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30 August 2017
489025

Mr. S. Jacobs
SiVEST
PO Box 2921
Rivonia
2128

Attention: Mr. S. Jacobs

Dear Mr. Jacobs

Peer review of the Graskoppies, Hartebeest Leegte, Ithemba and !Xha Boom Grid Project Visual Impact Assessments, Northern Cape Province, Visual Impact Assessment Report

SiVest Report: 13622: Revision #1

SiVEST (Pty) Ltd. (SiVEST) is undertaking a Basic Assessment (BA) processes for:

1) The construction of a 33kV/132kV on-site substation, a 132kV Linking Substation and an associated 132kV power line to the Helios Main Transmission Substation.

As part of the Environmental Authorisation process, a Visual Impact Assessment (VIA) is required for the construction and operational activities at the facility. As SiVEST is the primary environmental practitioner for the environmental assessments and VIA an external peer review is required.

This letter constitutes the peer review conducted by SRK Consulting (South Africa) (Pty) Ltd. (SRK).

1. Summary of Review

It must be noted that this review was focussed primarily on the content of the SiVEST VIA Report, and did not focus on formatting or grammatical errors. Some recommendations for grammatical review have however been made in the final report reviews.

SRK's review has been guided by the NEMA 2014 EIA Regulations, Government Notice (GN) R982 of 04 December 2014, whereby all specialist studies undertaken as part of an EIA, are required to comply with Appendix 6 of the notice. This is presented in Table 1, overleaf.

SRK is of the opinion that the VIA Report, compiled by SiVEST is fair and that the methodology used was transparent and well stated. There is a substantial focus on potential sensitive viewers, with care taken to attempt to identify sensitive viewers that could potentially be affected by the project.

In terms of the NEMA 2014 EIA Regulations, all specialist studies are required to comply with Appendix 6 of the notice. Table 1 summarises the legal requirements for all specialist studies, as well as an indication of the relevant Section of this report which complies with the requirement.

Table 1: Legal Requirements for Specialist Studies

Legal Requirement		Relevant Section in Specialist study
(1)	A specialist report prepared in terms of these Regulations must contain details of:	
(a)	The specialist who prepared the report; and	**Present**
	The expertise of that specialist to compile a specialist report including curriculum vitae.	**Missing**
(b)	A declaration that the specialist is independent in a form as may be specified by the competent authority.	**Present**
(c)	An indication of the scope of, and the purpose for which, the report was prepared.	**Present Section 1**
(d)	The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	**Date is mentioned, but season is not**
(e)	A description of the methodology adopted in preparing the report or carrying out the specialised process.	**Present Section 1.4**
(f)	The specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	**Present Section 2**
(g)	An identification of any areas to be avoided, including buffers.	**Present Section 2 and Section 3**
(h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers.	**Present (various sections)**
(i)	A description of any assumptions made and any uncertainties or gaps in knowledge.	**Present Section 1.3**
(j)	A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment.	**Present (Section 4 and Section 5)**
(k)	Any mitigation measures for inclusion in the EMPR. *Note that an EMPR has three levels of impact management:* *Impact management action;* *Impact management outcome; and* *Impact management objective.*	**Present Section 4**
(l)	Any conditions/aspects for inclusion in the environmental authorisation.	**Present (Section 4)**
(m)	Any monitoring requirements for inclusion in the EMPR or environmental authorisation.	**Present (Section 4)**
(n)	A reasoned opinion[1] (Environmental Impact Statement)-	**Present Section 6**
	As to whether the proposed activity or portions thereof should be authorised.	**Present Section 6**
	If the opinion is that the proposed activity or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPR, and where applicable, the closure plan.	**Present (Section 4 and Section 6)**
(o)	A description of any consultation process that was undertaken during the course of preparing the specialist report.	**N/A**
(p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	**N/A**
(q)	Any other information requested by the competent authority.	**N/A**

[1] Also include a summary of the impacts.

Some additional recommendations for improving the report were identified during the review process. These are listed below:

1. Comments made with reference to dust suppression mitigation. In the context of the remoteness of the development and the existing conditions, dust may not be an overarching problem. Comments and suggestions regarding dust and dust suppression is made in the report comments document.
2. Some text in the report may not be relevant or too emotive; these recommendations are made in the report.
3. Some text is repetitive and can be summarised, notes are made in the text.

Additional comments for the reports have been compiled in separate Word Document submitted to SiVEST on 30 August 2017:

- **SRK Report: 489025_SRK_Review_13622_Grasskoppie Grid_BA_Visual Report_20170830**

Should you have any queries regarding the review or comments made in the reviewed document, please do not hesitate to contact Mr. Keagan Allan, SRK (031 279 1200).

Yours faithfully,

SRK Consulting (South Africa) (Pty) Ltd

Mr. K. Allan (Pr. Sci. Nat.)
Senior GIS Specialist

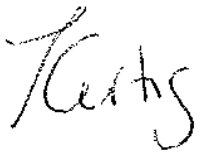
Mr. W. Jordaan (Pr. Sci. Nat.)
Partner

SOUTH AFRICA MAINTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD

Proposed Construction of the !Xha Boom On-site IPP Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontein, Northern Cape Province

Visual Impact Assessment Report - Basic Assessment

Issue Date: 21 November 2017
Version No.: 1
Project No.: 13622

Date:	20 July 2017
Document Title:	Proposed Construction of the !Xha Boom Substation, Linking Substation and Associated 132kV Power Line near Loeriesfontain, Northern Cape Province: Visual Impact Assessment Report – Basic Assessment
Author:	**Stephan Jacobs** B.Sc. (Hons) Environmental Management & Analysis (UP) BSc Environmental Sciences (UP) **Kerry Schwartz** BA (Geography), University of Leeds
Version Number:	#1
Checked by:	**Andrea Gibb** (internal review) B.Sc. (Hons) Environmental Management (UNISA) BSc Landscape Architecture *Cum Laude* (UP) **Keagan Allan** Pr. Sci. Nat., MSc. Geographical Sciences
Approved:	Tarryn Curtis
Signature:	
For:	SiVEST Environmental Division

For full details and the expertise of the specialists that compiled / checked this report refer to Appendix H of the Draft Basic Assessment Report (DBAR).

environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	To be confirmed
NEAS Reference Number:	
Date Received:	

Application for authorisation in terms of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010

PROJECT TITLE

Proposed Construction of the !Xha Boom On-site IPP Substation, Linking Substation and associated 132kV Power Line near Loeriesfontein, Northern Cape Province

Specialist:	**SiVEST SA (Pty) Ltd**		
Contact person:	Stephan Jacobs		
Postal address:	P O Box 2921, Rivonia		
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E-mail:	stephanj@sivest.co.za		
Professional affiliation(s) (if any)	None		

Project Consultant:	**SiVEST SA (Pty) Ltd**		
Contact person:	Andrea Gibb		
Postal address:	P O Box 2921, Rivonia		
Postal code:	2128	Cell:	072 587 6525
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E-mail:	andreag@sivest.co.za		

The specialist appointed in terms of the Regulations

I, **Stephan Jacobs**, declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

SiVEST SA (Pty) Ltd

Name of company (if applicable)

20 July 2017

Date

The specialist appointed in terms of the Regulations

I, **Andrea Gibb**, declare that --

General declaration:

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of Regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist

SiVEST SA (Pty) Ltd

Name of company (if applicable)

20 July 2017

Date

National Environmental Management Act, 1998 (Act No. 107 of 1998) and Environmental Impact Regulations (2017) Requirements for Specialist Reports (Appendix 6)

Regulation GNR 326 of 4 December 2014, as amended 7 April 2017, Appendix 6	**Section of Report**
(a) details of the specialist who prepared the report; and the expertise of that specialist to compile a specialist report including a *curriculum vitae*;	**Section 1.4**. Specialist CV's are included in **Appendix B**
(b) a declaration that the specialist is independent in a form as may be specified by the competent authority;	**Page 3 - 4**
(c) an indication of the scope of, and the purpose for which, the report was prepared;	**Section 1**
(cA) an indication of the quality and age of base data used for the specialist report;	**Section 1.5** **Section 2**
(cB) a description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	**Section 2** **Section 3** **Section 4**
(d) the duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	**Section 1.3** **Section 1.5.1**
(e) a description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	**Section 1.5**
(f) details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives;	**Section 2** **Section 4**
(g) an identification of any areas to be avoided, including buffers;	**Section 2.6** **Section 2.7**
(h) a map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	**Section 2.7**
(i) a description of any assumptions made and any uncertainties or gaps in knowledge;	**Section 1.3**
(j) a description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment, or activities;	**Section 4** **Section 5**
(k) any mitigation measures for inclusion in the EMPr;	**Section 4.6**
(l) any conditions for inclusion in the environmental authorisation;	**N/A**
(m) any monitoring requirements for inclusion in the EMPr or environmental authorisation;	**Section 4.5** **Section 4.6**
(n) a reasoned opinion—	

i. as to whether the proposed activity, activities or portions thereof should be authorised; iA. Regarding the acceptability of the proposed activity or activities; and ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr or Environmental Authorization, and where applicable, the closure plan;	**Section 6.1**
(o) a summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	**Feedback regarding the visual environment is based on the public participation process and is included in Environmental Impact Report.**
(p) any other information requested by the competent authority	**No information regarding the visual study has been requested from the competent authority.**
(2) Where a government notice gazetted by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	**N/A**

SOUTH AFRICA MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD

PROPOSED CONSTRUCTION OF THE !XHA BOOM SUBSTATION, LINKING SUBSTATION AND ASSOCIATED 132kV POWER LINE NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT - BASIC ASSESSMENT

Contents Page

List of Figures

List of Tables

Appendices

GLOSSARY OF TERMS

ABBREVIATIONS

BA	Basic Assessment
DBAR	Draft Basic Assessment Report
DM	District Municipality
DTM	Digital Terrain Model
EIA	Environmental Impact Assessment
FBAR	Final Basic Assessment Report
GIS	Geographic Information System
I&AP	Interested and/or Affected Party
IPP	Independent Power Producer
kV	Kilovolt
LM	Local Municipality
MTS	Main Transmission Substation
MW	Megawatt
NGI	National Geo-spatial Information
OHL	Overhead Line
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SANBI	South African National Biodiversity Institute
VIA	Visual Impact Assessment
VR	Visual Receptor

DEFINITIONS

Anthropogenic feature: An unnatural feature as a result of human activity.

Aspect: Direction in which a hill or mountain slope faces.

Cultural landscape: A representation of the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal (World Heritage Committee, 1992).

Power line route: The alignment followed by the proposed power line or power line alternatives.

Power line corridor: The 500m wide power line route assessed during the BA in order to allow for flexibility when determining the final route alignment. Ultimately the 31m wide power line servitude would be routed within the 500m wide corridor.

Sense of place: The unique quality or character of a place, whether natural, rural or urban. It relates to uniqueness, distinctiveness or strong identity.

Scenic route: A linear movement route, usually in the form of a scenic drive, but which could also be a railway, hiking trail, horse-riding trail or 4x4 trail.

Sensitive visual receptors: An individual, group or community that is subject to the visual influence of the proposed development and is adversely impacted by it. They will typically include locations of human habitation and tourism activities.

Study area: The study area or visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the power line corridor. This is also referred to as the visual assessment zone.

Vantage point: A point in the landscape from where a particular project or feature can be viewed.

Viewpoint: A point in the landscape from where a particular project or feature can be viewed.

Viewshed: The geographical area, based entirely on topography, from where an object / structure would be visible, i.e. the zone of visual influence. The viewshed defines the outer boundary of a visual envelope, usually along crests and ridgelines.

Visual assessment zone: The visual assessment zone is assumed to encompass a zone of 5km from the outer boundary of the power line corridor. This is also referred to as the study area.

Visual character: The physical elements and forms and land use related characteristics that make up a landscape and elicit a specific visual quality or nature. Visual character can be defined based on the level of change or transformation from a completely natural setting.

Visual contrast: The degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would be in conformity with the land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape.

Visual envelope: A geographic area, usually defined by topography, within which a particular project or other feature would generally be visible.

Visual exposure: The relative visibility of a project or feature in the landscape.

Visual impact: The effect of an aspect of the proposed development on a specified component of the visual, aesthetic or scenic environment within a defined time and space.

Visual receptors: An individual, group or community that is subject to the visual influence of the proposed development but is not necessarily adversely impacted by it. They will typically include commercial activities and motorists travelling along routes that are not regarded as scenic.

Visual sensitivity: The inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (visual character), spatial distribution of potential receptors, and the likely value judgements of these receptors towards the new development, which are usually based on the perceived aesthetic appeal of the area.

SOUTH AFRICA MAINSTREAM RENEWABLE POWER DEVELOPMENTS (PTY) LTD

PROPOSED CONSTRUCTION OF THE !XHA BOOM SUBSTATION, LINKING SUBSTATION AND ASSOCIATED 132kV POWER LINE NEAR LOERIESFONTEIN, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT REPORT - BASIC ASSESSMENT

1 INTRODUCTION

South Africa Mainstream Renewable Power Developments (Pty) Ltd (hereafter referred to as Mainstream) are proposing to construct a 33kV/132kV on-site substation, namely the !Xha Boom Substation, a 132kV Linking Substation and an associated 132kV power line near Loeriesfontein in the Northern Cape Province (hereafter referred to as the 'proposed development'). The proposed development is aimed at feeding electricity generated by Mainstream's proposed !Xha Boom Wind Farm (part of separate on-going EIA process) into the national grid. SiVEST South Africa (Pty) Ltd (hereafter referred to as SiVEST) have been appointed by Mainstream to undertake the Basic Assessment (BA) for the proposed development. As part of the BA studies conducted for the proposed development, the need to undertake a visual impact assessment (VIA) has been identified. During the BA, a desktop assessment of the visual environment within the study area was undertaken (with field based verification) in order to characterise the area and broadly identify all the potential visual impacts and issues relating to the proposed development. This visual assessment focuses on the potential sensitive receptor locations, and provides an assessment of the magnitude and significance of the visual impacts associated with the proposed development. The main deliverable of this study is the generation of maps indicating visual receptors within the various distance bands and this report indicating the findings of the study.

1.1 Project Description

At this stage, it is understood that the proposed development will include a 33kV/132kV on-site Independent Power Producer (IPP) substation (namely !Xha Boom Substation), as well as a 132kV Linking Substation and a 132kV power line. The aim of this development is to feed electricity generated by the proposed !Xha Boom Wind Farm (part of separate on-going EIA process) into the national grid via Helios Substation.

The proposed development will include the following main activities:

- Construction of 1 x 33kV/132kV substation (referred to as the "proposed !Xha Boom Substation")
- Construction of 1 x 132kV Linking Substation
- Construction of 1 x 132kV power line from the proposed !Xha Boom Substation, via the proposed Linking Substation to Helios substation, approximately 35kms south-east of the proposed !Xha Boom Wind Farm.

The size of the proposed !Xha Boom Substation site will be approximately 500m x 300m, while the Linking Substation site will be approximately 600m x 600m. Two (2) alternative sites for each substation type have been identified for assessment during the BA process.

In addition, four (4) power line corridor alternatives have been identified for assessment during the BA process. These corridors are as follows:

- Corridor Option 1: Approximately 52.2kms in length
- Corridor Option 2: Approximately 52.8kms in length
- Corridor Option 3: Approximately 47.0kms in length
- Corridor Option 4: Approximately 53.4kms in length

Each of these corridors are between 100m and 300m wide to allow flexibility when determining the final route alignment. The proposed power line however only requires a 31m wide servitude which will be positioned within the corridor. The proposed power line development comprises a series of towers located approximately 170m to 250m apart, the exact location of which will be determined during the final design stages of the power line. The type of towers being considered at this stage include self-supporting suspension monopole structures (**Figure 1**) for relatively straight sections of the line and angle strain towers where the route alignment bends to a significant degree. The steel monopole tower type is between 18 and 25m in height, depending on the terrain, but will be high enough to ensure minimum overhead line clearances from buildings and surrounding infrastructure.

Figure 1: Tower Type

1.2 Site Location

The proposed development will be located approximately 68km north of Loeriesfontein in the Northern Cape Province within the Hantam Local Municipalities (**Figure 2**).

The proposed 33/132kV!Xha Boom On-site IPP Substation will be located on Portion 2 of the Farm Georgs Vley No 217, while the proposed Linking Substation will be located on Portion 1 of the Farm Hartebeest Leegte No 216. The !Xha Boom Wind Farm application site, as well as the proposed substation site alternatives and the 132kV power line corridor route alternatives are shown in the route overview map below (**Figure 3**).

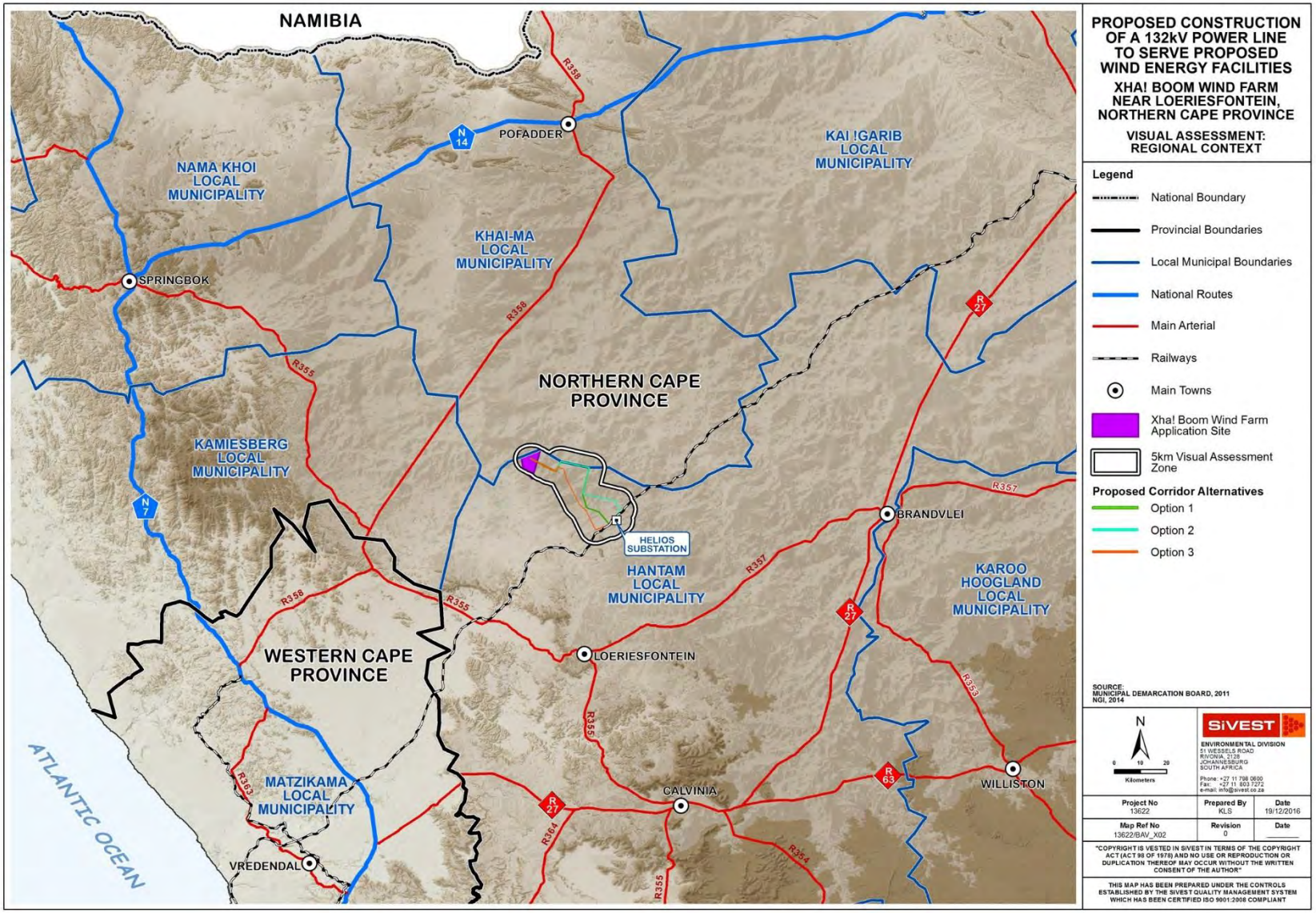

Figure 2: Regional Context Map

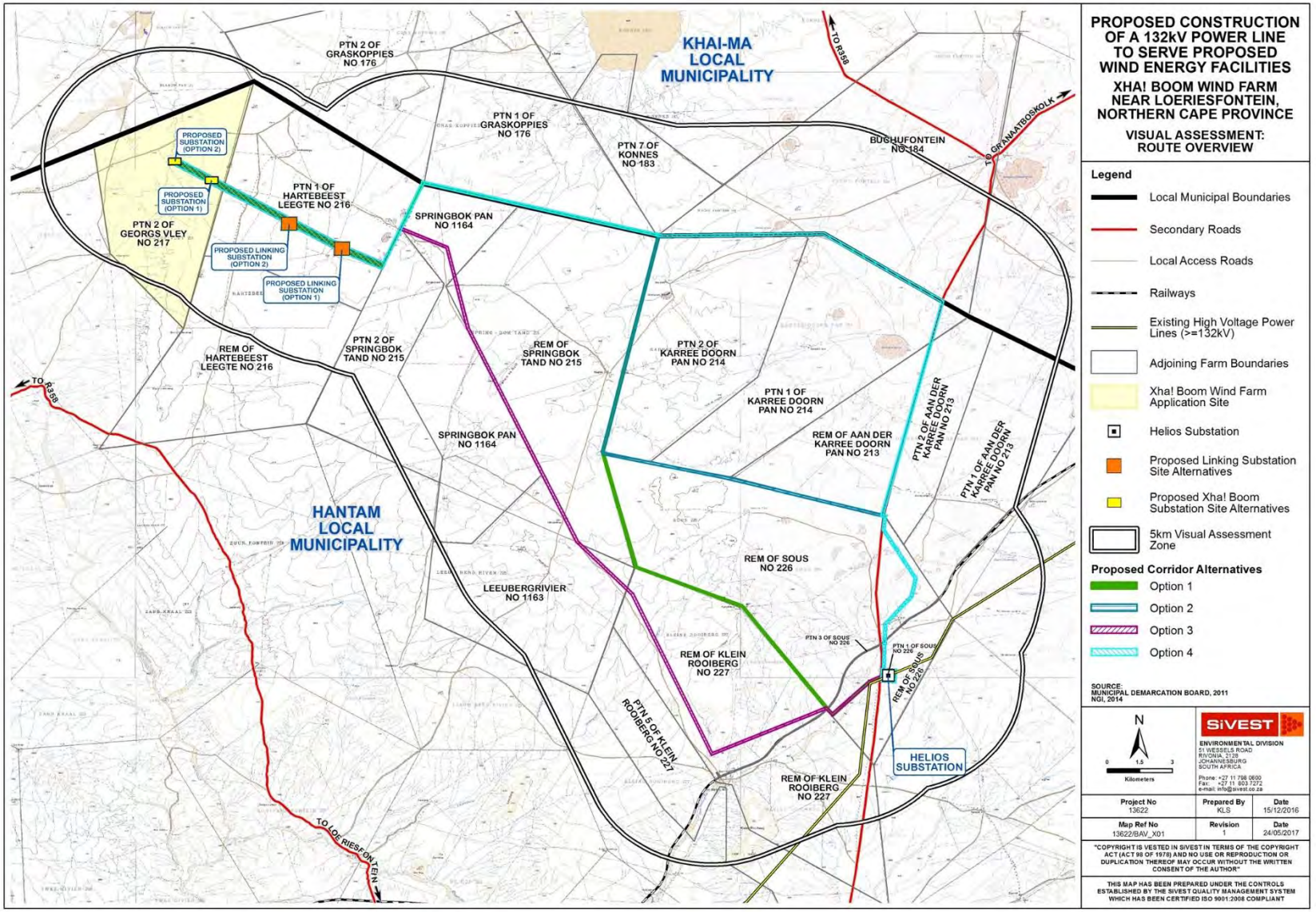

Figure 3: Route Overview Map

1.3 Assumptions and Limitations

- The identification of visual receptors has been based on a combination of desktop assessment as well as field-based observation. Initially Google Earth imagery was used to identify potential receptors within the study area. Thereafter a site visit was undertaken from the 05th to the 09th of December 2016 in order to verify the sensitive visual receptors within the study area and assess the visual impact of the development from these receptor locations where possible. Due to the extensive area covered by the study area, a number of broad assumptions have been made in terms of the sensitivity of the receptors to the proposed development. It should be noted that not all receptor locations would necessarily perceive the proposed development in a negative way. This is usually dependent on the use of the facility and the economic dependency on the scenic quality of views from the facility. Sensitive receptor locations typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities and scenic locations within natural settings. The presence of a receptor in an area potentially affected by the proposed development does not therefore necessarily mean that a visual impact will be experienced.

- On-site substations and power lines are very large structures by nature and could impact on receptors that are located relatively far away, particularly in areas with very flat terrain. Given the nature of the receiving environment and the height of the proposed development, the study area or visual assessment zone is assumed to encompass a zone of 5km from the proposed development– i.e. all areas within a 5km radius of the power line corridor and/or substation site alternatives. This 5km limit on the visual assessment zone was applied because distance is a critical factor when assessing visual impacts and although the proposed power line may still be visible beyond 5km, the degree of visual impact would diminish considerably. As such the need to assess the impact on potential receptors beyond this distance would not be warranted.

- Due to the varying scales and sources of information as well as the fact that only 20m contours were available to establish the Digital Terrain Model (DTM); maps and terrain models may have minor inaccuracies. As such, only large scale topographical variations have been taken into account and minor topographical features or small undulations in the landscape may not be depicted on the DTM.

- During the site visit, it was observed that a few of the farmsteads / residential dwellings identified via desktop means (i.e. Google Earth) have been abandoned and no one is currently residing within them. As such no further assessment was undertaken from these locations and they were eliminated from the list of potentially sensitive receptor locations for the purpose of this study.

- Due the extensive area covered by the study area, the extensive number of farmsteads and residential dwellings located within the study area and access limitations during the site visit access, the impact rating assessment of the proposed development on the potentially sensitive visual receptor locations was undertaken primarily via desktop means. Although the use of these farmsteads / residential dwellings could not be established during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed substations and power line and were assessed as part of the VIA.

- No viewsheds were generated during this visual study, as the topography within the study area is relatively flat and no detailed contours were available. Within this context, minor topographical features, vegetative screening, or man-made structures would be important factors which influence the degree of visibility, but would not be reflected in the viewsheds.

- A matrix has been developed to assist in the assessment of the potential visual impact at each receptor location. The limitations of quantitatively assessing a largely subjective or qualitative type of impact should be noted. The matrix is relatively simplistic in considering three main parameters relating to visual impact, but provides a reasonably accurate indicative assessment of the degree of visual impact likely to be exerted on each receptor location by the proposed substations and power line. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location.

- The assessment of receptor-based impacts has been based on the power line corridor and substation site alternatives provided by the proponent. It is recognised however that the exact route of the power line within the corridor has not been determined, and as such the final routing of the proposed power line may result in greater or lesser visual impacts on receptor locations.

- Visualisation modelling has not been undertaken for the proposed development as the power line route alignment within the corridor and tower locations have not been established.

- No feedback related to the visual environment has been received during the BA phase public participation processes. Should any feedback be received, this report will be updated accordingly.

- Operational and security lighting will be required for the substations proposed within the development footprint. At the time of undertaking the visual study no information was available regarding the type and intensity of lighting required and therefore the potential impact of lighting at night has not been assessed at a detailed level. General measures to mitigate the impact of additional light sources on the ambiance of the nightscape have been provided.

- Most rainfall within the area occurs from November to March, during the late summer months. It should be noted that the fieldwork was undertaken at the beginning of December 2016, during early summer. During winter months up until early summer, the visual impact of the proposed development may be greater, particularly from farmhouses surrounded by tall deciduous trees. As such, the surrounding vegetation is expected to provide less potential screening than in the late summer months.

- The weather conditions in the study area also have certain visual implications and are expected to affect the visual impact of the proposed development to some degree. As mentioned above, the fieldwork was undertaken during the early summer months which are characterised by clear weather conditions. In these clear weather conditions the contrast of the power line towers with the surrounding environment would be greater than the contrast on a cloudy day. As such, the weather conditions during the time of the study area were taken into consideration when undertaking the impact rating for each identified sensitive and potentially sensitive receptor locations (**section 4.2**).

1.4 Specialist Credentials

This VIA has been undertaken by Andrea Gibb and Stephan Jacobs from SiVEST. Andrea Gibb has 9.5 years' work experience and specialises in undertaking visual impact and landscape assessments, by making use of ArcGIS technology and field surveys.

Stephan joined SiVEST in May 2015 and holds the position of Graduate Environmental Consultant in the Johannesburg office. Stephan specialises in the field of Environmental Management and has been involved in undertaking of field work and the compilation of reports for specialist studies such as visual impact assessments.

Full CVs are attached as **Appendix B**. In addition, following best practice, an external peer review was undertaken by Mr. Kegan Allan (*Pr. Sci. Nat., MSc. Geographical Sciences*) of SRK Consulting (CV also attached – **Appendix B**).

1.5 Assessment Methodology

1.5.1 Field work and photographic review

A four (4) day site visit was undertaken between the 5th and the 9th of December 2016 (early summer). The study area was visited in order to;

- verify the landscape characteristics identified via desktop means;
- classify the study area into zones of visual contrast;
- capture photos of the proposed study area;
- verify the sensitivity of visual receptor locations identified via desktop means;
- eliminate receptors that are unlikely to be influenced by the proposed development;
- identify any additional visually sensitive receptor locations within the study area; and
- assist with the impact rating assessment from visually sensitive receptor locations.

1.5.2 Physical landscape characteristics

Physical landscape characteristics such as topography, vegetation and land use are important factors which influence the visual character and visual sensitivity of the study area. Baseline information about the physical characteristics of the study area was initially sourced from spatial databases provided by the National Geo-spatial Information (NGI), the South African National Biodiversity Institute (SANBI) and the South African National Land Cover Dataset (Geoterraimage – 2014). The characteristics identified via desktop means were later verified during the site visit.

1.5.3 Identification of sensitive receptors

Google Earth imagery was used in conjunction with field investigation to identify and assess visual receptor locations within the study area, such as residences, which may potentially be sensitive to visual impacts associated with the proposed development.

1.5.4 Impact Assessment

A rating matrix was used to evaluate objectively the significance of the visual impacts associated with the proposed development, both before and after implementing mitigation measures. Mitigation measures were identified (where possible) in an attempt to minimise the potential visual impact of the proposed development. The rating matrix made use of a number of different factors including geographical extent, probability, reversibility, irreplaceable loss of resources, duration, cumulative effect and intensity, in order to assign a level of significance to the visual impact of the project. A separate rating matrix was used to assess the visual impact of the proposed development on the sensitive receptor locations, as identified. This matrix is based on the distance of a receptor from the proposed development, the presence of screening factors and the degree to which the proposed development would contrast with the surrounding environment from a particular location. Thereafter, the proposed corridor and substation site alternatives were comparatively assessed, in order to ascertain the preferred alternatives from a visual perspective.

1.5.5 Consultation with I&APs

Continuous consultation with Interested and Affected Parties (I&APs) undertaken during the public participation process (PPP) will be used to help establish how the proposed development will be perceived from the various receptor locations and the degree to which the impact will be regarded as negative. Although I&APs have not as yet provided any feedback in this regard, the report will be updated to include relevant information as and when it becomes available.

2 VISUAL BASELINE ASSESSMENT

The physical and land use related characteristics are outlined below as they are important factors affecting the visibility of a development and contributing to the visual character of the study area. Defining the visual character is an important part of assessing visual impacts as it establishes the visual baseline or existing visual environment in which the development would be constructed. The visual impact of a development is measured against this visual baseline by establishing the degree to which the development would contrast with or conform to the visual character of the surrounding area. The inherent sensitivity of the area to visual impacts or visual sensitivity is thereafter determined, based on the visual character, economic importance of the scenic quality of the area, inherent cultural value of the area and presence of visual receptors.

2.1 Topography

The topography across much of the study area is characterised by a flat to gently undulating landscape with gentle slopes, typical of much of the Karoo (**Figure 4**). There are however areas of localised hilly topography characterised by the presence of small hills / ridges / koppies (**Figure 5**). In the wider area, the Klein and Groot Rooiberg and Leeuwberg koppies are significant features of the landscape, forming an areas of localised hilly topography to the south and south-west of the proposed development. It should however be noted that only the Klein Rooiberg koppie is located inside the visual assessment zone.

In the eastern sector of the study area, the presence of a number of pans signals that the topography is very flat and thus very poorly drained.

Maps showing the topography and slope characteristics in the study area are provided in **Figure 6** and **Figure 7** below.

Figure 4: View of the typically flat to gently undulating terrain found within the study area

Figure 5: View of localised hills / ridges/ koppies found in the wider visual assessment zone.

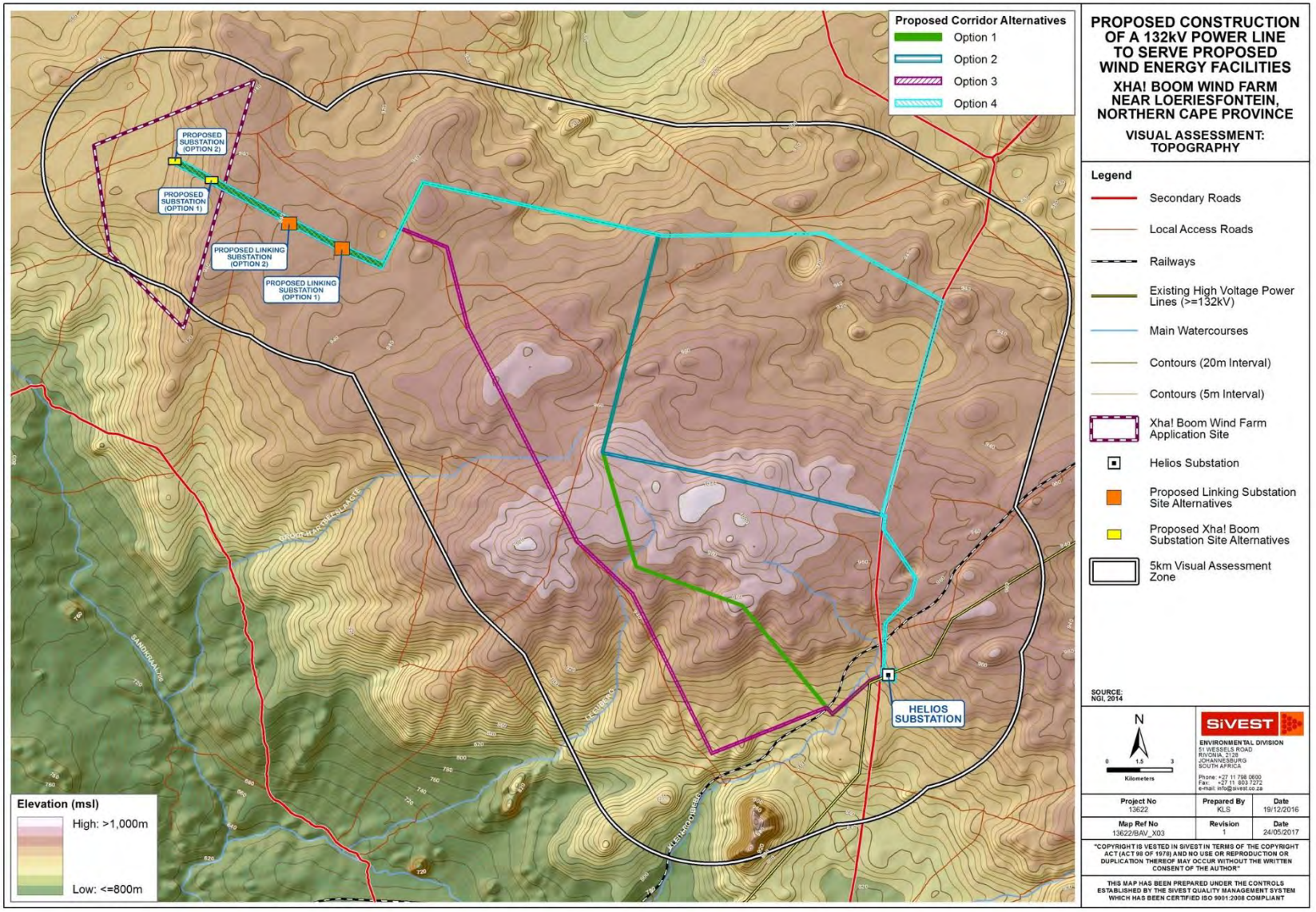

Figure 6: Map showing topography within the study area

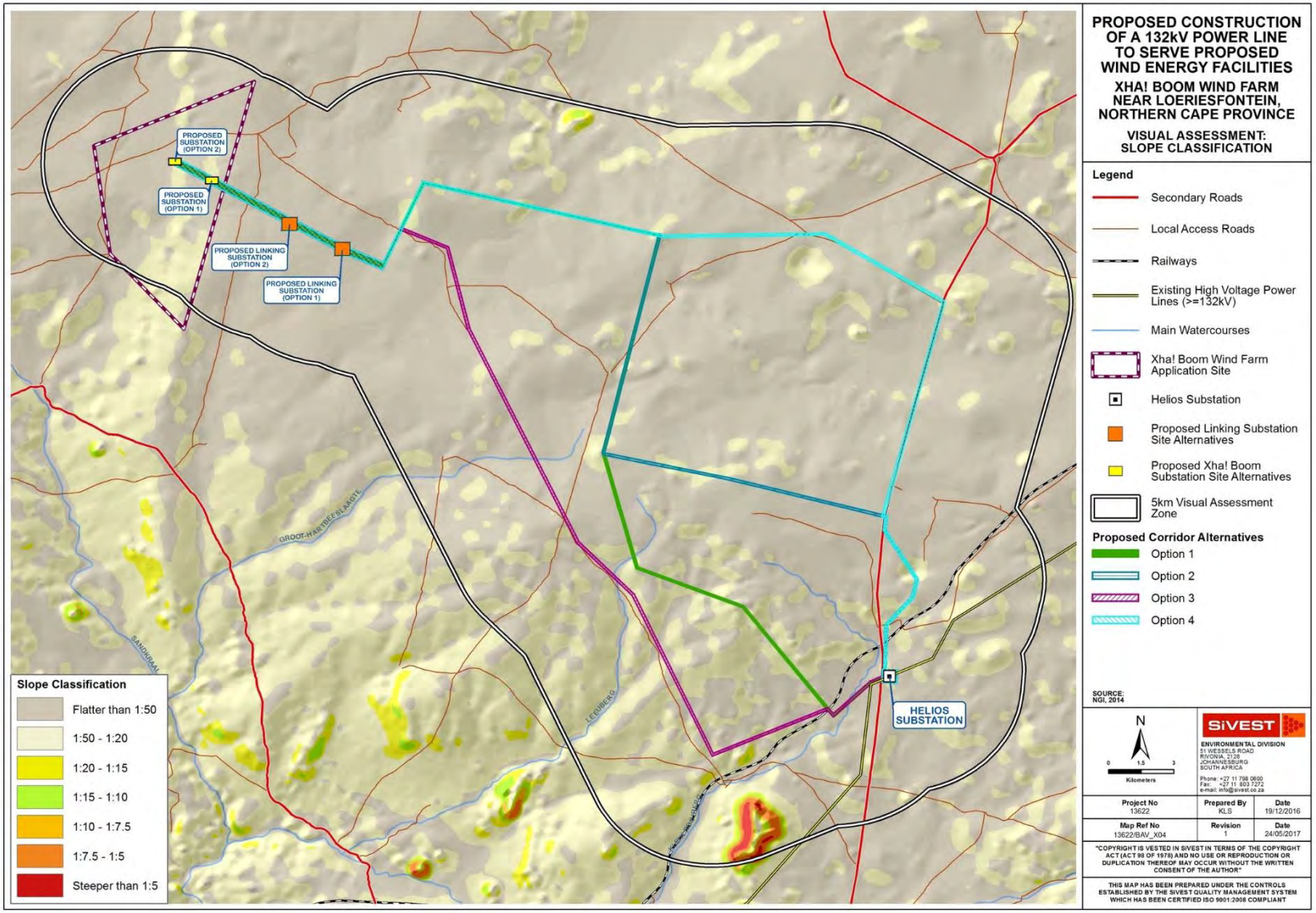

Figure 7: Map showing the slope within the study area

2.1.1 Visual Implications

The flat terrain that occurs across most of the study area results in generally wide-ranging vistas throughout the study area (**Figure 8**), and the horizon is usually visible across an entire 360º arc of the viewer. The only exception to this flat topography is the presence of the localised hills / ridges / koppies in parts of the wider visual assessment zone as well as the range of hills located some distance to the south and south-west of the proposed development which are expected to shield views of the proposed development to a degree.

Figure 8: Generally wide-ranging vistas found throughout the study.

2.2 Vegetation

According to the National Geo-spatial Information (NGI) (2014) and the South African National Biodiversity Institute (SANBI) (2012), the dominant vegetation class across the study area is Bushmanland Basin Shrubland (**Figure 9**) which is characterised by dwarf shrubland dominated by a mixture of low sturdy and spiny shrubs. The aridity of the area has restricted the vegetation to

low shrubs around 30-40 cm in height, distributed uniformly across the landscape, except in areas of disturbance where patches of bare earth occur (**Figure 10**) (Mucina & Rutherford, 2006). Western Bushmanland Klipveld occurs in the north-western portion of the study area, while Bokkeveld Sandstone Fynbos is present on the south-western boundary.

Bushmanland Vloere occurs in and around the salt pans scattered across the eastern half of the study area, and is largely characterized by dwarf shrubs with some loose thicket evident is some areas.

Some tree species (some relatively large and some low) can however also be found within certain parts of the study area (**Figure 11**). In certain areas, man has had an impact on the natural vegetation, especially around some farmsteads, where over many years' tall exotic trees and other typical garden plants have been established (**Figure 12**).

A map showing vegetation classification is provided in **Figure 13** below.

Figure 9: Typical vegetation cover found across most of the study area.

Figure 10: Patches of bare earth in the study area.

Figure 11: Examples of the tree species found in parts of the study area.

Figure 12: Example of tall trees that have been established around a farmhouse**.**

2.2.1 Visual Implications

The natural short vegetation cover will offer no visual screening. Parts of the visual assessment zone are however characterised by the presence of some tree species which occur naturally in some areas zone and are expected to contribute to the overall natural character of the study area as well as provide some form of screening from the proposed development. In addition, tall exotic trees may effectively screen the proposed development from farmhouses, where these trees occur in close proximity to the farmhouse and are located directly in the way of views to the proposed development.

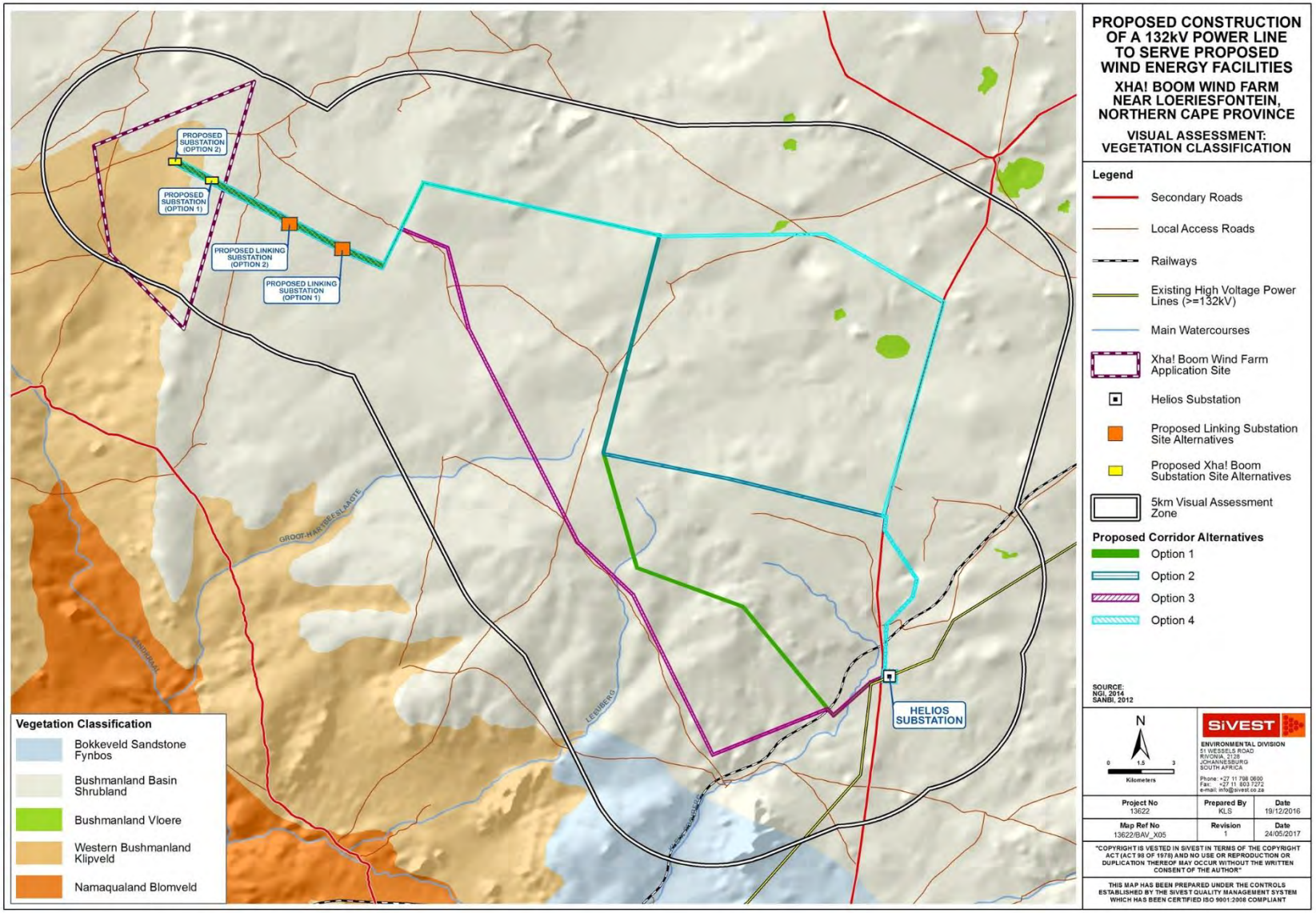

Figure 13: Map showing the vegetation classification within the study area

2.3 Land Cover

According to the South African National Land Cover (2013-2014) from Geoterraimage (2014), much of the land cover in the wider study area is classified as bare (non-vegetated) with some isolated patches of grassland, low shrubland, thicket and woodland in evidence mainly in the south-western sector of the study area (**Figure 23**). Sheep farming (**Figure 14**) is the dominant activity in the study area although the arid nature of the climate restricts stocking densities. As a result, farms in the area are relatively large and isolated farmsteads are scattered across the area resulting in a very low density of rural settlement. The area is therefore regarded as largely uninhabited and the natural vegetation has been retained across most of the study area

Built form in much of the of the study area is limited to isolated farmsteads, gravel access roads, ancillary farm buildings, telephone lines and boundary fences and the closest built up area is the small town of Loeriesfontein approximately 69km south of the site. It should be noted that the study area is also characterised by the presence of certain pastoral elements (**Figure 15**). These elements can be found throughout the study area and are typically present in areas where sheep farming is taking place. The study area is however traversed by a secondary road, known locally as the Granaatboskolk Road, which links Loeriesfontein with Granaatboskolk some 38kms north-east of the study area. In addition, a railway line crosses the southern section of the study area, running in a south-west to north east direction (**Figure 16**).

Limited human influence on the landscape is evident in the eastern section of the study area where small-scale mining/quarrying activities occur, mostly scattered along the Granaatboskolk Road and the railway line.

Built form and human influence on the landscape become more evident in the southern sector of the study area where several high voltage power lines feed into the Helios 400kV Main Transmission Substation (MTS) (**Figure 17**). The tall steel structures of the Substation, as well as the high voltage power line towers are highly visible from various parts of the study area (**Figure 18**). Also present in this area are the the Khobab and Loeriesfontein Wind Farms (**Figure 19**) which are presently under construction, as well as the on-site Khobab IPP substation which had already been constructed during the time of the in-field investigation (**Figure 20**). In addition, the construction camp area for the Khobab Wind Farm is also situated within this part of the study area, within close proximity to the Helios Substation (**Figure 21**). It should however be noted that during the time of the in-field investigation it was noted that the Khobab Wind Farm was still in the early stages of construction and no turbines had been erected (**Figure 22**). Each of these developments includes some 61 wind turbines with associated infrastructure as well as 132kV grid connections to Helios Substation. All of this development in combination is resulting in a significant level of transformation of the natural environment in this part of the study area.

A map showing the land cover classification within the study area has been provided in **Figure 23.**

Figure 14: Typical view of sheep farming activities in the study area.

Figure 15: Example of typical pastoral elements which can be found within parts of the study area, especially in areas where sheep farming is taking place. These elements are expected to give the surrounding area a more pastoral feel.

Figure 16: View of railway line which traverses the study area.

Figure 17: View of Helios Substation.

Figure 18: High voltage power lines feeding into Helios Substation.

Figure 19: Wind turbines at Loerisfontein Wind Farm

Figure 20: View of the on-site Khobab IPP Substation which had already been constructed during the time of the in-field investigation.

Figure 21: View of the Khobab Wind Farm construction camp area which is situated within the visual assessment zone, within close proximity to the Helios Substation.

Figure 22: View of the construction activities associated with the proposed Khobab Wind Farm. During the time of the in-field investigation it was noted that this wind farm was still in the early stages of construction and no turbines had thus been erected.

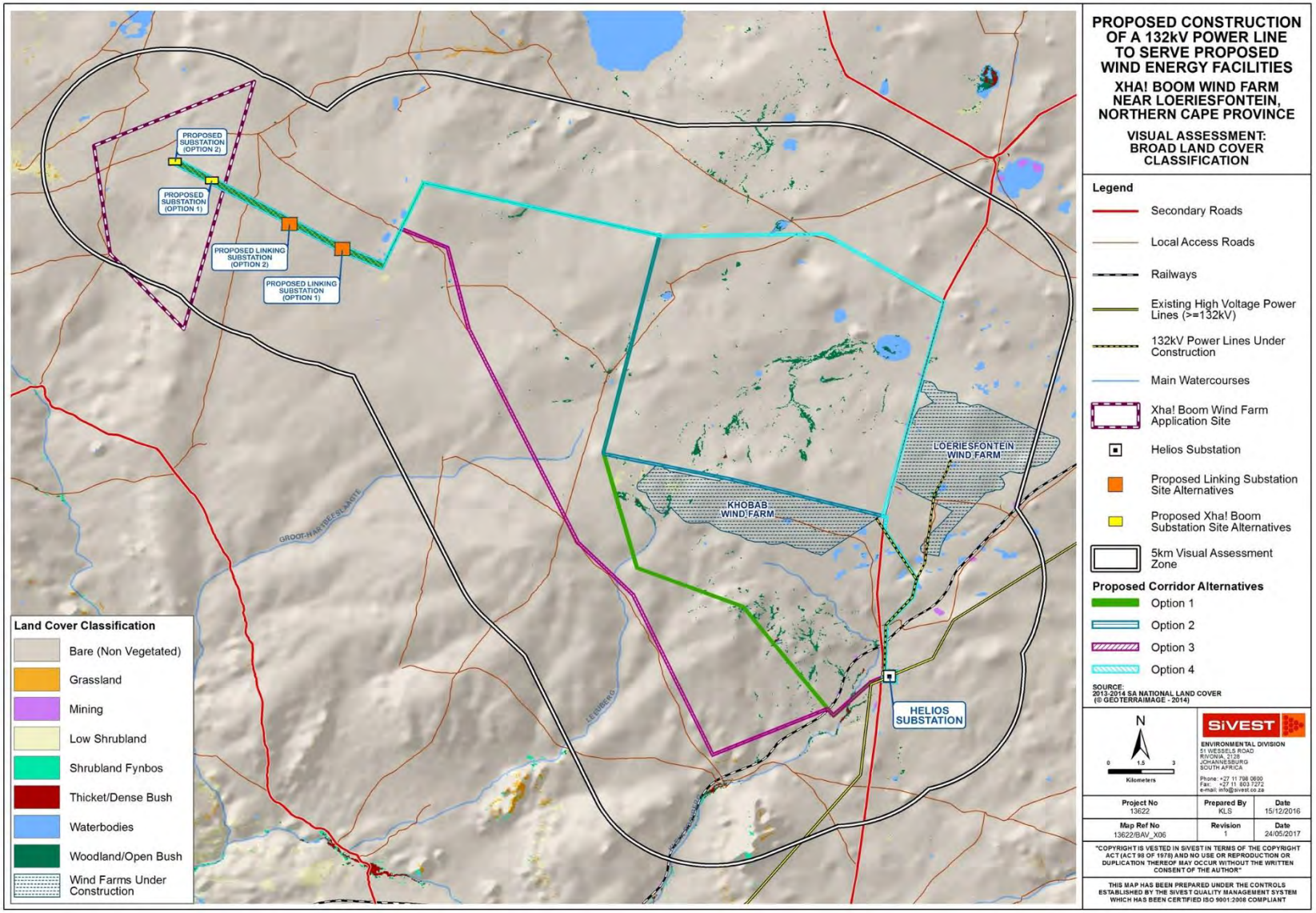

Figure 23: Map showing the land cover classification within the study area

2.3.1 Visual Implications

The general lack of human habitation and associated human infrastructure across much of the study area has a distinct impact on the sense of place, giving the area a largely natural, rural feel (**Figure 24**). The pastoral elements which are present in parts of the study area, especially where sheep farming occurs, are however expected to give the surrounding area a more pastoral feel.

Figure 24: Typical natural or scenic visual character found across much of the study area

High levels of human transformation are however evident in the south-eastern sector of the study area in the form of Helios Substation and associated high voltage power lines as well as the Khobab and Loeriesfontein Wind Farms which are presently under construction. As previously mentioned, the on-site Khobab IPP substation and the construction camp area for the Khobab Wind Farm can also be found within this part of the study area, within close proximity to the Helios Substation.

The influence of the level of human transformation on the visual character of the area is described in more detail below.

2.4 Visual Character

The physical and land cover related characteristics of the study area contribute to its overall visual character. Visual character can be defined based on the level of change or transformation from a completely natural setting, which would represent a natural baseline in which there is little evidence of human transformation of the landscape. Varying degrees of human transformation of a landscape would engender differing visual characteristics to that landscape, with a highly modified urban or industrial landscape being at the opposite end of the scale to a largely natural undisturbed landscape. Visual character is also influenced by the presence of built infrastructure such as buildings, roads and other objects such as electrical infrastructure.

The majority of the study area is considered to have a natural (almost vacant) visual character and there is minimal human habitation and associated infrastructure. In addition, the predominant land use (sheep farming) has not transformed the natural landscape and the area has thus largely retained its natural rural character. It should however be noted that there are some pastoral elements in the area which are expected to give the surrounding area a more pastoral feel. As mentioned above, built infrastructure across much of the study area is limited to isolated farmhouses, gravel farm access roads and farm boundary fences, although there is some quarrying activity in the north-eastern portion of the study area.

The relatively low density of human transformation throughout much of the area is an important component contributing to the largely natural visual character of the study area. This is important in the context of potential visual impacts associated with the proposed development of substations and power lines as introducing this type of development could be considered to be a degrading factor in this context particularly if no existing electrical infrastructure is located nearby.

There are however significant anthropogenic elements in the study area including the Granaatboskolk Road, the railway line, high voltage power lines and Helios Substation. In addition, there are two (2) wind farms presently under construction in the study area, namely Khobab and Loeriesfontein 2. The on-site Khobab IPP substation and the construction camp area for the Khobab Wind Farm can also be found within the study area, within close proximity to the Helios Substation. These facilities and their associated infrastructure consist of very large structures which are highly visible, significantly altering the visual character and baseline in the study area and resulting in a more industrial-type visual character in this part of the study area.

It is important to note that several renewable energy developments (solar and wind) are being proposed in the surrounding area. These facilities and their associated infrastructure typically consist of very large structures which are highly visible. The presence of these renewable energy developments (if constructed) will thus further transform the current visual character and lessen the

degree to which the proposed development would contrast with the elements and form in the surrounding environment.

2.5 Cultural, Historical and Scenic Value

Cultural landscapes are becoming increasingly important concepts in terms of the preservation and management of rural and urban settings across the world. The concept of 'cultural landscape' is a way of looking at a place that focuses on the relationship between human activity and the biophysical environment (Breedlove, 2002). The cultural landscape concept is relatively new in the heritage conservation movement across the world. In 1992 the World Heritage Committee adopted the following definition for cultural landscapes:

Cultural landscapes represent the combined worlds of nature and of man illustrative of the evolution of human society and settlement over time, under the influence of the physical constraints and/or opportunities presented by their natural environment and of successive social, economic and cultural forces, both external and internal.

According to the Committee's Operational Guidelines Cultural Landscapes can fall into three (3) categories

i) "a landscape designed and created intentionally by man";
ii) an "organically evolved landscape" which may be a "relict (or fossil) landscape" or a "continuing landscape";
iii) an "associative cultural landscape" which may be valued because of the "religious, artistic or cultural associations of the natural element"

The greater area surrounding the proposed development site is also an important component when assessing visual character. The area can be considered to be typical of a Karoo or "platteland" landscape that would characteristically be encountered across the high-lying dry western and central interior of South Africa. Much of South Africa's dry Karoo interior consists of wide open, uninhabited spaces sparsely punctuated by widely scattered farmsteads and small towns. Traditionally the Karoo has been seen by many as a dull, lifeless part of the country that was to be crossed as quickly as possible on route between the major inland centres and the Cape coast, or between the Cape and Namibia. However, in the last couple of decades this perception has been changing, with the launching of tourism routes within the Karoo, and the promotion of tourism in this little visited, but extensive part of South Africa. In a context of increasing urbanisation in South Africa's major centres, the Karoo is being marketed as an undisturbed getaway, especially as a stop on a longer journey from the northern parts of South Africa to the Western and Eastern Cape coasts. Examples of this may be found in the relatively recently published "Getaway Guide to Karoo, Namaqualand and Kalahari" (Moseley and Naude-Moseley, 2008). The exposure of the

Karoo in the national press during 2011, as part of the debate around the potential for fracking (hydraulic fracturing) mining activities, has brought the natural resources, land use and lifestyle of the Karoo into sharp focus. Many potential objectors stress the need to preserve the environment of the Karoo, as well as preserve the 'Karoo Way of Life', i.e. the stock farming practices which are highly dependent on the use of abstracted ground water (e.g. refer to the Treasure Karoo Action Group website http://treasurethekaroo.co.za/). Although the small town of Loeriesfontein may be used by tourists as a stop-over destination, the proposed development is located approximately 68km to the north of the town and would therefore not influence these visitors. None of the roads passing near the proposed development are considered to be tourism routes.

The typical Karoo landscape can also be considered a valuable 'cultural landscape' in the South African context. Although the cultural landscape concept is relatively new, it is becoming an increasingly important concept in terms of the preservation and management of rural and urban settings across the world (Breedlove, 2002).

The typical Karoo landscape consisting of wide open plains, and isolated relief, interspersed with isolated farmsteads, windmills and stock holding pens, is an important part of the cultural matrix of the South African environment. The Karoo farmstead is also a representation of how the harsh arid nature of the environment in this part of the country has shaped the predominant land use and economic activity practiced in the area, as well as the patterns of human habitation and interaction. The presence of small Karoo towns such as Loeriesfontein, engulfed by an otherwise rural environment, form an integral part of the wider Karoo landscape. As such, the Karoo landscape as it exists today has value as a cultural landscape in the South African context. In the context of the types of cultural landscape listed above, the Karoo cultural landscape would fall into the second category, that of an organically evolved, "continuing" landscape.

The study area, as visible to the viewer, represents a typical Karoo cultural landscape. This is important in the context of potential visual impacts associated with the proposed development of a power line and substation. Introducing this type of development is not considered to be a significant degrading factor in the context of the natural Karoo character of the study area, as electrical infrastructure forms part of the typical form present within the Karoo landscape (**Figure 25**).

Figure 25: View of a typical Karoo landscape, which includes electrical infrastructure (Kay, 2014)

2.6 Visual Sensitivity

Visual Sensitivity can be defined as the inherent sensitivity of an area to potential visual impacts associated with a proposed development. It is based on the physical characteristics of the area (i.e. topography, landform and land cover), spatial distribution of potential receptors, and the likely value judgements of these receptors towards a new development (Oberholzer, 2005). A viewer's perception is usually based on the perceived aesthetic appeal of an area and on the presence of economic activities (such as recreational tourism) which may be based on this aesthetic appeal.

In order to assess the visual sensitivity of the area SiVEST has developed a matrix based on the characteristics of the receiving environment which, according to the Guidelines for Involving Visual and Aesthetic Specialists in the EIA Processes, indicate that visibility and aesthetics are likely to be 'key issues' (Oberholzer, 2005).

Based on the criteria in the matrix (**Table 1**), the visual sensitivity of the area is broken up into a number of categories, as described below:

i) **High** - The introduction of a new development such as the erection of an on-site substation or power line would be likely to be perceived negatively by receptors in this area; it would be considered to be a visual intrusion and may elicit opposition from these receptors

ii) **Moderate** - Presence of receptors, but due to the nature of the existing visual character of the area and likely value judgements of receptors, there would be limited negative perception towards the new development as a source of visual impact.

iii) **Low** - The introduction of a new development would not be perceived to be negative, there would be little opposition or negative perception towards it.

The table below outlines the factors used to rate the visual sensitivity of the study area. The ratings are specific to the visual context of the receiving environment within the study area.

Table 1: Environmental factors used to define visual sensitivity of the study area

FACTORS	RATING									
	1	2	3	4	5	6	7	8	9	10
Pristine / natural character of the environment										
Presence of sensitive visual receptors										
Aesthetic sense of place / scenic visual character										
Value to individuals / society										
Irreplaceability / uniqueness / scarcity value										
Cultural or symbolic meaning										
Scenic resources present in the study area										
Protected / conservation areas in the study area										
Sites of special interest present in the study area										
Economic dependency on scenic quality										
Local jobs created by scenic quality of the area										
International status of the environment										
Provincial / regional status of the environment										
Local status of the environment										
**Scenic quality under threat / at risk of change										

**A rating above '5' for this factor will trigger the need to undertake an assessment of cumulative visual impacts.

Low							Moderate							High
10	20	30	40	50	60	70	80	90	100	110	120	130	140	150

Based on the above factors, the study area is rated as having a moderately-low visual sensitivity. This is mainly due to the relatively uninhabited character of the area. An important factor contributing to the visual sensitivity of an area is the presence, or absence of visual receptors that may value the aesthetic quality of the landscape and depend on it to produce revenue and create

jobs. As described below, very few potentially sensitive receptors are present in the study area. Although no formal protected areas or leisure / nature-based tourism activities exist within the study area, the area would still be valued as a typical Karoo cultural landscape.

As previously mentioned, there are two (2) wind farms under construction in the study area, and several other renewable energy facilities (solar and wind) are proposed in the study area. As such, an assessment of the cumulative impact is discussed in **section 4.3** below.

Although the area is associated with a moderately low visual sensitivity, it should be stressed that the concept of visual sensitivity has been utilised indicatively to provide a broad-scale indication of the likelihood that the area would be sensitive to the visual impacts. This is based on the physical characteristics of the study area, economic activities within the study area and land use that predominates. This does not mean that high visual impacts could not potentially be experienced in areas of low visual sensitivity. The potential presence and perception of sensitive receptors as discussed below must also be taken into account.

2.7 Sensitive and Potentially Sensitive Visual Receptor Locations

A sensitive receptor location is defined as a location from where receptors would potentially be adversely impacted by a proposed development. This takes into account a subjective factor on behalf of the viewer – i.e. whether the viewer would consider the impact as a negative impact. As described above, the adverse impact is often associated with the alteration of the visual character of the area in terms of the intrusion of the proposed substations and 132kV power line into a 'view', which may affect the 'sense of place'. The identification of sensitive receptors is typically undertaken based on a number of factors which include:

- the visual character of the area, especially taking into account visually scenic areas and areas with a natural visual character;
- the presence of leisure-based (esp. nature-based) tourism or sites with historical and cultural value in an area;
- the presence of sites / routes that are valued for their scenic quality and sense of place;
- the presence of homesteads / farmsteads in largely natural settings where the development may influence the typical character of their views; and
- feedback from interested and affected parties, as raised during the public participation process conducted as part of the BA study.

A distinction must be made between a receptor location and a sensitive receptor location. Receptor locations are sites from where the proposed on-site substations and 132kV power line may be visible, but the receptor may not necessarily be adversely affected by any visual intrusion associated with the development. Receptor locations include locations of commercial activities and certain movement corridors, such as roads that are not tourism routes. Sensitive receptor locations

typically include sites that are likely to be adversely affected by the visual intrusion of the proposed development. They include; tourism facilities, scenic sites and residential dwellings in natural settings.

Generally, the visibility of the development would diminish exponentially over distance. As such, the proposed development would be more visible to receptors located within a short distance and these receptors would experience a higher adverse visual impact than those located at a moderate or long distance from the proposed development. The distance of a sensitive receptor location from the proposed development site was taken into account when rating the visual impact of the proposed development on these potential receptors.

In order to account for this, distance bands were used to assign zones of visual impact from the proposed development site. Based on the height and scale of the project, as well as the investigations undertaken during the fieldwork, the radii chosen to assign these zones of visual impact are as follows:

- 0 < 500m (high impact zone);
- 500m < 2km (moderate impact zone);
- 2km < 5km (low impact zone); and
- >5km (Negligibly low impact zone)

A total number of nineteen (19) scattered farmsteads / homesteads which house the local farmers as well as their farm workers were identified within the study area. These dwellings are regarded as potentially sensitive visual receptors as they are located in a mostly rural setting and the proposed development will likely alter natural vistas experienced from these dwellings. The degree of visual impact experienced will vary from one inhabitant to another, as it is largely based on the viewer's perception. Factors influencing the degree of visual impact experienced by the viewer include the following:

- Value placed by the viewer on the natural scenic characteristics of the area.
- The viewer's sentiments toward the proposed structures. These may be positive (a symbol of progression toward a less polluted future) or negative (foreign objects degrading the natural landscape).
- Degree to which the viewer will accept a change in the typical Karoo character of the surrounding area.

As far as possible, each potentially sensitive visual receptor that was identified via desktop means was visited to determine the current use of the facility and assist with rating the impact of the proposed development from the location. However, due to the extensive area covered by the study area and access limitations during the site visit, it was not possible to verify the status of all the identified potentially sensitive receptor locations. As such, the impact rating assessment of the proposed development on the potentially sensitive visual receptor locations was undertaken

primarily via desktop means. Although the use of these farmsteads / residential dwellings could not be established during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA. As mentioned above, nineteen (19) potentially sensitive visual receptors were identified within the study area. No sensitive visual receptor locations with tourism significance were identified within the study area. This is mainly due to low levels of leisure-based or nature based tourism activities in the assessment area.

Table 2 below provides details of the potentially sensitive places that have cultural and symbolic importance that were identified within the study area.

It should be noted that a few of the farmsteads / homesteads which were identified via desktop means were excluded as potentially sensitive receptor locations for the purposes of this visual study as it was discovered during the time of the site visit that these were uninhabited and/or abandoned. No further assessment was undertaken from these abandoned farmsteads / homesteads as it was assumed that no individuals currently live in these farmsteads / homesteads and therefore no visual impact will be experienced from these locations.

Table 2: Visual receptor locations identified within the study area.

Name		Proximity to proposed Substation Site or Power Line Corridor	Visual Impact Zone
*VR13	Farmstead/Homestead	Approx. 2.6km from Power Line Corridor 1, 2, 3 and 4	Low
**VR18	Farmstead/Homestead	Approx. 3.0km from Power Line Corridor 1, 2, 3 and 4	Low
VR25	Farmstead/Homestead	Approx. 200m from Power Line Corridor Option 1	High
VR27	Farmstead/Homestead	Approx. 1.6km from Power Line Corridor Option 3	Moderate
VR28	Farmstead/Homestead	Approx. 2.2km from Power Line Corridor Option 3	Low
VR29	Farmstead/Homestead	Approx. 2.2km from Power Line Corridor Option 3	Low
VR30	Farmstead/Homestead	Approx. 2.2km from Power Line Corridor Option 3	Low
VR31	Farmstead/Homestead	Approx. 2.2km from Power Line Corridor Option 3	Low
VR32	Farmstead/Homestead	Approx. 800m from Power Line Corridor Option 1 and 2	Moderate
VR33	Farmstead/Homestead	Approx. 700m from Power Line Corridor Option 4	Moderate

Name		Proximity to proposed Substation Site or Power Line Corridor	Visual Impact Zone
VR34	Farmstead/Homestead	Approx. 180m from Power Line Corridor Option 2 and 4	High
VR35	Farmstead/Homestead	Approx. 1.2km from Power Line Corridor Option 3	Moderate
VR36	Farmstead/Homestead	Approx. 1.2km from Power Line Corridor Option 3	Moderate
VR37	Farmstead/Homestead	Approx. 1.6km from Power Line Corridor Option 3	Moderate
VR38	Farmstead/Homestead	Approx. 1.5km from Power Line Corridor Option 3	Moderate
VR39	Farmstead/Homestead	Approx. 4.2km from Power Line Corridor Option 4	Low
VR40	Farmstead/Homestead	Approx. 4.5km from Power Line Corridor Option 4	Low
VR41	Farmstead/Homestead	Approx. 4km from Power Line Corridor Option 4	Low
VR43	Farmstead/Homestead	Approx. 4.6km from Power Line Corridor Option 4	Low

** According to the Noise Specialist (with the Public Participation Practitioner's advice), this receptor was confirmed as a house which is used very temporary (one night) on occasion. There is also single room present for a shepherd (De Jager, 2017).*

***According to the Noise Specialist (with the Public Participation Practitioner's advice), this receptor was confirmed as a farmstead / homestead which is owned by a Mr Kallie van Zyl (De Jager, 2017). No further information was however provided with regards to this receptor.*

It should be noted that, as mentioned above, it was not possible to verify the status of all the identified potentially sensitive receptor locations. As such it is possible that some of the structures identified by desktop means may not, in reality, be potentially sensitive receptors. Although the use of these receptors could not be established during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA. In light of the above, the impact rating assessment of the proposed development on the potentially sensitive visual receptor locations was undertaken primarily via desktop means.

In many cases, roads along which people travel are considered to be sensitive receptor locations. Road infrastructure in the study area largely comprises gravel access roads used primarily by local farmers. The southern sector of the study area is however traversed by the Granaatboskolk Road, a secondary road which connects the town of Loeriesfontein with Granaatboskolk to the north. This

road is not part of any scenic tourist route and is not specifically valued or utilised for its scenic or tourism potential. As such, there are no visually sensitive roads within the study area.

The visually sensitive and potentially sensitive receptor locations in relation to the zones of visual impact are indicated in **Figure 26** below.

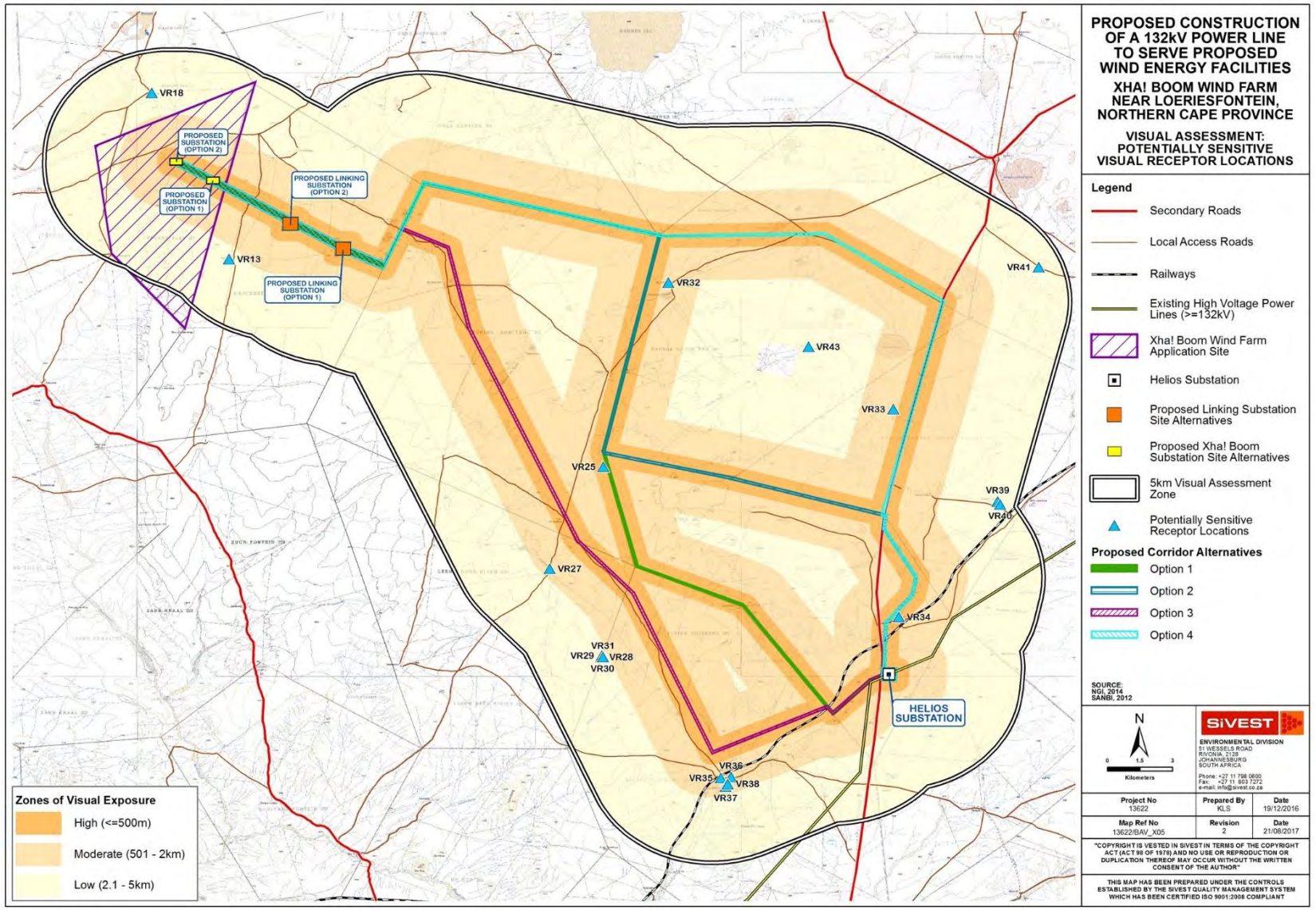

Figure 26: Potentially sensitive visual receptors in the study area.

3 TYPICAL VISUAL IMPACTS ASSOCIATED WITH ON-SITE SUBSTATIONS AND POWER LINES

In this section, the typical visual issues / impacts related to the establishment of on-site substations and a 132kV power line as proposed are discussed.

Power line towers and on-site substations are by their nature very large objects and thus highly visible. The standard tower height of the proposed 132kV power line is approximately 25m (equivalent in height to an eight storey building). Although a pylon/tower structure would be less visible than a building, the height of the structure means that the pylon would still typically be visible from a considerable distance. A 132kV power line consists of a series of pylons/towers spaced approximately 170m to 250m apart in a linear alignment, thus increasing its visibility.

The degree of visibility of an object informs the level and intensity of the visual impact, but other factors also influence the nature of the visual impact. The landscape and aesthetic context of the environment in which the object is placed, as well as the perception of the viewer are also important factors. In the context of the 132kV power line, the type of tower used as well as the degree to which the towers would impinge upon or obscure a view is also a factor that will influence the experience of the visual impacts.

As described above, power lines and substations are not features of the natural environment, but are rather representative of human (anthropogenic) alteration of the natural environment. Thus when placed in a largely natural landscape, a substation and/or power line can be perceived to be highly incongruous in this context. The height and linear nature of the power line will exacerbate this incongruity within a natural landscape, as the towers may impinge on views within the landscape. In addition, the practice of clearing any taller vegetation from areas within the power line servitude can increase the visibility and incongruity of the power line. In a largely natural, bushier setting, vegetation clearance will cause fragmentation of the natural vegetation cover, thus making the power line more visible and drawing the viewer's attention to the power line servitude.

As mentioned above, the viewer's / receptor's perception of the development is also very important, as certain receptors may not consider the development of substation and/or power line to be a negative visual impact. The scenic / aesthetic value of an area and the prevalent land use practices also tend to affect people's perception of whether a substation and/or power line is an unwelcome intrusion, and this in turn will determine the sensitivity of the identified receptors to the proposed development.

Power lines and substations are often perceived as visual impacts in areas where value is placed on the scenic or aesthetic character of the area, and where activities, which are based upon the enjoyment of, or exposure to, the scenic or aesthetic features of the area are practiced. Sensitivity to visual impacts is typically most pronounced in areas set aside for conservation of the natural

environment (such as protected natural areas or conservancies), or in areas in which the natural character or scenic beauty of the area attracts visitors (tourists) to the area. Residents and visitors to these areas may perceive substations and/or power lines to be an unwelcome intrusion that would degrade the natural character and scenic beauty of the area, and which would potentially even compromise the practicing of tourism activities in the area.

Conversely, the presence / existence of other anthropogenic objects associated with the built environment may influence the perception of whether a substation and/or power line is a visual impact. Where industrial-type built-form exists, (such as renewable energy facilities, roads, railways and other power lines and substations), the visual environment could be considered to be "degraded" and thus the introduction of a new power line and substation into this setting may be considered to be less of a visual impact than if there was no existing built infrastructure visible.

Other factors, as listed below, can also impact the nature and intensity of a potential visual impact associated with a substation and power line:

- The location of a substation and power line in the landform setting – i.e. in a valley bottom or on a ridge top. In the latter example the substation and/or power line would be much more visible and would "break" the horizon;
- The presence of macro- or micro-topographical features, such as buildings or vegetation that would screen views of the substation and power line from a receptor location;
- The presence of existing substations and power lines in the area and alignment in relation to these substations and power lines; and
- Temporary factors such as weather conditions (presence of haze, rainfall or heavy mist) which would affect visibility.

4 IMPACT ASSESSMENT

4.1 Visual Compatibility / Contrast

The visual compatibility of the proposed development refers to the degree to which the development would be congruent with the surrounding environment. It is based on whether or not the development would be in conformity with the land use, settlement density, structural scale, form and pattern of elements that define the structure of the surrounding landscape. Visual compatibility is an important factor to be considered when assessing the impact of the development within a specific context. A development that is incongruent with the surrounding area may change the character of the landscape and could have a significant visual impact on key scenic views within the study area. Where a development corresponds with the surrounding environment the development would be easily absorbed by the surrounding environment and would result in little or no change in the visual character of the area.

As previously mentioned, the proposed development includes the construction of a 132kV on-site substation (namely the !Xha Boom Substation), a 132kV Linking Substation and a 132kV power line and associated infrastructure which required to feed electricity generated by the proposed !Xha Boom Wind Farm (part of separate on-going EIA process) into the national grid. In general, the proposed development would not be consistent with the prevailing pastoral land use within the surrounding area. However, the existing anthropogenic elements in parts of the study area are expected to lessen the degree to which the proposed development would be considered incongruent with the surrounding landscape. As mentioned above, the presence of other built-form such as roads, railways, high voltage power lines and substations would influence the degree to which a new power line and substation would visually contrast with the elements already present within the landscape. Where existing electrical infrastructure is present the visual environment would already be visually 'degraded' and thus the introduction of a new power line or substation in this setting would result in less visual contrast than if no existing built infrastructure were visible.

The existing electrical infrastructure and industrial form within the study area, includes several high voltage power lines, the Helios MTS, road and rail infrastructure as well as some scattered small-scale quarrying activities. In addition, the Khobab and Loeriesfontein Wind Farms are presently under construction in this area, each these facilities comprising some 61 wind turbines with associated substations, ancillary buildings and internal roads. It should also be noted that the on-site Khobab IPP substation has already been constructed in this area, while the construction camp area for the Khobab Wind Farm is also situated within this area, within close proximity to the Helios Substation. These elements have already degraded the natural environment to some extent and will significantly reduce the visual impact as the proposed development would be in conformity with these elements. It is also important to note that the substations and power line are being proposed to serve the proposed !Xha Boom Wind Farm and as such the substation and power line would only be constructed if this Wind Farm is developed. The proposed development would therefore be dwarfed by the large number of wind turbines, thus significantly reducing the likely visual contrast of the proposed substations and power line.

Several other renewable energy facilities are proposed to be constructed within close proximity to the proposed development and could significantly alter the visual baseline within the study area, further reducing the visual contrast of the proposed power line and substations, if constructed. This is discussed further in **Section 4.3** below.

4.2 Receptor Impact Rating

In order to assess the potential visual impact of the proposed development on the sensitive / potentially sensitive receptor locations listed above, a matrix has been developed (**Table 3**), and is applied to each receptor location.

The matrix has been based on a number of factors as listed below:

- Distance of receptor location away from the proposed development (zones of visual impact);
- Presence of potential screening factors (topography, vegetation etc.); and
- Visual contrast of the development with the landscape pattern and form.

These factors are considered to be the most important factors when assessing the visual impact of a proposed development on a sensitive / potentially sensitive receptor location in this context. It should be noted that this rating matrix is a relatively simplified way to assign a likely representative visual impact, which allows a number of factors to be considered. Experiencing of visual impacts is however a complex and qualitative phenomenon, and thus difficult to quantify accurately. The matrix should therefore be seen as a representation of the likely visual impact at a receptor location. Part of its limitation lies in the quantitative assessment of what is largely a qualitative or subjective impact.

Table 3: Visual assessment matrix used to rate the impact of the proposed development on sensitive / potentially sensitive visual receptors

	VISUAL IMPACT RATING			
VISUAL FACTOR	**HIGH**	**MODERATE**	**LOW**	**OVERRIDING FACTOR: NIL**
Distance of receptor away from proposed development	0 < 500m **Score: 3**	500m < 2km **Score: 2**	2km < 5km **Score: 1**	5km <
Presence of screening factors	Limited or no screening factors – development highly visible **Score: 3**	Screening factors likely to partially obscure the development **Score: 2**	Screening factors likely to obscure most of the development **Score: 1**	Screening factors completely block any views towards the development, i.e. the development is not within the viewshed
Zone of Visual Contrast	**High:** The development would contrast highly with the typical land use and/or pattern and form of human elements (infrastructural form). Typically a natural / pastoral environment with low-density rural infrastructure present (low voltage power lines and farm boundary fences). **Score: 3**	**Moderate:** The development would contrast moderately with the typical land use and/or pattern and form of human elements (infrastructural form) and existing level of visual transformation. Typically areas within close proximity to other prominent infrastructure (high voltage power lines and railway lines) and within intensive agricultural lands / cultivated fields. **Score: 2**	**Low:** The development would correspond with the typical land use and/or pattern and form of human elements (infrastructural form) and existing level of visual transformation. Presence of urban form and industrial-type infrastructure. The area is not highly valued or sensitive to change (e.g. the outskirts of urban and built-up areas). **Score: 1**	

4.2.1 Distance

As described above, distance of the viewer / receptor location away from the development is an important factor in the context of experiencing of visual impacts. A higher impact rating has thus been assigned to receptor locations that are located closer to proposed development. Beyond 5km, the visual impact would be virtually nil, as the development would appear to merge with the elements on the horizon.

The radii chosen to assign the zones of visual impact are as follows:

- 0 < 500m (high impact zone);
- 500m < 2km (moderate impact zone);
- 2km < 5km (low impact zone); and
- >5km (Negligibly low impact zone)

4.2.2 Screening factors

The presence of screening factors is as important in this context as the distance away from the development. Screening factors can be vegetation, buildings and topography. For example, a grove of trees located between a receptor location and an object could completely shield the object from the receptor location. Topography (relative elevation and aspect) plays a similar role as a receptor location in a deep or incised valley will have a very limited viewshed and may not be able to view an object that is in close proximity, but not in its viewshed. As such, the complete screening of the development has also been assigned an overriding nil impact rating, as the development would not impose any impact on the receptor.

4.2.3 Zones of visual contrast

The degree to which the proposed development would appear to contrast with the surrounding land use, settlement density, forms and patterns of elements that define the structure of the surrounding landscape is also considered in the matrix. Visual contrast is an important factor to be considered when assessing the impact of the proposed development from a specific location, as a development that appears to contrast with the visual backdrop may change the visual character of that landscape. This could have a significant visual impact on potentially sensitive visual receptors within the study area.

Land use and visual character in the surrounding landscape was assessed to determine the level of transformation and the degree to which the proposed development would appear to be visually

compatible with the surrounding environment when viewed from a particular location. In the context of this proposed development, the presence or absence of existing electrical infrastructure, dense settlement or other urban built-up form were important factors influencing the level of visual contrast. For example, if the development was located adjacent to an existing substation or power line it would result in significantly less visual contrast. The development site was therefore classified into the following zones of visual contrast:

- **High –** undeveloped / natural / rural areas;
- **Moderate –**
    - within 500m of existing power lines and Helios Substation;
    - within 500m of rail infrastructure, and
    - between 1.5 - 3km from existing windfarms;
- **Low –** within 1.5km of Khobab and Loeriesfontein Wind Farms.

The outcome of the visual contrast classification in relation to the sensitive / potentially sensitive visual receptor locations is provided in **Figure 27** below.

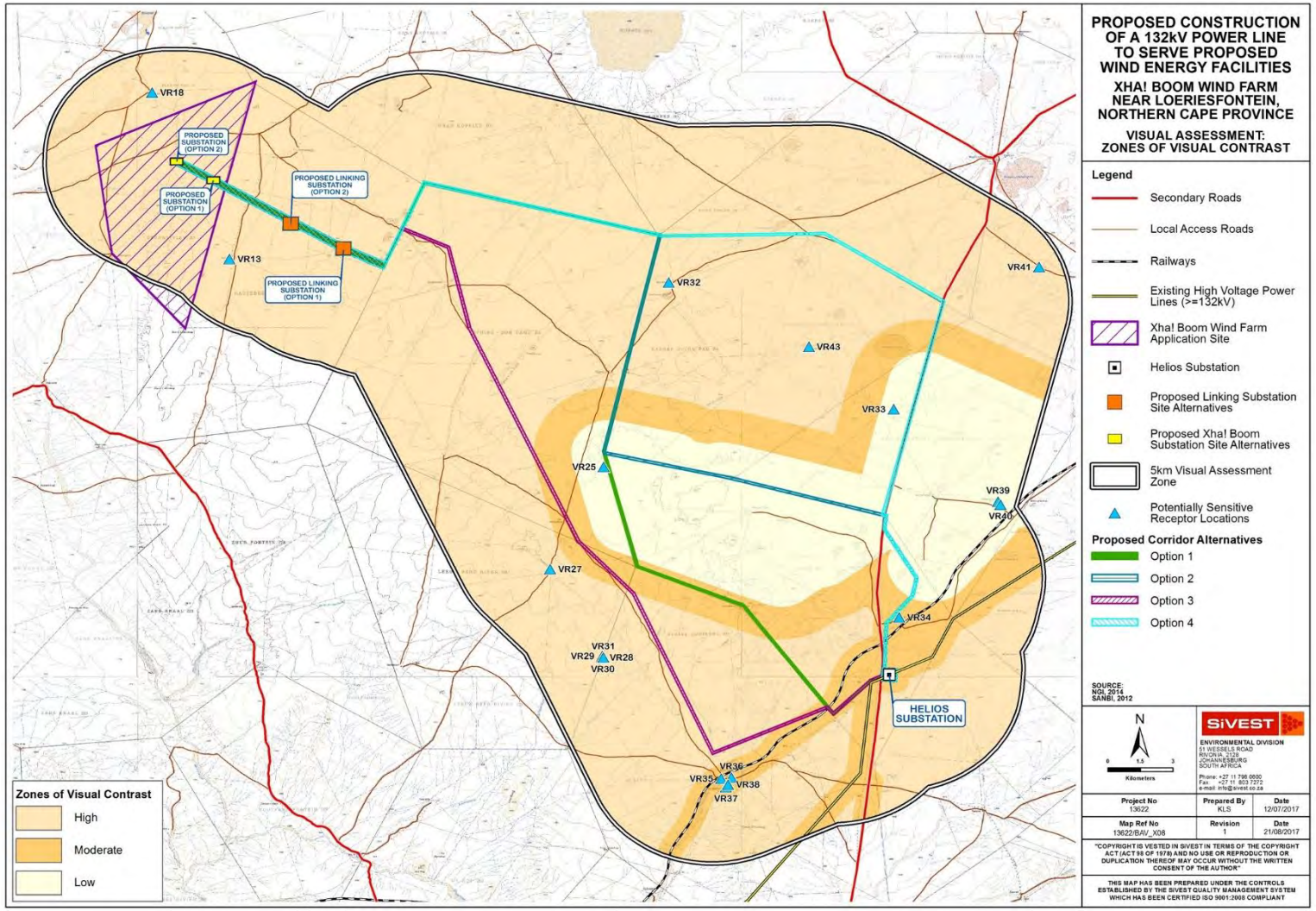

Figure 27: Zones of Visual Contrast

Table 4 below presents the results of the visual impact matrix

Categories of impact:

Rating	Overall Score
High Visual Impact	8-9
Moderate Visual Impact	5-7
Low Visual Impact	3-4
Negligible Visual Impact	(overriding factor)

Table 4: Visual impact of the proposed development on sensitive / potentially sensitive visual receptors within the study area

Receptor Location	Distance	Screening	Contrast	OVERALL IMPACT RATING
VR13	Low (1)	High (3)	High (3)	**MODERATE**
VR18	Low (1)	High (3)	High (3)	**MODERATE**
VR25	High (3)	High (3)	Low (1)	**MODERATE**
VR27	Moderate (2)	High (3)	High (3)	**HIGH**
VR28	Low (1)	High (3)	High (3)	**MODERATE**
VR29	Low (1)	High (3)	High (3)	**MODERATE**
VR30	Low (1)	High (3)	High (3)	**MODERATE**
VR31	Low (1)	High (3)	High (3)	**MODERATE**
VR32	Moderate (2)	High (3)	High (3)	**HIGH**
VR33	Moderate (2)	High (3)	Low (1)	**MODERATE**
VR34	High (3)	High (3)	Moderate (2)	**HIGH**
VR35	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR36	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR37	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR38	Moderate (2)	Moderate (2)	Moderate (2)	**MODERATE**
VR39	Low (1)	Moderate (2)	Low (1)	**LOW**
VR40	Low (1)	Moderate (2)	Low (1)	**LOW**
VR41	Low (1)	Moderate (2)	High (3)	**MODERATE**
VR43	Low (1)	High (3)	High (3)	**MODERATE**

As previously mentioned, a few of the farmsteads / homesteads identified via desktop means were excluded as potentially sensitive receptor locations for the purposes of this study as during the time of the site visit it appeared as if these were uninhabited and/or abandoned. No further assessment was undertaken from these farmsteads / homesteads as it was assumed that no individuals currently live in these farmsteads / homesteads and therefore no visual impact will be experienced from these locations. In addition, it was not possible to verify the status of all the identified potentially sensitive receptor locations. As such it is possible that some of the structures identified by desktop means may not, in reality, be potentially sensitive receptors. Although the use of these farmsteads / residential dwellings could not be established during the field investigation, they were still regarded as being potentially sensitive to the visual impacts associated with the proposed development and were assessed as part of the VIA. In light of the above, the impact rating

assessment of the proposed development on the potentially sensitive visual receptor locations was undertaken primarily via desktop means.

As indicated above, the proposed development would result in a moderate visual impact on all but five (5) of the potentially sensitive visual receptor locations within the study area (14 in total). It is important to note that the proposed development would result in a high visual impact on three (3) of the potentially sensitive receptor locations identified within the study area, namely VR 27, VR 32 and VR 34. In addition, the proposed development would result in a low visual impact on two (2) of the potentially sensitive receptor locations identified within the study area, namely VR 39 and VR 40.

4.3 Cumulative Visual Impact

Although it is important to assess the visual impacts of the proposed development itself, it is equally important to assess the cumulative visual impact that could materialise in the area should other large scale developments and in particular renewable energy facilities (both wind and solar) be granted environmental authorisation to proceed and are ultimately constructed. Cumulative impacts are the impacts from different developments / facilities which may, in combination, result in significant impacts that may be larger than the sum of all the impacts combined.

The renewable energy developments that are being proposed in the surrounding area, are specified in **Table 5** and **Figure 28** below.

Table 5: Renewable energy developments planned in close proximity to the proposed power line and substations

Development	Current status of EIA/development	Proponent	Capacity	Farm details
Dwarsrug Wind Farm	Environmental Authorisation issued	Mainstream Renewable Power	140MW	Remainder of Brak Pan No 212
Khobab Wind Farm	Under Construction	Mainstream Renewable Power	140MW	Portion 2 of the Farm Sous No 226
Loeriesfontein 2 Wind Farm	Under Construction	Mainstream Renewable Power	140MW	Portions 1& 2 of Aan de Karree Doorn Pan No 213
Graskoppies Wind Farm	EIA ongoing	Mainstream Renewable Power	235MW	Portion 2 of the Farm Graskoppies No 176 & Portion 1 of the Farm Hartebeest Leegte No 216
Hartebeest Leegte Wind Farm	EIA ongoing	Mainstream Renewable Power	235MW	Remainder of Hartebeest Leegte No 216

Ithemba Wind Farm	EIA ongoing	Mainstream Renewable Power	235MW	Portion 2 of Graskoppies No 176 & Portion 1 of Hartebeest Leegte No 216
Loeriesfontein PV3 Solar Energy Facility	Environmental Authorisation issued	Mainstream Renewable Power	100MW	Portion 2 of Aan de Karree Doorn Pan No 213
Hantam PV Solar Energy Facility	Environmental Authorisation issued	Solar Capital (Pty) Ltd	Up to 525MW	Remainder of Narosies No 228
PV Solar Energy Facility	Environmental Authorisation issued	Mainstream Renewable Power	100MW	Portion 2 of the Farm Aan de Karree Doorn Pan 213
PV Solar Power Plant	Environmental Authorisation issued	BioTherm Energy	70MW	Portion 5 of Kleine Rooiberg No 227
Kokerboom 1 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	240MW	Remainder of the Farm Leeuwbergrivier No. 1163 & Remainder of the Farm Kleine Rooiberg No. 227
Kokerboom 2 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	240MW	Remainder of the Farm Leeuwbergrivier No. 1163 & Remainder of the Farm Kleine Rooiberg No. 227
Kokerboom 3 Wind Farm	Environmental Impact Assessment (EIA) underway	Business Venture Investments No. 1788 (Pty) Ltd (BVI)	240MW	▪ Remainder of the Farm Aan De Karree Doorn Pan No. 213; ▪ Portion 1 of the Farm Karree Doorn Pan No. 214; and ▪ Portion 2 of the Farm Karree Doorn Pan No. 214.
Wind Farm	Environmental Authorisation issued,	Mainstream Renewable Power	50MW	Portion 1 of the Farm Aan de Karree Doorn Pan 213

	however the project is no longer active.			

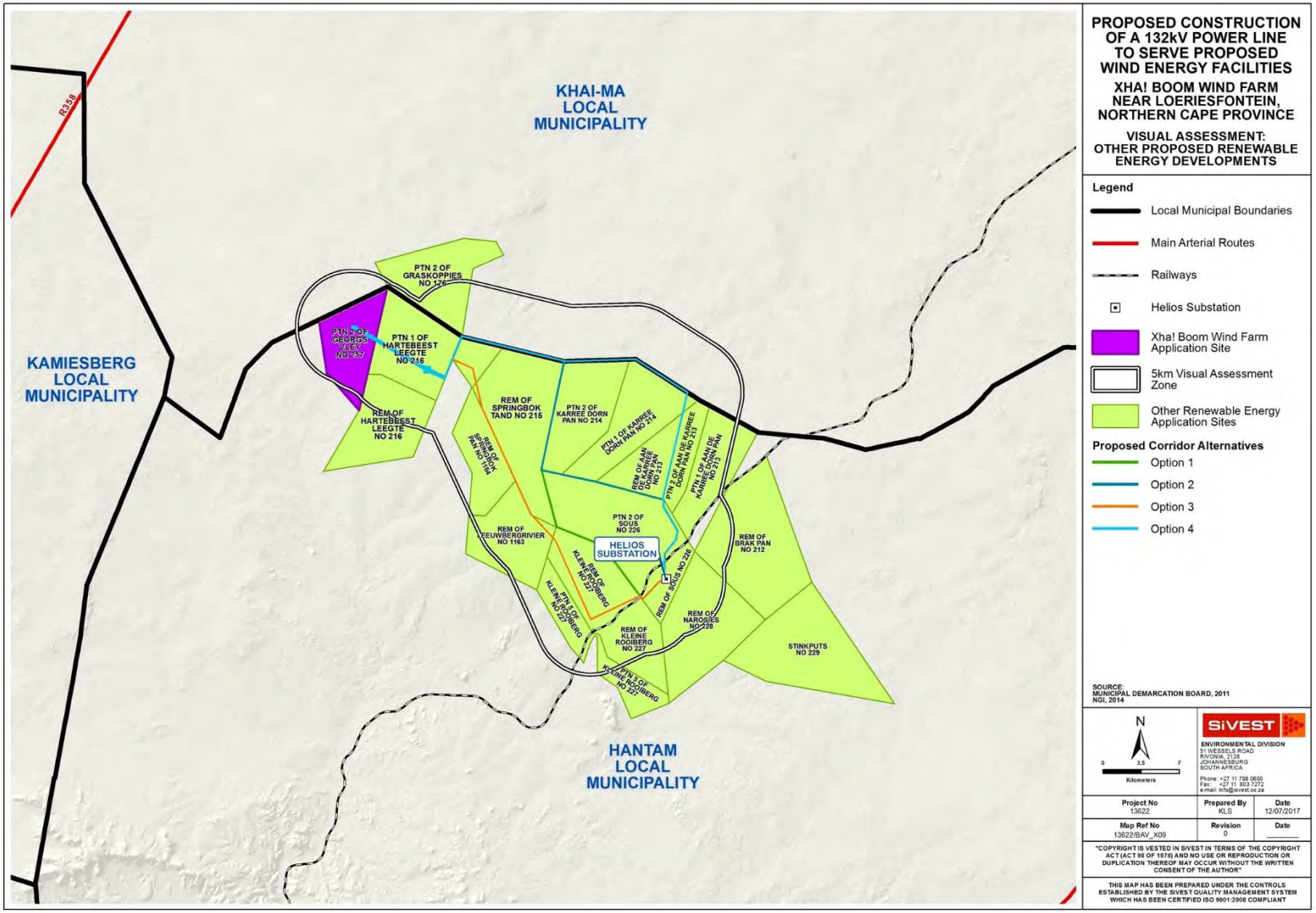

Figure 28: Renewable energy development application sites in close proximity to the study area.

These renewable energy developments and their potential for large scale visual impacts could significantly alter the sense of place and visual character within the study area, once constructed. The cumulative visual impact experienced from each potentially sensitive visual receptor location will depend on the number of proposed renewable energy developments and their associated electrical infrastructure within viewing distance of the receptors. As mentioned above, the height of the development in combination with distance from the receptor are critical factors when assessing visual impacts. As such, solar energy facilities are unlikely to result in visual impacts beyond 5km, while wind energy facilities are unlikely to result in visual impacts beyond 8km and as such the degree of visual impact on receptors beyond these distances would be considered to be insignificant. On this basis, renewable energy developments constructed on all of the above mentioned sites, except for the farm Stinkputs No 229 which accommodates a portion of the Dwarsrug Wind Farm, will be within viewing distance of most of the potentially sensitive receptor locations identified within the study area. However, it is envisaged that the biggest cumulative impact would be the change in the visual character within the study area due to the presence of these large scale industrial-type developments. These facilities will therefore significantly alter the visual baseline within the study area, thereby reducing the visual impact of the proposed power line on the surrounding potentially sensitive receptor locations. The impact of the proposed power line would therefore be outweighed by the impact of the other renewable energy developments being proposed and/or constructed in the surrounding area.

4.4 Night-Time Impacts

The visual impact of lighting on the nightscape is largely dependent on the amount of existing light present in the surrounding area at night. The night scene in areas where there are numerous light sources will be visually degraded by the existing light pollution and therefore additional light sources are unlikely have a significant impact on the nightscape. In contrast, introducing light sources into a relatively dark night sky will impact on the visual quality of the area at night. It is thus important to identify a night-time visual baseline before exploring the potential visual impact of the proposed development.

Much of the study area is uninhabited and as a result, relatively few light sources are present. At night, the study area is characterised by a picturesque dark starry sky and the visual character of the night environment is considered to be mostly ‘unpolluted’ and pristine. The town of Loeriesfontein is also too far away to have an impact on the night scene. It must however be noted that security lighting at the Helios Substation and at the site offices for the Khobab and Loeriesfontein Wind Farms are prominent light sources in the study area. Additional impacts on the night scene are expected to emanate from the substations and ancillary buildings at these Wind Farms once constructed as they will also require lighting for security and operational reasons. Other prominent light sources within the study area at night are largely restricted to isolated lighting from

the surrounding farmsteads and residential dwellings, as well as transient light from passing cars travelling along the Granaatboskolk Road.

Operational and security lighting at night will be required for the proposed on-site !Xha Boom Substation as well the proposed Linking Substation. The type and intensity of lighting required was unknown at the time of writing this report and therefore this assessment of the potential night-time impact of the development is based on the general effect that additional light sources will have on the ambient nightscape.

Although the area is not generally renowned as a tourist destination, the natural dark character of the nightscape will be sensitive to the impact of additional lighting at night, particularly from nearby farmhouses. The operational and security lighting required for the proposed development is likely to intrude on the nightscape and create glare, which will contrast with the extremely dark backdrop of the surrounding area. Existing night time views from sensitive / potentially sensitive receptors are characteristic of a relatively dark night scene with some visible light sources, these including Helios Substation and security lighting associated with Khobab and Loeriesfontein Wind Farms.

As a result, lighting impacts from the proposed on-site !Xha Boom Substation and the proposed Linking Substation will marginally increase the existing light pollution in the surrounding area. It should also be noted that the substation and power line will only be constructed if the proposed !Xha Boom Wind Farm (part of a separate on-going EIA process) is developed as well. Operational and security lighting at night will be required for the wind farm in addition to permanent aviation lights or red aircraft warning lights on the top of each wind turbine, creating a network of red lights in the dark night-time sky. The lighting impacts from the proposed on-site !Xha Boom Substation and the proposed Linking Substation would therefore be dwarfed by the glare and contrast of the lights associated with the wind farm. As such, the substations are not expected to result in significant lighting impacts.

4.5 Visual Impact Summary

4.5.1 Access Roads

As previously mentioned, there are no main or arterial roads in close enough proximity to the proposed development. The study area is however traversed by a secondary road, known locally as the Granaatboskolk Road, which links the town of Loeriesfontein with Granaatboskolk some 38kms north-east of the study area.

A network of gravel roads will be constructed to provide access to the proposed power line for maintenance work. Roads are typically only associated with significant visual impact if they traverse sloping ground on an aspect that is visible to the surrounding area. Considering the flat nature of the terrain on the site, it is likely that the visual impact associated with these roads would be limited

to the impact of clearing the vegetation. However, if these roads are not maintained correctly during the construction phase, construction vehicles travelling along the gravel access roads could expose surrounding farmstead to dust plumes.

4.5.2 Power Line

Power lines consist of a series of tall towers which make them highly visible. Power lines are not features of the natural environment, but are representative of anthropogenic transformation. Thus when placed in largely natural landscapes, they will be perceived to be highly incongruous in this setting. Conversely, the presence of other anthropogenic elements associated with the built environment, especially other power lines, may result in the visual environment being considered to be 'degraded' and thus the introduction of a new power line into this setting may be less of a visual impact than if there was no existing built infrastructure visible.

Power lines are anthropogenic elements that are not uncommon in the landscape, in both built-up and natural rural settings. The visual impact of a power line would largely be related to the physical characteristics of the area, land use and the spatial distribution of potential receptors. When combining this with the likely value judgements of visual receptors, the visual impact of the proposed power line can be determined. In areas, where the power line would contrast with the surrounding area it may change the visual character of the landscape and be perceived negatively by visual receptors.

As previously mentioned, four (4) power line corridor alternatives are being assessed, linking the proposed on-site !Xha Boom Substation, via the proposed Linking Substation, with Helios Substation some 35kms to the south east. All of the proposed power line corridor alternatives traverse parts of the study area which have remained largely natural. The south-eastern sector of the study area however has already been degraded / transformed to some degree by the presence of existing electrical infrastructure and industrial form, including high voltage power lines, Helios Substation and the Khobab and Loeriesfontein Wind Farms presently under construction.

A summary of the visual impact of the proposed power line corridor alternatives, in relation to the physical characteristics, land use, visual character, presence of visual receptors and existing power lines or other infrastructure in the surrounding landscape, is discussed in **Table 6** below. These factors have been investigated in order to determine the degree to which the proposed power line corridor would be visually compatible with the surrounding environment and to determine its overall visual impact.

Table 6: Visual impact summary of the proposed power line corridor alternatives in relation to surrounding environment

Physical and Land Use Characteristics	Visual Character	Visual Contrast	Presence of Visual Receptors	Overall Visual Impact
Topography: The proposed power line is expected to be visible from much of the study area due to the largely flat terrain and wide-ranging vistas in the study area. The localised hills / koppies in parts of the study area would offer some localized visual screening, however the topographical undulations would offer minimal visual screening. **Vegetation:** The natural short shrub-like vegetation cover which dominates most of the study area results in wide-ranging vistas across most of the study area. Parts of the study area are however characterised by tree species (both naturally occurring and artificial) which are expected provide localised screening from the proposed development.	Most of the study area is considered to have a natural (almost vacant) visual character resulting from minimal human habitation and associated infrastructure. The predominant land use (sheep farming) has not transformed the natural landscape and thus the natural rural character has been retained across much of the study area. There are however some pastoral elements in the area which are expected to give the surrounding area a more pastoral feel. Typical anthropogenic elements and built infrastructure in the rural parts of the study area include isolated farmhouses, gravel access roads, boundary fences and telephone poles. The visual	The area is largely natural or rural / pastoral in character and the prevailing land use (i.e. sheep farming) has retained the natural vegetation across much of the study area. As such the development would not be consistent with the prevailing pastoral land use within the surrounding area. However, the existing anthropogenic elements in parts of the study area are expected to lessen the degree to which the proposed development would be considered incongruent with the surrounding landscape. The presence of road and rail infrastructure in the south-eastern parts of the study area introduces distinct linear elements into the landscape. In this setting,	Approximately nineteen (19) potentially sensitive visual receptors were identified within viewing distance (5km) of the power line corridor. All of these are believed to be scattered farmsteads / homesteads / residential dwellings. It must be noted that only two (2) of the potentially sensitive visual receptors identified are located within the 'High' Visual Exposure zone (i.e. within 500m of the nearest proposed power line corridor alternative). Seven (7) potentially sensitive receptors are located in the 'Moderate' Visual Exposure zone (i.e. between 500m and 2km of the nearest power line corridor alternative) while the remaining ten (10) receptors are located more than 2km	Due to the fact that most of the visual receptors identified are located in either Moderate or Low zones of visual exposure, distance from the proposed power line corridors, and the presence of existing anthropogenic elements (such as the road and rail infrastructure, Helios Substation and associated high voltage power lines and Khobab and Loeriesfontein Wind Farms), the visual impact resulting from the proposed power line is rated as moderate. Refer to **Section 4.6** for the overall visual impact rating.

Land use: Much of the assessment area is characterised by natural unimproved vegetation with sheep farming being the dominant activity. A major portion of the study area is very sparsely populated, with relatively little human-related infrastructure in evidence. The southern sections of the study area are however characterised by greater human influence in the form of rail and electrical infrastructure as well as the Khobab and Loeriesfontein Wind Farms presently under construction. These anthropogenic elements are expected to alter the visual character of the study area and as such the visual contrast of the proposed power line would be reduced in these degraded areas.	character is more transformed in the southern and south-eastern parts of the study area due to the presence of the Granaatboskolk Road, rail infrastructure, Helios Substation and associated high voltage power lines. In addition, significant transformation is occurring in the south-eastern section of the study area with the construction of the Khobab and Loeriesfontein Wind Farms.	the development of a new power line would contrast only moderately with the surrounding environment. It is also important to note that the south-eastern sections of the study area are characterised by greater human influence in the form of Helios Substation with associated high voltage power lines and the Khobab and Loeriesfontein Wind Farms presently under construction. These anthropogenic elements are expected to alter the visual character of the study area thus reducing the visual contrast of the proposed development.	from the nearest corridor alternative.	

4.5.3 On-site Substations

Two (2) new substations are proposed in conjunction with the 132kV power line development, namely the 33/132kV on-site IPP substation (!Xha Boom Substation) and a Linking Substation. The proposed !Xha Boom substation, located at the western-most end of the power line corridor, will serve to transform or 'step-up' the voltage of electricity generated by the proposed !Xha Boom Wind Farm to feed into the National Grid. The proposed Linking Substation will be located south-east of the proposed !Xha Boom Substation within the power line assessment corridor.

In isolation, the proposed substations may be considered to be visually intrusive, but as these substations are intended to serve the proposed !Xha Boom Wind Farm (part of a separate on-going EIA process), they would only be constructed in conjunction with the proposed wind farm development. When viewed from the surrounding area, the substations would likely form part of the wind farm complex and would therefore be dwarfed by the large number of wind turbines comprising the wind farm. As such, the substations are not expected to be associated with a significant visual impact, or even a measurable cumulative impact.

4.6 Overall Visual Impact Rating

The BA requires that an overall rating for visual impact be provided to allow the visual impact to be assessed alongside other environmental parameters. SiVEST has developed an impact rating matrix for this purpose. The tables below present the impact matrix for visual impacts associated with the proposed construction and operation of the 33/132kV on-site !Xha Boom Substation, the Linking Substation and the 132kV power line with associated infrastructure.

Please refer to **Appendix A** below for an explanation of the impact rating methodology.

4.6.1 Planning

No visual impacts are expected during planning.

4.6.2 Construction

Table 7: Rating of visual impacts of the proposed !Xha Boom Substation, Linking Substation and 132kV power line (including associated infrastructure) during construction

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	Large construction vehicles and equipment during the construction phase will alter the natural character of the study area and expose visual receptors to visual impacts associated with the construction phase. The construction activities may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. A network of gravel access roads will be required in order to provide access to the proposed power line and substation sites. Considering the largely flat nature of the terrain in the study area, it is likely that the visual impact associated with these roads would be limited to the impact resulting from the clearing of vegetation. However, if these roads are not maintained correctly during the construction phase, maintenance vehicles travelling along these roads could increase dust emissions and create dust plumes. The increased traffic on the gravel roads and the dust plumes could therefore also create a visual impact and may evoke negative sentiments from surrounding viewers. It should however be noted that the existing roads which can be found around the project site are also gravel. As such, the proposed gravel access roads are not expected to internally contribute to the overall visual impact from the proposed development. The visual intrusion of the construction activities associated with the proposed substations and power line could adversely affect farmsteads / homesteads within the visual assessment zone. Surface disturbance during construction would also expose bare soil which could visually contrast with the surrounding environment. Additionally, the temporary stockpiling of soil during construction may alter the generally flat landscape and wind blowing over these disturbed areas could result in dust which would have a visual impact. Vegetation clearance required for the construction of the proposed substations is expected to increase dust emissions and alter the natural character of the surrounding area, thus creating a visual impact.
Extent	Local / District (2)

Probability	Probable (3)	
Reversibility	Completely reversible (1)	
Irreplaceable loss of resources	Marginal loss (2)	
Duration	Short term (1)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Low negative impact **After mitigation measures:** Low negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	3	2
Reversibility	1	1
Irreplaceable loss	2	1
Duration	1	1
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-24 (negative low)	-20 (negative low)
Mitigation measures	▪ Carefully plan to reduce the construction period. ▪ Minimise vegetation clearing and rehabilitate cleared areas as soon as possible. ▪ Vegetation clearing should take place in a phased manner. ▪ Maintain a neat construction site by removing rubble and waste materials regularly. ▪ Make use of existing gravel access roads where possible. ▪ Limit the number of vehicles and trucks travelling to and from the proposed site, where possible. ▪ If dust plumes become an issue, dust suppression techniques must be implemented on gravel access roads utilised during construction, where possible. ▪ If dust plumes become an issue, dust suppression must be implemented in all areas where vegetation clearing has taken place. ▪ Ensure that dust suppression techniques are implemented on all soil stockpiles.	

	▪ Select the power line and substation site alternatives that will have the least impact on visual receptors. ▪ Establish erosion control measures on areas which will be exposed for long periods of time. This is to reduce the potential impact heavy rains may have on the bare soil.

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

4.6.3 Operation

Table 8: Rating of visual impacts of the proposed !Xha Boom Substation, Linking Substation and 132kV power line (including associated infrastructure) during operation

IMPACT TABLE	
Environmental Parameter	Visual Impact
Issue/Impact/Environmental Effect/Nature	The proposed on-site !Xha Boom Substation, Linking Substation and 132kV power line could exert a visual impact by altering the visual character of the surrounding area and exposing sensitive visual receptor locations to visual impacts. The development may be perceived as an unwelcome visual intrusion, particularly in more natural undisturbed settings. This is especially true for the power line towers, which are tall structures and will most likely be visible for greater distances. However, where existing power lines are present the visual environment would already be visually 'degraded' and thus the introduction of a new power line in this setting may be considered to be less of a visual impact than if no existing built infrastructure were visible. A network of gravel access roads will be required in order to provide access to the proposed power line and to the substations. Considering the largely flat nature of the terrain within the study area, it is likely that the visual impact associated with these roads would be limited to the impact resulting from the clearing of vegetation. However, if these roads are not maintained correctly, vehicles travelling along the gravel access roads could increase dust emissions and create dust plumes. The increased traffic on the gravel roads and the dust plumes could create a visual impact and may evoke negative sentiments from surrounding viewers. . It should however

	be noted that the existing roads which can be found around the project site are also gravel. As such, the proposed gravel access roads are not expected to internally contribute to the overall visual impact from the proposed development. Security and operational lighting at the proposed substations could result in light pollution and glare, which could be an annoyance to surrounding viewers. The visual intrusion of the proposed !Xha Boom Substation, the Linking Substation and the 132kV power line could also adversely affect farmsteads / homesteads within the visual assessment zone.	
Extent	Local/district (2)	
Probability	Definite (4)	
Reversibility	Barely reversible (3)	
Irreplaceable loss of resources	Marginal (2)	
Duration	Long term (3)	
Cumulative effect	Medium cumulative effects (3)	
Intensity/magnitude	Medium (2)	
Significance Rating	**Prior to mitigation measures:** Medium negative impact **After mitigation measures:** Medium negative impact	
	Pre-mitigation impact rating	Post mitigation impact rating
Extent	2	2
Probability	4	4
Reversibility	3	3
Irreplaceable loss	2	2
Duration	3	3
Cumulative effect	3	3
Intensity/magnitude	2	2
Significance rating	-34 (negative medium)	-34 (negative medium)
Mitigation measures	▪ Light fittings for security at night should reflect the light toward the ground and prevent light spill. ▪ Where possible, limit the amount of security and operational lighting present at the on-site substation. ▪ Where possible, limit the number of maintenance vehicles using access roads.	

	▪ Ensure that dust suppression techniques are implemented on gravel access roads utilised during operation, where possible. ▪ Non-reflective surfaces should be utilised where possible.

** Please note in the context of the visual environment 'resources' are defined as scenic / natural views that are almost impossible to replace.*

4.6.4 Decommissioning

Visual impacts during the decommissioning phase are potentially similar to those during the construction phase.

5 COMPARATIVE ASSESSMENT OF ALTERNATIVES

As previously mentioned, four (4) power line corridor alternatives (Options 1-4) are being investigated in order to provide grid access via Helios Substation. In addition, two (2) on-site substation site alternatives, and two (2) linking substation site alternatives are being investigated at this stage, namely !Xha Boom Substation Options 1 and 2, Linking Substation Options 1 and 2.

The preference rating for each alternative is provided in **Table 9** below. The alternatives are rated as follows as preferred, not-preferred, favourable or no-preference.

The degree of visual impact and rating has been determined based on the following factors:

- The location of the power line or on-site substation site in relation to areas of high elevation, especially ridges, koppies or hills;
- The location of the power line or on-site substation site in relation to sensitive receptor locations; and
- The location of the power line or on-site substation site in relation to areas of natural bushveld vegetation (clearing site for the development worsens the visibility).

Key

PREFERRED	The alternative will result in a low impact / reduce the impact
FAVOURABLE	The impact will be relatively insignificant
NOT PREFERRED	The alternative will result in a high impact / increase the impact
NO PREFERENCE	The alternative will result in equal impacts

Table 9: Comparative Assessment of Alternatives

Alternative	Preference	Reasons (incl. potential issues)
SUBSTATION ALTERNATIVES		
!Xha Boom Substation Option 1	Favourable	Two (2) potentially sensitive visual receptors can be found within 5km of !Xha Boom Substation Option 1, these being VR 13 and VR 18. Both of these receptors are more than 3kms from the substation site and therefore in the low impact zone. There is no notable preference between the two (2) options and both are considered to be favourable. In addition, the proposed substation would form part of the proposed !Xha Boom Wind Farm and would be dwarfed by the large number of wind turbines that would be visible.
!Xha Boom Substation Option 2	Favourable	Two (2) potentially sensitive visual receptors are located within 5kms of !Xha Boom Substation Option 2, these being VR 13 and VR 18. Both of these receptors are more than 3kms from the substation site and therefore in the low impact zone. There is however no notable preference between the two (2) options and both are considered to be favourable. In addition, the proposed substation would form part of the proposed !Xha Boom Wind Farm and would be dwarfed by the large number of wind turbines that would be visible.
LINKING SUBSTATION ALTERNATIVES		
Linking Substation Option 1	Favourable	There is only one (1) potentially sensitive visual receptor located within 5km of the proposed Linking

Alternative	Preference	Reasons (incl. potential issues)
		Substation Option 1, this being VR 13 which is approximately 4.2kms from the substation site and therefore in the low impact zone. Although Substation Option 1 is located further from the potentially sensitive receptor, there is no notable preference between the two (2) options and both are considered to be favourable.
Linking Substation Option 2	Favourable	As with Option 1, there is only one (1) potentially sensitive visual receptor located within 5km of the proposed Linking Substation Option 2, this being VR 13 which is approximately 2.5kms from the substation site and therefore in the low impact zone. Although Substation Option 2 is located closer to the potentially sensitive receptor, there is no notable preference between the two (2) options and both are considered to be favourable.
POWER LINE CORRIDOR ALTERNATIVES		
Power Line Corridor Option 1	Favourable	A total of eleven (11) potentially sensitive visual receptors are located within 5kms of Option 1. Of these, one (1) receptor is within 500m of the corridor (i.e. high impact zone), this being VR 25. One (1) receptor (namely VR 32) is also located in the moderate impact zone (between 500m and 2km) and the remaining nine (9) are located in the low impact zone (between 2km and 5km). It should be noted that VR 25 is relatively close to Khobab Wind

Alternative	Preference	Reasons (incl. potential issues)
		Farm and is thus located in an area already undergoing significant visual transformation. Much of the route alignment for Option 1 traverses areas which have remained largely natural, although a section of the route passes within 1km of the Khobab Wind Farm where the landscape is undergoing significant transformation. Visual impacts are likely to be negligible in these transformed areas, and although the development overall is expected to alter the character of the surrounding area to some degree, visual impact associated with this option is expected to be moderate. Option 1 is therefore considered favourable.
Power Line Corridor Option 2	Preferred	A total of eight (8) potentially sensitive visual receptors are located within 5kms of Power Line Corridor Option 2. Of these, one (1) receptor is within 500m of the corridor (i.e. high impact zone), this being VR 34. Two (2) receptors (namely VR 25 and VR 32) are located in the moderate impact zone (between 500m and 2km) and the remaining five (5) are located in the low impact zone (between 2km and 5km. Although Option 2 traverses some areas which have remained largely natural, much of the route alignment passes through areas which are undergoing considerable visual transformation as a result of the development of the Khobab and

Alternative	Preference	Reasons (incl. potential issues)
		Loeriesfontein Wind Farms. As such, the visual impact associated with this option is expected to be negligible. As Option 2 has the least number of potentially sensitive receptors within 5kms of the corridor, this is considered to be the preferred option from a visual perspective.
Power Line Corridor Option 3	Not preferred	A total of thirteen (13) potentially sensitive visual receptors are located within 5kms of Power Line Corridor Option 3. None of these are located within 500m of the corridor. Five (5) receptors are however located in the moderate impact zone (between 500m and 2km) and the remaining eight (8) are located in the low impact zone (between 2km and 5km). Most of the route alignment for Option 3 traverses areas which have remained largely natural with few anthropogenic elements in evidence. As such, the development of a power line along this route alignment is expected to alter the character of the surrounding area to some degree and to have a significant visual impact in these untransformed parts of the study area. As such, Option 3 is not preferred from a visual point of view.
Power Line Corridor Option 4	Favourable	A total of nine (9) potentially sensitive visual receptors are located within 5kms of Power Line Corridor Option 4. Of these, one (1)

Alternative	Preference	Reasons (incl. potential issues)
		receptor is within 500m of the corridor (i.e. high impact zone), this being VR 34. One (1) (1) receptor (namely VR 33) is also located in the moderate impact zone (between 500m and 2km) and the remaining seven (7) are located in the low impact zone (between 2km and 5km). Although Option 4 traverses some areas which have remained largely natural, much of the route alignment passes through areas which are undergoing considerable visual transformation as a result of the development of the Khobab and Loeriesfontein Wind Farms with associated infrastructure. As such, the visual impact associated with this option is expected to be negligible. Option 4 is therefore considered favourable from a visual point of view.

6 CONCLUSIONS

The Visual Impact Assessment (VIA) conducted for the proposed development has demonstrated that much of the study area has a largely natural, untransformed visual character, although there are some pastoral elements in the area which are expected to give the surrounding area a more pastoral feel. Significant anthropogenic elements are however present, particularly in the south-eastern section of the study area where road and rail infrastructure, combined with the Helios Substation and associated high voltage power lines have altered the natural visual character of the surrounding area to some extent. Further transformation and landscape degradation is occurring in this sector of the study area as a result of the Khobab and Loeriesfonetin Wind Farms which are presently under construction. In addition, there are several renewable energy developments (solar and wind) proposed within the study area and, once constructed, these facilities and their associated infrastructure will significantly alter the visual character and baseline in the study area

resulting in a more industrial-type visual character. The proposed development is therefore not expected to have a significant visual impact within these above-mentioned parts of the study area.

Due to the dominant livestock (i.e. sheep) rearing practices and relatively limited human habitation in the surrounding area, no sensitive visual receptors (such as Guesthouses and other tourism facilities) were identified within the study area. A total of nineteen (19) scattered farmsteads / homesteads were however identified within the study area as potentially sensitive visual receptors due to their location in a largely rural setting as well as the fact that they are used to house the local farmers as well as their farm workers. Upon investigation it was established that the proposed substation and power line development would have a moderate visual impact on fourteen (14) of these receptors and a low visual impact on two (2) of these receptors. It should however be noted that the proposed development is expected to result in a high visual impact on three (3) of the potentially sensitive receptor locations identified within the study area, namely VR 27, VR 32 and VR 34.

It must be noted that the Granaatboskolk Road road (which traverses the visual assessment zone) is not considered to be a visually sensitive road as it does not form part of any scenic tourist routes and is not specifically valued or utilised for its scenic or tourism potential.

The overall significance of the visual impacts resulting from of the proposed development during construction and operation was assessed according to SiVEST's impact rating matrix in order to allow the visual impact to be assessed alongside other environmental parameters. The impact assessment revealed that overall the proposed development would have a low negative visual impact during construction and a medium negative visual impact during operation, with a number of mitigation measures available.

As part of the VIA, the proposed power line corridor alternatives and substation site alternatives were also comparatively assessed. The comparative assessment of alternatives revealed that both site alternatives for the proposed !Xha Boom Substation are favourable and there is no notable preference between the two (2) options from a visual perspective. Similarly, both site alternatives for the proposed Linking Substation are favourable and there is no preference for either site. With regard to the proposed power line corridor alternatives, the comparative assessment revealed that Power Line Corridor Option 2 would be the preferred option from a visual perspective, while Power Line Corridor Options 1 and 4 were deemed to be favourable. In addition, it was deemed that Power Line Corridor Option 3 is not preferred from a visual point of view.

Overall it can be concluded that the visual impact of the proposed development would be reduced due to the lack of sensitive visual receptors present. However, it is expected that the proposed development would alter the largely natural / scenic character of the study area and contrast moderately with the typical land use and/or pattern and form of human elements present. It should also be noted that several renewable energy developments (both wind and solar) are being proposed within close proximity to the proposed development. These renewable energy

developments would reduce the overall natural / scenic character of the study area, however they would increase the cumulative visual impacts, should some or all of these developments be granted environmental authorisation (EA) to proceed, receive a license and be constructed.

6.1 Visual Impact Statement

It is SiVEST's opinion that the visual impacts are not significant enough to prevent the project from proceeding and that an EA should be granted. It should be noted that no visually sensitive receptors with tourism significance have been identified within the study area. A total number of nineteen (19) potentially sensitive visual receptors were however identified. These included scattered farmsteads / homesteads which house the local farmers as well as their farm workers. These dwellings are regarded as potentially sensitive visual receptors as they are located within a mostly rural setting and the proposed development will likely alter natural vistas experienced from these dwellings. From a visual impact perspective, only three (3) of the potentially sensitive visual receptors (namely VR 27, VR 32 and VR 34) are expected to experience a high degree of visual impact from the proposed development. In addition, the proposed development is expected to alter the largely natural / scenic character of the study area and contrast significantly with the typical land use and/or pattern and form of human elements present as the study area is largely natural / scenic and untransformed. The existing anthropogenic elements already present in the study area have however already altered the natural character of the surrounding environment to a degree and are expected to lower the visual contrast of the proposed development with the surrounding area. SiVEST is therefore of the opinion that the visual impact associated with the construction and operation phases can be mitigated to acceptable levels provided the recommended mitigation measures are implemented.

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Appendix A

IMPACT RATING METHODOLOGY

IMPACT RATING METHODOLOGY

The determination of the effect of an environmental impact on an environmental parameter (in this instance, wetlands) is determined through a systematic analysis of the various components of the impact. This is undertaken using information that is available to the environmental practitioner through the process of the environmental impact assessment. The impact evaluation of predicted impacts was undertaken through an assessment of the significance of the impacts.

Determination of Significance of Impacts

Significance is determined through a synthesis of impact characteristics which include context and intensity of an impact. Context refers to the geographical scale (i.e. site, local, national or global) whereas intensity is defined by the severity of the impact (e.g. the magnitude of deviation from background conditions, the size of the area affected, the duration of the impact and the overall probability of occurrence). Significance is calculated as per the example shown in **Table 1**.

Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. The total number of points scored for each impact indicates the level of significance of the impact.

Impact Rating System Methodology

Impact assessments must take account of the nature, scale and duration of effects on the environment whether such effects are positive (beneficial) or negative (detrimental). Each issue / impact is usually assessed according to the project stages:

- planning
- construction
- operation
- decommissioning

In this case, a unique situation is present whereby various scenarios have been posed and evaluated accordingly. A brief discussion of the impact and the rationale behind the assessment of its significance has also been included.

Rating System Used To Classify Impacts

The rating system is applied to the potential impact on the receiving environment and includes an objective evaluation of the mitigation of the impact. Impacts have been consolidated into one rating. In assessing the significance of each issue, the following criteria (including an allocated point system) is used:

Table 1: Example of the significance impact rating table.

NATURE		
Includes a brief description of the impact of environmental parameter being assessed in the context of the project. This criterion includes a brief written statement of the environmental aspect being impacted upon by a particular action or activity.		
GEOGRAPHICAL EXTENT		
This is defined as the area over which the impact will be expressed. Typically, the severity and significance of an impact have different scales and as such bracketing ranges are often required. This is often useful during the detailed assessment of a project in terms of further defining the determined.		
1	Site	The impact will only affect the site
2	Local/district	Will affect the local area or district
3	Province/region	Will affect the entire province or region
4	International and National	Will affect the entire country
PROBABILITY		
This describes the chance of occurrence of an impact		
1	Unlikely	The chance of the impact occurring is extremely low (Less than a 25% chance of occurrence).
2	Possible	The impact may occur (Between a 25% to 50% chance of occurrence).
3	Probable	The impact will likely occur (Between a 50% to 75% chance of occurrence).
4	Definite	Impact will certainly occur (Greater than a 75% chance of occurrence).
REVERSIBILITY		
This describes the degree to which an impact on an environmental parameter can be successfully reversed upon completion of the proposed activity.		
1	Completely reversible	The impact is reversible with implementation of minor mitigation measures
2	Partly reversible	The impact is partly reversible but more intense mitigation measures are required.

3	Barely reversible	The impact is unlikely to be reversed even with intense mitigation measures.
4	Irreversible	The impact is irreversible and no mitigation measures exist.
IRREPLACEABLE LOSS OF RESOURCES		
This describes the degree to which resources will be irreplaceably lost as a result of a proposed activity.		
1	No loss of resource.	The impact will not result in the loss of any resources.
2	Marginal loss of resource	The impact will result in marginal loss of resources.
3	Significant loss of resources	The impact will result in significant loss of resources.
4	Complete loss of resources	The impact is result in a complete loss of all resources.
DURATION		
This describes the duration of the impacts on the environmental parameter. Duration indicates the lifetime of the impact as a result of the proposed activity		
1	Short term	The impact and its effects will either disappear with mitigation or will be mitigated through natural process in a span shorter than the construction phase (0 – 1 years), or the impact and its effects will last for the period of a relatively short construction period and a limited recovery time after construction, thereafter it will be entirely negated (0 – 2 years).
2	Medium term	The impact and its effects will continue or last for some time after the construction phase but will be mitigated by direct human action or by natural processes thereafter (2 – 10 years).
3	Long term	The impact and its effects will continue or last for the entire operational life of the development, but will be mitigated by direct human action or by natural processes thereafter (10 – 50 years).
4	Permanent	The only class of impact that will be non-transitory. Mitigation either by man or natural process will not occur in such a way or such a time span that the impact can be considered transient (Indefinite).
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts on the environmental parameter. A cumulative effect/impact is an effect which in itself may not be significant but may become significant if added to other existing or potential impacts emanating from other similar or diverse activities as a result of the project activity in question.		

1	Negligible Cumulative Impact	The impact would result in negligible to no cumulative effects
2	Low Cumulative Impact	The impact would result in insignificant cumulative effects
3	Medium Cumulative impact	The impact would result in minor cumulative effects
4	High Cumulative Impact	The impact would result in significant cumulative effects

INTENSITY / MAGNITUDE		
Describes the severity of an impact		
1	Low	Impact affects the quality, use and integrity of the system/component in a way that is barely perceptible.
2	Medium	Impact alters the quality, use and integrity of the system/component but system/ component still continues to function in a moderately modified way and maintains general integrity (some impact on integrity).
3	High	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component is severely impaired and may temporarily cease. High costs of rehabilitation and remediation.
4	Very high	Impact affects the continued viability of the system/component and the quality, use, integrity and functionality of the system or component permanently ceases and is irreversibly impaired (system collapse). Rehabilitation and remediation often impossible. If possible rehabilitation and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.

SIGNIFICANCE

Significance is determined through a synthesis of impact characteristics. Significance is an indication of the importance of the impact in terms of both physical extent and time scale, and therefore indicates the level of mitigation required. This describes the significance of the impact on the environmental parameter. The calculation of the significance of an impact uses the following formula:

(Extent + probability + reversibility + irreplaceability + duration + cumulative effect) x magnitude/intensity.

The summation of the different criteria will produce a non-weighted value. By multiplying this value with the magnitude/intensity, the resultant value acquires a weighted characteristic which can be measured and assigned a significance rating.		
Points	**Impact Significance Rating**	**Description**
6 to 28	Negative Low impact	The anticipated impact will have negligible negative effects and will require little to no mitigation.
6 to 28	Positive Low impact	The anticipated impact will have minor positive effects.
29 to 50	Negative Medium impact	The anticipated impact will have moderate negative effects and will require moderate mitigation measures.
29 to 50	Positive Medium impact	The anticipated impact will have moderate positive effects.
51 to 73	Negative High impact	The anticipated impact will have significant effects and will require significant mitigation measures to achieve an acceptable level of impact.
51 to 73	Positive High impact	The anticipated impact will have significant positive effects.
74 to 96	Negative Very high impact	The anticipated impact will have highly significant effects and are unlikely to be able to be mitigated adequately. These impacts could be considered "fatal flaws".
74 to 96	Positive Very high impact	The anticipated impact will have highly significant positive effects.

Appendix B

SPECIALIST CVs

CURRICULUM VITAE

Name	Andrea Gibb
Profession	Environmental Practitioner
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Environmental Practitioner and Visual Specialist: Environmental Division
Years with Firm	6 Years
Date of Birth	29 January 1985
ID Number	8501290020089
Nationality	South African

Education

Matriculated 2003, Full Academic Colours, Northcliff High School, Johannesburg, South Africa

Professional Qualifications

BSc (Hons) Environmental Management (University of South Africa 2008-2010)
Coursework**:** Project Management, Environmental Risk Assessment and Management, Ecological and Social Impact Assessment, Fundamentals of Environmental Science, Impact Mitigation and Management, Integrated Environmental Management Systems & Auditing, Integrated Environmental Management, Research Methodology.
Research Proposal**:** Golf Courses and the Environment

BSc Landscape Architecture (with distinction) (University of Pretoria 2004-2007)
Coursework: Core modules focused on; design, construction, environmental science, applied sustainability, shifts in world paradigms and ideologies, soil and plant science, environmental history, business law and project management.
Awards: Cave Klapwijk prize for highest average in all modules in the Landscape Architecture programme, ILASA book prize for the best Landscape Architecture student in third year design, Johan Barnard planting design prize for the highest distinction average in any module of plant science.

ArcGIS Desktop 1 (ESRI South Africa December 2010)
Environmental Impact Assessment (EIA) 2014 Legal Regime Workshop (Imbewu 2015)

Employment Record

Aug 2010 – to date	SiVEST SA (Pty) Ltd: Environmental Practitioner
Jan 2008 – July 2010	Cave Klapwijk and Associates: Environmental Assistant and Landscape Architectural Technologist
Feb 2006 – Dec 2006	Cave Klapwijk and Associates: Part time student

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Fluent	Fluent	Fluent

Key Experience

Specialising in the field of Environmental Management and Visual Assessment.

Andrea joined SiVEST in August 2010 and holds the position of Environmental Practitioner in the Johannesburg Office. She has 8.5 years' work experience and specialises in managing large scale multifaceted EIAs and Basic Assessment (BAs), primarily related to renewable energy generation and electrical distribution. She also specialises in undertaking visual impact and landscape assessments. She has extensive experience in overseeing public participation and stakeholder engagement processes and has been involved in environmental baseline assessments, fatal flaw / feasibility assessments and environmental negative mapping / sensitivity analyses. From a business and administrative side, Andrea is actively involved in maintaining good client relationships, mentoring junior staff and maintaining the financial performance of the projects she leads.

Skills include:

- Project Management (MS Project)
- Environmental Impact Assessment (EIA)
- Basic Assessment (BA)
- Public Participation Management
- Visual Impact Assessment (VIA)
- Landscape Assessment
- Strategic Environmental Planning
- Documentation / Quality Control
- Project Level Financial Management

Projects Experience

Aug 2010 – to date

ENVIRONMENTAL IMPACT ASSESSMENT (EIA) / BASIC ASSESSMENT (BA)

- EIA for the proposed development of the Tlisitseng 1 and 2 75MW Solar Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.
- EIAs for the proposed development of the Sendawo 1, 2, and 3 75MW Solar PV Energy Facilities near Vryburg, North West Province.
- EIA for the proposed construction of the Sendawo Common Collector Substation and power line near Vryburg, North West Province.
- EIA for the proposed construction of the Aletta 140MW Wind Energy Facility near Copperton, Northern Cape Province.
- Application for an Amendment of the Environmental Authorisation (EA) for the proposed construction of the 100MW Limestone Solar Thermal Power Project near Danielskuil, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of three 75MW solar PV facilities near Prieska, Northern Cape Province.
- Applications for the Amendment of the EAs for the proposed construction of the 75MW Arriesfontein and Wilger Solar Power Plants near Danielskuil, Northern Cape Province.
- Completion and submission of the final EIA report for the proposed Rooipunt PV Solar Power Park Phase 1 and proposed Rooipunt PV Solar Power Park Phase 2 near Upington, Northern Cape Province.
- EIAs for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- EIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- EIA for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.

- BA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- BA for the proposed Construction of the SSS1 5MW Solar PV Plant on the Western Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Construction of the SSS2 5MW Solar PV Plant on the Eastern Part of Portion 6 (Portion of Portion 5) of Farm Spes Bona 2355 near Bloemfontein, Free State Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the proposed Bophirima Substation to the existing Schweizer-Reneke Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of a 132kV power line from the Mookodi Substation to the existing Magopela Substation, North West Province.
- BA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- Amendment of the Final Environmental Impact Report for the Proposed Mookodi 1 Integration Project near Vryburg, North West Province.
- BA for the proposed 132kV power line and associated infrastructure for the proposed Redstone Solar Thermal Energy Plant near Lime Acres, Northern Cape Province.
- BA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- BA for the proposed establishment of a Learning and Development Retreat and an Executive Staff and Client Lodge at Mogale's Gate, Gauteng Province.
- Application for an Amendment of the EA to increase the output of the proposed 40MW PV Facility on the farm Mierdam to 75MW, Northern Cape Province.
- BA for the proposed construction of a power line and substation near Postmasburg, Northern Cape Province.
- BA for the proposed West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- EIA for the proposed construction of a wind farm and PV plant near Prieska, Northern Cape Province.
- Public Participation assistance as part of the EIA for the proposed Thyspunt Transmission Lines Integration Project – EIA for the proposed construction of 5 x 400kV transmission power lines between Thyspunt to Port Elizabeth, Eastern Cape Province.
- EIA assistance for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- Public Participation as part of the EIA for the proposed Delareyille Kopela Power Line and Substation, North West Province.
- Public Participation as part of the EIA for the Middelburg Water Reclamation Project, Mpumalanga Province.

VISUAL IMPACT ASSESSMENT (VIA)

- VIA (Scoping Phase) for the proposed construction of a 3000MW Wind Farm and associated infrastructure near Richmond, Northern Cape Province.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberley, Free State and Northern Cape Provinces.
- VIA for the proposed construction of a power line and associated infrastructure for the proposed Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- VIAs (Impact Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.

- VIA (Impact Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIAs (Impact Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- VIA for the proposed construction of the Tlisitseng substation and associated 132kV power line near Lichtenburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo substation and associated power line near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Sendawo 1, 2 and 3 solar PV energy facilities near Vryburg, North West Province.
- VIA (Scoping Phase) for the proposed construction of the Tlisitseng 1 and 2 solar PV energy facilities near Lichtenburg, North West Province.
- Visual recommendations for Phase 1 of the proposed Renishaw Estate Mixed Use Development, KwaZulu-Natal Province.
- VIA for the proposed Tinley Manor South Banks Development, KwaZulu-Natal Province.
- VIAs (Impact Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- VIA (Scoping Phase) for the proposed construction of the Helena 1, 2 and 3 75MW Solar PV Energy Facilities near Copperton, Northern Cape Province.
- Visual Due Diligence Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- Visual Status Quo and Constraints Report for the possible rapid rail extensions to the Gauteng network, Gauteng Province.
- VIA for the proposed agricultural components of the Integrated Sugar Project in Nsoko, Swaziland.
- VIA for the proposed Tweespruit to Welroux power lines and substation, Free State Province.
- VIA for the proposed construction of the Nokukhanya 75MW Solar PV Power Plant near Dennilton, Limpopo Province.
- VIA (Impact Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed amendment to the authorised power line route from Hera Substation to Westgate Substation, Gauteng Province.
- VIA (Impact Phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from the Redstone Solar Thermal Power Project site to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA for the proposed construction of two 132kV power lines and associated infrastructure from Silverstreams DS to the Olien MTS near Lime Acres, Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of the Dwarsrug Wind Farm near Loeriesfontein, Northern Cape Province.
- VIA for the proposed Rorqual Estate Development near Park Rynie on the South Coast of KwaZulu Natal.
- VIA (Scoping Phase) for the proposed construction of a Coal-fired Power Station, Coal Mine and Associated Infrastructure near Colenso, KwaZulu-Natal Province.
- VIA for the proposed Mookodi Integration Phase 2: Proposed Construction of the Mookodi - Ganyesa 132kV power line, proposed Ganyesa Substation and Havelock LILO, North West Province.
- VIA for the proposed construction of the Duma transmission substation and associated Eskom power lines, KwaZulu-Natal Province.
- VIA for the proposed construction of the Madlanzini transmission substation and associated Eskom power lines, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Normandie substation to Hlungwane substation, Mpumalanga and KwaZulu-Natal Provinces.
- VIA for the proposed construction of the Nzalo transmission substation and associated Eskom power lines, KwaZulu-Natal Province.

- VIA for the proposed construction of the Sheepmoor traction substation with two 20MVA transformer bays and a new associated 88kV turn-in power line, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Uitkoms substation to Antra T-off, Mpumalanga Province.
- VIA for the proposed rebuild of the 88kV power line from Umfolozi substation to Eqwasha traction substation including an 88kV turn-in power line to Dabula traction substation, Kwazulu-Natal Province.
- VIA for the proposed construction of the new 88/25kV Vryheid traction substation with two 20MVA transforma bays and a new associated 88kV turn-in power line, KwaZulu-Natal Province.
- VIA for the proposed construction of a 132kV power line and substation associated with the 75MW PV Plant on the Farm Droogfontein (PV 3) in Kimberley, Northern Cape Province.
- VIA (Impact Phase) for the proposed Construction of a Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Wind Farm near De Aar, Northern Cape Province.
- VIA for the (Impact Phase) proposed Construction of the Renosterberg Solar PV Power Plant near De Aar, Northern Cape Province.
- VIA for the proposed construction of a 132kV power line for the Redstone Thermal Energy Plant near Lime Acres, Northern Cape Province.
- VIA for the proposed Mookodi Integration phase 2 132kV power lines and Ganyesa substation near Vryburg, North West Province.
- VIA for the proposed 132kV power lines associated with the PV Plants on Droogfontein Farm near Kimberley, Northern Cape Province.
- VIA (Scoping phase) for the Eastside Junction Mixed Use Development near Delmas, Mpumalanga Province.
- VIA for the proposed development of a learning and development retreat and an executive and staff lodge at Mogale's Gate, Gauteng Province.
- VIA for the proposed construction of a substation and 88kV power line between Heilbron (via Frankfort) and Villiers, Free State Province.
- Visual Status Quo Assessment for the Moloto Development Corridor Feasibility Study in the Gauteng Province, Limpopo Province and Mpumalanga Province.
- VIA the West Rand Strengthening Project – 400kV double circuit power line and substation extension in the West Rand, Gauteng.
- VIA for the proposed construction of a wind farm and solar photovoltaic plant near Loeriesfontein, Northern Cape Province.
- Visual sensitivity mapping exercise for the proposed Mogale's Gate Expansion, Gauteng.
- VIA (Scoping Phase) for the proposed Renosterberg Solar PV Power Plant and Wind Farm near De Aar, Northern Cape Province.
- Scoping level VIAs for the proposed construction of three Solar Power Plants in the Northern Cape Province.
- VIAs for the Spoornet Coallink Powerline Projects in KZN and Mpumalanga.
- Visual Constraints Analysis for the proposed establishment of four Wind Farms in the Eastern and Northern Cape Province.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in De Aar, Northern Cape.
- VIA (Scoping Phase) for the proposed development of a solar energy facility in Kimberley, Northern Cape.

STRATEGIC ENVIRONMENTAL PLANNING

- Assistance with the Draft Environmental Management Framework for the Mogale City Local Municipality, Gauteng Province.
- Sensitivity Negative Mapping Analysis for the proposed Mogale's Gate Development, Gauteng Province.

OTHER

Jan 2008 – July 2010

Environmental management, research, report writing, and landscape design for several development projects:

- Report writing, coordination and public participation for several BAs.
- Planting design (including rehabilitation) in accordance with natural ecological processes, endemic species and appropriate techniques.
- Graphic presentations and mapping for several VIAs and landscape architectural designs, including three-dimensional imagery.

Feb 2006 – Dec 2006

Landscape Architectural drafting, rendering and planting design for a variety of projects including the Oprah Winfrey Academy for girls and the New UNISA Student Entrance Building.

CURRICULUM VITAE

Name	Stephan Hendrik Jacobs
Profession	Environmentalist
Name of Firm	SiVEST SA (Pty) Ltd
Present Appointment	Graduate Environmental Consultant
Years with Firm	Joined May 2015
Date of Birth	28 May 1991
ID Number	9105285065080
Nationality	South African

Education

Pretoria Boys High, Pretoria, South Africa, Matriculated 2009.

Professional Qualification

- BSc Hons Environmental Management and Analysis, (Post Graduate) University Of Pretoria Honours (2014).
- BSc Environmental Sciences (Undergraduate) University Of Pretoria (2012-2013)

Employment Record

May 2015 – current	SiVEST SA (Pty) Ltd – Graduate Environmental Consultant
Nov 2014 – Feb 2015	Sodwana Bay Fishing Charters – Assistant Manager
Oct 2014 – Mar 2015	Ufudu Turtle Tours – Tour Guide

Language Proficiency

LANGUAGE	SPEAK	READ	WRITE
English	Excellent	Excellent	Excellent
Afrikaans	Good	Good	Good

Key Experience

Stephan joined SiVEST in May 2015 and holds the position of Graduate Environmental Consultant in the Johannesburg office.

Stephan specialises in the field of Environmental Management and has been involved in the compilation of Environmental Impact Assessments (EIAs) and Basic Assessments (BAs). Stephan has also assisted extensively in the undertaking of field work and the compilation of reports for specialist studies such as surface water and visual impact assessments. Stephan also has experience in Environmental Compliance and Auditing and has acted as an Environmental Control Officer (ECO) for several infrastructure projects.

Stephan has been educated and achieved his degrees (BSc and BSc Hons) at the University of Pretoria in Environmental Sciences (Environmental Management & Analysis).

Throughout his time at SiVEST, Stephan has acquired the following skills:

- Strong computer skills (Work, excel, powerpoint etc);
- Strong Proposal and report writing skills;
- Report compilation skills for Environmental Impact Assessments (EIAs) and Basic Assessments (BAs);

- Report compilation skills for Environmental Management Plans/Programmes (EMPr);
- Compilation and conducting Visual Impact Assessments;
- Assisting in Surface Water / Wetland Delineations and Assessments.

Key experience includes:

- Environmental Impact Assessment (EIA) of small, medium and large-scale infrastructure projects,
- Basic Assessment (BA), of small, medium and large-scale infrastructure projects,
- Environmental Management Plans (EMPr), of small, medium and large-scale infrastructure projects,
- Proposal and tender compilation,
- Environmental Compliance and Auditing (ECO);
- Various site inspections, and
- Visual Impact Assessments (Field work and report compilation).

Projects Experience

Stephan is responsible for the following activities: report writing, proposal writing, assisting in specialist surface water delineation and functional assessments, assisting in visual impact assessments and environmental compliance and auditing procedures. Current and completed projects / activities are outlined in detail below:

- Environmental Control Officer (ECO) for the Polokwane Integrated Rapid Public Transport System (IRPTS), Limpopo Province.

- Basic Assessment (BA) for the construction of a Non-Motorised Transport (NMT) Training and Recreational Park adjacent to the Peter Mokaba Stadium in Polokwane, Limpopo Province.

- Basic Assessment (BA) for the Proposed Expansion of the Tissue Manufacturing Capacity at the Twinsaver Kliprivier Operations Base, Gauteng Province.

- Environmental Control Officer (ECO) for Phase 1 and Phase 2 of the Newmarket Retail Development, Gauteng Province.

- Environmental Review of the Xakwa Coal Operations, adjacent to the proposed Eastside Junction Development.

- Environmental Due Diligence for the Woodlands and Harrowdene Office Parks in Woodmead, Gauteng Province.

- Visual Impact Assessment for the Helena Solar PV Plant, Northern Cape Province.

- Visual Impact Assessment for the Nsoko Msele Integrated Sugar Project, Swaziland.

- Visual Impact Assessments for the proposed construction of the Sendawo Solar 1, Sendawo Solar 2 and Sendawo Solar 3 Photovoltaic (PV) Energy Facilities near Vryburg, North West Province.

- Visual Impact Assessments for the proposed construction of the Sendawo Substation and Associated 400kV Power Line near Vryburg, North West Province.

- Visual Impact Assessments for the proposed construction of the Tlisitseng Solar 1 and Tlisitseng Solar 2 Photovoltaic (PV) Energy Facilities near Lichtenburg, North West Province.

- Visual Impact Assessment for the proposed construction of the 3000MW PhilCo Green Energy Wind Farm and Associated Infrastructure near Richmond, Northern Cape Province.

- Visual Impact Assessment for the proposed construction of the Aletta 140MW Wind Energy Facility neat Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 140MW Wind Energy Facility and associated Infrastructure near Copperton, Northern Cape Province.
- Visual Impact Assessment for the proposed construction of the Eureka 400kV Substation and 400kV Power Line neat Copperton, Northern Cape Province.
- Basic Visual Impact Assessments for the proposed construction of the Tlisitseng 1 and Tlisitseng 2 Substations and Associated 132kV Power Lines near Lichtenburg, North West Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the Rooipunt Solar Thermal Power Plant near Upington, Northern Cape Province.
- Basic Visual Impact Assessment for the proposed construction of up to a 132kV Power Line and Associated Infrastructure for the proposed Kalkaar Solar Thermal Power Plant near Kimberly, Free State and Northern Cape Provinces.
- Surface Water Assessment for the Steve Thswete Local Municipality, Mpumalanga Province.
- Surface Water Delineation and Assessment for the proposed coal Railway Siding at the Welgedacht Marshalling Yard and associated Milner Road Upgrade near Springs, Ekurhuleni Metropolitan Municipality.

Keagan Allan

Senior Scientist

Profession	Senior Scientist & GIS Specialist
Education	BSc Geographical Science – 2003 BSc (Hons) Geographical Science and Environmental Management – 2004 MSc Geographical Science (Cum Laude) – 2007
Registrations/ Affiliations	Registered Professional Natural Scientist (Pr.Sci.Nat), South African Council for Natural Scientific Professions (SACNASP), 400185/13 IAIA South Africa
Awards	Won Best Poster at the 2010 IAIAsa Conference – Poster Applications of GIS in EMF.

Specialisation

Geographical Information Systems and Remote Sensing

Expertise

Keagan Allan has been involved in the field of Geographical Information Systems (GIS) for the past 8 years. His expertise includes:

- Geographical Information Systems (GIS), more specifically data collection and manipulation; modelling of various spatial data for Visual Impact Assessments and Ground Water management and database management.
- Visual Impact Assessment Specialist – using GIS and modelling to conduct Visual Impact Assessments (VIAs) for large scale mining and industrial developments.
- GIS Development – using Visual Basic scripting to develop tools for use within the ESRI ArcMap environment.
- GIS in Environmental Management Frameworks – using Visual Basic in conjunction with GIS techniques to generate information for use in the GIS reporting in an EMF study.
- Remote Sensing (RS) more specifically the use of remotely sensed images in the classification of various land use types.

Employment

Jul 2008 – Present	SRK Consulting, Environmental Scientist, Westville
Feb 2008 – Jun 2008	Haley Sharpe, Assistant Tourism Planner, Southern Africa
Feb 2007 – Aug 2007	UKZN, Cartographic Technician, Pietermaritzburg

Languages

English – read, write, speak
Afrikaans – read, write, speak

Publications

1. ALLAN, K., EMANUAL, P., and MORRIS, J. (2010) Poster Presentation: Applications of GIS in EMF, IAIAsa Conference, Pretoria, August, 2010.
2. ALLAN, K. (2015) Paper Presentation: Environmental Management in the 21st Century: Combining Environmental Processes and GIS Technologies, IAIAsa Conference, KwaZulu-Natal, August 2015.

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