COMPARATIVE VIEWSHED ANALYSIS AND VISUAL IMPACT ASSESSMENT FOR THE PART 2 AMENDMENT OF THE EXISTING GAMMA SUBSTATION AND 400KV POWERLINES LOCATED NEAR VICTORIA WEST IN THE NORTHERN AND WESTERN CAPE PROVINCE

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PREPARED FOR:

NALA Environmental Consulting Firm

DATE:

January 2023

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Report number:	01

DECLARATION

I, **Tosca de Villiers**, as an independent consultant compiled this Visual Impact Assessment and declare that it correctly reflects the findings made at the time of the report's compilation. I further declare that I, act as an independent consultant in terms of the following:

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act,1998 (Act 107 of 1998);
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, will present the results and conclusion within the associated document to the best of my professional judgement.

Tosca de Villiers
Landscape Architect & Environmental Assessment Practitioner
SACLAP Reg nr: 20421
EAPASA Reg nr: 2019/1582

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1. BACKGROUND

In 2007, a full scoping and environmental impact report, inclusive of specialist studies, was undertaken for the proposed 765kV Gamma Substation near Victoria West on the boundary of the Northern and Western Cape (ACER, 2007). The impact assessment entailed the construction of the Gamma Substation alongside the existing 400kV power lines on an area of land approximately 170ha. The visual impact assessment (VIA) for the Environmental Impact Assessment (EIA) was originally undertaken by Cave Klapwijk and Associates (CKA) in May 2007. Environmental Authorisation (EA) was granted on the 19 November 2007. Construction of a portion of the originally assessed development footprint of the Gamma Substation was undertaken following approval.

Subsequently, the Applicant wishes to undertake the inclusion of the substation yard (which falls within the existing authorised footprint of the Gamma Substation) and to realign the existing 400kV Hydra- Droer Rivier power line to now turn into the substation yard, as was originally planned. A Part 1 amendment was undertaken to update the wording in the EA, however, DFFE has indicated that the EIA and the specialist studies undertaken was not detailed enough for them to determine if the corridor to accommodate the turn-in of the powerline to the proposed substation yard was assessed in the original assessments undertaken in 2007.

DFFE have therefore indicated that a Part 2 Amendment process and submit of a motivation report including comparative specialist assessments to indicate the sensitivity and assess the impacts associated with the 400kV powerline turn-in will need to be undertaken. No additional properties will be affected by the amendments as the proposed amendment is within the originally assessed and authorised development footprint and all other associated infrastructure will remain the same as originally assessed.

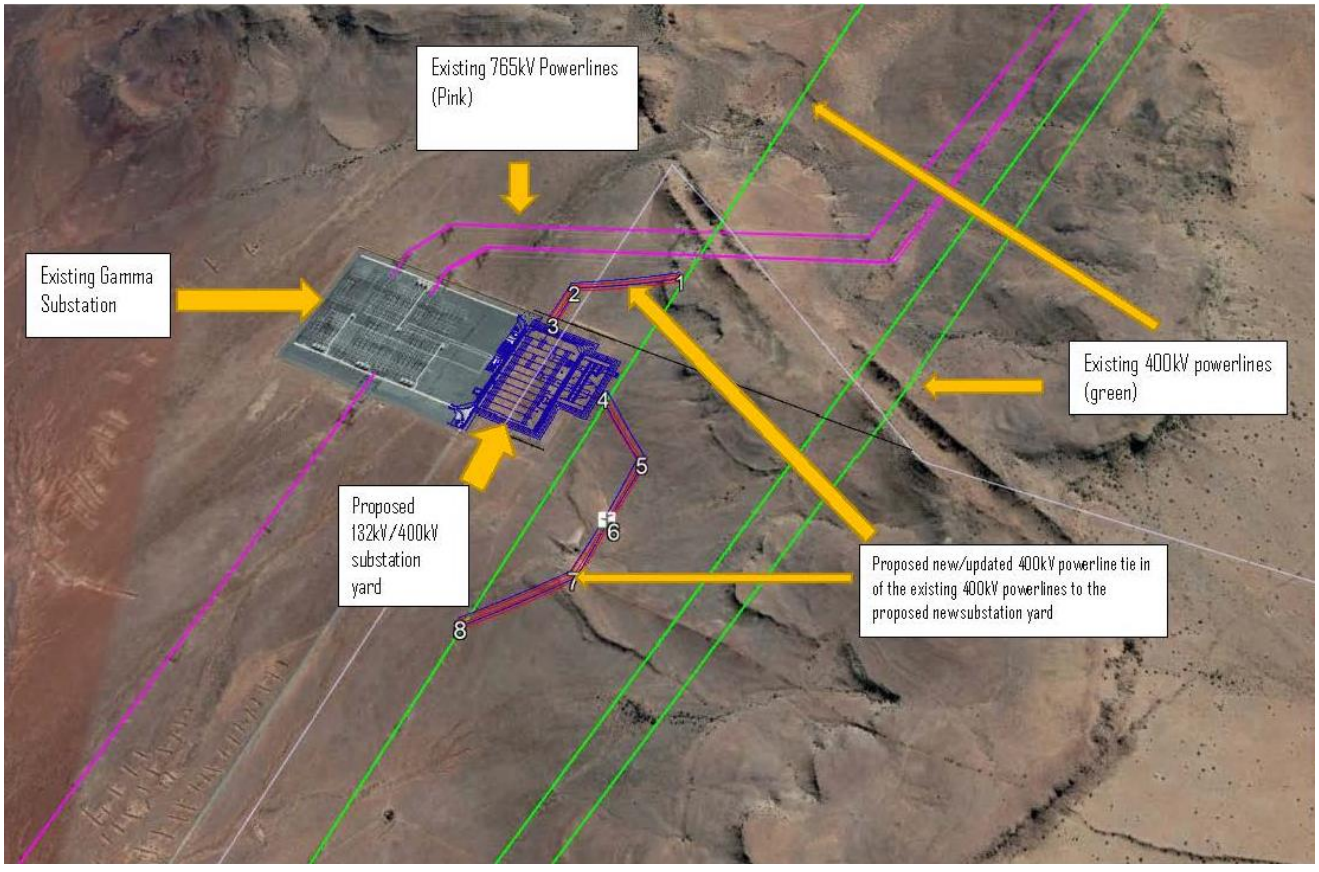


Figure 1: Diagram illustrating the proposed 400kV powerline turn-in and yard extension at the existing Gamma Substation

Nuleaf Planning and Environmental (Pty) Ltd have been appointed to undertake a comparative visual impact assessment, to assess the impacts associated with the Substation extension and 400kV powerline turn-in in relation to what was initially assessed in the original VIA undertaken by CKA in 2007. Please note that this report should be read in conjunction with the original VIA.

2. INTRODUCTION

7.1. QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM

Nuleaf Planning and Environmental (Pty) Ltd, specialising in Visual Impact Assessment, undertook the review and subsequent amendment to the visual assessment.

The team undertaking the review and amendment to the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

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

7.2. LEGAL FRAMEWORK

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

- **The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA):** This report is in line with Appendix 6 of NEMA: Environmental Impact Assessment (EIA) Regulations (2014, as amended) which details the minimum requirements a specialist report must contain for an Environmental Impact Assessment.
- **Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005):** This guideline was developed for use in the Western Cape, however, in the absence of the development of any other guideline, this provides input for the preparation of visual specialist input into EIA processes. The guideline documents the requirements for visual impact assessment, typical issues that trigger the need for specialist visual input, the scope and extent of a visual assessment, information required, as well as the assessment ad reporting of visual impacts and management actions.
- **Screening Tool as per Regulation 16 (1)(v) of the Environmental Impact Assessment Regulations, 2014 as amended:** A Screening report was generated for this proposed project, whereby a visual impact assessment was identified as one of the specialist studies that would be required.

7.3. INFORMATION BASE

This assessment was based on information from the following sources:

- The initial visual assessment conducted in May 2007 by CKA;
- Site Sensitivity Verification Report undertaken by Nuleaf in 2023;
- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

7.4. ASSUMPTIONS AND LIMITATIONS

This Report has been prepared by Nuleaf on behalf, and at the request, of Nala Environmental to provide them with an independent specialist assessment and review. Unless otherwise agreed by Nuleaf in writing, Nuleaf does not accept responsibility or legal liability to any person other than the Nala Environmental for the contents of, or any omissions from, this Report.

To prepare this Report, Nuleaf utilised only the documents and information provided by Nala Environmental or any third parties directed to provide information and documents by Nala Environmental. Nuleaf has not consulted any other documents or information in relation to this Report, except where otherwise indicated.

The findings, recommendations and conclusions given in this report are based on the author's best scientific and professional knowledge, as well as the available information. This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. Nuleaf and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field or pertaining to this investigation.

Although Nuleaf exercises due care and diligence in rendering services and preparing documents, Nuleaf accepts no liability, and Nala Environmental, by receiving this document, indemnifies Nuleaf and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with the services rendered, directly or indirectly by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If this report is used as part of a main report, the report in its entirety must be included as an appendix or separate section to the main report.

This report should be read in conjunction with the original VIA complied by CKA in May 2007. This assessment was undertaken during the planning stage of the project and is based on information available at that time.

This assessment was undertaken during the planning stage of the project and is based on information available at that time. It is assumed that all information regarding the project details provided by Nala Environmental and the Applicant is correct and relevant to the proposed project. No public participation had been undertaken at the time of the writing of this report. This assessment and all associated mapping have been undertaken according to the worst-case scenario.

7.5. LEVEL OF CONFIDENCE

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

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

- The information available, understanding of the project and experience of this type of project by the practitioner:
  - **3**: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
  - **2**: A moderate level of information and knowledge is available of the project and the visual impact assessor is moderately experienced in this type of project and level of assessment.
  - **1**: Limited information and knowledge is available of the project and the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Roles and responsibilities outlined for each applicable party on site

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

[1] Adapted from Oberholzer (2005).

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

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

3. SCOPE OF WORK

The scope of work includes a comparative viewshed analysis, a visual impact analysis and identification of potential sensitive visual receptors that may be influenced by the proposed Substation extension (substation yard) and the 400kV powerline turn-in. This is done in order to determine:

- If there are any additional visual receptors that may be negatively influenced by the amendment
- Whether the proposed amendment would significantly aggravate the potential visual impact on identified receptors (identified during the EIA phase)
- If additional impact mitigation measures are relevant
- To suggest amendments or additions to the Environmental Management Programme (EMPr) (if applicable)

4. METHODOLOGY

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours from the National Geo-spatial Information data supplied by the Department: Rural Development and Land Reform.

The approach utilised to identify potential issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This includes cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The identification of sensitive environments upon which the proposed Substation extension and 400kV powerline turn-in could have a potential visual impact;
- The creation of viewshed analyses from the proposed amended area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.
- A comparative viewshed analysis in order to determine the visual exposure (visibility) of the original authorised infrastructure compared to the potential exposure of the Substation extension and 400kV powerline turn-in, as proposed in the amendment.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed amendment in comparison to what was originally assessed in the VIA undertaken by CKA in 2007, as well as offer potential mitigation measures, where required.

5. STATUS OF THE AFFECTED ENVIRONMENT

5.1. INITIAL ASSESSMENT - STATUS OF THE ENVIRONMENT (2007)

As part of the original Visual Impact Assessment undertaken by CKA in 2007, a description of the characteristics of the receiving environment was undertaken. This consisted of the description of the natural physical elements making up the landscape in terms of the prevailing topography, vegetation cover, *Genius Loci,* visual quality and character, as well as land use in the study area. A summary of these findings as per the original VIA report undertaken in 2007 is as follows:

Topography

The topography was characterised as a landform that slopes gently south to south-east towards the R63. Low hills to the east, north and west were noted to form a low horseshoe enclosure. It was concluded that the surrounding hills would form

a low visual barrier from the east, north and west by screening much of the lower and bulkier parts of the substation. Additionally, the flat and open topography to the south would allow open views from the R63 and N1 (when traveling in a northern direction).

Vegetation

The study area was reported to be located on the interface between the Upper Nama Karoo and the Eastern Mixed Nama Karoo of the Nama Karroo Biome. It was concluded that the low open vegetation provided no screening of the substation and infrastructure or a visually diverse landscape that could increase the Visual Absorption Capacity of the landscape. Any object or structure would remain visible within this vegetation type.

Land Use

The land use in the study area was predominantly determined at the time to be sheep and goat farming combined with game farming for the hunting market. Urban areas such as Victoria West, Murraysburg, Richmond and Three Sisters were all determined to be at least 40km away. Generally, the economic activity in the areas were deemed not to rely on the visual and aesthetic environment.

The R63 from Murraysburg to Victoria West and the N1 from Three Sisters to Richmond were the main arterial and national routes identified to occur in the study area. These routes were determined to contain critical views towards the site as they carried the most viewers that would be exposed to the visual impact. Additionally, a guesthouse (Skeitkuil Holiday Farm) located adjacent to the N1/R63 intersection was identified to be close to the site, but was deemed not to be visually affected.

The existing visual quality of the study area was noted to have been compromised by the existing 400kV transmission lines and small substation already located within the vicinity of the site. The area was deemed to be already visually degraded as a result of the existing infrastructure.

It was concluded that the area had a relatively low visual interest or character, which could be described as rural agriculture, very typical of the open and vastness of the Central Karoo. The visual intrusion as a result of the Gamma Substation was deemed to not have a significant impact or influence on existing land uses.

5.2. CURRENT ASSESSMENT - STATUS OF THE ENVIRONMENT (2023)

A desktop assessment of the current affected environment was undertaken in January 2023 to determine the status of the physical landscape characteristics now. As per the previous VIA undertaken in 2007, this consisted of describing the current physical landscape characteristics in terms of the prevailing topography, vegetation cover and land use within the study area. These findings are described below:

Topography

The topography of the study area is flats and gently sloping plains interspersed with hills and rocky areas located in the north east and north western portions of the study area. The elevation ranges from 1175m above sea level (a.s.l.) in the south east (along the Brak river) to 1625m a.s.l. at the top of the Bulberg. The existing Gamma Substation itself is located in a lower lying area at an average elevation of 1225m a.s.l. and has an even slope to the south towards the Brak River and Skietkilspruit. Refer to **Map 1** for a current topographical map of the study area.

Figure 2: Long distance view over the existing Gamma Substation, high voltage powerline and the undulating topography further afield

Vegetation

Regionally, the site is located some 40km south east of the town of Victoria West (at the closest) on the boundary of the Northern and Western Cape Province, within a region commonly referred to as the Central Karoo. The study area falls within the arid Nama-Karoo Biome; a biome characterised by its dry semi-dessert climate and associated dessert-like vegetation. The vegetation cover of the study area is identified as Eastern Upper Karoo, dominated by low shrubs and grasses. Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed to be low by virtue of the low growing vegetation and sparsely populated/limited development overall.

Figure 3: View of the expansive landscape dominated by low shrubs and grasses

Land Use

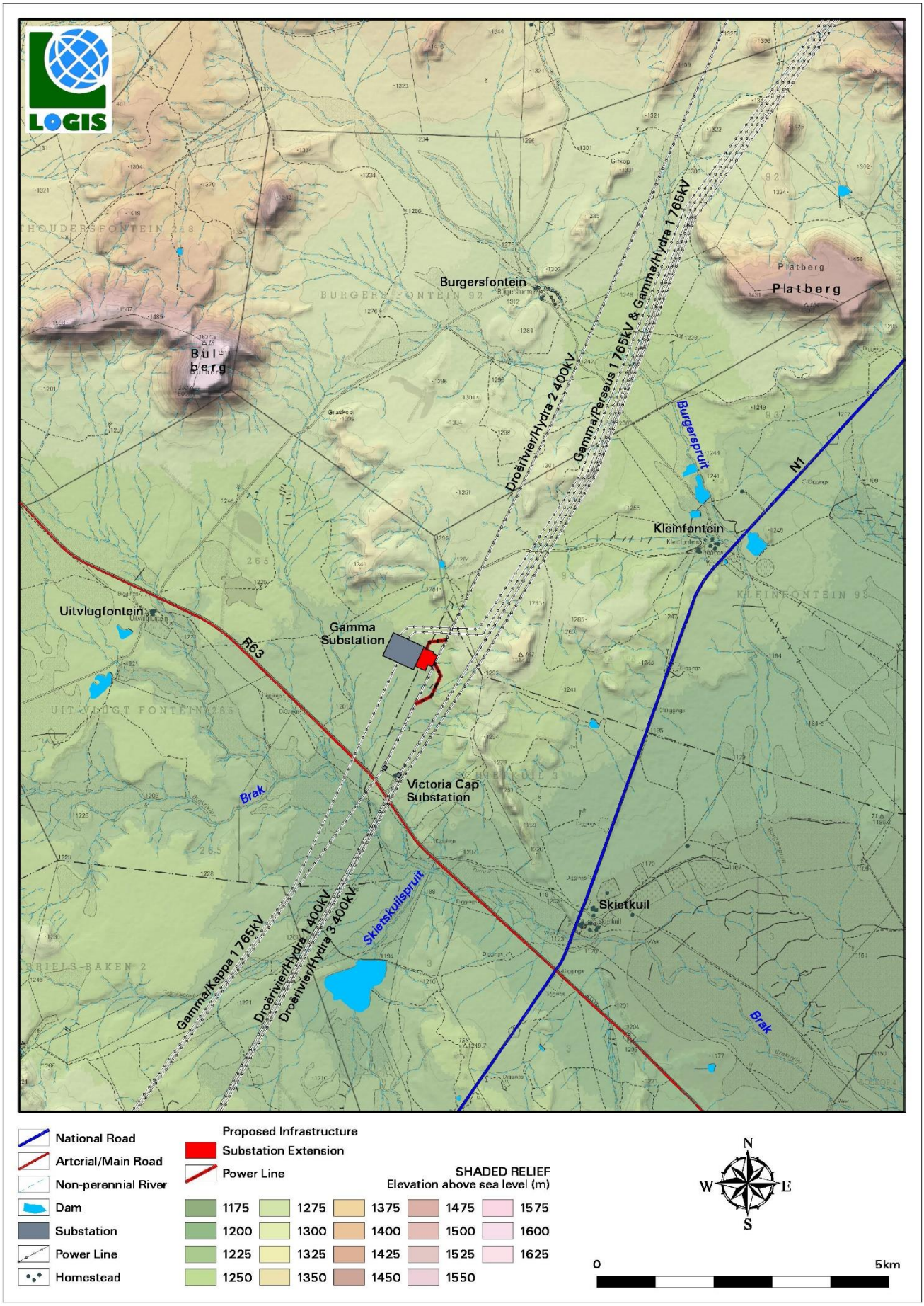
The dominant land use (at present) within the region is sheep farming. There are very limited agricultural activities due to the limited rainfall (less than 300mm per annum) and arid climate. The land cover within the study area is predominately low shrubland (Nama Karoo), bare rock and soil with small scattered areas of agriculture (rainfed and irrigated) and grasslands. As a result, the landscape is characterised by wide-open expanses of extreme isolation. Refer to **Map 2** for the current land cover and broad land use patterns within the study area.

The majority of the study area is sparsely populated and consists of a landscape of wide-open expanses. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of permanent water. Settlements, where they occur, are usually rural homesteads and farmsteads.

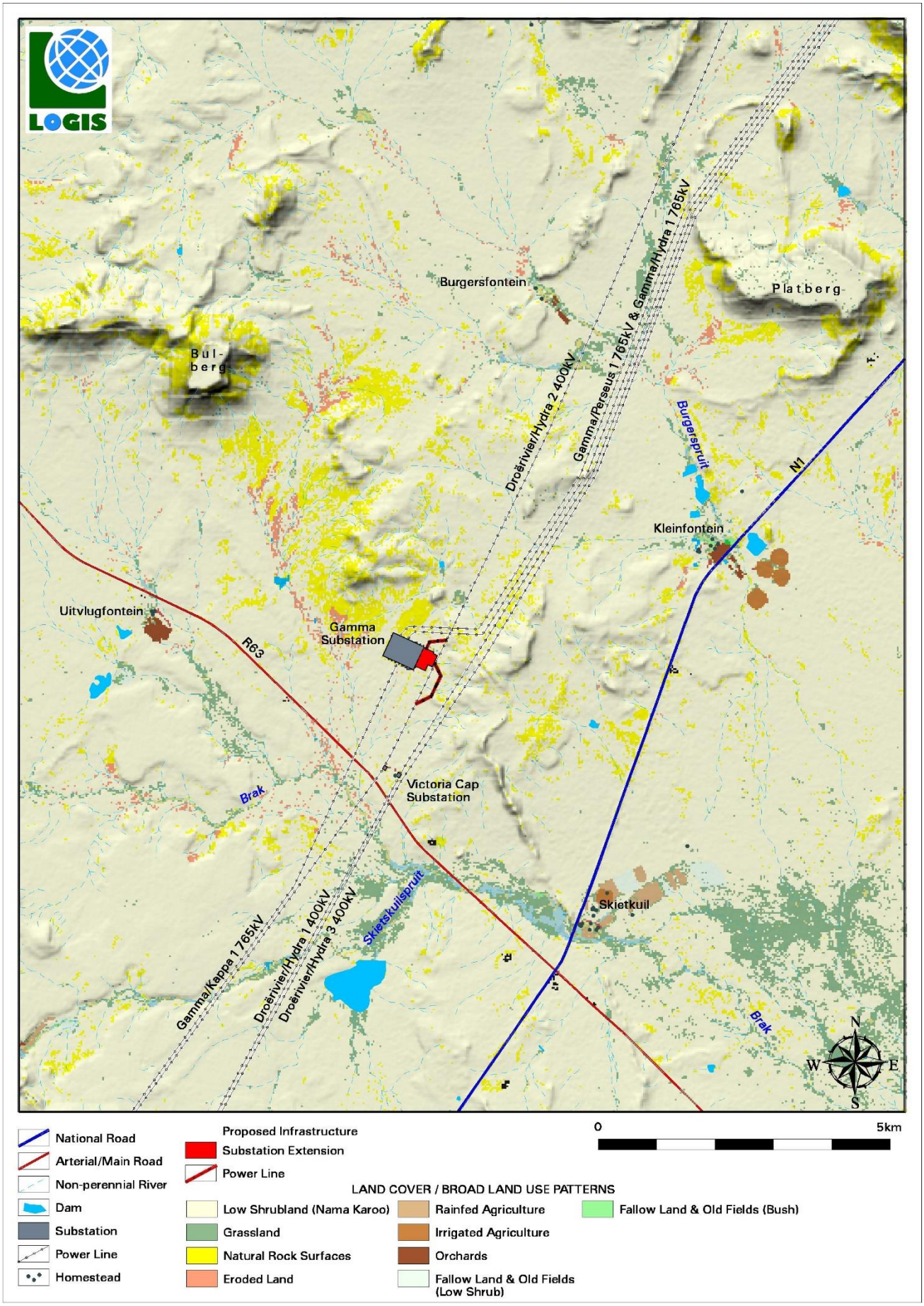
Access to the study area is via the R63 and N1. The N1 is a national road and is the main link from Gauteng to Cape Town. Seeing as the N1 is a main route serving the region, it can be considered to be a route that is most likely to carry tourists. The R63 can also be considered an alternative route to Graaf-Reinet which is a popular tourist town located within the Camdeboo National Park in the Eastern Cape Province. Commuters and possible tourists using the national and arterial roads may also be negatively impacted upon by the visual exposure to the proposed infrastructure, however, this intrusion would be fleeting.

The landscape character of the study area and site itself is largely undeveloped and natural with wide-open expanses. However, there is some industrial infrastructure within the study area which includes the existing Gamma and Victoria Cap Substations. Additionally numerous existing high voltage power lines traverse the study area from north to south.

Overall, the region has a predominantly undeveloped, rural and natural character, with scattered isolated homesteads or farm settlements occurring within the study area. These are generally located at great distances from each other. The region has a population density of less the 1 person per km^2.



Map 1: Current shaded relief map of the study area



Map 2: Current land cover / broad land use map of the study area

5.3. COMPARATIVE ASSESSMENT – CHANGES TO STATUS OF THE ENVIRONMENT BETWEEN 2012 - 2023

Since the initial VIA undertaken by CKA in 2007, the landscape characteristics comprising the topography, vegetation, as well as, land use and land cover of the study area have remained unchanged. Overall, the study area has retained its low population density with predominately undeveloped, rural and natural character, interspersed with existing industrial infrastructure which includes the Victoria Cap Substations, as well as, numerous existing high voltage power lines. The only noticeable change is that the Gamma Substation (as assessed in 2007) has been constructed. Therefore, in the opinion of the author, the **status of the environment has largely remained the same**.

6. VISUAL IMPACT ASSESSMENT

6.1. POTENTIAL VISUAL EXPOSURE - 2007

Map 3 below illustrates the viewshed generated during the initial visual study undertaken by CKA in 2007. It was determined that the viewshed, based on the GIS assessment and fieldwork, extends for the main part beyond a distance of 15km and that local variations in topography and man-made structures would cause local obstruction of views.

The methodology followed applied the concept that the Gamma Substation would be more visible to receptors located within a short distance. These receptors would then experience a higher adverse visual impact than those located at a moderate or long distance from the Gamma Substation. The distance of the potentially sensitive receptors from the Gamma Substation was then considered when rating the visual impact of the development on identified sensitive receptors. Refer to **Map 3** (CKA, 2007).

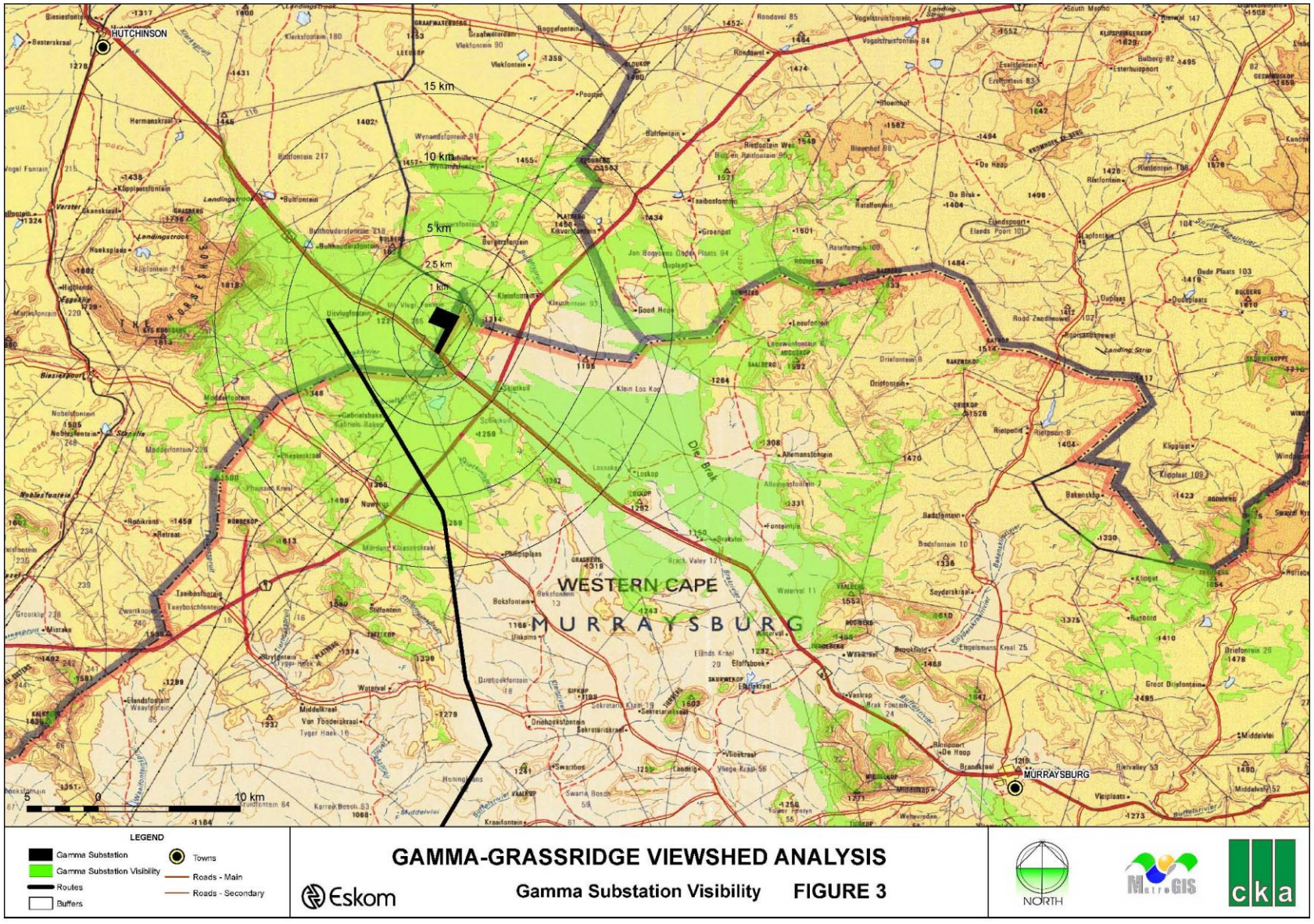
The distance radii chosen was as follows:

- 0 – 1km (Short distance)
- 1km – 2.5km (Moderate distance)
- 5km – 10km (Long distance)
- 10km – 15km (Very long distance)

The viewshed analysis undertaken in 2007 concluded that visibility decreases exponentially over distance and that the visual impact of the substation would be insignificant beyond 10 km. Based on the application of the above, the following affected areas and/or visual receptors potentially sensitive to the Gamma Substation were identified:

- Observers located in the visually exposed areas within the 10km zone. No specific observers were listed.
- The hills and mountains around Murraysburg
- Travellers moving in a northerly direction on the N1 (located approximately 5km away)
- Observers travelling along the R63 (located within 1km of the site) running north-west to south-east along its southern boundary. It was determined that the views from this road will be within the high impact 1km zone.

The VAC was also concluded to be regarded as low. This implied that the landscape was unable to accept the visual change. In other words, the area would be visually highly impacted on because the characteristics of the landscape were unable to naturally provide amelioration.



Map 3: Viewshed analysis of the existing Gamma Substation as assessed in 2007 by CKA

6.2. POTENTIAL VISUAL EXPOSURE - 2023

A viewshed analysis for the proposed amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in) was undertaken in order to determine the validity of the results of the previous VIA undertaken in 2007. The result of the viewshed analyses for the proposed Gamma Substation extension and 400kV powerline turn-in, is shown on **Map 4** that follows. An analysis has been undertaken within the proposed development area in order to determine the general visual exposure (visibility) of the area under investigation. A generic height of 45m was used in order to illustrate the anticipated visual exposure of the highest proposed structure (i.e. the power lines). Typically, structures of this height (i.e. 45m) may be visible from up to 6km away. In this respect, the anticipated Zone of Visual Influence for this facility as calculated from the development footprint has been indicated at 6km.

The viewshed analysis does not include the effect of vegetation cover or existing structures (i.e., VAC) on the exposure of the proposed facility, therefore signifying a worst-case scenario.

Map 4 indicates areas from which any number of the proposed infrastructure could potentially be visible, as well as proximity offsets from the proposed facility. These proximity offsets are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e., depending on the size and nature of the proposed infrastructure).

Therefore, for the purpose of this study, proximity offsets have been calculated from the expected boundary of the site, as indicated on **Map 4** and as follows:

- 0 – 1km. Short distance view where the infrastructure would dominate the frame of vision and constitute a very high visual prominence.
- 1 - 3km. Short to medium distance view where the structures would be easily and comfortably visible and constitute a high to moderate visual prominence.
- 3 - 6km. Medium to long distance view where the infrastructure would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a moderate visual prominence.
- > 6km. Long distance view of the development where the structures are not expected to be immediately visible and not easily recognisable. This zone constitutes a lower visual prominence for the facility.

The following is an overview of the findings of the viewshed based on the layout illustrated on the Map provided:

- The potential visual exposure of the facility is contained to a core area on the already disturbed site itself and within a 1km radius thereof. **No sensitive visual receptors** are located within this zone.

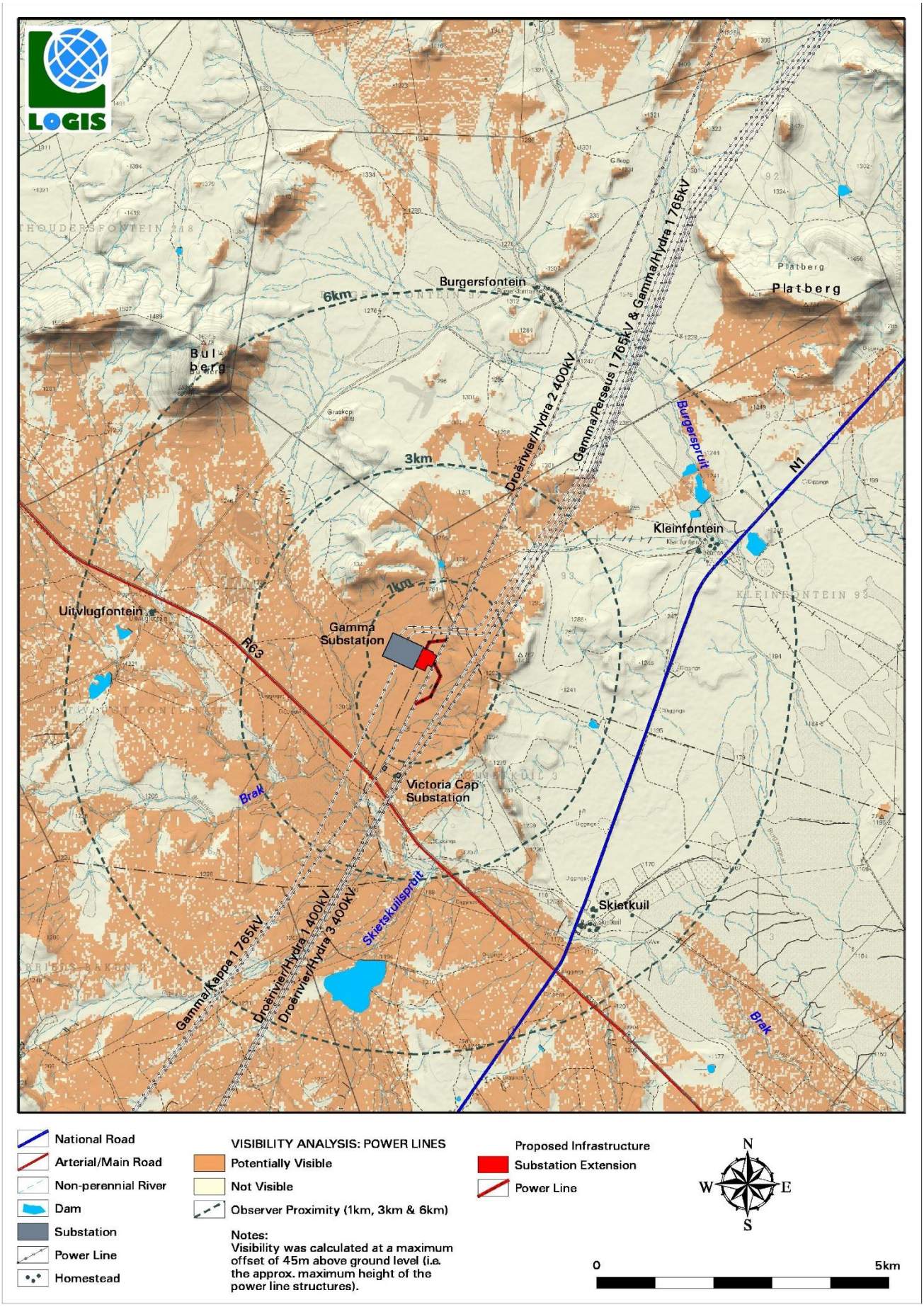
- Potential visual exposure in the short to medium distance (i.e., between 1 and 3km), is scattered throughout with visually screened areas to the north and east. Sensitive visual receptors are observers travelling along the R63. These receptors are likely to experience a **high** visual impact.

- In the medium to long distance (i.e. between 3 and 6km offset), the extent of potential visual exposure is fragmented throughout the area with large visually screened areas lying to the north and east of the site. Sensitive visual receptors include residents of Uitvlugfontein, as well as, observers travelling along the N1 in a northerly direction as well as the R63. These receptors are likely to experience a **moderate** visual impact.

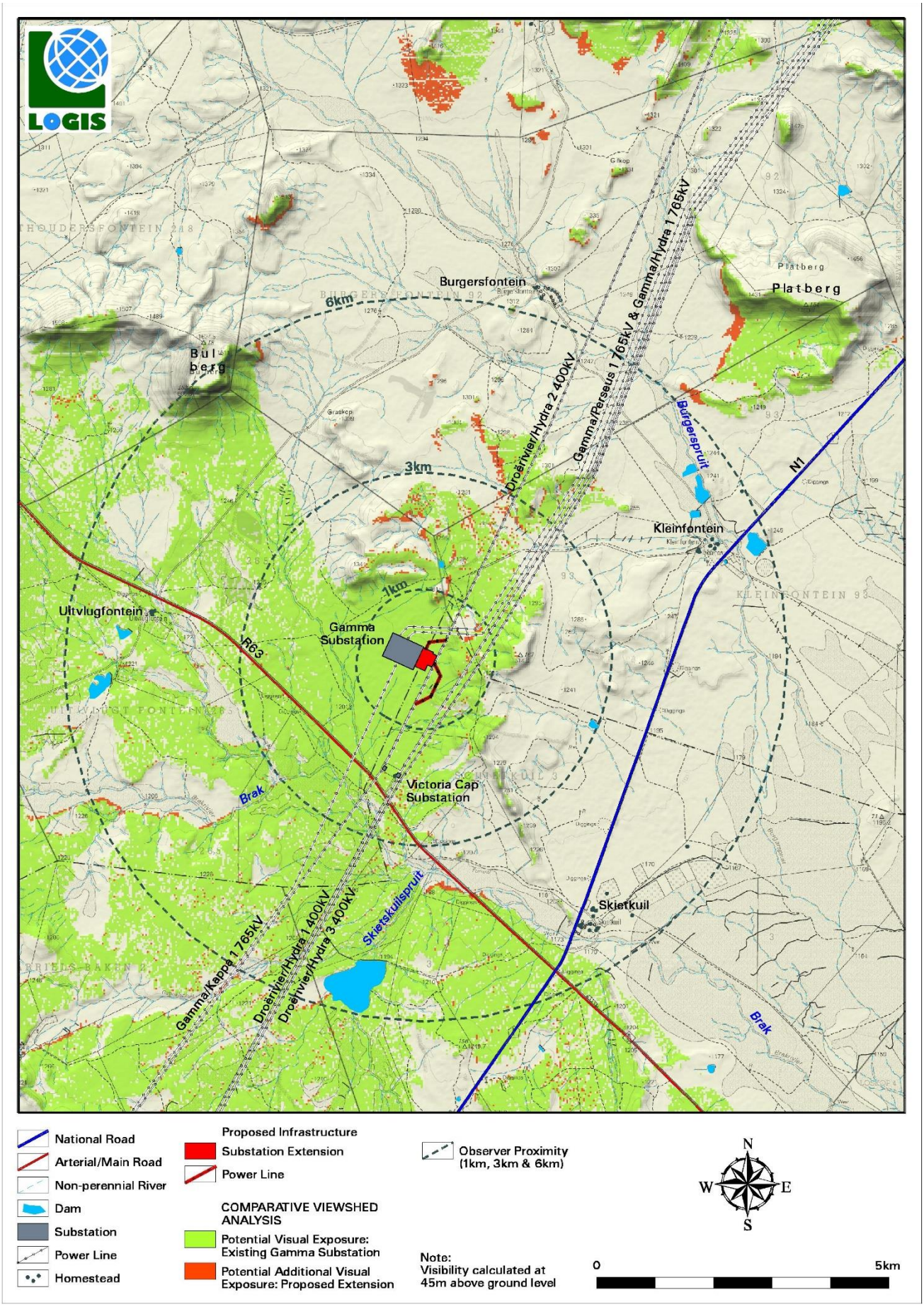
  Of note is that while the homesteads of Kleinfontein and Skietkuil fall within this zone, no visual exposure is expected based on the viewshed analysis modelling.

- Beyond the 6km offset from the proposed facility, potential visual exposure becomes extremely scattered and very low. Sensitive visual receptors are not likely to be visually exposed to the proposed infrastructure, despite lying within the viewshed.

In general, as a result of the existing infrastructure, as well as, the scattered and lower population density of the study area, based on the viewshed analysis the amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in) may constitute a visual prominence, potentially resulting in a possible moderate - low visual impact.



Map 4: Viewshed analysis of the proposed amendments (i.e. Substation extension & 400kV powerline turn-in)



Map 5: Comparative Viewshed Analysis Map

6.3. COMPARATIVE VIEWSHED ANALYSIS

A visibility analysis was undertaken from the proposed Substation extension and 400kV powerline turn-in at an offset of the highest proposed infrastructure (i.e. the power lines) at 45m (i.e. the approximate maximum height of the power line structures) above ground level. The result of this analysis represents the potential total visual exposure of the existing Gamma Substation and Power line dimensions (indicated in green). The viewshed analysis was repeated at an offset of 45m to indicate the visual exposure (shown in red) of the proposed amendments. The results of the visibility analyses are displayed on **Map 5** below.

It is clear that the proposed Substation extension and 400kV powerline turn-in, would have a relatively small influence on the overall visual exposure, due to the presence of the already tall power line existing power line structures and Gamma Substation. There are no additional sensitive visual receptors located within the area of increased visual exposure.

Potential sensitive visual receptors within an approximately 6km radius include:

- Observers travelling along the N1
- Observers travelling along the R63
- Residents of Uitvlugfontein

6.4. COMPARATIVE ASSESSMENT STATEMENT

In consideration of the proposed amendments**, there is no (zero) change to the visibility compared with the currently authorized and constructed Gamma Substation and its associated power lines**. It is expected that the proposed amendments would be equally visible and noticeable from both the roads and homesteads identified above, therefore signifying a **negligible change** to the potential visual impact from the currently authorised development at the Gamma Substation.

Of note is that, while indicated to be within the viewshed of the viewshed map undertaken by CKA in 2007 (Map 3), the residents of the homestead Uitvlugfontein were not specifically mentioned as sensitive receptors in the original VIA undertaken.

6.5. IMPACT RATINGS - 2012

In order to assess the impact of the proposed substation yard and 400kV turn-in infrastructure on the potentially sensitive receptor locations listed above, the VIA undertaken by CKA in 2007 utilised a matrix that took into account a number of factors which was then applied to the development of the Gamma Substation. The matrix adopted was based on the factors as listed below:

- Nature of the Impact
- Extent
- Duration
- Intensity
- Frequency of occurrence
- Probability of occurrence
- Legal requirements
- Significance
- Status of the impact
- Degree of confidence in predictions

Based on the application of this matrix, it was determined that the impact of the Gamma Substation would be as follows during the construction and operational phase:

Table 2: Impact table summarising the significance ratings as determined in 2007

765kV Gamma Substation		
Theme	Aesthetics	
Legal requirements	None	
Stage	**Construction and Decommissioning**	**Operation**
Extent	Local	Local extending to 15 km
Duration of impact	Short term	Long term
Intensity	High within 1 000 m	High within 1 000 m, medium along roads, low beyond 5 000 m
Frequency of occurrence	Continuous for duration of construction	Continuous
Probability of occurrence	Highly probable	Highly probable
Nature of the impact	Negative	Negative
Cumulative Impact	Low	Medium
Confidence in predictions	Medium	Medium
Ability to adapt	Low (-)	Low (-)
Level of significance	**High**	**Low**
Mitigation measures	Limit extent of construction area. Rehabilitate all disturbed areas to reduce visual scarring. Blend earthworks and road access cuttings into the landscape. Limit footprint area to strip only the minimum area required to set up the construction area. Focus all night lighting downwards and limit to that what is necessary only.	Limit night lighting to the minimum.
Level of significance after mitigation	**Potentially high**	**Potentially low**
EMP requirements	Yes – environmental rehabilitation and implementation of the design mitigation measures	Environmental maintenance and rehabilitation
Discussion: The visual impact extends beyond the 15 km radius but the significance thereof is low due to the existing visual clutter and degradation by the existing transmission lines and substation. The area has a low visual absorption capacity due to the low and sparse vegetation but the development is partially screened to the north, east and west by the low surrounding hills. Critical viewpoints are from the N1 and R3. Visual intrusion could be exacerbated at night if the substation is to be lit up at night.		

The **impact ratings as determined for the Gamma Substation in 2007 were regarded as significantly low**. These findings were based on the field observations and the assessment undertaken, notwithstanding the large extent and height of the substation, the low VAC and the close proximity to the R63 and the N1. The significance was also noted to be tempered by the low surrounding hills, the already altered landscape due to existing transmission lines, substation and major roads and the lack of economic activities that rely on the visual environment such as game reserves, conservation areas and lodges.

6.6. IMPACT RATINGS - 2023

The previous section of this report identified the impact ratings determined in the previous VIA undertaken by CKA in 2007 with regards to the visual impacts likely to occur during the construction and operational phases of the Gamma Substation. This section will attempt to quantify the potential visual impacts within today's context, taking into consideration the current land user within their respective geographical locations in relation to the proposed amendment to the existing Gamma Substation and in terms of the identified issues related to the visual impact, in order to determine if the significance ratings as assessed in the VIA undertaken in 2007 are still valid.

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

Extent - How far the visual impact is going to extend and to what extent it will have the highest impact. In the case of this type of development the extent of the visual impact is most likely to have a higher impact on receptors closer to the development and decrease as the distance increases.

- (1) Very low: Long distance > 6km
- (2) Low: Medium to long 3-6km
- (3) Medium: Short distance 1-3km
- (4) High: Very Short < 1km

Duration - The timeframe over which the effects of the impact will be felt.

- (1) Very short: 0-1 years
- (2) Short: 2-5 years
- (3) Medium: 5-15 years
- (4) Long: >15 years
- (5) Permanent

Magnitude - The severity or size of the impact. This value is read off the Visual Impact Index maps.

- (0) None
- (2) Minor
- (4) Low
- (6) Moderate
- (8) High
- (10) Very High

Probability - The likelihood of the impact actually occurring.

- (1) Very improbable: Less than 20% sure of the likelihood of an impact occurring
- (2) Improbable: 20-40% sure of the likelihood of an impact occurring
- (3) Probable: 40-60% sure of the likelihood of an impact occurring
- (4) Highly probable: 60-80% sure of the likelihood of that impact occurring
- (5) Definite: More than 80% sure of the likelihood of that impact occurring

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

- (0-12) Negligible:
  Where the impact would have no direct influence on the decision to develop in the area. The impact would be of a very low order. In the case of negative impacts, almost no mitigation and or remedial activity would be needed, and any minor steps, which might be needed, would be easy, cheap, and simple.
- (13-30) Low:

Where the impact would have a very limited direct influence on the decision to develop in the area. The impact would be of a low order and with little real effect. In the case of negative impacts, mitigation and / or remedial activity would be either easily achieved or little would be required, or both.

- (31-60) Moderate:
  Where the impact could influence the decision to develop in the area. The impact would be real but not substantial. In the case of negative impacts, mitigation and / or remedial activity would be both feasible and fairly easily possible.
- (61-80) High:
  Where the impact must have an influence on the decision to develop in the area. The impacts are of a substantial order. In the case of negative impacts, mitigation and / or remedial activity would be feasible but difficult, expensive, time-consuming or some combination of these.
- (81-100) Very High:
  Where the impact will definitely have an influence on the decision to develop in the area. The impacts are of the highest order possible. In the case of negative impacts, there would be no possible mitigation and / or remedial activity possible.

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

Status – The perception of Interested and Affected Parties towards the proposed development.

- Positive
- Negative
- Neutral

Reversibility – The possibility of visual recovery of the impact following the decommissioning of the proposed development

- (1) Reversible
- (3) Recoverable
- (5) Irreversible

6.6.1. POTENTIAL VISUAL IMPACT OF CONSTRUCTION ACTIVITIES ON SENSITIVE VISUAL RECEPTORS IN CLOSE PROXIMITY TO THE PORPOSED INFRASTRUCTURE

During construction, there may be an increase in heavy vehicles utilising the roads to the substation that may cause, at the very least, a visual nuisance to other road users in the area.

Construction activities may potentially result in a **low** temporary visual impact both before and after mitigation.

A mitigating factor within this scenario is the presence of the existing Gamma Substation and high voltage power line infrastructure running adjacent to the site, as well as, the fact that no receptors are located within the immediate area thereby reducing the probability of this impact occurring.

Table 3: Impact table summarising the significance of the visual impacts of the proposed infrastructure on sensitive visual receptors in close proximity

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed infrastructure		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Very High **(10)**	High **(8)**
Probability	Improbable **(2)**	Very Improbable **(1)**
Significance	Low **(24)**	Low **(14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: Planning: ➢ Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude. Construction: ➢ Ensure that vegetation is not unnecessarily removed during the construction phase. ➢ Plan the placement of lay-down areas (if required) and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. ➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads. ➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities. ➢ Reduce and control construction dust using appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. ➢ Rehabilitate all disturbed areas immediately after the completion of construction works.
Residual impacts: None, provided rehabilitation works are carried out as specified.

6.6.2. POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS LOCATED WITHIN A 1KM RADIUS OF THE INFRASTRUCTURE DURING THE OPERATIONAL PHASE

The proposed infrastructure is expected to have a **low** visual impact on observers within a 1km radius (and potentially up to a 3km radius) of the infrastructure. The visual impact of the substation extension and 400kV power line turn-in will largely be absorbed by the presence of the existing Gamma Substation and numerous high voltage power line infrastructure already in the study area.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice.

A mitigating factor within this scenario is the presence of the existing Gamma Substation and high voltage power line infrastructure running adjacent to the site, as well as, the fact that no receptors are located within the immediate area thereby reducing the probability of this impact occurring. The table below illustrates this impact assessment.

Table 4: Impact table summarising the significance of visual impacts on sensitive visual receptors in close proximity to the proposed infrastructure

Nature of Impact: Visual impact on observers in close proximity to the infrastructure.		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Very Improbable **(1)**	Very Improbable **(1)**
Significance	Low **(16)**	Low **(16)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Best Practise Mitigation/Management: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: ➢ Maintain the general appearance of the infrastructure. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.		

6.6.3. POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN THE REGION (1 – 6KM RADIUS) DURING THE OPERATION OF THE INFRASTRUCTURE

The proposed infrastructure will have a **low** visual impact on observers traveling along the R63 and residents of Uitvlugfontein within a 1 - 6km radius of the infrastructure.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

A mitigating factor within this scenario is that observers traveling along the R63 will only be exposed to the visual intrusion for a short period of time. Additionally, the proximity of existing powerlines and substations reduces the probability of this impact occurring as there is already an existing visual intrusion. This reduces the probability of this impact occurring.

Table 5: Impact table summarising the significance of the visual impacts of associated infrastructure on sensitive visual receptors within the region

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 1.5 – 3km radius of the grid connection infrastructure.		
	Without mitigation	***With mitigation***
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(26)**	Low **(26)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Best Practise Mitigation/Management: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: ➢ Maintain the general appearance of the servitude as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided that the grid connection infrastructure is removed. Failing this, the visual impact will remain.		

6.6.4. POTENTIAL VISUAL IMPACT OF LIGHTING ON SENSITIVE VISUAL RECEPTORS IN THE REGION

It can be expected that the light trespass and glare from the security and after-hours operational lighting (flood lights) for the proposed substation extension will have some significance on the receiving environment.

Another potential lighting impact known as sky glow. Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contributes to the increase in sky glow. The substation lighting may contribute to the effect of sky glow.

The proposed infrastructure is expected to have a **low** visual impact on observers within a 1km radius (and potentially up to 3km radius) of the proposed substation extension and can be mitigated to **negligible**.

A mitigating factor within this scenario is the presence of the existing Gamma Substation and associated lighting thereby reducing the probability of this impact occurring.

Table 6: Impact table summarising the significance of lighting on sensitive visual receptors in close proximity

Nature of Impact: Potential visual impact of lighting at night on visual receptors in close proximity to the proposed infrastructure		
	No Mitigation	**Mitigation considered**
Extent	Short **(3)**	Short **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Improbable **(2)**	Very Improbable **(1)**
Significance	**Low (26)**	Negligible **(11)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: ➢ Planning & operation: ➢ The possibility of limiting aircraft warning lights to the turbines on the perimeter according to CAA requirements, thereby reducing the overall impact, must be investigated. ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ➢ Make use of minimum lumen or wattage in fixtures. ➢ Make use of down-lighters, or shielded fixtures. ➢ Make use of Low-Pressure Sodium lighting or other types of low impact lighting. ➢ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Residual impacts: The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.		

6.6.5. THE POTENTIAL VISUAL IMPACT OF THE PROPOSED INFRASTRUCTURE ON THE SENSE OF PLACE OF THE REGION.

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

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has retained its low population density with predominately undeveloped, rural and natural character, interspersed with existing industrial infrastructure which includes the Gamma and Victoria Cap Substations, as well as, numerous existing high voltage power lines. While these generally undeveloped landscapes are considered to have a high visual quality, the presence of power generation/distribution infrastructure does represent an existing visual disturbance to the landscape. The presence of this existing visual disturbance is thus a mitigating factor within this scenario, thereby reducing the probability of this impact occurring.

The anticipated visual impact of the proposed infrastructure on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

Table 7: Impact table summarising the significance of the potential impact on the sense of place of the region.

Nature of Impact: The potential impact of the development of the proposed grid connection infrastructure on the sense of place of the region.		
	Without mitigation	***With mitigation***
Extent	Medium to longer distance **(2)**	Medium to longer distance **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**

Significance	Low **(20)**	Low **(20)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: ➢ Maintain the general appearance of the servitude as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.		

6.6.6. POTENTIAL VISUAL IMPACT ON TOURIST ACCESS ROUTES AND TOURIST DESTINATIONS WITHIN THE REGION.

The greater region is generally seen as having a high scenic value and tourism value potential. The landscape is characterised by wide-open spaces with a high visual quality and strong sense of place. The N1 and R64 are primary roads in the region and thus considered to be routes that are likely to carry tourists. The greater region is also renowed as a halfway stopping point for travellers travelling between Johannesburg and Cape Town.

A mitigating factor within this scenario is that observers traveling along the N1 (travelling in a northerly direction) and R63 will only be exposed to the visual intrusion for a short period of time. Additionally, the proximity of existing powerlines and substations reduces the probability of this impact occurring as there is already an existing visual intrusion. This reduces the probability of this impact occurring.

The anticipated visual impact of the proposed infrastructure on tourist access routes (i.e. the N1 and R63) and tourist destinations (i.e. accommodation and attracctions) within the region is therefore expected to be of **low** significance.

No mitigation is possible within this environment and for a facility of this scale, but measures have been included as best practice guidelines. The table below illustrates the assessment of this anticipated impact.

Table 8: Impact table summarising the significance of visual impacts on tourist access routes and destinations within the region

Nature of Impact: Visual impact of the proposed development on the tourist access routes (N1 and R63) and tourist destinations within the region.		
	No mitigation	***Mitigation considered***
Extent	Medium to longer distance **(2)**	Medium to longer distance **(2)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(24)**	Low **(24)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation / Management: Planning: ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. ➢ Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.		

Construction: ➢ Rehabilitate all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for infrastructure. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. ➢ Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

6.7. SUMMARY OF THE IMPACT RATINGS FINDINGS

In light of the results and findings of the Visual Impact Assessment undertaken for the proposed amendments to the Gamma Substation (i.e. substation extension and 400kV power line turn-in), the below table indicates a summary of the impact ratings as determined for the development based on the viewshed modelled, as well as, present day land uses:

Table 9: Impact table summarising the significance ratings as determined in 2023

Significance Ratings Summary (2023)		
	Pre-mitigation impact rating	**Post mitigation impact rating**
Potential visual impact of construction on sensitive visual receptors in close proximity to the facility	Low (24) (negative)	Low (14) (negative)
Potential visual impact on sensitive visual receptors in close proximity to the infrastructure during the operational phase	Low (16) (negative)	Low (16) (negative)
Potential visual impact on sensitive visual receptors within the area (between 1 – 6km) during the operational phase	Low (26) (negative)	Low (26) (negative)
Potential visual impact of lighting on sensitive visual receptors in the region	Low (26) (negative)	Negligible (11) (negative)
Potential visual impact of the proposed infrastructure on the sense of place of the region	Low (20) (negative)	Low (20) (negative)
Potential visual impact on tourist access routes and tourist destinations within the region	Low (24) (negative)	Low (24) (negative)

The impact ratings as determined in 2007 were expected to be **contained to low** for the Gamma Substation and associated infrastructure. In comparison, with the addition of the proposed amendments to the Gamma Substation (i.e. substation extension and 400kV power line turn-in), it is expected that the **impact ratings will still be low considering the present-day land uses and expected visual exposure**. Therefore, **no increase in the visual impact is anticipated**.

7. POTENTIAL CUMULATIVE VISUAL EXPOSURE

7.1. CUMULATIVE IMPACTS - GENERAL

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In this case, the 'development' would be the extensions to the existing Gamma Substation, as well as the 400kV power line turn-in, as seen in conjunction with the existing Gamma Substation and high voltage powerline infrastructure in close proximity.

Cumulative visual impacts may be:

- Combined, where facilities are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various structures of a renewable energy facility; and
- Sequential, when the observer has to move to another viewpoint to see different renewable energy facilities, or different views of the same facility (such as when travelling along a route).

The visual impact assessor is required (by the competent authority) to identify and quantify the cumulative visual impacts and to propose potential mitigating measures. This is often problematic as most regulatory bodies do not have specific rules, regulations or standards for completing a cumulative visual assessment, nor do they offer meaningful guidance regarding appropriate assessment methods. There are also not any authoritative thresholds or restrictions related to the capacity of certain landscapes to absorb the cumulative visual impacts of the renewable energy infrastructure.

To complicate matters even further, cumulative visual impact is not just the sum of the impacts of two developments. The combined effect of both may be much greater than the sum of the two individual effects, or even less.

The cumulative impact of the proposed amendment to the Gamma Substation on the landscape and visual amenity is a product of:

- The distance between the substation and power lines;
- The distance over which the structures are visible;
- The overall character of the landscape and its sensitivity to the structures;
- The siting and design of the substation and power line; and
- The way in which the landscape is experienced.

The specialist is required to conclude if the proposed 'development' will result in any unacceptable loss of visual resource considering the infrastructure proposed in the area.

7.2. CUMULATIVE IMPACTS - 2012

The cumulative impacts as assessed by CKA in the original VIA undertaken in 2007 stated since the development of the Gamma Substation was to be located adjacent to an existing, but smaller substation (Victoria Cap Substation) and alongside several existing transmission lines, the cumulative impact would increase. The increase in the cumulative impact was deemed not to be able to be measured empirically. However, it was assumed that, as visual impacts reduce exponentially with distance, doubling the size and volume of a development would increase the impact exponentially.

No quantification of the impacts in terms of an impact rating were made.

7.3. CUMULATIVE IMPACTS - 2023

It is a requirement that a visual specialist identify and quantify the cumulative visual impacts of a proposed development, propose potential mitigating measures and conclude if the proposed development will result in any acceptable loss of visual resources taking into consideration the other existing infrastructure in the area.

The table below illustrates the assessment of the anticipated cumulative visual impact of infrastructure on sensitive visual receptors within the region.

Table 10: Impact table summarising the significance of the cumulative visual impact of the proposed infrastructure when considered with other development in the area on sensitive visual receptors within the region

Nature of Impact: The potential cumulative visual impact of the proposed infrastructure when considered with other development in the area on sensitive visual receptors within the region		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Very low **(1)**	Very low **(1)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Moderate **(6)**	Moderate **(6)**
Probability	Very Improbable **(1)**	Improbable **(2)**
Significance	Negligible **(11)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very Difficult	

The cumulative visual impacts of the proposed amendment to the Gamma Substation is ultimately expected to be of **low** significance, when considered with the existing infrastructure in the area on sensitive visual receptors within the region. Particularly when considering its remote location and the general low occurrence of potential sensitive visual receptors.

7.4. COMPARATIVE FINDINGS

Comparatively since 2007 only the Gamma Substation (the subject of the assessment) has been constructed within the study area Additionally, no specific cumulative impact ratings were undertaken in the original 2007 VIA undertaken by CKA. These variations in data therefore make it difficult to comparatively compare the cumulative impacts expected in 2007 and what can be expected to date (2023) as a result of the proposed amendments to the Gama Substation.

It can however, be stated that since the proposed infrastructure is limited in size and located adjacent to the existing Gamma Substation, as well as, numerous high voltage power lines it is expected that it will likely be seen as an extension of the existing infrastructure on the site already, therefore resulting in a **low** significance.

Taking into account all the above findings, the potential cumulative visual impact is therefore expected to be **within acceptable limits**, as it is not expected to contribute significantly to the increased cumulative visual impact of grid infrastructure in the region.

8. MITIGATIONS

The primary visual impact, namely the presence of the proposed amendments to the Gamma Substation, is not possible to mitigate, especially in this receiving environment. Low lying vegetation, the undeveloped nature of the study area, and the high contrast of the infrastructure within the surrounding receiving environment results in a low VAC.

General good practice mitigation measures did form part of the initial VIA undertaken by CKA in 2007. These mitigation measures are still valid and should be implements. Refer to the original VIA for a detailed breakdown of these mitigation measures.

In addition, it is recommended that the following best practice mitigation measure also be included (over and above those already provided as part of the 2007 VIA):

- Retain/re-establish and maintain natural vegetation in all areas immediately adjacent to the development footprint/servitude. This measure will help to soften the appearance of the infrastructure within its context.
- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:
    - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
    - Plan the placement of laydown areas (if required) and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
    - Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.
    - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
    - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist must be consulted to assist or give input into rehabilitation specifications.
- During operation, the maintenance of the grid connection infrastructure will ensure that the infrastructure does not degrade, therefore aggravating visual impact.
- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.
- Once the grid connection infrastructure has exhausted its life span, all associated infrastructure not required for the post rehabilitation use of the site/servitude should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.
- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

- Mitigation of other lighting impacts includes the pro-active design, planning and specification lighting for the facility. The correct specification and placement of lighting and light fixtures will go far to contain rather than spread the light. Additional measures include the following:
    - Shielding the sources of light by physical barriers (walls, vegetation, or the structure itself);
    - Limiting mounting heights of lighting fixtures, or alternatively using foot-lights or bollard level lights;
    - Making use of minimum lumen or wattage in fixtures;
    - Making use of down-lighters, or shielded fixtures;
    - Making use of Low-Pressure Sodium lighting or other types of low impact lighting.
    - Making use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.

The possible mitigation of both primary and secondary visual impacts as listed above should be implemented and maintained on an on-going basis.

9. CONCLUSION AND RECOMMENDATIONS

Since the initial VIA undertaken by CKA in 2007, the landscape characteristics comprising the topography, vegetation and land use of the study area have remained unchanged.

Overall, the study area has retained its low population density with predominately undeveloped, rural and natural character, interspersed with existing industrial infrastructure which includes the Victoria Cap Substations, as well as, numerous existing high voltage power lines. The only noticeable change is that the Gamma Substation (as assessed in 2007) has been constructed. Therefore, in the opinion of the author, the **status of the environment has largely remained the same**.

In consideration of the proposed amendments, there is **no (zero) change to the visibility compared with the currently authorized and constructed Gamma Substation** and its associated power lines. It is expected that the proposed amendments would be equally visible and noticeable from both the roads and homesteads identified above, therefore signifying a negligible change to the potential visual impact from the currently authorised development at the Gamma Substation.

The impact ratings as determined in 2007 were expected to be **contained to low** for the Gamma Substation and associated infrastructure. In comparison, with the addition of the proposed amendments to the Gamma Substation (i.e. substation extension and 400kV power line turn-in), it is expected that the **impact ratings will still be low considering the present-day land uses and expected visual exposure**. Therefore, **no increase in the visual impact is anticipated**.

The cumulative visual impacts of the proposed amendment to the Gamma Substation is ultimately expected to be of **low** significance, when considered with the existing infrastructure in the area on sensitive visual receptors within the region. Particularly when considering its remote location and the general low occurrence of potential sensitive visual receptors. The potential cumulative visual impact is therefore expected to be **within acceptable limits**, as it is not expected to contribute significantly to the increased cumulative visual impact of grid infrastructure in the region.

The sensitivity of the visual environment for the proposed amendment to the Gamma Substation, as determined by the Site Sensitivity Verification Report undertaken, is **moderate,** owing to the low VAC of the area, the presence of an arterial road (R63) located within 1 – 2km of the proposed amendments, as well as the presence of the existing Substation and high voltage power lines on the site. The visual impact is already in place and the proposed amendment is expected to contribute to the existing visual clutter.

Based on the above assessment, there has been no changes in the land cover and minimal changes in land uses (i.e. the construction of the Gamma Substation). Additionally, the impacts as assessed at present will be low. Therefore, it is recommended that the proposed **Part 2 Amendment of the Existing Gamma Substation and 400kV Powerlines be supported, subject to the conditions and recommendations as stipulated in the current EA, and according to the Environmental Management Programme (EMPr), as well as, the suggested mitigation measures, as provided in this and the original Visual Impact Assessment report compiled in 2007**.

10. REFERENCES

Council for Scientific and Industrial Research (CSIR), 2015. *The Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa.*

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Oberholzer, B. (2005). Guideline for involving visual and aesthetic specialists in EIA processes: Edition 1.

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Cave Klapwijk and Associates (CKA), 2007. *Specialist study of the proposed 765kV Gamma Substation on the affected aesthetic environment - Gamma Substation Visual Impact Assessment*

SITE SENSITIVITY VERIFICATION: FOR THE PART 2 AMENDMENT OF THE EXISTING GAMMA SUBSTATION AND 400KV POWERLINES LOCATED NEAR VICTORIA WEST IN THE NORTHERN AND WESTERN CAPE PROVINCE

PREPARED BY:

Nuleaf Planning and Environmental (Pty) Ltd

PREPARED FOR:

Nala Environmental Consulting Firm

DATE:

January 2023

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DOCUMENT CONTROL

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Report date:	31 January 2023
Report number:	01

DECLARATION

I, **Tosca de Villiers**, as an independent consultant compiled this Visual Impact Assessment and declare that it correctly reflects the findings made at the time of the report's compilation. I further declare that I, act as an independent consultant in terms of the following:

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act,1998 (Act 107 of 1998);
- Based on information provided to me by the project proponent, and in addition to information obtained during the course of this study, will present the results and conclusion within the associated document to the best of my professional judgement.

Tosca de Villiers
Landscape Architect & Environmental Assessment Practitioner
SACLAP Reg nr: 20421
EAPASA Reg nr: 2019/1582

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1. INTRODUCTION

1.1. QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM

Nuleaf Planning and Environmental (Pty) Ltd, specialising in Visual Impact Assessments, undertook the Site Sensitivity Verification visual impact report for the proposed infrastructure.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

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

Nuleaf Planning and Environmental have been appointed as an independent specialist consultant to undertake the site sensitivity verification assessment. Neither the author, nor Nuleaf Planning and Environmental will benefit from the outcome of the project decision-making.

1.2. LEGAL FRAMEWORK

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

- **The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA):** This report is in line with Appendix 6 of NEMA: Environmental Impact Assessment (EIA) Regulations (2014, as amended) which details the minimum requirements a specialist report must contain for an Environmental Impact Assessment.
- **Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005):** This guideline was developed for use in the Western Cape, however in the absence of the development of any other guideline, this provides input for the preparation of visual specialist input into EIA processes. The guideline documents the requirements for visual impact assessment, typical issues that trigger the need for specialist visual input, the scope and extent of a visual assessment, information required, as well as the assessment ad reporting of visual impacts and management actions.
- **Screening Tool as per Regulation 16 (1)(v) of the Environmental Impact Assessment Regulations, 2014 as amended:** a Screening report was generated for this proposed project, whereby a visual impact assessment was identified as one of the specialist studies that would be required.

1.3. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Observations made and photographs taken during site visits;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

1.4. ASSUMPTIONS AND LIMITATIONS

This Report has been prepared by Nuleaf on behalf, and at the request, of Nala Environmental to provide them with an independent specialist assessment. Unless otherwise agreed by Nuleaf in writing, Nuleaf does not accept responsibility or legal liability to any person other than Nala Environmental for the contents of, or any omissions from, this Report.

To prepare this Report, Nuleaf utilised only the documents and information provided by Nala Environmental or any third parties directed to provide information and documents by Nala Environmental. Nuleaf has not consulted any other documents or information in relation to this Report, except where otherwise indicated. The findings, recommendations and conclusions given in this report are based on the author's best scientific and professional knowledge, as well as, the available

information. This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. Nuleaf and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, or pertaining to this investigation.

Although Nuleaf exercises due care and diligence in rendering services and preparing documents, Nuleaf accepts no liability, and Nala Environmental, by receiving this document, indemnifies Nuleaf and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages and expenses arising from or in connection with the services rendered, directly or indirectly by the use of the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If this report is used as part of a main report, the report in its entirety must be included as an appendix or separate section to the main report.

This assessment was undertaken during the planning stage of the project and is based on information available at that time. It is assumed that all information regarding the project details provided by Nala Environmental and the Applicant is correct and relevant to the proposed project. No public participation had been undertaken at the time of this Site Sensitivity Verification Visual Assessment.

1.5. LEVEL OF CONFIDENCE

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

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

- The information available, understanding of the project and experience of this type of project by the practitioner:
    - **3**: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
    - **2**: A moderate level of information and knowledge is available of the project and the visual impact assessor is moderately experienced in this type of project and level of assessment.
    - **1**: Limited information and knowledge is available of the project and the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

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

Table 1: Level of confidence

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

[1] Adapted from Oberholzer (2005).

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

2. METHODOLOGY

The site sensitivity verification visual assessment was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Terrain Model (DTM) for the study area was created from 5m interval contours from the National Geo-spatial Information data supplied by the Department: Rural Development and Land Reform.

The approach utilised to identify potential issues related to the visual impact included the following activities:

- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This includes cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The creation of a preliminary viewshed analyses from the proposed area in order to determine the potential visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analysis takes into account the dimensions of the proposed structures in their proposed locations as per the layout provided by the applicant.
- The identification of sensitive receptors upon which the proposed Amelia and New Vaal Grid connection infrastructure could have a potential visual impact.

3. PROJECT DESCRIPTION

The construction of the Eskom Gamma Substation was authorised by the Department of Environmental Affairs in 2007. The approval was for constructing the complete Gamma substation. However, it was noted that individual components would be constructed in a phased approach as determined by the electricity demand over several years.

As such, the first construction phase of the Gamma substation commenced during the original validity period of the EA and was completed in 2013 (Figure 1).

Proposed Second Phase

The holder of the EA proposes to commence construction of the second phase of the authorised substation development, specifically the development of a 132/400kV yard at the existing MTS and OHL turn-in of the existing 400kV Droer-Hydra 2 Overhead Powerline into the substation yard, as provided for in the current EA.

The next phase of construction activities associated with the EA is directly linked to the increased demand for grid infrastructure which is linked to upcoming Renewable Energy projects in the Northern and Western Cape Provinces. Notably, the 132kV/400kV yard and 400kV OHL turn-ins are needed to enable the connection of the authorised Umsinde Emoyeni Wind Farm (DFFE Ref: 14/12/16/3/3/2/686) with has been registered as Strategic Integrated Project (SIP).

The proposed 132kV/400kV yard and 400kV OHL turn-ins fall within the scope of the current EA. However – based on further technical analysis and design – it has been identified that the layout of the authorised infrastructure will need to be updated to reflect the updated configuration proposed (i.e., the 132kV/400kV substation yard and 400kV turn-in) to be implemented. The updated layout falls within the scope and footprint of what was originally assessed in the original EIA process, however for the avoidance of doubt the holder wishes to have the updated layout approved by DFFE prior to implementation thereof.

A Part 2 amendment application is proposed to be undertaken for the proposed update to the layout to the existing 765kV Gamma Substation and associated powerline turn-in infrastructure. The next phase of the Gamma MTS development that will now be implemented will consist of:

- A substation yard with a step-up voltage of 132kV/400kV on Farm Schietkuil 3 and Farm Uit Vlugt Fontein 265; and

- In addition, the existing Eskom 400kV overhead powerline that currently bypasses the existing Gamma Substation (i.e. the "Droerivier- Hydra No. 2" 400kV OHL) will be reconfigured to turn-in and turn-out of the new substation yard

In accordance with GN 320 and GN 1150 (20 March 2020) of the NEMA EIA Regulations of 2014 (as amended), prior to commencing with a specialist assessment, a site sensitivity verification must be undertaken to confirm the current land use and environmental sensitivity of the proposed project areas as identified by the National Web-Based Environmental Screening Tool (i.e., Screening Tool). NuLeaf Planning and Environmental, as visual specialists, have been commissioned to verify the sensitivity of the project site under these specialist protocols.

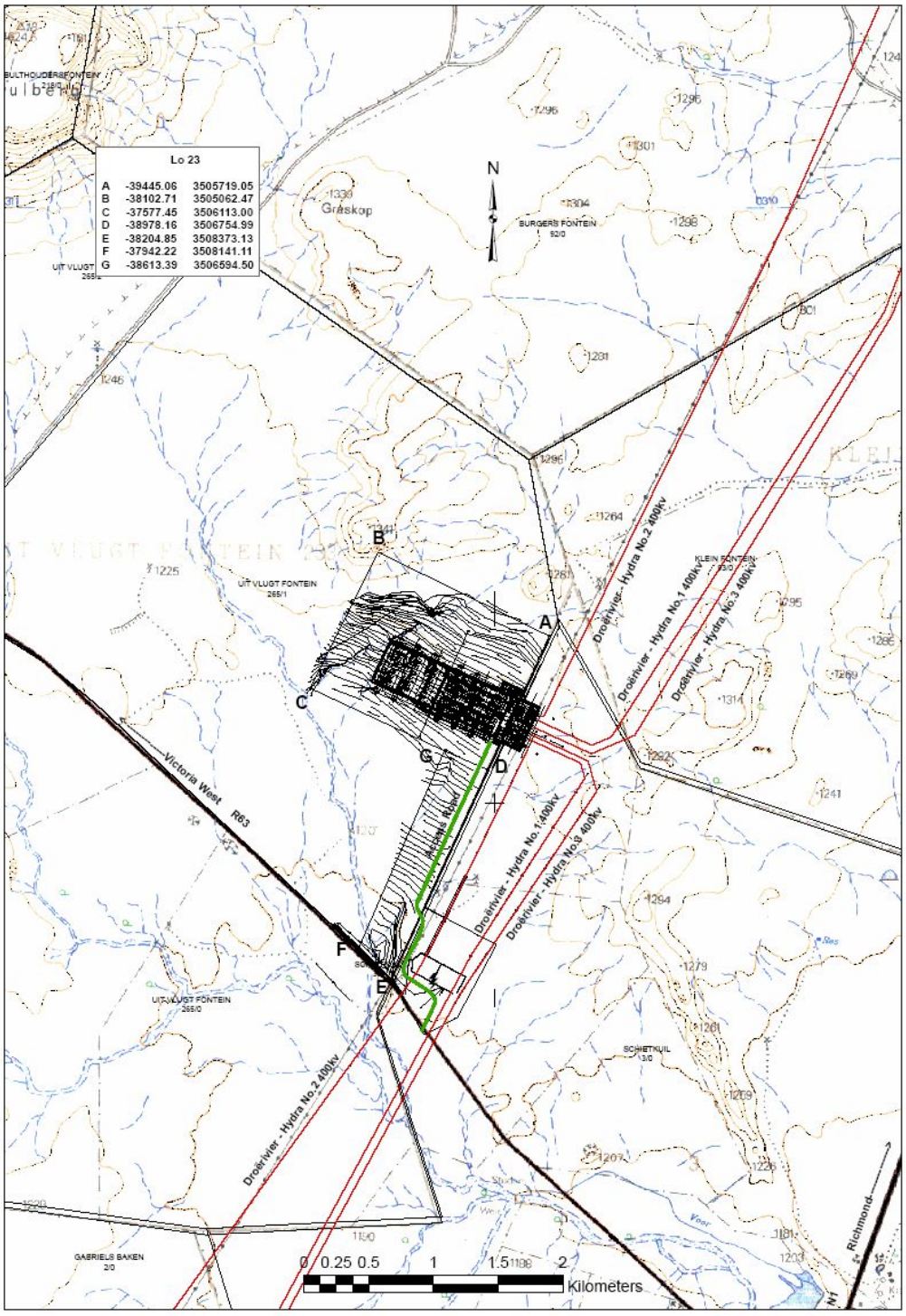


Figure 1: As per the Final Environmental Impact Report (FEIR) (2007) indicating the layout of the 765kV Gamma Substation as authorised.

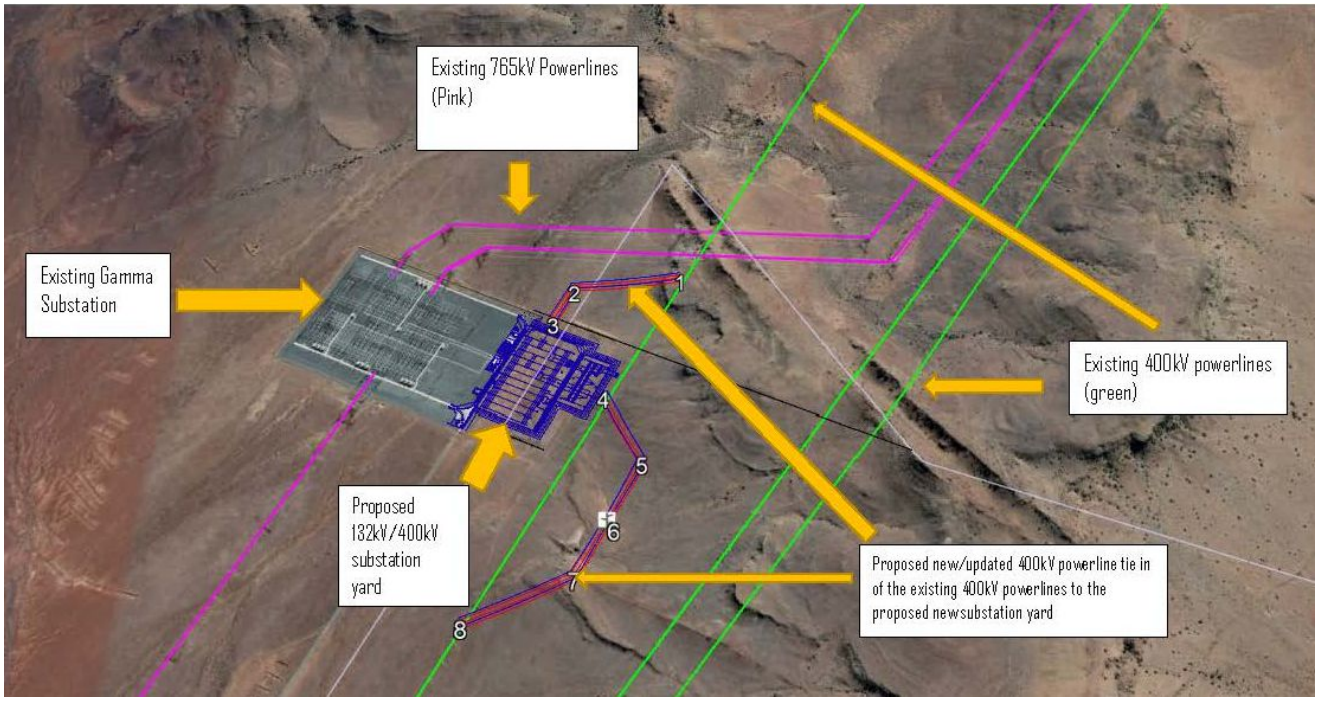


Figure 2: Proposed Updated Layout depicting the existing Gamma Substation with the next phase of the authorised development now proposed for implementation (new proposed 132kV/400kV Substation yard and new reconfigured turn-in and turn-out of the existing 400kV powerline).

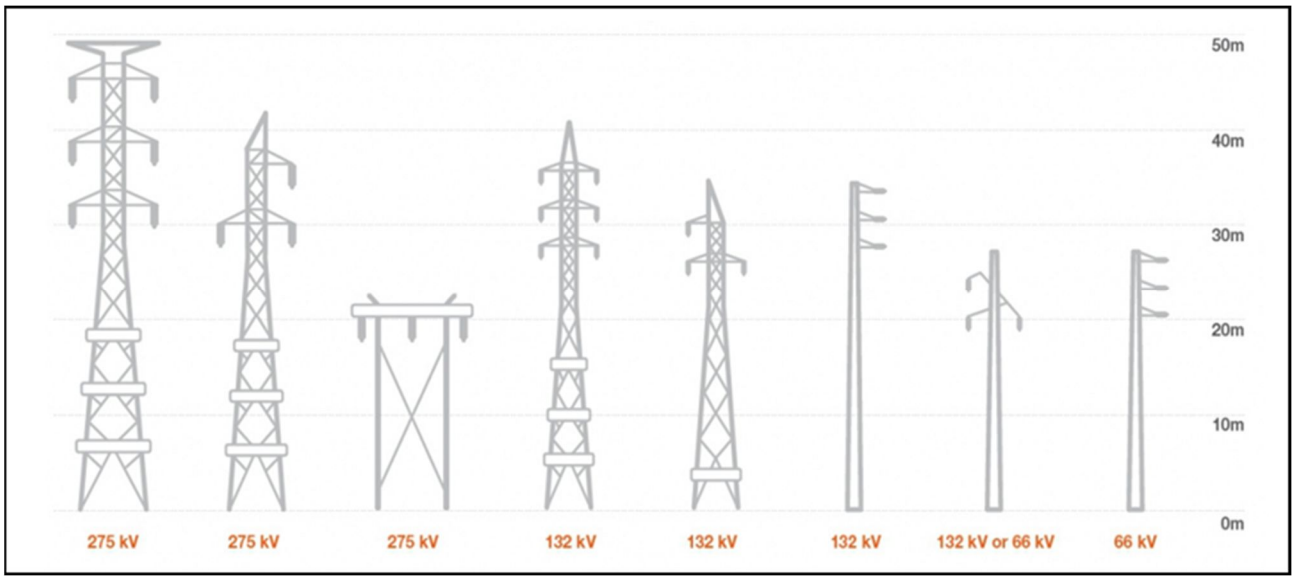


Figure 3: Schematic representation of power line towers

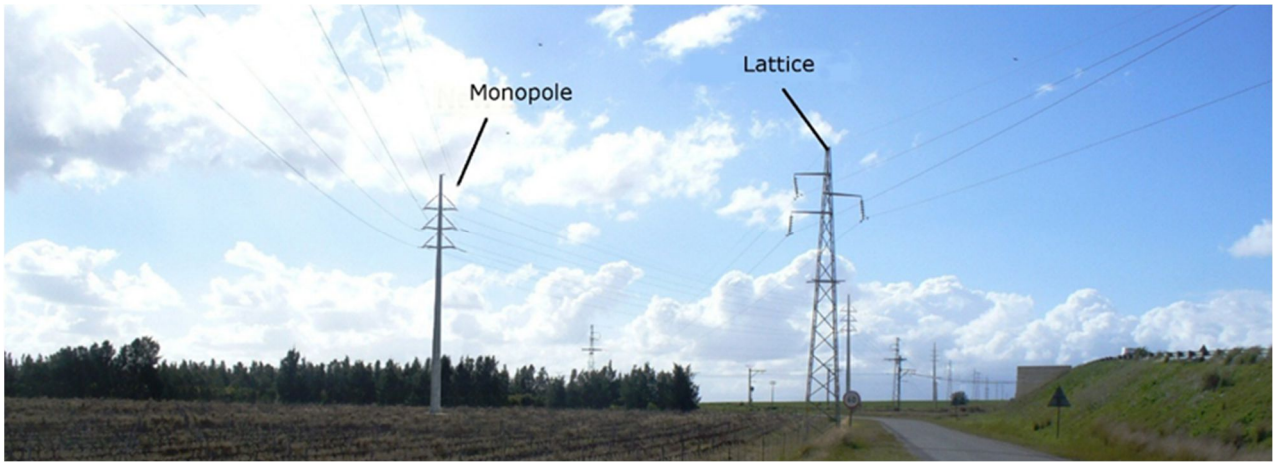


Figure 4: Typical 132 kV power line structures

4. OUTCOME OF SITE SENSITIVTY VERIFICATION

4.1. DFFE SCREENING TOOL

No specific mention to visual impact sensitivity was made in the DFFE screening tools generated for the proposed amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in).

4.2. AFFECTED ENVIRONMENT

A site visit to the affected environment was undertaken in July 2022 to determine the status of the physical landscape characteristics. These findings are described below:

Topography

The topography of the study area is flats and gently sloping plains interspersed with hills and rocky areas located in the north east and north western portions of the study area. The elevation ranges from 1175m above sea level (a.s.l.) in the south east (along the Brak river) to 1625m a.s.l. at the top of the Bulberg. The existing Gamma Substation itself is located in a lower lying area at an average elevation of 1225m a.s.l. and has an even slope to the south towards the Brak River and Skietkilspruit. Refer to **Map 1** for a current topographical map of the study area.

Figure 5: Long distance view over the existing Gamma Substation, high voltage powerline and the undulating topography further afield

Vegetation

Regionally, the site is located some 40km south east of the town of Victoria West (at the closest) on the boundary of the Northern and Western Cape Province, within a region commonly referred to as the Central Karoo. The study area falls within the arid Nama-Karoo Biome; a biome characterised by its dry semi-dessert climate and associated dessert-like vegetation. The vegetation cover of the study area is identified as Eastern Upper Karoo, dominated by low shrubs and grasses. Overall, the Visual Absorption Capacity (VAC) of the receiving environment is deemed to be low by virtue of the low growing vegetation and sparsely populated/limited development overall.

Figure 6: View of the expansive landscape dominated by low shrubs and grasses

Land Use

The dominant land use (at present) within the region is sheep farming. There are very limited agricultural activities due to the limited rainfall (less than 300mm per annum) and arid climate. The land cover within the study area is predominately low shrubland (Nama Karoo), bare rock and soil with small scattered areas of agriculture (rainfed and irrigated) and grasslands. As a result, the landscape is characterised by wide-open expanses of extreme isolation. Refer to **Map 2** for the current land cover and broad land use patterns within the study area.

The majority of the study area is sparsely populated and consists of a landscape of wide-open expanses. The scarcity of water and other natural resources has influenced settlement within this region, keeping numbers low, and distribution limited to the availability of permanent water. Settlements, where they occur, are usually rural homesteads and farmsteads.

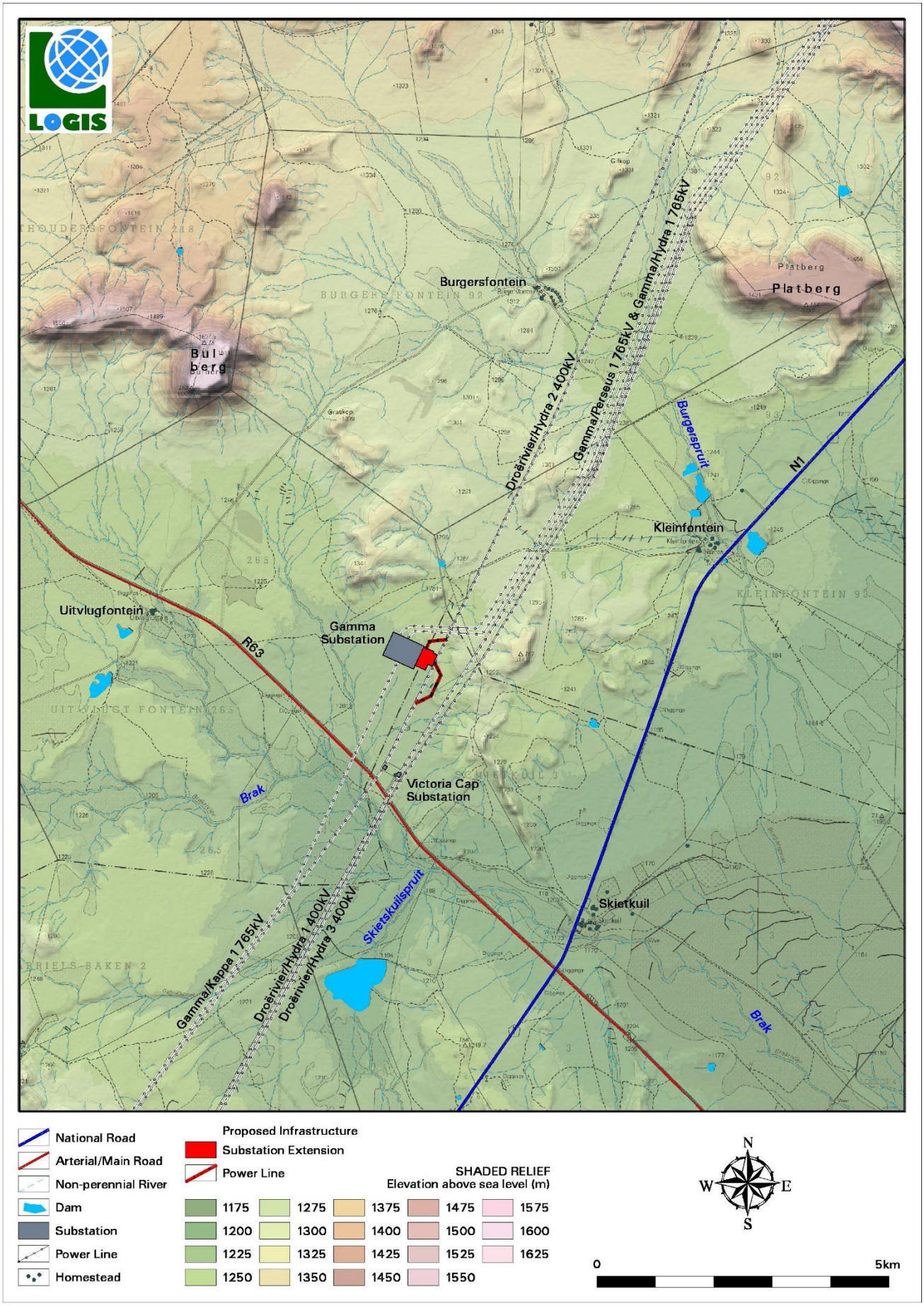
Access to the study area is via the R63 and N1. The N1 is a national road and is the main link from Gauteng to Cape Town. Seeing as the N1 is a main route serving the region, it can be considered to be a route that is most likely to carry tourists. The R63 can also be considered an alternative route to Graaf-Reinet which is a popular tourist town located within the Camdeboo National Park in the Eastern Cape Province. Commuters and possible tourists using the national and arterial roads may also be negatively impacted upon by the visual exposure to the proposed infrastructure, however, this intrusion would be fleeting.

Figure 7: View of the R63 with the Gamma Substation located on the right

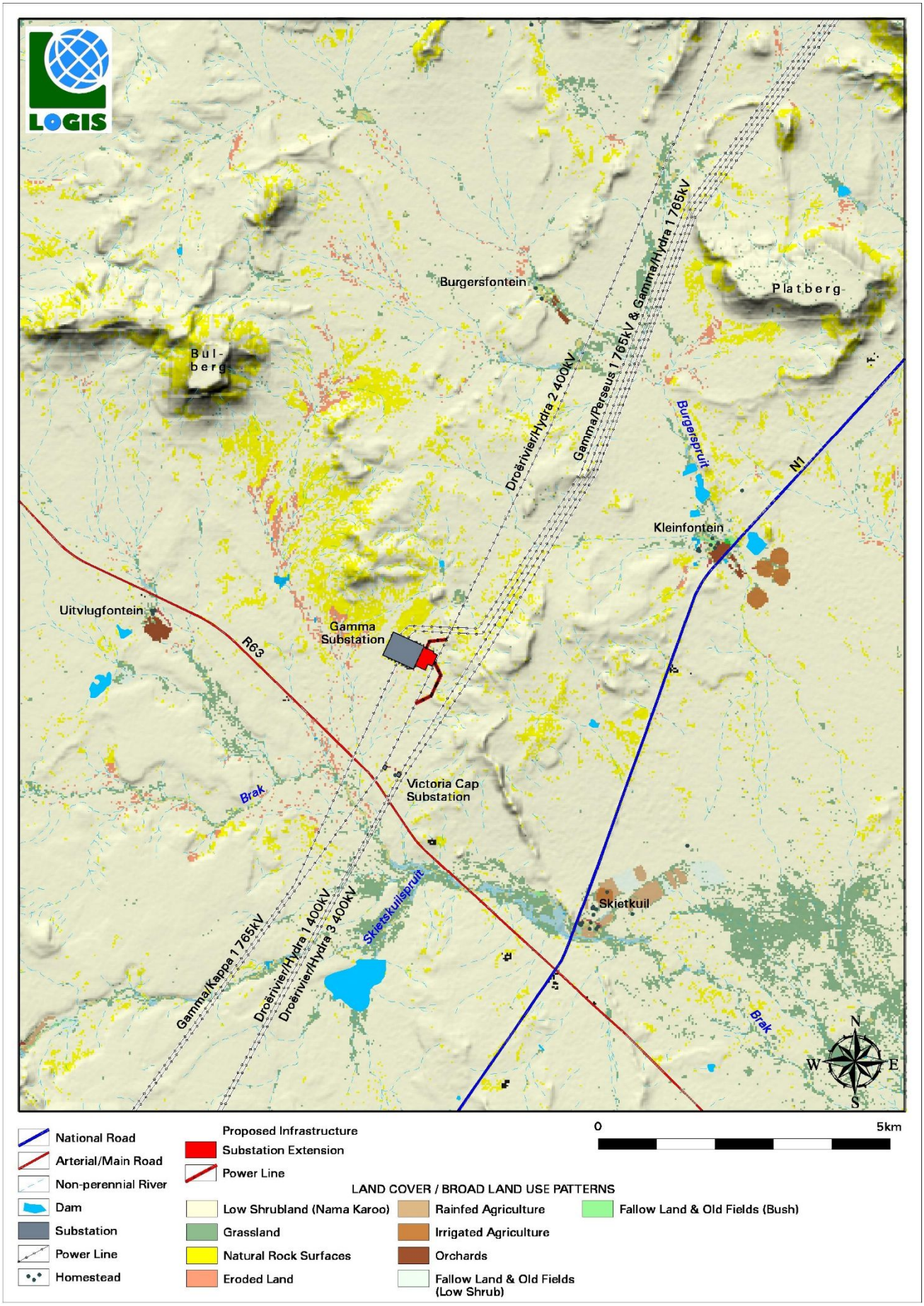
The landscape character of the study area and site itself is largely undeveloped and natural with wide-open expanses. However, there is some industrial infrastructure within the study area which includes the existing Gamma and Victoria Cap Substations. Additionally numerous existing high voltage power lines traverse the study area from north to south.

Figure 8: Numerous existing high voltage power lines traverse the study area from north to south

Overall, the region has a predominantly undeveloped, rural and natural character, with scattered isolated homesteads or farm settlements occurring within the study area. These are generally located at great distances from each other. The region has a population density of less the 1 person per km^2.



Map 1: Current shaded relief map of the study area



Map 2: Current land cover / broad land use map of the study area

4.3. RESULTS

In order to determine the overall visual sensitivity of the proposed sites in the absence of any mitigation, the following matrix was utilized:

Table 2: Matrix to determine overall visual sensitivity for the proposed amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in)

	Sensitive Receptor	Very High Sensitivity (4)	High Sensitivity (3)	Moderate Sensitivity (2)	Low Sensitivity (1)
1.	**Topographic features incl mountain ridges and steep slopes**	Within 250m	Within 250 - 500m	Within 500 – 1km	>1km
2.	**Major rivers, Water bodies, dams, wetlands and pans**	Within 500m	Within 500m - 1km	Within 1 - 2km	>2km
3.	**Ramsar Sites**	Within 1km	Within 1 - 2km	Within 2 – 3km	>3km
4.	**Coastal zone**	Within 1km	Within 1 - 2km	Within 2 – 3km	>3km
5.	**Protected area: National Parks & World Heritage Sites**	Within 2km	Within 2 - 3km	Within 3 - 4km	>4km
6.	**Protected areas: Nature Reserves**	Within 1km	Within 1 – 2km	Within 2 – 3km	>3km
7.	**Private reserves and game farms**	N/A	Within 1km	Within 1 – 2km	>2km
8.	**Cultural landscapes**	Within 250m	Within 250 - 500m	Within 500 – 1km	>1km
9.	**Heritage Sites Grades I, ii and iii**	Within 250m	Within 250 - 500m	Within 500 – 1km	>1km
10.	**Towns / Villages / Settlements**	Within 500m	Within 500m - 1km	Within 1 - 2km	>2km
11.	**Home/farmsteads**	Within 1km	Within 1 - 3km	Within 3 - 6km	>6km
12.	**National Roads**	Within 500m	Within 500m - 1km	Within 1 - 2km	>2km
13.	**Provincial/arterial roads**	Within 250m	Within 250 - 500m	Within 500 – 1km	>1km
14.	**Scenic routes**	Within 1km	Within 1 - 2km	Within 2 – 3km	>3km
15.	**Passenger rail lines**	Within 250m	Within 250 - 500m	Within 500 – 1km	>1km
16.	**Airfields**	Within 3km	Within 3 – 6km	Within 6 – 8km	>8km
17.	**Located with a Strategic Transmission Corridors**	No	-	-	Yes – Central Corridor
18.	**VAC**	Low VAC	Moderate VAC	High VAC	Very High VAC
19.	**Visual Quality**	Natural environment intact with no built infrastructure	Natural environment intact with limited built infrastructure	Natural environment somewhat intact with fair amount of built infrastructure	Built infrastructure is dominant with little to no natural environment remaining
20.	**Presence of existing infrastructure**	Absent	Very low densities	Present in moderate quantities	High densities
	Total	**Moderate (28)**			

Overall visual sensitivity rating:

- Low (0 - 20)
- Moderate (21 - 40)
- High (41 - 60)
- Very High (61 - 80)

5. CONCLUSION

Overall, the study area has a low population density with predominately undeveloped, rural and natural character, interspersed with existing industrial infrastructure which includes the Victoria Cap Substations, as well as, numerous existing high voltage power lines. As a result, thereof, the visual quality of the study area has been determined to be moderate which was confirmed during a site visit that was undertaken on July 2022.

The dominant land use (at present) within the region is sheep farming. There are very limited agricultural activities due to the limited rainfall (less than 300mm per annum) and arid climate. The land cover within the study area is predominately low shrubland (Nama Karoo), bare rock and soil with small scattered areas of agriculture (rainfed and irrigated) and grasslands.

Visual Absorption Capacity (VAC) of the receiving environment is deemed to be low by virtue of the low growing vegetation and sparsely populated/limited development overall. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics.

The majority of the study area is sparsely populated and consists of a landscape of wide-open expanses. Access to the study area is via the R63 and N1. The N1 is a national road and is the main link from Gauteng to Cape Town. Seeing as the N1 is a main route serving the region, it can be considered to be a route that is most likely to carry tourists. The R63 can also be considered an alternative route to Graaf-Reinet which is a popular tourist town located within the Camdeboo National Park in the Eastern Cape Province. Commuters and possible tourists using the national and arterial roads may also be negatively impacted upon by the visual exposure to the proposed infrastructure, however, this intrusion would be fleeting.

Homesteads and farmsteads, by virtue of their visually exposed nature, are considered to be sensitive visual receptors. Residential receptors in natural contexts are more sensitive than those in more built-up contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas.

No specific mention to visual impact sensitivity was made in the DFFE screening tools generated for the proposed amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in). Based on the above findings, the sensitivity of the visual environment for the proposed amendments to the Gamma Substation (i.e. Substation extension and 400kV powerline turn-in) is **moderate**. This is owing to the low VAC of the area, the presence of an arterial road (R63) located within 1 – 2km of the proposed amendments, as well as the presence of the existing Substation and high voltage power lines on the site. The visual impact is already in place and the proposed amendment is expected to contribute to the existing visual clutter.

6. REFERENCES

Council for Scientific and Industrial Research (CSIR), 2015. *The Strategic Environmental Assessment for wind and solar photovoltaic energy in South Africa.*

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