mitigation measures should be considered.

Observers in the study area will be affected differently by the potential impacts, due to their distance away from the source of impact and their sensitivity towards their visual environment. Residents and tourists residing or entering the ZMVE are considered the most sensitive observers in the study area. These are limited to the residents of Groblershoop, the surrounding farmers and tourists seeking lodging at the accommodation facilities in the ZMVE. Their exposure to the impacts is expected high to medium and at least a portion of the powerline will be visible to viewers inside the ZMVE. The significance of impacts is the highest on residents and tourists inside the ZMVE if no mitigation is implemented.

The landscape character will experience a transformation as a result of the new powerline. The completed project will introduce a new 4km powerline to a landscape that is valued for its natural beauty and picturesque agricultural land use. These features are central to the sense of place and the scenic quality of the study area. A new powerline will noticeably change the baseline environment, thereby detracting from the current values and qualities of the natural features and the scenic quality associated with the agricultural fields. The significance of impacts is the highest on the Orange River and agricultural landscapes if no mitigation is implemented.

A very high risk of cumulative impacts is likely as the powerline route is also shared with other existing powerlines in the same corridor. The proposed powerline will increasing the visual dominance of power infrastructure, thereby compounding the negative affect on views towards valued landscape features and reducing scenic quality of the landscape character. Cumulative impacts can only be effectively reduced with the implementation of drastic design alterations as recommended mitigation.

Residual risks can be effectively reduced if a drastic design alteration is implemented, in particular the consolidation of existing powerlines or underground cabling. If this is not an option, residual risks will remain, as the powerline cannot be effectively mitigated with remediation or reduction strategies.

Impacts can be marginally mitigated during the construction phase, but little can be done to mitigate impacts during the operational phase unless major design changes are considered. One such consideration is the avoidance of a new powerline and the construction of an underground cable or the consolidation of parallel lines on a single powerline. This is subject to technical and cost-benefit scrutiny. An alternative, but less preferred option, is the rerouting of the powerline to avoid areas of sensitive visual and landscape receptors. These are considered the most effective mitigation measure to address the potential impacts.

No fatally flawed impacts are identified, but the significance of impact on the highly sensitive landscapes, are considered major and require mitigation intervention to prevent further loss in scenic quality and visual value.

9 REFERENCES

As a matter of best practice, this assessment is based on internationally accepted guidelines and standards with regards to VIA.

- Barnard, D, Friend, F, Barnard, C and Visser, H. 2006. *Road Map to Environmental Legislation: Edition 3.* Impact Books CC, Pretoria.
- Forest Stewardship, 2008. *Forest Investment Account: integrated Visual Design Procedures and Standards.* British Columbia. (http://www.for.gov.bc.ca/hfp/publications/00040/FIA-Standards-Final.pdf). Accessed May 2012.
- Hull, R.B. and I.D. Bishop. 1988. *Scenic Impacts of Electricity Transmission Towers: The influence of Landscape Type and Observer Distance.* Journal of Environmental Management. 1988. Vol. 27: pp. 99-108.
- Landscape Institute and Institute of Environmental Management and Assessment. 2013. *Guidelines for Landscape and Visual Impact Assessment 3rd edition*. London: Routledge, United Kingdom.
- Lita Furby, Paul Slovic, Baruch Fischhoff, Robin Gregory. 1988. *Public perceptions of electric power transmission lines.* Journal of Environmental Psychology, Volume 8, Issue 1, March 1988, Pages 19-43, ISSN 0272-4944, 10.1016/S0272-4944(88)80021-5. (http://www.sciencedirect.com/science/article/pii/S0272494488800215). Accessed May 2012.
- Oberholzer, B. 2005. Guideline for Involving Visual and Aesthetic Specialists in EIA Processes. Edition 1. CSIR Report No. ENV-S-C 2005 053 F. Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning, Cape Town.
- The Countryside Agency and Scottish Natural Heritage (2002). *Landscape Character Assessment – Topic paper 6.*
- Thomas Priestley, Gary W. Evans. 1996. *Resident Perceptions of a Nearby Electric Transmission Line*. Journal of Environmental Psychology, Volume 16, Issue 1, March 1996, Pages 65-74, ISSN 0272-4944, 10.1006/jevp.1996.0006. (http://www.sciencedirect.com/science/article/pii/S0272494496900067). Accessed May 2012.
- Swanwick, C. Department of Landscape, University of Sheffield and Land Use Consultants. 2002. *Landscape Character Assessment: Guidance for England and Scotland.* The Countryside Agency / Scottish Natural Heritage.
- Soini, K., Pouta, E., Salmiovirta, M., Uusitalo, M., Kivinen, T. 2009. *Perceptions of power transmission lines among local residents: A case study from Finland.* Paper presented at the International Conference of Landscape Economics @ University of Natural Resources and Applied Life Science (BOKU), Vienna, Austria. (http://www.ceep-europe.org/workshop.php?id_workshop=48&view=programme). Accessed May 2012.
- The Institution of Lighting Engineering (ILE) (2005). *Guidance Notes for the Reduction of Obtrusive Lighting.* (http://www.ile.org.uk/documents/RLP%202005.pdf). Accessed February 2006.
- Tudor C (Natural England). 2014. *An approach to Landscape Character Assessment.* (www.gov.uk/natural-england). Accessed October 2022.
- U.S. Department of the Interior, Bureau of Land Management - Visual Resource Management. Web Site (www.blm.gov/VRM/index.html). Accessed April 2005.

- U.S.D.O.T., Federal Highway Administration, Office of Environmental Policy. (1981). *Visual Impact Assessment for Highway Projects*. U. S. Department of Transportation Washington D. C.

APPENDIX 1

GLOSSARY OF TERMS

(Derived from the IEMA & LI Guidelines with additional descriptions)

Baseline assessment: Record and analysis of existing landscape and visual conditions. A description of the status quo.
Cumulative effects/impacts: The summation of effects that result from changes caused by a development in the conjunction with other past, present and reasonably foreseeable actions.
Landscape: The European Landscape Convention (2000) defines landscape as "an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors." It can also include rural landscapes, townscapes and seascapes.
No-Go or Do-Nothing alternative: Continued change/evolution of the landscape or of the environment in the absence of the proposed development.
Impact severity: A combination of the probability, duration, extent and magnitude of an impact. It is calculated with an equation of S=(E+D+M)P where E,D,M and P are given values in the impact report and impact severity is determined to be low, medium or high.
Impact significance: A combination of the impact severity and the receptor sensitivity based on values of high to insignificant.
Indirect impacts: Impacts on the environment, which are not a direct result of the development, but are often produced away from it, or as a result of, a complex pathway. Sometimes referred to as secondary impacts.
Land use: The primary use of the landscape or dominant functions.
Land cover: Refers to the elements that are on the surface of the landscape. Relates to the land use.
Landform: Combinations of slope and elevation that produce the shape and form of the land surface.
Landscape Character Assessment: A Landscape Character Assessment (LCA) identifies and describes the comprising attributes and their qualities/values in the study area. It recognises that a landscape consists of interconnected systems, patterns and individual components that is defined by the natural, cultural and historical aspects of the region.
Landscape exposure: Landscape exposure is a description of the inter-visibility between parts of a study area and the potential screening of project components. It refers to the openness of a landscape and the ability or inability to experience panoramic views across vast distances. It relates to the VAC of a landscape.
Landscape type: A landscape type (LT) will have broadly similar patterns of geology, landform, vegetation, land uses, settlement patterns, etc. that gives it a common character.
Landscape feature: A prominent eye-catching element that is unique to a specific landscape.
Landscape sensitivity: The extent to which a landscape can accept change of a particular type and scale without unacceptable adverse effects.
Mitigation: Measures, including any process, activity or design implementation to avoid, reduce, remedy or compensate for the adverse effect of an impact or visual effect due to a development.
Receptor (Landscape or viewer): A physical landscape feature, resource, character component or viewer group that will experience an impact from a development.
Residual risks: The risk that will remain after all the recommended measures have been undertaken to mitigate the impact associated with the activity (Green Leaves III, 2014)

Study area: An area determined by the specialist to be the area of impact. This area may vary from project to project and is usually the extent of visibility.
Viewshed: A viewshed analysis or visibility mapping is a GIS generated area that calculates the direct line of sight of an object in a study area based on the topography in the study area. This provides a first order impression of the visibility of an object without the screening effect of vegetation or other structures.
Visual Absorption Capacity (VAC): VAC is the degree of ability of a study area/landscape to conceal or absorb the proposed project.
Visual Exposure: Visual exposure has reference to a specific observer or observer group, and relates to how close a viewer is to an impact, or what percentage of the impact is visible, and how it affects the viewers' visual field.
Visual Resource: Any scene of a landscape can be referred to as a visual resource. The term, visual resource, is commonly used when the value of the scene is described.
Visual tolerance/intolerance threshold: A visual tolerance/intolerance threshold is a point where a specific cumulative impact oversteps the boundary between being accepted or not accepted. It is a very subjective matter, and it is up to the visual specialist to motivate why the threshold is reached or exceeded.
Visual Value: The value that is attached to a visual resource that entices people to visit an area and take photographs. It refers to the scenic quality of a visual resource and the contribution to the sense of place.
Zone of Visual Influence (ZVI): Area from which a proposed development is likely to be visible, based on GIS viewsheds and field observations.

APPENDIX 2

IMPACT SEVERITY ASSESSMENT CRITERIA

The assessment of the significance of a visual or landscape impact is a combination of how severe an impact is considered to be, and how sensitive are the receptors that are being impacted on. According to Section 13 of the 2014 EIA Regulations 982, the following assessment criteria is followed to describe the severity of the impact along the topics of nature of impact, extent, duration, magnitude and probability.

Nature of impact:
A description of what causes the effect, what will be affected and how it will be affected. A distinction is made between direct, indirect, cumulative and residual impacts.

Extent:

1. Contained on site.
2. Local area, limited to the project site and adjacent properties.
3. Regional, often affecting a large community such as a town or municipal area.
4. Larger region, affecting an area that is on a provincial or national scale.
5. Crossing international borders.

Duration:

1. Very short duration, <1 years.
2. Short term, 2-5 years.
3. Medium term, 5-15 years.
4. Long term, >15 years.
5. Permanent.

Magnitude:

0. Small and will have no effect on the environment.
2. Minor, although detectable, it will not result in an impact on processes.
4. Low and will cause a slight impact on processes.
6. Moderate and will result in processes continuing but in a modified way.
8. High, processes are altered to the extent that they temporarily cease.
10. Very high and result in complete destruction of patterns and permanent cessation of processes.

Probability:

1. Very improbable, will probably not happen.
2. Improbable, some possibility but low likelihood.
3. Probable, distinct possibility.
4. Highly probable, most likely.
5. Definite, impact will occur regardless of any prevention measure.

Additional to the aforementioned criteria, there is also mention of the **Reversibility** of an impact and the risk of **Irreplaceable loss of resources**:

Reversibility:

1. Low – Irreversible.
2. Medium – Reversible but with human intervention.
3. High – Completely reversible.

Irreplaceable loss of resources:

1. High – No potential for replacing a particularly vulnerable resource that will be impacted.
2. Medium – Resource can be replaced with human intervention.
3. Low – No irreplaceable resource will be impacted.

The significance of the impact is determined by plotting the severity of the impact and the sensitivity of the receptors on a matrix.

	Impact severity					
Receptor sensitivity		Very high	High	Medium	Low	Very low
	Very high	Substantial	Major	Major/Moderate	Moderate	Moderate/Minor
	High	Major	Major	Moderate	Moderate/Minor	Minor
	Medium	Major/Moderate	Moderate	Moderate/Minor	Minor	Minor/Negligible
	Low	Moderate	Moderate/Minor	Minor	Minor/Negligible	Negligible
	Very low	Moderate/Minor	Minor	Minor/Negligible	Negligible	Negligible/None