DONAWAY
ENVIRONMENTAL

VISUAL IMPACT ASSESSMENT

The Proposed Kareerand Battery Energy Storage System
near Klerksdorp, North West Province

PROJECT DETAILS

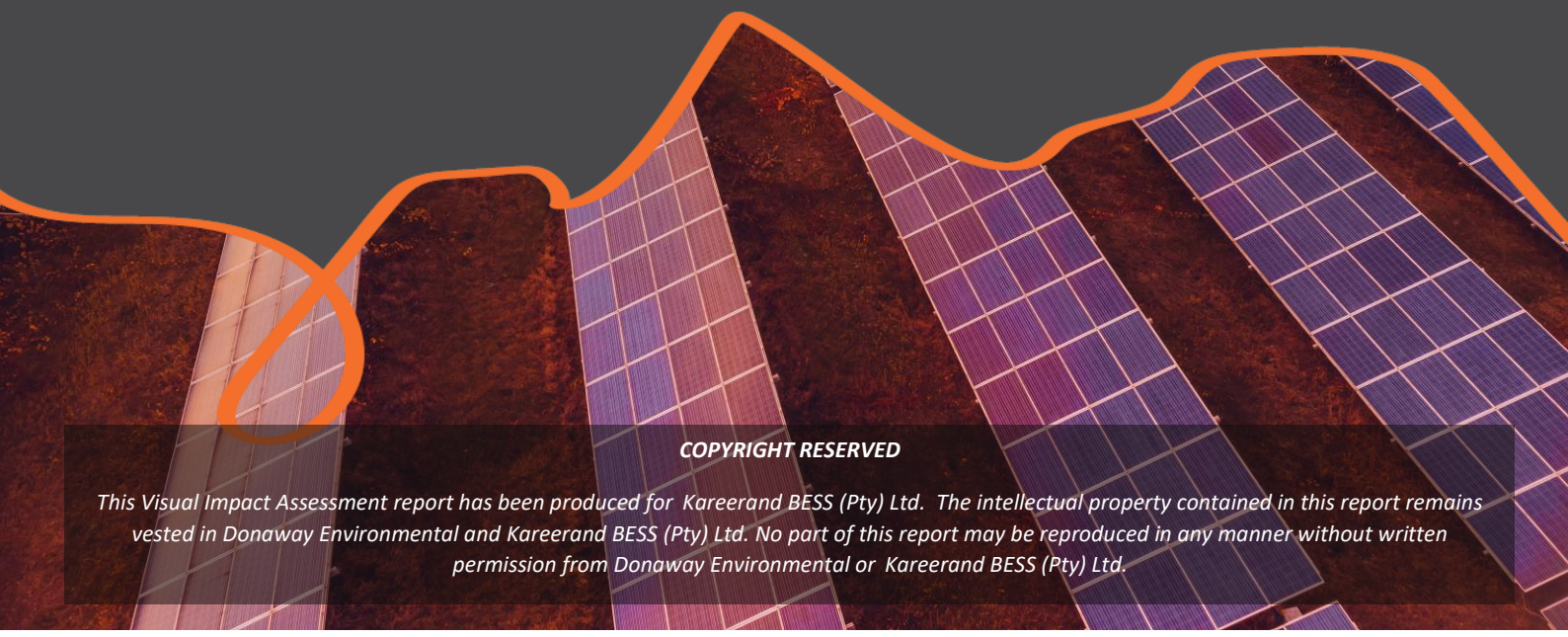
Project title: **Visual Impact Assessment –** The Proposed Kareerand Battery Energy Storage System near Klerksdorp, North West Province.

Prepared by: Johan Botha
Donaway Environmental
30 Fouché Street
Steynsrus
9515
Tel: +27 82 316 7749
Email: johan@donaway.co.za

Prepared for: Kareerand BESS (Pty) Ltd

Report date: January 2024

When used as reference this report should be cited as: Donaway Environmental (2024). Visual Impact Assessment: The Proposed Kareerand Battery Energy Storage System near Klerksdorp, North West Province.



EXECUTIVE SUMMARY

PROJECT BACKGROUND

Kareerand BESS (Pty) Ltd ('the Applicant') is proposing the construction of the Kareerand Battery Energy Storage (BESS) Facility, consisting of a BESS and solar photovoltaic (PV) infrastructure, and associated infrastructure, located on Portion 3 of the Farm Kareerand No. 444, approximately 22 km east of Klerksdorp within the North West Province. A powerline of up to 11.5km is also proposed to evacuate the electricity into the national grid. The proposed development is located within the Klerksdorp Renewable Energy Development Zone (REDZ). The proposed development is intended to form part of the Department of Mineral Resources and Energy (DMRE) Battery Energy Storage Independent Power Producer Procurement (BESIPPP) Programme, but the option also exists for other tenders, wheeling or to supply privately, without a generation license from NERSA.

The BESIPPP and Renewable Energy Independent Power Producer Procurement (REIPPP) programmes, aims to secure new generation capacity from renewable energy sources and battery energy storage, while simultaneously diversifying South Africa's electricity mix. In 2022 a Climate Change Bill was introduced that seeks to enable the alignment of policies that influence South Africa's climate change response, to ensure South Africa's transition to a low-carbon economy and climate-resilient economy, and to enhance the country's ability and capacity over time to reduce greenhouse gas emissions. The Climate Change Bill was then announced on October 24, 2023. Furthermore, as part of the 2023 State of the Nation Address, the Energy Action Plans' one year progress report was reflected. Objective 3 in the Energy Action Plan still emphasises fast-tracking the procurement of new generation capacity from renewables, gas and battery storage. South Africa is also responsible for fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, our largest greenhouse gas emitter, has committed in principle to net zero emission by 2050 and to increase its renewable capacity.

KEY FINDINGS

1. **Diverse Development Types:** The region under consideration exhibits a multifaceted developmental landscape, encompassing industrial, urban, sports and recreational, agricultural, service, and limited tourism developments. Notably, mining plays a pivotal role in the local economy, with associated infrastructure contributing significantly to industrial development.

2. **Urban and Industrial Relationship:** Urban centres like Orkney, Klerksdorp, and Stilfontein are intricately linked with mining activities, highlighting the symbiotic relationship between urban and industrial development. The towns serve as key hubs in the broader mining landscape.

3. **Recreational Features and Tourism Constraints:** The Vaal River stands out as the predominant water feature, offering recreational opportunities such as fishing and boating. However, tourism development remains constrained, as the region prioritises agriculture and mining over tourism. The lack of distinctive attractions hinders significant visitor attention.

4. **Agricultural Dominance:** Agricultural development, predominantly focused on livestock, dryland, and crop irrigation farming, defines a substantial aspect of the region's development. Limited game farming was also observed.

5. **Limited Scenic Features:** The area lacks significant topographic features, with the Vaal River providing the most prominent scenic resource. Vegetation along the Vaal River and specific southern areas contributes to more pleasant views. The project property, utilised for game farming, boasts better vegetation features.
6. **Nature Reserves and Mining Impact:** Two nature reserves, Bushybend Private Nature Reserve and Mispah Game Farm, exist within the 10km PAOI. Mining activities are located within Mispah Game Farm. The visual sensitivity assessment indicates low impact due to the absence of specific scenic quality.
7. **Urban Development within the PAOI:** Stilfontein, Khuma township, and Vaal Reefs, a residential mining development, constitute the urban development within the 10km PAOI. Farmsteads, river homes, and lodging facilities are scattered across the area.
8. **Visual Impact and Sensitivity:** Visual sensitivity in the area is classified as "Low", influenced by the extensive mining developments. The proposed development's impact might be diminished against the backdrop of mining activities, especially noticeable for those traveling on the R502 regional road. The most sensitive receptors are those along the banks of the Vaal River, but they will have mining developments as a backdrop. This backdrop has been prominent for many years.
9. **Visual Absorption Capacity (VAC):** The area exhibits a moderate VAC, with good screening along the Vaal River. Receptors along the river are less likely to be severely impacted. Private vegetation surrounding farmsteads provides screening potential, but open cultivation fields to the south may expose the proposed development.

A summary of the potential significance is identified in **Table A** below.

Table A: Significance

Impact	Significance Without Mitigation	Significance With Mitigation
Visual Impact – Construction: BESS & PV	(45) Negative Medium	(33) Negative Medium
Visual Impact – Construction: Powerline Corridor	(28) Negative Low	(24) Negative Low
Visual Impact – Operation: BESS & PV	(34) Negative Medium	(28) Negative Low
Visual Impact – Operation: Powerline Corridor	(32) Negative Medium	(28) Negative Low
Visual Impact - Lighting	(28) Negative Low	(20) Negative Low
Visual Impact – Cumulative impact of the project considered in isolation	(28) Negative Low	
Visual Impact – Cumulative impact of the project and other projects in the area	(34) Negative Medium	

Conclusion

Aesthetic characteristics are subjective, and some people find energy facilities and their associated infrastructure pleasant and optimistic while others may find it visually invasive; It is mostly perceived as symbols of energy independence, and local prosperity. The visual impact is also dependant on the land use of an area and the sensitivity thereof in terms of visual impact, such as protected areas, parks and other tourism related activities.

The proposed development is of a modest scale when compared to other proposed alternative energy initiatives and the existing expansive mining operations in the area. Given the relatively small footprint of the project and the prevailing visual pollution generated by extensive mining activities, coupled with the region's economic reliance on mining and industrial ventures, it is anticipated that the visual impact of the proposed development will be inconspicuous against the backdrop of the dominating mining infrastructure. Therefore, it is recommended that the development proceed, taking into account its minimal visual impact within the context of the prevalent industrial landscape. **PLEASE NOTE** details of the project should be submitted to the South African Civil Aviation Authority (SACAA).

It is therefore Donaway Environmental' s recommendation that the project be approved, provided that the proposed mitigation measures are implemented.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ACRONYMS

AMSL	Above Mean Sea Level
AGL	Above Ground Level
PAOI	Project area of influence
BAR	Basic Assessment Report
BESIPPP	Battery Energy Storage Independent Power Producer Procurement Programme
CLO	Community Liaison Officer
DFFE	Department Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
DM	District Municipality
EA	Environmental Authorisation
ECA	Environment Conservation Act (No. 73 of 1989)
ECO	Environmental Control Officer
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EMPr	Environmental Management Programme
EP	Equator Principles
EPC	Engineering, Procurement and Construction
HA	Hectares
I&APs	Interested and Affected Parties
IFC	International Finance Corporation
IUCN	International Union for Conservation of Nature
GIS	Geographic Information System
KM	Kilometre
LED	Local Economic Development
LM	Local Municipality
MTS	Main Transmission Substation
MW	Megawatt
N12	National Route 12

NEMA	National Environmental Management Act (No. 107 of 1998)
O&M	Operations and Maintenance
OHS	Occupational Health and Safety
PV	Photovoltaic
REDZ	Renewable Energy Development Zone
REIPPP	Renewable Energy Independent Power Producer Procurement Programme
SEF	Solar Energy Facility
SPP	Solar Power Plant
ToR	Terms of Reference
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
ZTV	Zone of Theoretical Visibility

1. INTRODUCTION

1.1. Project Background

Kareerand BESS (Pty) Ltd ('the Applicant') is proposing the construction of the Kareerand Battery Energy Storage (BESS) Facility, consisting of a BESS and solar photovoltaic (PV) infrastructure, and associated infrastructure, located on Portion 3 of the Farm Kareerand No. 444, approximately 22 km east of Klerksdorp within the North West Province. A powerline of up to 11.5km is also proposed to evacuate the electricity into the national grid. The proposed development is located within the Klerksdorp Renewable Energy Development Zone (REDZ). The proposed development is intended to form part of the Department of Mineral Resources and Energy (DMRE) Battery Energy Storage Independent Power Producer Procurement (BESIPPP) Programme, but the option also exists for other tenders, wheeling or to supply privately, without a generation license from NERSA.

The BESIPPP and Renewable Energy Independent Power Producer Procurement (REIPPP) programmes, aims to secure new generation capacity from renewable energy sources and battery energy storage, while simultaneously diversifying South Africa's electricity mix. In 2022 a Climate Change Bill was introduced that seeks to enable the alignment of policies that influence South Africa's climate change response, to ensure South Africa's transition to a low-carbon economy and climate-resilient economy, and to enhance the country's ability and capacity over time to reduce greenhouse gas emissions. The Climate Change Bill was then announced on October 24, 2023. Furthermore, as part of the 2023 State of the Nation Address, the Energy Action Plans' one year progress report was reflected. Objective 3 in the Energy Action Plan still emphasises fast-tracking the procurement of new generation capacity from renewables, gas and battery storage. South Africa is also responsible for fulfilling their commitments under the United Nations Framework Convention on Climate Change and its Paris Agreement which include the reduction of greenhouse gas emissions. Eskom, our largest greenhouse gas emitter, has committed in principle to net zero emission by 2050 and to increase its renewable capacity.

The proposed development of the Kareerand BESS facility requires Environmental Authorisation (EA) from the competent environmental authority in accordance with the National Environmental Management Act (No. 107 of 1998) (NEMA), and the 2014 Environmental Impact Assessment (EIA) Regulations.

The Visual Impact Assessment (VIA) Report has been prepared by Donaway Environmental on behalf of Kareerand BESS (Pty) Ltd and is intended to provide input into the EIA process.

1.2. Project Location

The following approximate distances from certain key points were identified:

- The BESS is located approximately 22km east of Klerksdorp.
- The powerline corridor is located approximately 12km east of Klerksdorp.
- The BESS is located approximately 5.5km south-east of the R502 regional road.
- The power line corridor intersects the R502 regional road.

Please refer to **Figure 1.1** below, Locality Map.

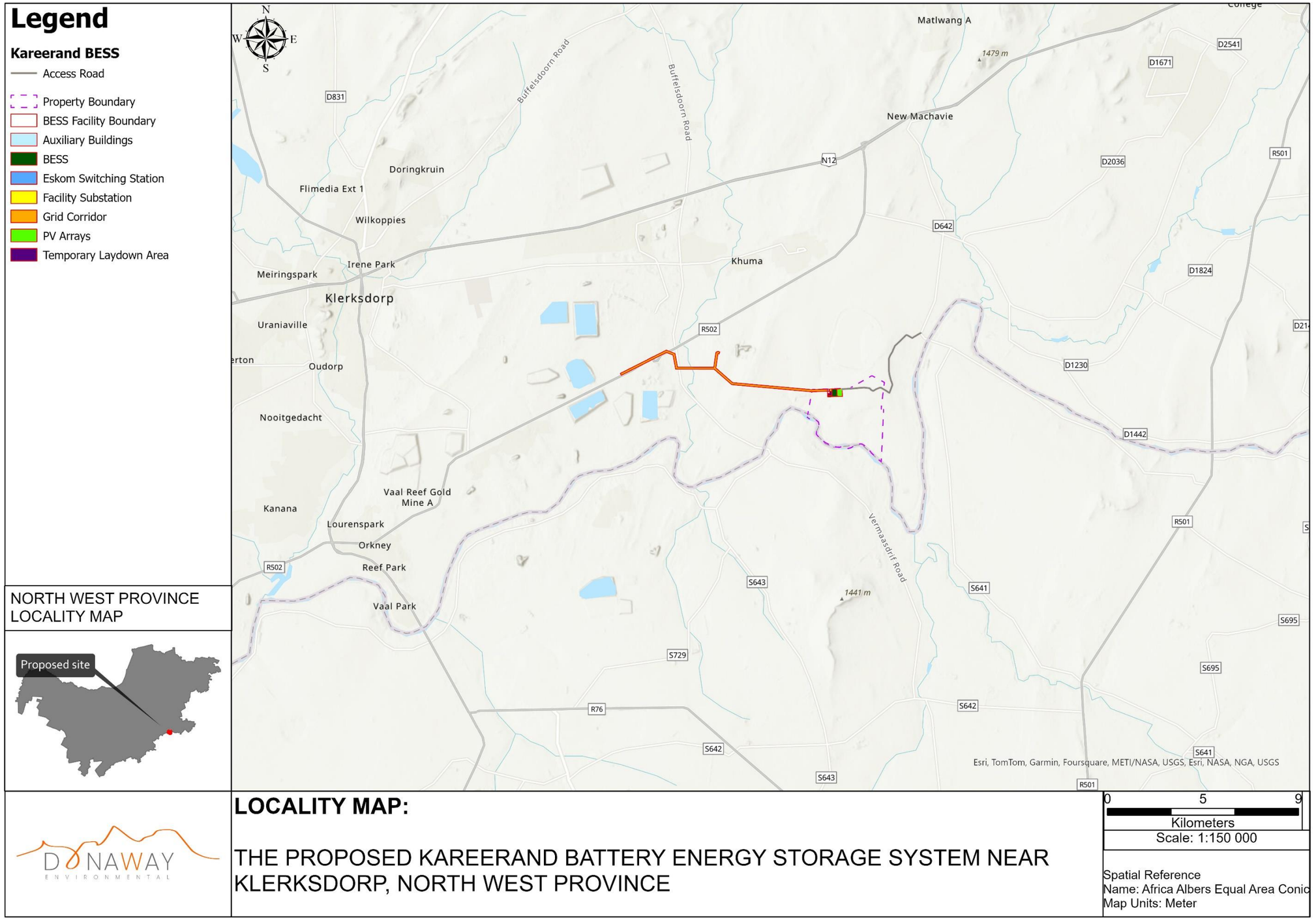


Figure 1.1: Locality map

1.3. Project Description and Technical Detail

1.3.1. The location of the activity and property description

The Kareerand BESS facility will have a total development footprint of up to approximately 25 ha and will have a maximum export capacity of up to 77 MW. The development area is situated within the City of Matlosana Local Municipality and the JB Marks Local Municipality. The site is accessible via existing tarred and gravel roads to the north-east of the site. These existing gravel roads will be upgraded to a maximum width of 8m.

Table 1.1: General site information

Description of affected farm portions	BESS and PV: • Portion 3 of the Farm Kareerand No. 444 Grid connection: • Portion 3 of the Farm Kareerand No. 444 • Portion 15 of the Farm Kromdraai 443 • Remainder of Portion 5 of Farm no. 422 • Portion 6 of the Farm Buffelsfontein 443 • Portion 3 of the Farm Kareerand 444 • Portion 2 of the Farm Buffelsfontein 443 • Portion 103 of the Farm Hartebeestfontein 422 • Portion 38 of the Farm Hartebeestfontein 422 • Portion 79 of the Farm Hartebeestfontein 422 • Portion 8 of the Farm Hartebeestfontein 422 • Portion 2 of the Farm Mapaiskraal No. 441 • Portion 41 of the Farm Hartebeestfontein 422 • Portion 4 of the Farm Mapaiskraal 441 Access road • Portion 3 of the Farm Kareerand No. 444 • Portion 4 of the Farm Kareerand 444 • Portion 16 of the Farm Kromdraai 420 • Portion 17 of the Farm Kromdraai 420 • Farm Umfula No. 575 • 20 of Farm Umfula No. 567 • Portion 56 of the Farm Kromdraai 420
Province	North West
Local Municipality	JB Marks & City of Matlosana
District Municipality	Dr Kenneth Kaunda
Ward numbers	2, 34 and 33

Closest towns	The town of Stilfontein is located approximately 11km north west of the proposed development.
Area under assessment (Development Area)	25 hectares
Development footprint	25 hectares

1.3.2. Technical Details

The development footprint associated with the BESS facility will include specific infrastructure that will be developed as part of the facility layout.

The design of the detailed layout will however consider and adhere to the limitations of the development area and aspects such as environmentally sensitive areas, roads, fencing and servitudes on site. The total surface area proposed for the layout will include the PV panel arrays (spaced to avoid shadowing), the BESS facility, access and maintenance roads and associated infrastructure (buildings, power inverters, power line, on-site substation and collector substation and perimeter fences).

The proposed Kareerand BESS facility will include the following infrastructure:

- PV modules and mounting structures (up to 10 ha).
- Inverters and transformers.
- Solid State Battery Energy Storage System (BESS) (up to 10 ha).
- Site and internal access roads (up to 8m wide).
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses and workshops for storage and maintenance (up to 1 ha).
- Laydown areas (3 ha temporary and 1 ha permanent).
- A 132 kV facility substation (up to 1 ha).
- 33 kV cabling between the project components and the facility substation.

The project will also include Grid connection infrastructure consisting of:

- A 132 kV Eskom Switching Station (up to 1 ha).
- 132 kV powerline (up to 11.5 km long) connecting the Eskom switching station to the Hermes Main Transmission Substation (a grid connection corridor of 100m wide will be assessed to allow for environmental sensitivities and/or micro-siting).

The Grid connection infrastructure, although assessed cumulatively with the BESS, will be subject to a separate environmental application process administered by the provincial authority.

1.3.3. Consideration of Alternatives

This section describes the alternatives under consideration for the Kareerand BESS facility. In terms of the Regulations only 'feasible' and 'reasonable' alternatives should be considered for development. The process undertaken by the Applicant for the identification of alternatives has been an iterative process and will continue to be an iterative process between the EAP and the Applicant in order to ensure that the preferred alternative proposed for authorisation is ultimately appropriate from a technical feasibility perspective as well as an environment perspective. Refer to **Table 1.2** for an overview of the alternatives being considered.

Table 1.2: Summary of the alternatives considered

Alternatives considered	Description of the Alternative relating to the development
Site specific and Layout Alternatives	One preferred site / development area has been identified for the development of the Kareerand BESS facility based on specific site characteristics such as proximity to the National grid and Hermes MTS, the solar resource, land availability, topographical characteristics and environmental features. The development area of 25 hectares is considered to be sufficient for the development of the facility with a contracted capacity of up to 77 MW. The development footprint will have an extent of up to 25 ha.
Activity Alternatives	Only the development of a BESS and renewable energy facility is considered by Kareerand BESS (Pty) Ltd. Due to the location of the site / development area and the suitability of the solar resource, only the development of a BESS and solar PV facility is considered feasible considering the natural resources and land available to the area, and the current land-use activities undertaken within the site (i.e., agricultural activities).
Technology Alternatives	Only the development of a BESS and photovoltaic solar facility is considered due to the characteristics of the site, including the natural resources and land available.
'Do-nothing Alternative	The option to not construct the Kareerand BESS facility. No impacts (positive or negative) are expected to occur on the social and environmental sensitive features or aspects located within the surrounding areas of the site. The opportunities associated with the development of the facility in the area will however not be made available.

1.4. EIA Regulations

The National Environmental Management Act identifies listed activities (in terms of Section 24) which are likely to have an impact on the environment. These activities cannot commence without obtaining an EA from the relevant competent authority. Sufficient information is required by the competent authority to make an informed decision and the project is therefore subject to an environmental assessment process which can be either a Basic Assessment Process or a full Scoping and Environmental Impact Assessment process.

The EIA Regulations No. 324, 325 and 327 outline the activities that may be triggered and therefore require EA.

2. METHODOLOGY

A site inspection was conducted on the 19th of January 2023. Most of the visual receptors were determined by using ZTV and geographical imagery within a 10km project area of influence (PAOI) before the site inspection.

2.1. Purpose of the Study

To determine the purpose of the study, one would first have to understand what a visual impact is: Visual impacts occur when changes in the landscape are noticeable to viewers looking at the landscape from their homes or from parks and conservation areas, highways and travel routes, and important cultural features and historic sites.

Visual impacts therefore relate to the changes that arise in the composition of views as a result of:

- Changes to the landscape;
- People's response to those changes; and
- the overall negative effect with respect to the scenic beauty of that landscape, which can be subjective.

Visual impact is therefore measured as the change or contrast to the existing visual environment and the extent to which that change compromises (negative impact) or enhances (positive impact) or maintains the visual quality of the landscape.

Visual impacts can be seen as an issue because it reduces the public's enjoyment and appreciation of the landscape and impair the character or quality of such a place as well as the aesthetic quality of the landscape if it is considered to be a national resource.

VIAs address the importance of the inherent aesthetics of the landscape, the public value of viewing that landscape, and the contrast or change in the landscape derived from the physical presence of a proposed project. For instance, Sensitive Geographical Areas can be classified as sensitive properties that are evaluated for the potential for adverse visual impacts, based on the current land use or enjoyment of the view. The sensitivity of a certain geographical area is the degree to which a particular area can accommodate change. An example of a sensitive geographical area would be when scenic quality was influential in its being. In other words, a geographical area is not sensitive to visual impact if visual aspects of its feeling and setting are not part of what makes it eligible.

A project therefore has a significant visual impact in a certain geographical area when the proximity of the proposed project impairs aesthetic features or attributes of that area in a substantially visual way such that features, or attributes are considered important contributing elements to the value of the resource.

The purpose and objectives of this VIA report is to:

- Give the reader an overview of the aesthetics of the landscape.
- Determine the visual receptors present within the study area.
- Determine the receptors likely to be sensitive to the proposed development.
- Determine the extent and significance of the visual impact.

The scope of the assessment includes the proposed development area and its associated structures and infrastructure.

2.2. Terms of Reference

Specialist reports must comply with Appendix 6 of GNR326 published under sections 24(5), and 44 of the National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and whereby the following are to be included:

Table 2.1: Appendix 6 of GNR326 – Report sections

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
The details of the specialist who prepared the report and the expertise of that specialist to compile a specialist report including a curriculum vitae.	Section 2.9
A declaration that the specialist is independent in a form as may be specified by the competent authority.	A separate Declaration of Independence is commissioned for each project and sent to the Environmental Assessment Practitioner.
An indication of the scope of, and the purpose for which, the report was prepared.	Section 1
The date and season of the site investigation and the relevance of the season to the outcome of the assessment.	Section 2 states the date of the site visit. Season is not applicable for a Visual Impact Assessment.
A description of the methodology adopted in preparing the report or carrying out the specialised process; the specific identified sensitivity of the site related to the activity and its associated structures and infrastructure.	Section 2
An identification of any areas to be avoided, including buffers.	This will be reflected in Section 5 and in Section 8 if applicable.
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 1, Section 3 and Section 5
A description of any assumptions made and any uncertainties or gaps in knowledge.	Section 2.8
A description of the findings and potential implications of such findings on the impact of the proposed activity, including identified alternatives on the environment.	Section 6 and Section 8
Any mitigation measures for inclusion in the EMPr.	Section 6 and Section 7

Requirements of Appendix 6 – GN R326 EIA Regulations of 7 April 2017	Relevant section in report
Any conditions for inclusion in the environmental authorisation.	Section 7
Any monitoring requirements for inclusion in the EMPr or environmental authorisation.	Section 7
A reasoned opinion as to whether the proposed activity or portions thereof should be authorised, and 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.	Section 8.2
A description of any consultation process that was undertaken during preparing the specialist report.	N/A. Public Participation Process undertaken as part of the EIA executed by the Environmental Assessment Practitioner (EAP).
A summary and copies of any comments received during any consultation process and where applicable all responses thereto.	N/A. Public Participation Process undertaken as part of the EIA executed by the Environmental Assessment Practitioner (EAP)
Any other information requested by the competent authority.	N/A

In development of the above, specialists are expected to:

- Review the EIA, with specific reference to the Comments and Response Report to familiarize with all relevant issues or concerns relevant to their field of expertise.
- In development of the impacts listed in the EIA, identify any issue or aspect that needs to be assessed and provide expert opinion on any issue in their field of expertise that they deem necessary in order to avoid potential detrimental impacts.
- Assess the degree and extent of all identified impacts (including cumulative impacts) that the preferred project activity and its proposed alternatives, including that of the no-go alternative, may have.
- Identify and list all legislation and permit requirements that are relevant to the development proposal in context of the study.
- Reference all sources of information and literature consulted; and
- Include an executive summary to the report.

The terms of reference for this Visual Impact Assessment (VIA) requires providing the following:

- Conduct a desktop review of available information that can support and inform the specialist study;

- Describe the receiving environment and the visual absorption for the proposed project;
- Conduct a field survey to determine the actual or practical extent of potential visibility of the proposed development;
- Conduct a photographic survey of the landscape surrounding the development;
- Identify issues and potential visual impacts for the proposed project, to be considered in combination with any additional relevant issues that may be raised through the public consultation process;
- Identify possible cumulative impacts related to the visual aspects for the proposed project;
- Assess the potential impacts, both positive and negative, associated with the proposed project for the construction, operation and decommissioning phases;
- Identify management actions to avoid or reduce negative visual impacts; and to enhance positive benefits of the project; and
- Use mapping and photo-montage techniques as appropriate.

2.3. Approach to the Study

The approach to the study followed various guidelines for visual impact assessments that are available. This assessment will be undertaken in accordance with:

- Oberholzer, B. South African Provincial Government (Western Cape Province) – Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (2005);
- United States of America, Texas Department of Transportation - Standard Operating Procedure for Visual Impact Assessments (2012);
- The Landscape Institute with the Institute of Environmental Management and Assessment – Guidelines for Landscape and Visual Impact Assessments, Second Edition (2002); and
- World Bank Group - Environmental, Health, and Safety Guidelines for Wind Energy (2015).

By using the above resources and guidelines, triggers for specialist input are identified.

2.4. Triggers for Visual Specialist Input

A 'trigger' refers to a characteristic of either the receiving environment or the proposed project that indicates the likelihood of visibility and aesthetics becoming significant concerns. In such cases, it may be necessary to engage a qualified and experienced specialist.

The following indicators can suggest the necessity of visual input, taking into account both the nature of the receiving environment and the characteristics of the project at hand.

The nature of the receiving environment:

- Areas with protection status, such as national parks or nature reserves;
- Areas with proclaimed heritage sites or scenic routes;
- Areas with intact wilderness qualities, or pristine ecosystems;
- Areas with intact or outstanding rural or townscape qualities;
- Areas with a recognized special character or sense of place;

- Areas lying outside a defined urban edge line;
- Areas with sites of cultural or religious significance;
- Areas of important tourism or recreation value;
- Areas with important vistas or scenic corridors; and
- Areas with visually prominent ridgelines or skylines.

The nature of the project:

- High intensity type projects including large-scale infrastructure;
- A change in land use from the prevailing use;
- A use that is in conflict with an adopted plan or vision for the area;
- A significant change to the fabric and character of the area;
- A significant change to the townscape or streetscape;
- Possible visual intrusion in the landscape; and
- Obstruction of views of others in the area.

To streamline specialist input, it is essential to identify key issues that necessitate their expertise. These issues encompass questions or concerns regarding the visual or scenic impact of the proposed development. However, in cases where stakeholders lack interest or knowledge in visual matters, these concerns may be overlooked. Hence, involving a visual specialist during the scoping phase becomes crucial, particularly when triggers indicate the potential significance of visibility.

Table 2.2 presents a range of environments, ranging from the most visually sensitive to the least sensitive, along one axis, and various development types, spanning from the least intensive to the most intensive, along the other axis (refer to **Table 2.3** for details).

This correlation between environment types and development types results in varying levels of expected visual impact, ranging from no impact to very high impact (see **Table 2.4**).

Table 2.2: Categorisation of issues to be addressed by the visual assessment specialist (Oberholzer, B. 2005.)

Type of environment	**Type of development (see Table 2.2) Low to high intensity**				
	Category 1 development	**Category 2 development**	**Category 3 development**	**Category 4 development**	**Category 5 development**
Protected/wild areas of international, national, or regional significance	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected	Very high visual impact expected
Areas or routes of high scenic, cultural, historical significance	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected	Very high visual impact expected

Type of environment	Type of development (see Table 2.2) Low to high intensity				
	Category 1 development	Category 2 development	Category 3 development	Category 4 development	Category 5 development
Areas or routes of medium scenic, cultural or historical significance	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected	High visual impact expected
Areas or routes of low scenic, cultural, historical significance / disturbed	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected	High visual impact expected
Disturbed or degraded sites / run-down urban areas / wasteland	Little or no visual impact expected. Possible benefits	Little or no visual impact expected. Possible benefits	Little or no visual impact expected	Minimal visual impact expected	Moderate visual impact expected

Table 2.3: Key to Categories of Development

Type of Development	Description
Category 1 development	e.g., nature reserves, nature-related recreation, camping, picnicking, trails and minimal visitor facilities.
Category 2 development	e.g., low-key recreation / resort / residential type development, small-scale agriculture / nurseries, narrow roads and small-scale infrastructure.
Category 3 development	e.g., low density resort / residential type development, golf or polo estates, low to medium-scale infrastructure.
Category 4 development	e.g., medium density residential development, sports facilities, small-scale commercial facilities / office parks, one-stop petrol stations, light industry, medium-scale infrastructure.
Category 5 development	e.g., high density township / residential development, retail and office complexes, industrial facilities, refineries, treatment plants, power stations, wind energy farms, power lines, freeways, toll roads, largescale infrastructure generally. Large-scale development of agricultural land and commercial tree plantations. Quarrying and mining activities with related processing plants.

Explanation of terms used:

Low-key development – generally small-scale, single-storey domestic structures, usually with more than 75% of the area retained as natural (undisturbed) open space.

Low density development - generally single or double-storey domestic structures, usually with more than 50% of the area retained as natural (undisturbed) open space.

Medium density development - generally 1 to 3-storey structures, including cluster development, usually with more than 25% of the area retained as green open space.

High density development - generally multi-storey structures, or low-rise high density residential development.

Table 2.4: Key to Categories of Issues

Very high visual impact expected:	Potentially significant effect on wilderness quality or scenic resources. Fundamental change in the visual character of the area. Establishes a major precedent for development in the area.
High visual impact expected:	Potential intrusion on protected landscapes or scenic resources. Noticeable change in visual character of the area. Establishes a new precedent for development in the area.
Moderate visual impact expected:	Potentially some effect on protected landscapes or scenic resources. Some change in the visual character of the area. Introduces new development or adds to existing development in the area.
Minimal visual impact expected:	Potentially low level of intrusion on landscapes or scenic resources. Limited change in the visual character of the area. Low-key development, similar in nature to existing development.
Little or no visual impact expected:	Potentially little influence on scenic resources or visual character of the area. Generally compatible with existing development in the area. Possible scope for enhancement of the area.

Explanation of terms used:

Fundamental change – dominates the view frame and experience of the receptor.

Noticeable change – clearly visible within the view frame and experience of the receptor.

Some change – recognisable feature within the view frame and experience of the receptor.

Limited change – not particularly noticeable within the view frame and experience of the receptor.

Generally compatible – Practically not visible or blends in with the surroundings.

Project Specific Category

The project is identified as a **Category 5** development with the potential for a high visual impact. The visual impact can be linked to the potential intrusion on protected landscapes or scenic resources, change in visual character of the area and the establishment of a new precedent for development in the area. Although the project has the potential for a high visual impact, this outcome might be different due to other influential factors and the results of the impact assessment.

2.5. Baseline Assessment – Significance Rating

Impact assessment must take account of the nature, scale and duration of impacts on the visual receptors whether such impacts are positive or negative. Each impact was assessed according to density and number of sensitive visual receptors within designated radii, which were determined by using the ZTV, Google Earth (for visual receptors and development types) and the following project phases:

- Construction;
- Operation; and
- Decommissioning.

Where necessary, the proposal for mitigation or optimisation of an impact should be detailed. A brief discussion of the impact and the rationale behind the assessment of its significance should also be included. The rating system is applied to the potential impacts on the receiving visual receptors and includes an objective evaluation of the mitigation of the impact. In assessing the significance of each impact, **Table 2.5** below, will be utilised as the baseline impact assessment for visual receptors and phases of the project.

Table 2.5: Impact Significance Rating

NATURE		
Include 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 experienced.		
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).
DURATION		
This describes the duration of the impacts. Duration indicates the lifetime of the impact as a result of the proposed activity.		
1	Short term	The impact will either disappear with mitigation or will be mitigated through natural processes in a span shorter than the construction phase (0 – 1 years), or the impact 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 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 – 30 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 indefinite.
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. Rehabilitation and remediation often impossible. If possible, rehabilitation

		and remediation often unfeasible due to extremely high costs of rehabilitation and remediation.
REVERSIBILITY		
This describes the degree to which an impact 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.
CUMULATIVE EFFECT		
This describes the cumulative effect of the impacts. A cumulative 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
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. 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.

2.6. Visual Impact Assessment Criteria

In order to facilitate decision-making, ensuring consistency in the interpretation of impact assessment criteria is crucial when assessing and reporting potential impacts. **Table 2.6** provides several criteria specifically related to visual impact assessments. It is important to evaluate the proposed project against these criteria before attempting the baseline impact assessment set out in **Table 2.5**.

When determining the significance of impacts, it is essential to consider the projected impact of the proposed development in relation to the envisioned future of the area, rather than solely focusing on its effect on the existing baseline conditions.

Table 2.6: Visual Impact Assessment Criteria

Specific Criteria for Visual Impact Assessments **(Oberholzer, B. 2005.)**	
Visibility of the project	The geographic area from which the project will be visible, or view catchment area. (The actual zone of visual influence of the project may be smaller because of screening by existing trees and buildings). This also relates to the number of receptors affected.

	• ***High visibility*** – visible from a large area (e.g., several square kilometres). • ***Moderate visibility*** – visible from an intermediate area (e.g., several hectares). • ***Low visibility*** – visible from a small area around the project site.
Visual exposure	Based on distance from the project to selected viewpoints. Exposure or visual impact tends to diminish exponentially with distance. • ***High exposure*** – dominant or clearly noticeable (0-1km); • ***Moderate High exposure (included by the visual specialist)*** – somewhat significant and noticeable to the viewer, but not as dominant (1-3km); • ***Moderate exposure*** – recognisable to the viewer (3-5km); • ***Low exposure*** – not particularly noticeable to the viewer (5-10km);
Visual sensitivity of the area	The inherent visibility of the landscape, usually determined by a combination of topography, landform, vegetation cover and settlement pattern. This translates into visual sensitivity. • ***High visual sensitivity*** – highly visible and potentially sensitive areas in the landscape. • ***Moderate visual sensitivity*** – moderately visible areas in the landscape. • ***Low visual sensitivity*** – minimally visible areas in the landscape.
Visual sensitivity of Receptors	The level of visual impact considered acceptable is dependent on the type of receptors. • ***High sensitivity*** – e.g., residential areas, nature reserves and scenic routes or trails; • ***Moderate sensitivity*** – e.g., sporting or recreational areas, or places of work; • ***Low sensitivity*** – e.g., industrial, mining or degraded areas.
Visual absorption capacity (VAC)	The potential of the landscape to conceal the proposed project, i.e., • ***High VAC*** – e.g., effective screening by topography and vegetation; • ***Moderate VAC*** - e.g., partial screening by topography and vegetation; • ***Low VAC*** - e.g., little screening by topography or vegetation.
Visual intrusion	The level of compatibility or congruence of the project with the particular qualities of the area, or its 'sense of place'. This is related to the idea of context and maintaining the integrity of the landscape or townscape. • ***High visual intrusion*** – results in a noticeable change or is discordant with the surroundings; • ***Moderate visual intrusion*** – partially fits into the surroundings, but clearly noticeable;

	• ***Low visual intrusion*** – minimal change or blends in well with the surroundings.

2.7. Zone of Theoretical Visibility (ZTV)

The ZTV maps reflects the visibility in term of proximity of viewers to the proposed development within a 10km PAOI. **Table 2.7** below is used for Visual Exposure rating within the different radii:

Table 2.7: Exposure Rating

Distance (km)	Exposure Rating
0-1	High Exposure
1-3	Moderate High Exposure
3-5	Moderate Exposure
5-10	Low Exposure

The distances were calculated using satellite imagery, but the Exposure Rating was determined by using previous experiences, assumptions and opinions, it is therefore theoretical. The ZTV maps will give a clearer understanding of areas susceptible to line of sight within a 10km PAOI which means, an imaginary line from the eye to a perceived object. The ZTV **did not consider existing screening such as buildings and vegetation cover but rather the terrain's above mean sea level (AMSL) which indicates line of sight**. The receptors which were identified were subject to an impact assessment and the ZTV will form part of the Visual Impact Assessment Criteria set out in **Section 2.5** of this report.

2.8. Assumptions and Limitations

2.8.1. Spatial Data Accuracy

Spatial data used for visibility analysis originate from various sources and scales. Inaccuracy and errors are therefore inevitable. Where relevant, these are highlighted in the report. Every effort was made to minimize their effect.

2.8.2. Viewer Subjectivity

Viewer subjectivity plays a significant role when assessing the visual impacts of PV facilities. Individuals' perceptions and preferences can vary greatly, leading to subjective interpretations of visual impacts. Factors such as personal aesthetics, cultural background, and individual experiences influence how viewers perceive and evaluate the visual effects of PV facilities. Some viewers might appreciate the industrial character and economic benefits associated with renewable energy, while others may view it as an intrusion on natural landscapes.

2.8.3. Site Access and UAV Photos

Access to certain areas of the proposed project can sometimes be difficult due to terrain limitations or access denied by landowners. Thus, site photos are taken at the best possible location.

Photos taken by the Unmanned Arial Vehicle (UAV) are conducted at a certain Above Ground Level (AGL) shown on the UAV's controller. The AGL on the UAV's controller might slightly differ from the real world AGL.

2.9. Project Team and Experience

The project team will consist of Johan Botha and Michael Cloete.

Johan Botha graduated with an Honours degree in 2011 from the North West University in the field of Environmental Sciences specialising in Geography and Environmental Management and has since been involved in the environmental management of substations, powerlines and solar PV plants together with over 150 Visual Impact Assessments (VIA) and 70 Social Impact Assessments (SIA), mostly in the field of Renewable Energy. All the above-mentioned experience accumulated the necessary skills to conduct visual and social impact assessments.

Michael Cloete graduated with a Masters degree in 2020 from the North West University in Geography and Environmental Management with a focus on Geographic Information Systems (GIS) and Visual Impact Assessments (VIA). Accumulating two years of environmental specialist knowledge and reporting in the Hydrogeology field. The accumulated experience provides the necessary skills to conduct visual and social impact assessment.

3. EXISTING LANDSCAPE

This section describes the types of landscape that may be impacted, indicating the likely degree of sensitivity and describes how the landscape areas are likely to be impacted.

3.1. Landscape Character

Landscape character is a composite of several influencing factors including:

- Topography and drainage.
- Vegetation patterns.
- Land use / Development.
- Sense of Place.

3.1.1. Topography and Drainage

The proposed project is located in a region with limited array of natural landforms and with lower differences in elevation as it falls in a region mainly focused on crop cultivation and livestock farming. Additionally, mining plays a big role in the surrounding region with mine heaps and tailings dams as prominent elevated landscape features. The region slopes in a southern direction toward the Vaal River, located approximately 800m south of the powerline corridor and 1.1km south-west of the BESS facility. Within a 10km PAOI from the grid connection and BESS facility, the elevation above mean sea level (AMSL) varies with about 113m. The higher areas reach approximately 1396m AMSL atop a mine tailings dam, while the lower regions descend to 1283m AMSL at the Vaal River.

For a better understanding of the visual landscape surrounding the proposed development, please refer to the Topography map below as well as photos of the surrounding landscape.

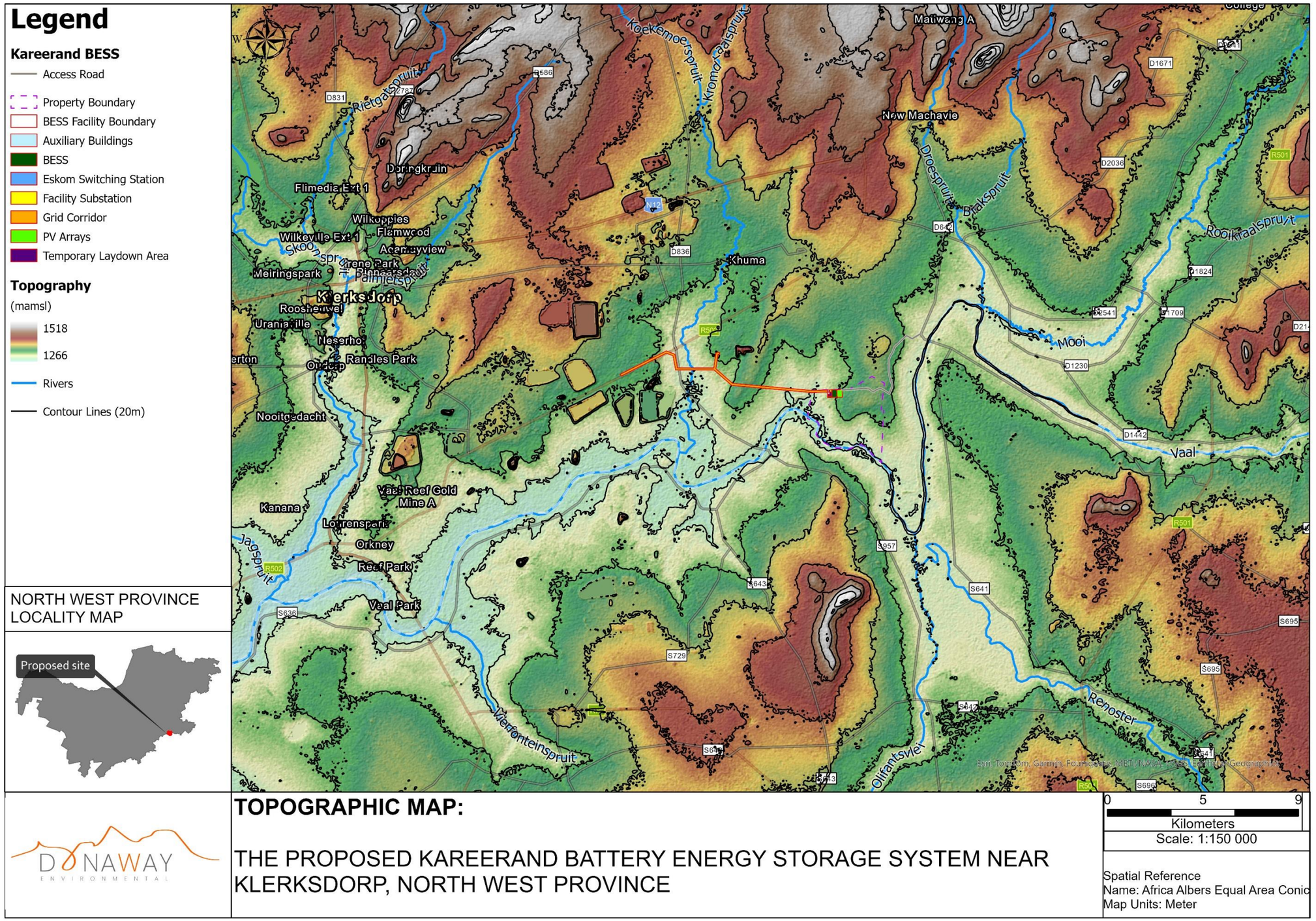


Figure 3.1: Topography Map

Figure 3.2: Aerial photo at Kareerand BESS taken towards the north: AGL 100m

Figure 3.3: Aerial photo at Kareerand BESS taken towards the north-east: AGL 100m

Figure 3.4: Aerial photo at Kareerand BESS taken towards the east: AGL 100m

Figure 3.5: Aerial photo at Kareerand BESS taken towards the south-east: AGL 100m

Figure 3.6: Aerial photo at Kareerand BESS taken towards the south: AGL 100m

Figure 3.7: Aerial photo at Kareerand BESS taken towards the south-west: AGL 100m

Figure 3.8: Aerial photo at Kareerand BESS taken towards the west: AGL 100m

Figure 3.9: Aerial photo at Kareerand BESS taken towards the north-west: AGL 100m

Figure 3.10: Aerial photo at Buffels East Substation taken towards the north: AGL 30m

Figure 3.11: Aerial photo at Buffels East Substation taken towards the north-east: AGL 30m

Figure 3.12: Aerial photo at Buffels East Substation taken towards the east: AGL 30m

Figure 3.13: Aerial photo at Buffels East Substation taken towards the south-east: AGL 30m

Figure 3.14: Aerial photo at Buffels East Substation taken towards the south: AGL 30m

Figure 3.15: Aerial photo at Buffels East Substation taken towards the south-west: AGL 30m

Figure 3.16: Aerial photo at Buffels East Substation taken towards the west: AGL 30m

Figure 3.17: Aerial photo at Buffels East Substation taken towards the north-west: AGL 30m

Figure 3.18: Aerial photo at Hermes Substation taken towards the north: AGL 30m

Figure 3.19: Aerial photo at Hermes Substation taken towards the north-east: AGL 30m

Figure 3.20: Aerial photo at Hermes Substation taken towards the east: AGL 30m

Figure 3.21: Aerial photo at Hermes Substation taken towards the south-east: AGL 30m

Figure 3.22: Aerial photo at Hermes Substation taken towards the south: AGL 30m

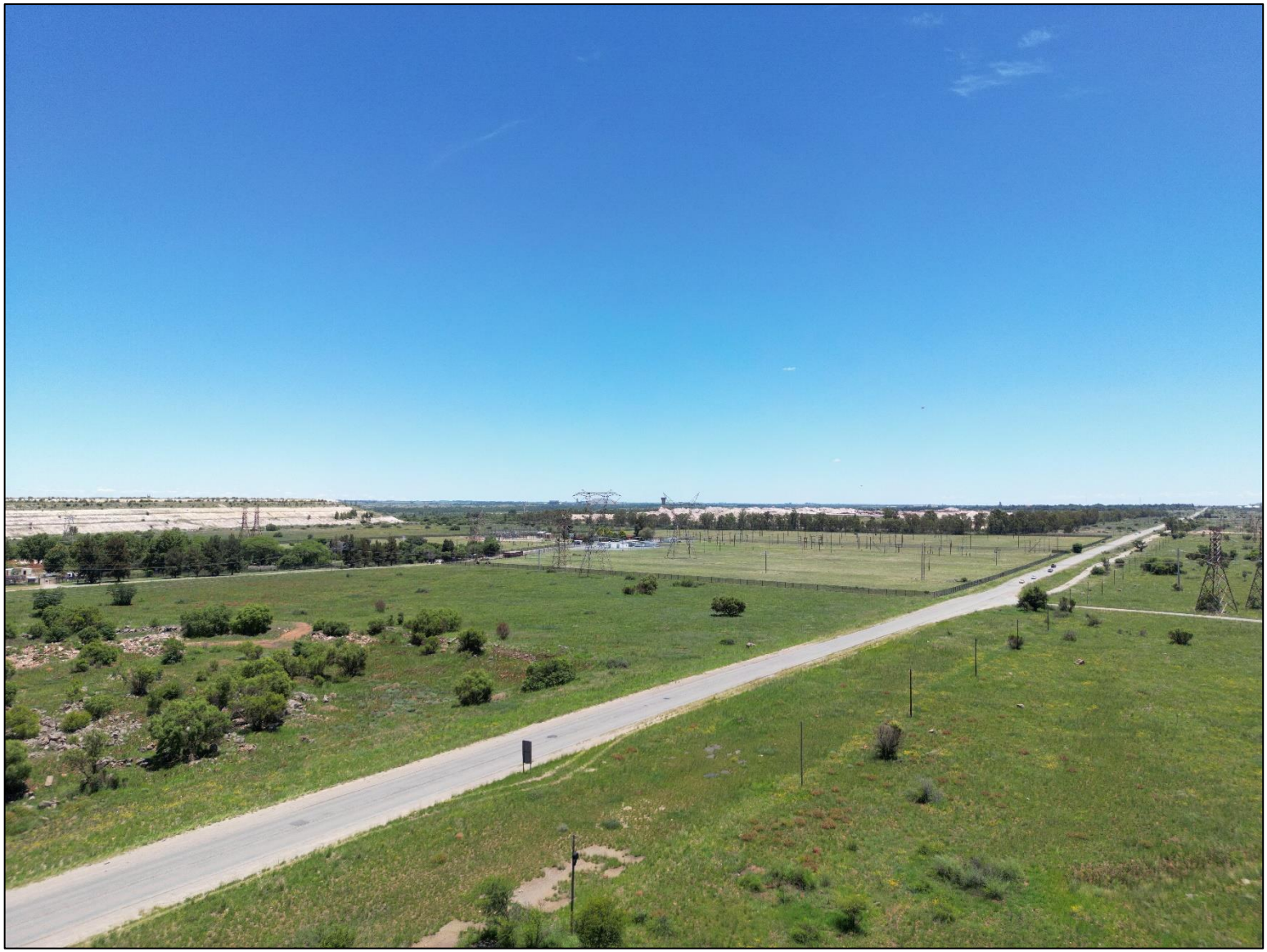


Figure 3.23: Aerial photo at Hermes Substation taken towards the south-west: AGL 30m

Figure 3.24: Aerial photo at Hermes Substation taken towards the west: AGL 30m

Figure 3.25: Aerial photo at Hermes Substation taken towards the north-west: AGL 30m

3.1.2. Vegetation Patterns

Visual impact extends beyond affecting only sensitive visual receptors; it also leaves its imprint on the surrounding landforms and vegetation. Vegetation can be regarded as a valuable visual asset, underscoring the significance of gaining insights into the specific vegetation that the proposed development may influence. By grasping the character of the vegetation in question, one can also draw preliminary findings of its screening potential in the given area.

The most recent classification of the area by Mucina & Rutherford (2006) shows that the BESS facility and powerline corridor cover two vegetation types namely the *Rand Highveld Grassland* and *Vaal Reefs Dolomite Sinkhole Woodland.* The latter is only covered by approximately 800 meters of the EGI corridor.

3.1.2.1. Rand Highveld Grassland

Distribution includes the Gauteng, North-West, Free State and Mpumalanga Provinces: In areas between rocky ridges from Pretoria to Witbank, extending onto ridges in the Stoffberg and Roossenekal regions as well as west of Krugersdorp centred in the vicinity of Derby and Potchefstroom, extending southwards and northeastwards from there. Altitude 1 300–1 635 m, but reaches 1 760 m in places.

The vegetation and landscape features can be described as highly variable landscape with extensive sloping plains and a series of ridges slightly elevated over undulating surrounding plains. The vegetation is species-rich, wiry, sour grassland alternating with low, sour shrubland on rocky outcrops and steeper slopes. Most common grasses on the plains belong to the genera *Themeda*, *Eragrostis*, *Heteropogon* and *Elionurus*. High diversity of herbs, many of which belong to the Asteraceae, is also a typical feature. Rocky hills and ridges carry sparse (savannoid) woodlands with *Protea caffra* subsp. *caffra*, *P. welwitschii*, *Vachellia caffra* and *Celtis africana*, accompanied by a rich suite of shrubs among which the genus *Rhus* (especially *R. magalismonata*) is most prominent.

The conservation status is classified as “Endangered”. Poorly conserved (only 1%). Small patches protected in statutory reserves (Kwaggavoetpad, Van Riebeeck Park, Bronkhorstspruit, Boskop Dam Nature Reserves) and in private conservation areas (e.g. Doornkop, Zemvelo, Rhenosterpoort and Mpopomeni). Almost half has been transformed mostly by cultivation, plantations, urbanisation or dam-building. Cultivation may also have had an impact on an additional portion of the surface area of the unit where old lands are currently classified as grasslands in land-cover classifications and poor land management has led to degradation of significant portions of the remainder of this unit (D.B. Hoare, personal observation). Scattered aliens (most prominently *Vachellia mearnsii*) occur in about 7% of this unit. Only about 7% has been subjected to moderate to high erosion levels.

3.1.2.2. Vaal Reefs Dolomite Sinkhole Woodland

Distribution includes the North-West and Free State Provinces: Small area associated with the dolomite sinkholes in and around Stilfontein and Orkney (Vaal Reefs). The Vaal River forms the southern distribution limit of this vegetation unit. Altitude 1 280–1 380 m.

The vegetation and landscape features can be described as slightly undulating landscape dissected by prominent rocky chert ridges and supporting a grassland-woodland vegetation complex. The most typical vegetation feature is the woodland, which occurs naturally in clumps around sinkholes, especially in places of dolomite outcrops.

The conservation status is classified as “Vulnerable”. Only a small patch conserved in the statutory conservation area of Sterkfontein Caves (part of the Cradle of Humankind World Heritage Site)—the legendary archaeological site associated with the discovery of a skeleton of *Australopithecus africanus*. The proposed ‘Highveld National Park’ is supposed to conserve a considerable area of this vegetation unit. Aesthetically this is one of the most scenic landscapes in the western Grassland Biome and certainly deserves high conservation priority. Almost a quarter has been transformed already—mainly by mining, cultivation, urban sprawl and road-building. The region of this unit contains possibly the highest concentration of mines of any other vegetation in South Africa. Erosion is generally very low.

3.1.3. Land Use / Development

Development within the region can be divided into the following types:

- **Industrial Development;** The main industrial development in the region is mining with associated infrastructure. Mining plays an important role in the economy of the region.
- **Urban Development;** The main urban developments in the wider region are Orkney, Klerksdorp and Stilfontein. These towns are mainly associated with mining developments.
- **Sports and Recreational Development;** Developments as part of urban development. The nearest recreational area is the Vaal River. The Vaal River is used for activities like fishing and boating. Along the banks of the Vaal River are river homes and some accommodation facilities.
- **Agricultural Development;** This is one of the main development types in the area consisting mostly out of livestock, dryland and crop irrigation farming with limited game farming.
- **Service Development;** Facilities and infrastructure associated with development. These include mostly roads and power infrastructure linked to the surrounding area influenced by mining.
- **Tourism Development;** Tourism development in the area remains limited as the region primarily prioritises agriculture and mining over tourism. Consequently, there are no distinctive tourist attractions within the area to draw significant visitor attention.

Please refer to the Land Use & Landcover Map below for an indication of the landcover and developments.

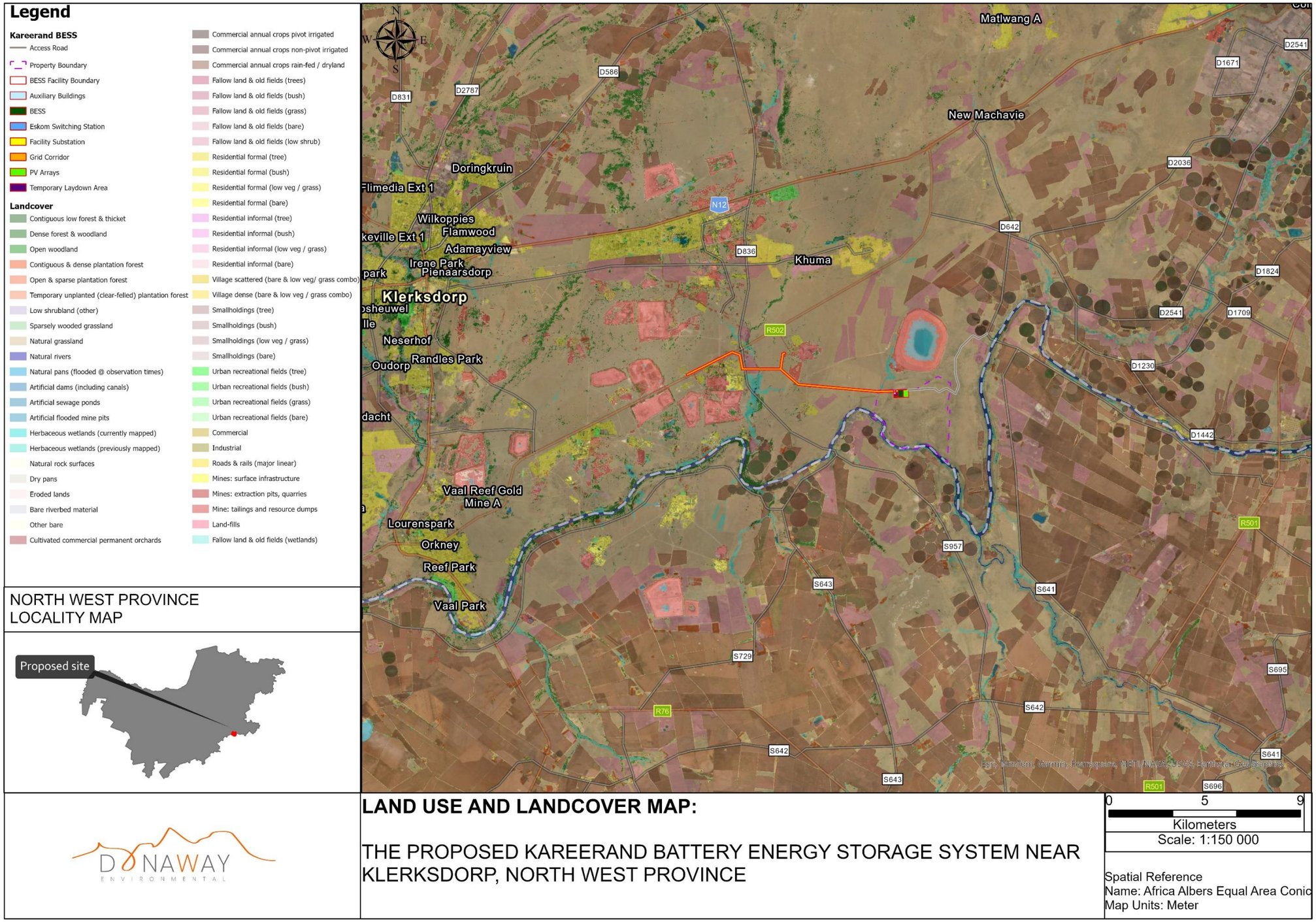


Figure 3.26: Land Use and Landcover map

3.1.4. Sense of Place

In this area, the sense of place is deeply shaped by the flat and unremarkable landscape that stretches as far as the eye can see. The vast expanse of open fields and distant horizons creates a sense of spaciousness, but it may lack the dramatic landforms or striking features commonly found in more diverse landscapes.

A defining aspect of the local scenery is the presence of blue gum tree plantations, thoughtfully interspersed closer to homesteads on farms. These plantations not only provide a visual contrast to the otherwise monotonous surroundings but also serve as windbreaks and sources of timber for the community. The sight of these carefully arranged plantations adds a touch of variety and human intervention to the natural environment.

The beating heart of the region lies in the dominant activities of livestock farming, crop cultivation and mining. Agriculture and mining play vital roles in the local economy, sustaining livelihoods and fostering a strong sense of community around the shared dependence on the land and resources. As a result of the area's rural and industrial nature, there may be a sense of simplicity and a slower pace of life outside the busy urban and mining developments. This unpretentious atmosphere can be both charming and unexciting to some, depending on individual preferences. For those who appreciate the uncluttered beauty of farmlands and the simplicity of rural living, this landscape may exude a certain sense of nostalgia and tranquillity.

Despite the apparent plainness of the region's agricultural setting and the existing visual pollution caused by mining, there is an oasis of leisure and relaxation found along the banks of the Vaal River. This natural waterway breathes life into the surroundings, attracting mainly locals seeking moments of respite from the continuous agricultural and mining landscapes. Here, people come together to enjoy recreational activities such as fishing, boating, or simply lounging by the water's edge, creating a vibrant contrast to the otherwise quiet rural backdrop and industrial setting.

Overall, the sense of place in this area is a harmonious blend of rural simplicity, the industriousness of mining, and the serene allure of the Vaal River.

4. VISUAL FEATURES AND SENSITIVE RECEPTORS

The study area is characterised by a variety of landscape features that possess a visual or scenic value. These natural elements along with potential sensitive visual receptors serve as a visual baseline for assessing the surroundings. The following landscape features and potential sensitive visual receptors can be observed:

Table 4.1: Landscape Features

Scenic Resource	Landscape features within the 10km PAOI.
Topographic Features	No significant topographic features, except for mine heaps and tailings dams scattered throughout the region. These features do not add to scenic value but are historical in nature. The nearest topographic feature as part of mining developments is a tailings dam, located a mere 700m north of the proposed development.
Water Features	The Vaal River stands out as the most prominent water feature. The Vaal River is known for recreational activities and one of South Africa's most important rivers. More scenic views along the Vaal River.
Vegetation Features	The only specific vegetation that draws more attention is the vegetation along the Vaal River and certain area to the south with more pleasant vegetation features. The project property has better vegetation features in terms of trees as it being used for game farming. Please refer to **section 3.1.2: Vegetation Patterns** for a detailed overview.
Cultural Landscapes	No specific cultural landscape except that of the agriculture landscape where some farms are carried over to new generations within the family.

Table 4.2: Potential Sensitive Receptors

Sensitive Receptors	Potential sensitive receptors within the 10km PAOI.
Nature reserves and national parks	Two nature reserves are located within the 10km PAOI namely: • Bushybend Private Nature Reserve (part of development footprint). Proclamation – 1973. • Mispah Game Farm. Proclamation – 2001. Activities with this nature reserve consist only of mining.
Human settlements and farmsteads	Urban development within the 10km PAOI includes the town of Stilfontein and associated township, Khuma, as well as Vaal Reefs a residential mining development. Numerous farmsteads and river homes are also located within the 10km PAOI. River homes are mainly used for recreational purposes and residents.

Scenic routes and arterial roads	No specific scenic routes. Arterial roads include the R502 regional road and National Route 12 (N12).
Cultural and heritage sites	These form part of the heritage study, if any. A development might have a visual impact on cultural or heritage sites only if these sites are visited frequently by tourists or interested parties.
Tourism facilities / sites	Some lodging facilities in the area, especially along the Vaal River, but no specific tourism sites.

4.1. Impacts on airports and aerodromes

4.1.1. Objects affecting airspace and applicable legislation

Any communications structure, building or other structure, whether temporary or permanent, which has the potential to endanger aviation in navigable airspace, or has the potential to interfere with the operation of navigation or surveillance systems or Instrument Landing Systems, including meteorological systems for aeronautical purposes, is considered an obstacle and shall be submitted to the Commissioner for Civil Aviation for evaluation (refer to SA-CAR Part 139.01.33).

As navigable airspace is any airspace where "heavier than air" craft can operate, it means that any obstacle, anywhere, needs to be evaluated.

The main reason is to control or prevent structures that could have a serious effect on aviation safety, especially in the vicinity of an aerodrome. It also follows that the knowledge of where obstacles are, will add to aviation safety.

Power lines

Power lines, overhead wires and cables are considered as obstacles and the detail shall be communicated to the Commissioner for Civil Aviation at an early planning stage.

The Commissioner shall require the route of the power line, the co-ordinates (latitude and longitude in degree, minute, seconds and tenth of seconds format) of turning points in the line, the maximum height of the structures above ground level and the name of the power line. The Commissioner shall evaluate the route and require those sections of the line (if any), which is considered a danger to aviation to be marked or rerouted.

Power lines shall be marked when crossing a river, valley or major highway with marker spheres of a diameter of not less than 60 cm. The spheres shall be of one colour and displayed alternately orange/red and white or a colour that is in sharp contrast to the background as seen from an airborne perspective. The spacing between the spheres and between the spheres and the supporting towers shall not exceed 30m. On lines with multiple cables, the spheres shall be fitted to the highest cable.

The marker spheres shall be visible from at least 1000m from an airborne perspective and 300m from the ground.

Where power lines cross a river or valley, the co-ordinates (latitude and longitude in degree, minute, seconds and tenth of seconds format) and the height of the line above the valley or river, shall be communicated to the Commissioner for publication in the appropriate media.

The Commissioner may require that supporting towers be marked and lighted.

Cranes

Where cranes are erected, prior permission shall be obtained from the Commissioner. The co-ordinates (latitude and longitude in degree, minute, seconds and tenth of seconds format), the ground elevation of the site above mean sea level, the height of the crane, the dimensions of the jib as well as the erecting date and duration of the project must be communicated to the Commissioner for evaluation and publication in the relevant media.

The Commissioner shall specify markings, if required.

When markings are required, the crane shall be painted in a conspicuous colour which in a sharp contrast to the background from an airborne perspective. Illumination shall clearly define the shape of the crane and the extremities of the structure shall be illuminated by medium intensity Type B flashing red light (20 – 60 flashes per minute), of 2000 candela (±25 %) intensity.

Variations on Markings

Written, motivated request for the variation of any of the requirements for the marking of structures may be addressed to the Commissioner.

Specifications on markings

Specification on the lighting and painting of structures can be found in International Civil Aviation Organization's Annex 14 chapter 6 and the specifics in Annex 14 APPENDIX 1. COLOURS FOR AERONAUTICAL GROUND LIGHTS, MARKINGS, SIGNS AND PANELS. (https://www.flashtechnology.com/wp-content/uploads/2017/09/ICAO-Annex-14-Chapter-6-2013.pdf).

4.1.2. Glare

Solar panels are designed to absorb light, and accordingly only reflect a small amount of the sunlight that falls on them compared to most other everyday objects (Refer to **Figure 4.1 to 4.4**). Most notably, solar panels reflect significantly less light than flat water.

In fact, glass, one of the uppermost and important components of a solar panel, reflects only a small portion of the light that falls on it–about 2-4%, depending on whether it has undergone an anti-reflective treatment. These days, to increase solar panel efficiency and power output, most panels are treated with anti-reflective coating.

The potential glint and glare effects for Bi-facial panels remains the same due to both faces consisting of a reflective surface, it is deemed very unlikely that significant glare effects from the underside are possible for static, single and dual axis trackers. This is because this face will almost always be facing away from the Sun. On static systems (north facing with a 20-degree elevation angle, for example), the underside of the panel will be angled downward towards the ground. Considering the path of the Sun throughout a typical day in South Africa, any reflections will only ever go towards the floor. The

possibility of glare effects for the optimised face (the face orientated towards the Sun) remains the same.

Figure 4.1: Reflection Characteristics of normal glass (left) and PV glass (right)

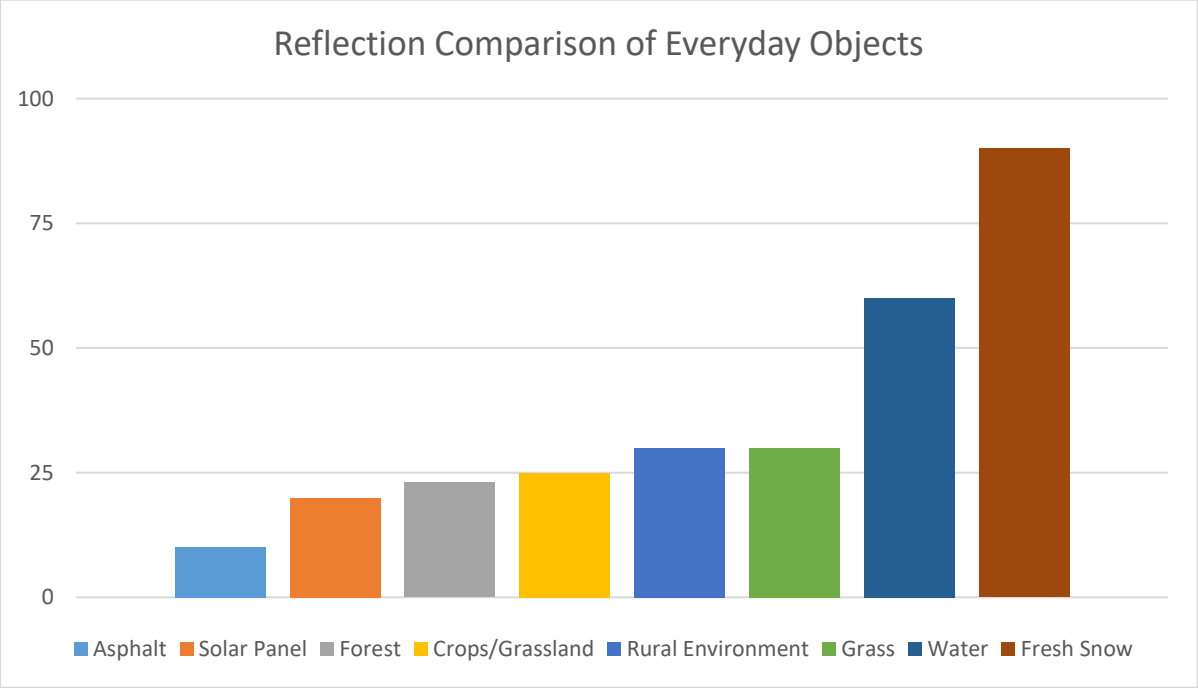


Figure 4.2: Reflection Comparison of everyday objects

Numerous airports around the world have solar installations located on their premises (Refer to Figure 4.3). Airports Company South Africa (ACSA) has commissioned three solar powered airports, George Airport in the Western Cape, followed by Kimberley Airport and Upington International Airport, both in the Northern Cape. Most examples in which solar panels have been installed at, on or near airports are testament to fact that they are not automatically a hazard to pilots.

Figure 4.3: Solar Installations at the Cape Town International Airport in the Western Cape

Figure 4.4: View of the Bokamoso PV facility from an airplane at a height of 36000 feet amsl

5. VISUAL IMPACT ASSESSMENT CRITERIA

Please refer to **Section 2 (Methodology)** of this report for a detailed understanding of the Visual Impact Assessment Criteria.

5.1. VIA Criteria Assessed

Table 5.1.1: Visual Impact Assessment Criteria - Assessed

<table>
<tr><th colspan="2">Specific Criteria for Visual Impact Assessments</th></tr>
<tr><td>VISIBILITY OF THE PROJECT</td><td>
HIGH VISIBILITY

The rating is solely based on the size of the Zone of Theoretical Visibility (ZTV) and serves as an indicator of the potential visual impacts of the development on the surrounding region according to topography, excluding vegetation and infrastructure screening. A high visibility does not necessarily imply a significant visual impact or exposure, although it may have one if the region has a dense population of sensitive visual receptors together with sparse vegetation and infrastructure screening.

Visibility Coverage: BESS & PV
<table>
<tr><th>Distance (km)</th><th>Total Buffer Area (ha)</th><th>Area Visible (ha)</th><th>Percentage (%)</th></tr>
<tr><td>0-1 (High Exposure)</td><td>547,92</td><td>343,88</td><td>62,76%</td></tr>
<tr><td>1-3 (Moderate High Exposure)</td><td>2930,64</td><td>1019,99</td><td>34,8%</td></tr>
<tr><td>3-5 (Moderate Exposure)</td><td>5444,15</td><td>926,83</td><td>17,02%</td></tr>
<tr><td>5-10 (Low Exposure)</td><td>24605,4</td><td>1174,66</td><td>4,77%</td></tr>
</table>
</td></tr>
</table>

Visibility Coverage: Grid Connection Corridor

Distance (km)	Total Buffer Area (ha)	Area Visible (ha)	Percentage (%)
0-1 (High Exposure)	2677,84	2606,97	97,35%
1-3 (Moderate High Exposure)	6673,67	4579,18	68,62%
3-5 (Moderate Exposure)	9077,04	3822,2	42,11%
5-10 (Low Exposure)	33556,8	9309,3	27,74%

The tables above (extracted from the ZTV maps below) indicates a “High Visibility”, according to the Specific Criteria for Visual Impact Assessment (Oberholzer, B. 2005), for the entire 10km radius. Visibility within the 10km PAOI covers thousands of hectares, with a significant exposure percentage within the 1km radius, especially for the powerline. Exposure percentage for the powerline up to 3km is still on the higher end but starts to diminish exponentially beyond the 3km radius. Visibility of the BESS and PV area is somewhat significant up to 1km but decreases exponentially beyond.

Furthermore, air quality and atmospheric conditions play a crucial role in determining visibility levels. Poor air quality, characterized by high levels of pollutants and particulate matter, can significantly reduce visibility by scattering and absorbing light. Fine particulate matter, such as smoke, haze, and smog, can absorb and scatter sunlight, creating a hazy or foggy appearance. Similarly, pollutants like sulphur dioxide and nitrogen dioxide can react with other compounds in the atmosphere to form smog, which further impairs visibility. Atmospheric conditions, such as humidity and temperature inversions, also affect visibility. High humidity levels can lead to the formation of fog and mist, reducing visibility to mere meters. Temperature inversions occur when a layer of warm air traps cooler air near the ground, causing pollutants and particulate matter to be trapped closer to the surface and reducing visibility. In summary, air quality and atmospheric conditions are closely linked to visibility, with poor air quality and specific weather phenomena significantly impacting the clarity of our surroundings.

VISUAL EXPOSURE

As mentioned above, the exposure rating is based on the ZTV (line of site influenced solely by topography) and not existing visual screening such as vegetation cover and / or other infrastructure. The receptors listed below are exclusively those that have the potential to visually observe or perceive the project. Visual exposure diminishes exponentially with distance.

	Radius	Sensitive Visual Receptors	Exposure rating in terms of proximity
	0-1km	**BESS & PV** - Bushybend Private Nature Reserve (development property)	**High Exposure**
		Powerline Corridor - Bushybend Private Nature Reserve (development property) - Three farmsteads - R502 regional road	
	1-3km	**BESS & PV** - Five farmsteads - Four homesteads on the banks of the Vaal River - Bushybend Private Nature Reserve (development property)	**Moderate-High Exposure**
		Powerline Corridor - Bushybend Private Nature Reserve (development property) - Four farmsteads - R502 regional road - A number of river homes - Vaal River	
	3-5km	**BESS & PV**	**Moderate Exposure**

		- One homestead - One farmstead - One lodging facility	
		Powerline Corridor - Three farmsteads - Two lodging facilities - Vaal River - A number of river homes - R502 regional road - Khuma - One local community	
	5-10km	**BESS & PV** - Three farmsteads - R502 regional road	**Low Exposure**
		Powerline Corridor - 21 farmsteads - Stilfontein - Khuma - N12 - R502 regional road - Three lodging facilities - A number of river homes - Vaal River - Orkney Airfield (Vaal River Gliding Club)	

		- Mispah Game Farm (mining area)	
VISUAL SENSITIVITY OF THE AREA	**LOW VISUAL SENSITIVITY** The assessment of visual sensitivity in the area reveals a low impact, primarily attributed to an area with no specific scenic quality and mining developments. The area's scenic quality in the summer is moderate, but during the winter very low. The exception of the Vaal River remains as the more scenic resource in the area.		
VISUAL SENSITIVITY OF RECEPTORS	**MODERATE RECEPTOR SENSITIVITY** Please refer to the **ZTV map** below and **Section 4** of this report for an indication of sensitive visual receptors in the area. The most sensitive receptors might be those along the Vaal River that enjoys the little bit of scenic quality and serenity the banks of the Vaal River provide against the overwhelming mining landscape. Most people living permanently in the area might already be desensitised to industrial infrastructure due to the extensive mining developments. People travelling on the R502 regional road, who haven't seen the area before, will notice that they are entering a mining area, especially with mine heaps and tailings dams that can be seen from afar. The visual impact of the proposed development might diminish against the backdrop and feel of extensive mining developments.		
VISUAL ABSORPTION CAPACITY (VAC)	**MODERATE VAC** The area surrounding the proposed development reflects a moderate Visual Absorption Capacity (VAC). Screening is good along the banks of the Vaal River and unlikely that receptors along the Vaal River will be severely impacted by the project. Furthermore, most farmsteads are surrounded by private vegetation which has the potential for screening, but a large part of the landscape are open cultivation fields and open pasture, mostly to the south.		
VISUAL INTRUSION	**MODERATE VISUAL INTRUSION** The proposed development may alter the visual harmony closer to the proposed development, drawing attention away from the rhythmic patterns of grazing fields, crop cultivation and the more scenic resource the Vaal River provides. A large part of the landscape to the west		

	and north includes mining developments visually polluting the landscape. The closest mining development, a tailings dam, is located a mere 700m to the north. Viewers located to the south, and some to the north, will have mining developments as backdrop.

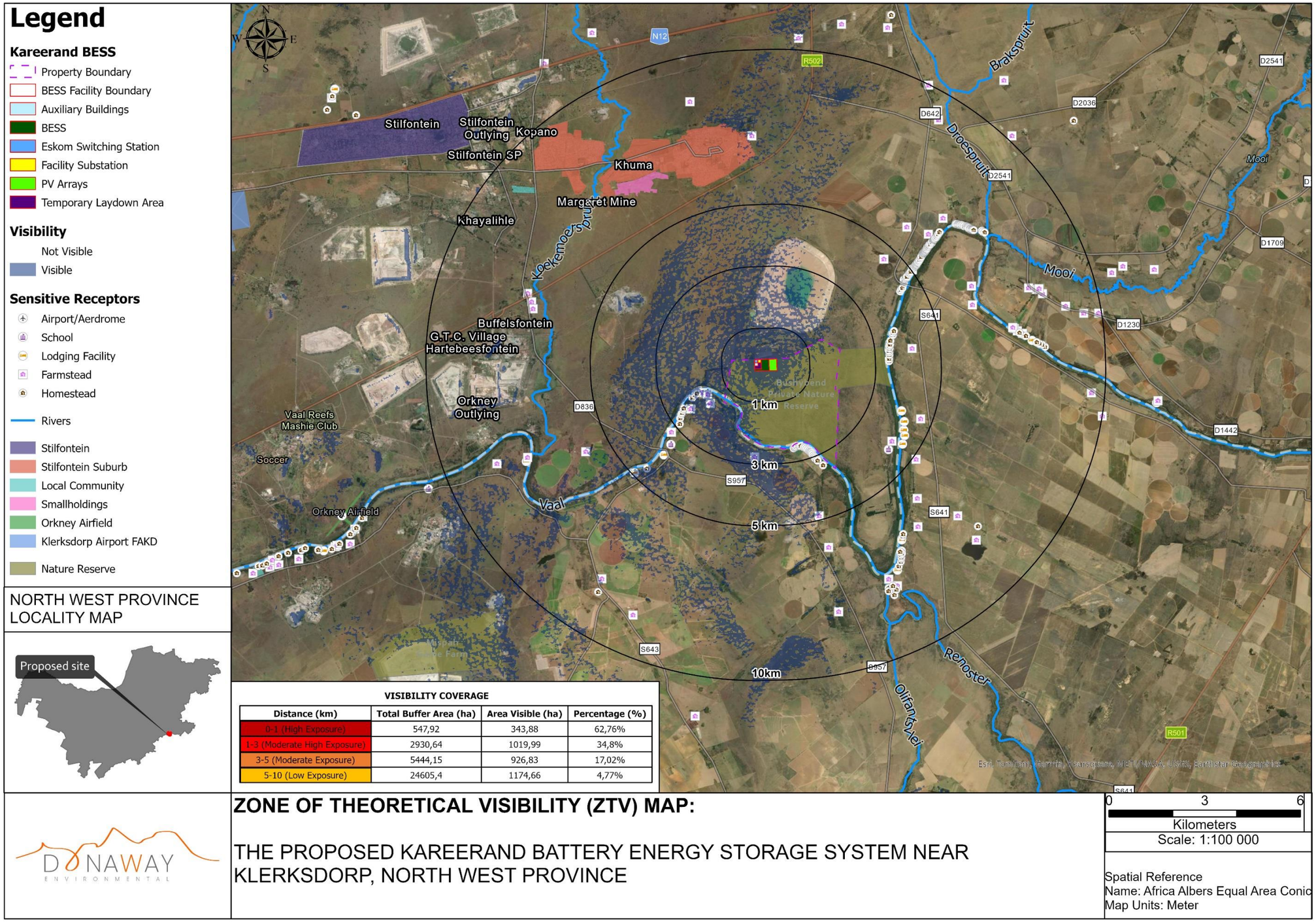


Figure 5.1.1: ZTV Map: BESS & PV

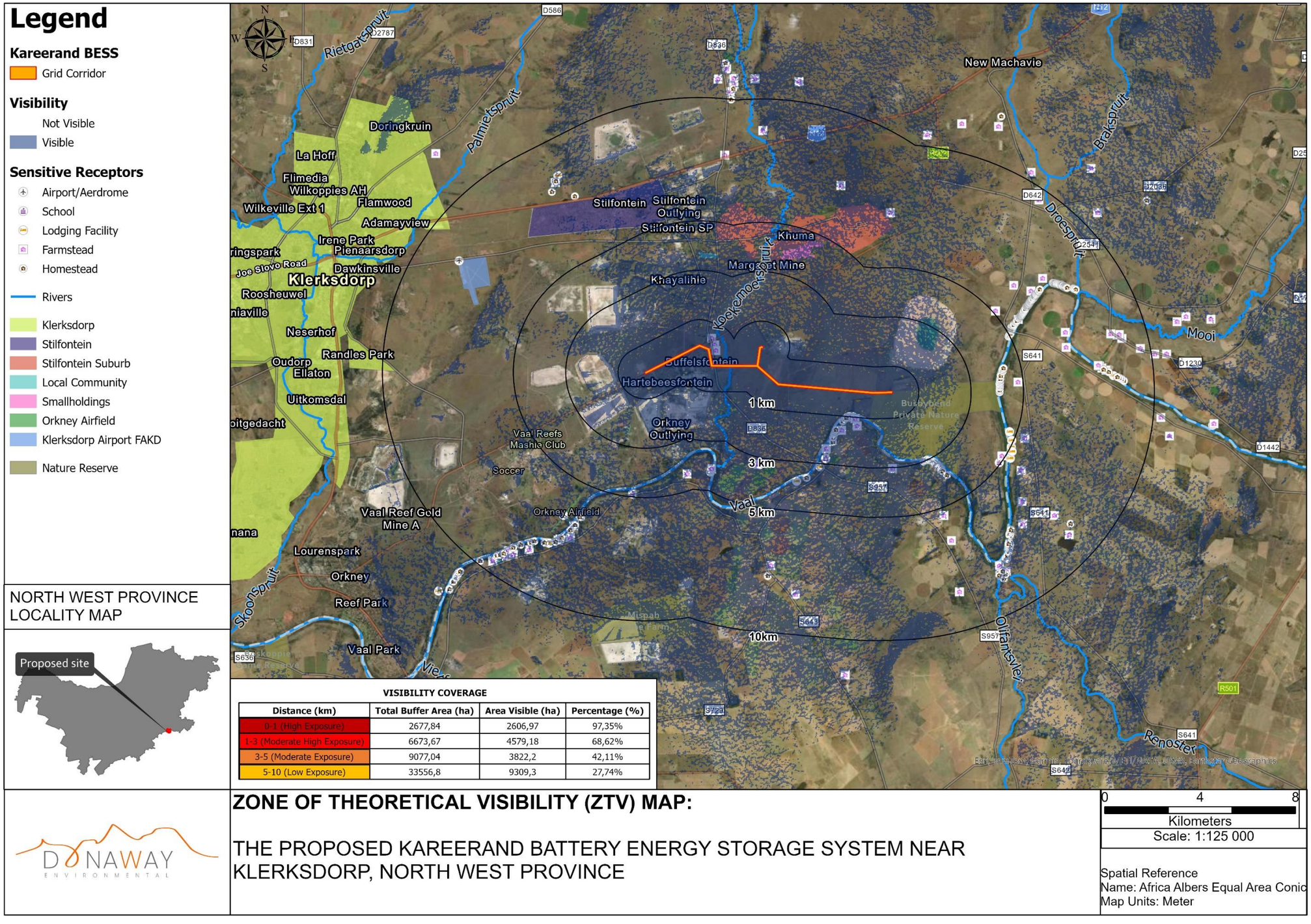


Figure 5.1.2: ZTV Map: Powerline Corridor

5.2. Visual representation of an operational PV facility

The photos below reflect a view towards the operational 200 hectares Matla A Bokone Solar Power Plant, previously known as Droogfontein 2, at a distance of approximately 1km and 2km respectively. Three photos were taken at different AGL of 6m, 30m and 50m. The photos reflect an almost negligible visibility of the solar power plant in its operational phase. Furthermore, as seen in the photos, almost no existing screening is present.

Figure 5.2.1: View towards the Droogfontein 2 SEF at 2km: 6m AGL

Figure 5.2.2: View towards the Droogfontein 2 SEF at 2km: 30m AGL

Figure 5.2.3: View towards the Droogfontein 2 SEF at 2km: 50m AGL

Figure 5.2.4: View towards the Droogfontein 2 SEF at 1km: 6m AGL

Figure 5.2.5: View towards the Droogfontein 2 SEF at 1km: 30m AGL

Figure 5.2.6: View towards the Droogfontein 2 SEF at 1km: 50m AGL

6. VISUAL IMPACT ASSESSMENT

This section provides a detailed description and assessment of the potential visual impacts that were identified during the VIA process for the detailed design and construction, operation, and decommissioning phases of the proposed project.

6.1. Design & Construction Phase

The design and construction phase are expected to take approximately 18 months to complete. It is anticipated that the following activities would be included and would form part of the detailed design and construction phase:

- **Pre-planning:** Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the positioning of infrastructure. The construction process is dynamic and unforeseen changes to the project specifications may occur. The final facility design is required to be approved by competent authorities prior to any construction activities commencing on-site. Should any substantive changes or deviations from the original scope or layout of the project reflected in the EIA process occur, the competent authority would need to be notified thereof, and where applicable additional approval may need to be obtained.
- **Conduct surveys**: Prior to initiating construction, several surveys will be required. These include, but are not limited to, confirmation of the micro-siting footprint (i.e., confirming the precise location of the PV panels, BESS, and the plant's associated infrastructure) and a geotechnical survey.
- **Procurement and employment**: At the peak of construction the project is likely to create up to 100 employment opportunities during the peak of construction. These employment opportunities will be temporary and will last for a period of approximately 18 months (i.e., the length of construction). Employment opportunities generated during the construction phase will include low skilled, semi-skilled, and skilled opportunities. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area. Most of the labour force is expected to be sourced from the surrounding cities. No labourers will be accommodated on-site during the construction period.
- **Establishment of an access road to the site:** Access is most likely to be obtained via the D642 district road. An internal site road network will also be required to provide access to all components. The final layout will be determined following the identification of site related sensitivities.
- **Undertake site preparation:** Site preparation activities will include clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled and / or spread on site.
- **Transport of components and equipment to site:** The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the proposed development. Some of the components (i.e., substation

transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTO) by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g., excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of support structures, construction of the substation and site preparation.

- **Establishment of laydown areas on site:** Laydown and storage areas will be required for typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area will need to be established adjacent to the workshop area. The equipment construction camp serves to confine activities and storage of equipment to one designated area to limit potential impacts associated with this phase of development. The laydown area will be used for assembly of components and the general placement / storage of construction equipment.
- **Erect BESS and PV arrays and construct substation and invertors:** The construction phase involves installation of the BESS and PV solar panels, and structural and electrical infrastructure required for the operation of the facility. In addition, preparation of the soil and improvement of the access roads is likely to continue for most of the construction phase. For array installations, vertical support posts are driven into the ground. The posts will hold the support structures (tables) on which the PV modules would be mounted. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared if necessary. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the facility's onsite substation. The construction of the substation will require a survey of the site, site clearing and levelling and construction of access road(s) (where applicable), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and rehabilitation of any disturbed areas, and protection of erosion sensitive areas.
- **Establishment of ancillary infrastructure:** Ancillary infrastructure will include workshop, storage and laydown areas, gatehouse and security complex, as well as a temporary contractor's equipment camp. The establishment of the ancillary infrastructure and support buildings will require the clearing of vegetation and levelling of the development site, and the excavation of foundations prior to construction. Laydown areas for building materials and equipment associated with these buildings will also be required.
- **Undertake site rehabilitation:** Once construction is completed and all construction equipment has been removed, the site will be rehabilitated where practical and reasonable. In addition, on full commissioning of the facility, any access points which are not required during operation must be closed and rehabilitated accordingly.

The majority of visual impacts associated with the project are anticipated to occur during the operational phase of the development. Impacts during the construction phase of the project are typical of the type of visual impacts generally associated with construction activities. Impacts associated with the design and construction phase of a project are usually of a short duration and temporary in nature but could have long-term effects on the surrounding visual environment if not planned or managed appropriately. It is therefore necessary that the design phase be conducted in such a manner so as not to result in permanent impacts associated with the ill placement of project components or associated infrastructure.

6.1.1. BESS & PV

Mitigation: Planning

- Retain and maintain natural vegetation immediately adjacent to the development footprint, beyond any required firebreaks.

Mitigation: Construction

- Ensure that vegetation is not unnecessarily removed during the construction phase.
- Plan the placement of laydown areas and temporary construction equipment camps to minimise vegetation clearing (i.e., in already disturbed areas) where possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site.
- Reduce and control dust during construction by utilising dust suppression measures.
- Limit construction activities between 07:00 and 18:00, where possible, to reduce the impacts of construction lighting.
- Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Cumulative Impacts:

- 11 other alternative energy project applications have been submitted to the Department within a 30km radius.

Residual Impacts:

- None, if rehabilitation is carried out as specified.

Table 6.1: Visual Impact – Construction Phase: BESS & PV

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Visual impact of construction activities on sensitive visual receptors and a rural landscape.	Before mitigation	Negative	2	4	2	3	1	3	3	45	Medium (29-50)	Yes	Yes	**Planning** • Retain and maintain natural vegetation immediately adjacent to the development footprint, beyond any required firebreaks. **Construction** • No unnecessary removal of vegetation. • Reduce vegetation clearance through planning of laydown areas and construction equipment camps. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during by utilising dust suppression measures. • Limit construction activities between 07:00 and 18:00, to reduce the impacts of lighting. • Rehabilitate all disturbed areas immediately after the completion of construction.
	After mitigation	Negative	2	3	1	2	1	2	3	33	Medium (29-50)			

6.1.2. Powerline Corridor

Mitigation: Planning

- Retain and maintain natural vegetation immediately adjacent to the development footprint.

Mitigation: Construction

- Ensure that vegetation is not unnecessarily removed during the construction phase.
- Plan the placement of laydown areas and temporary construction equipment camps to minimise vegetation clearing (i.e., in already disturbed areas) where possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site.
- Reduce and control dust during construction by utilising dust suppression measures.
- Limit construction activities between 07:00 and 18:00, where possible, to reduce the impacts of construction lighting.
- Rehabilitate all disturbed areas immediately after the completion of construction work and maintain good housekeeping.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Cumulative Impacts:

- 11 other alternative energy project applications have been submitted to the Department within a 30km radius.

Residual Impacts:

- None, if rehabilitation is carried out as specified.

Table 6.2: Visual Impact – Construction Phase: Powerline Corridor

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Visual impact of construction activities on sensitive visual receptors and a rural landscape.	Before mitigation	Negative	2	3	2	2	1	4	2	28	Low (6-28)	Yes	Yes	**Planning** • Retain and maintain natural vegetation immediately adjacent to the development footprint. **Construction** • No unnecessary removal of vegetation. • Reduce vegetation clearance through planning of laydown areas and construction equipment camps. • Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads. • Ensure that rubble, litter, etc. are appropriately stored (if it can't be removed daily) and then disposed of regularly at a licenced waste site. • Reduce and control dust during by utilising dust suppression measures. • Limit construction activities between 07:00 and 18:00, to reduce the impacts of lighting. • Rehabilitate all disturbed areas immediately after the completion of construction.
	After mitigation	Negative	2	3	1	2	1	3	2	24	Low (6-28)			

6.2. Operational Phase

The project is anticipated to operate permanently. The development will operate continuously, 7 days a week. Key elements of the Operation and Management (O&M) Plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security.

6.2.1. BESS & PV

Mitigation: Planning

- Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint, beyond any required firebreaks.
- Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient.

Mitigation: Operations

- Maintain general appearance of the development.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Cumulative Impacts:

- 11 other alternative energy project applications have been submitted to the Department within a 30km radius.

Residual Impacts:

- The visual impact will be removed after decommissioning of the site.

Table 6.3: Visual Impact – Operational Phase: BESS & PV

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Visual impact of industrial operational infrastructure on sensitive visual receptors, landscape and scenic resources. Change in the sense of place of the local area.	Before mitigation	Negative	2	4	2	3	3	3	2	34	Medium (29-50)	Yes, but only partially	Yes	**Planning** • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint, beyond any required firebreaks. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. **Operations** • Maintain general appearance of the development.
	After mitigation	Negative	2	3	1	2	3	3	2	28	Low (6-28)			

6.2.2. Powerline Corridor

Mitigation: Planning

- Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint.
- Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient.

Mitigation: Operations

- Maintain general appearance of the development.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Cumulative Impacts:

- 11 other alternative energy project applications have been submitted to the Department within a 30km radius.

Residual Impacts:

The visual impact will be removed after decommissioning of the site.

Table 6.4: Visual Impact – Operational Phase: Powerline Corridor

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Visual impact of industrial operational infrastructure on sensitive visual receptors, landscape and scenic resources. Change in the sense of place of the local area.	Before mitigation	Negative	2	3	2	2	3	4	2	32	Medium (29-50)	Yes, but only partially	Yes	**Planning** • Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. • Where insufficient natural vegetation exists next to the property, a 'screen' can be planted if the landowner requests additional mitigation. This can be done using endemic, fast growers that are water efficient. **Operations** • Maintain general appearance of the development.
	After mitigation	Negative	2	2	1	2	3	4	2	28	Low (6-28)			

6.3. Lighting impacts of the BESS & PV.

These lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions, and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. It is possible that the project may add sky glow to a rural landscape.

Mitigation: Planning & Operation
As far as practically possible:

- Shield the source of light by physical barriers (walls, vegetation etc.)
- Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights.
- Make use of minimum lumen or wattage in fixtures.
- Make use of down-lighters, or shield fixtures.
- Make use of low-pressure sodium lighting or other types of low impact lighting.
- Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
- As a recommendation only, the use of night vision or thermal security cameras are very effective and can replace security lighting entirely, except for lighting as per the SACAA regulations.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Cumulative Impacts:

- The project may increase the cumulative visual impact together with lighting from surrounding communities and mines.

Residual Impacts:

- The visual impact will be removed after decommissioning of the site.

Table 6.5: Visual Impact – Lighting

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Visual impacts of lighting at night on sensitive visual receptors and the effect of sky glow on a rural landscape.	Before mitigation	Negative	2	3	1	2	3	3	2	28	Low (6-28)	Yes, but only partially	Yes	**Planning & Operation** As far as practically possible: • Shield the source of light by physical barriers (walls, vegetation etc.) • Limit mounting heights of lighting fixtures, or alternatively use footlights or bollard level lights. • Make use of minimum lumen or wattage in fixtures. • Make use of down-lighters, or shield fixtures. • Make use of low-pressure sodium lighting or other types of low impact lighting. • Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes. • As a recommendation only, the use of night vision or thermal security cameras are very effective and can replace security lighting entirely, except for lighting as per the SACAA regulations.
	After mitigation	Negative	2	2	1	1	3	2	2	20	Low (6-28)			

6.4. Cumulative Impacts

The EIA Regulations (as amended in 2017) determine that cumulative impacts, "*in relation to an activity, means the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to the existing and reasonably foreseeable impacts eventuating from similar or diverse activities*." Cumulative impacts can be incremental, interactive, sequential or synergistic. EIAs have traditionally failed to come to terms with such impacts, largely as a result of the following considerations:

- Cumulative effects may be local, regional or global in scale and dealing with such impacts requires coordinated institutional arrangements;
- Complexity - dependent on numerous fluctuating influencing factors which may be completely independent of the controllable actions of the proponent or communities; and
- Project level investigations are ill-equipped to deal with broader biophysical, social and economic considerations.

According to the DFFE's database 11 other alternative energy project applications have been submitted to the Department within the geographic area of investigation (refer to **Table 6.6** and **Figure 6.1** for an overview of other alternative energy facilities within a 30km radius of the project site).

Table 6.6: A summary of related projects, that may have a cumulative impact, in a 30 km radius of the study area

Project name	Distance from study area	Proposed generating capacity	DFFE reference	EIA process	Project status
Projects included in the REEA database (May 2023)					
The proposed 100MW Buffels solar energy facility and its associated infrastructure near Orkney, North West Province.	0 km	100	14/12/16/3/3/2/777/AM2	Amendment	Approved
The proposed Construction of the 100MW Buffels Solar 2 Solar Energy Facilities on Portion 5 and 57 within the City of Matlosana Local Municipality.	430m	100	14/12/16/3/3/2/778	Scoping & EIA	Approved
The establishment of 100MW Nyarhi solar power plant and its associated infrastructure near Viljoenskroon, Free State Province.	4.1 km	100	14/12/16/3/3/1/2533	BAR	Approved
Proposed construction of the 61MW Witkop Solar PV II facility on a site near Orkney, North West Province	4.2 km	61	12/12/20/2507/2	Amendment	In Process
The proposed vaal river solar 3 PV facility, North West Province.	5.8 km	250	12/12/20/2513/3/AM6	Amendment	Approved
The proposed 150MW Siyanda photovoltaic solar facility and associated infrastructure on the remaining extent of portion 1 of the farm Grootdraai 468, registration division Viljoenskroon situated within Moqhaka local municipality and the Greater Fezile FS..	8.8 km	150	14/12/16/3/3/2/1/2369	BAR	Approved
he 150MW Paleso solar power plant near Viljoenskroon situated within the Moqhaka local municipality, the Greater Fezile Dabi District Municipality in the Free State Province	11.5 km	150	14/12/16/3/3/1/2365	BAR	Approved

Project name	Distance from study area	Proposed generating capacity	DFFE reference	EIA process	Project status
Projects included in the REEA database (May 2023)					
The proposed Noko solar plant near Orkney, North West Province.	19 km	150	14/12/16/3/3/1/2474	BAR	Approved
The proposed 50MW Doornhoek 2 PV facility on portion 18 of the farm Doornhoek 372 IP within the Dr Kenneth Kaunda District Municipality in the North West Province.	22 km	50	14/12/16/3/3/1/2549	BAR	Approved
The 100MW Orkney PV solar energy facility & the 92 meter 132kv powerline on the rem/ext of ptn 7 & the rem/ext of ptn 21 0f the farm Wolvehuis.	24	100	14/12/16/3/3/2/954/AM1	Amendment	Approved
The Proposed Construction Of A Grid Connected 20mwp Photovoltaic Power Plant And Its Associated Infrastructure On A Portion Of Portion 434 Of The Farm Town And Townlands 435 Iq, Potchefstroom, North West Province.	27.8 km	20	12/12/20/2629/AM1	Amendment	Approved

***It is unclear whether other projects not related to alternative energy will be constructed in this area. In general, development activity in the area is focused on agriculture and mining. It is quite possible that more future alternative energy developments may take place within the general area.*

The potential for cumulative impacts to occur as a result of the projects may therefore be likely.

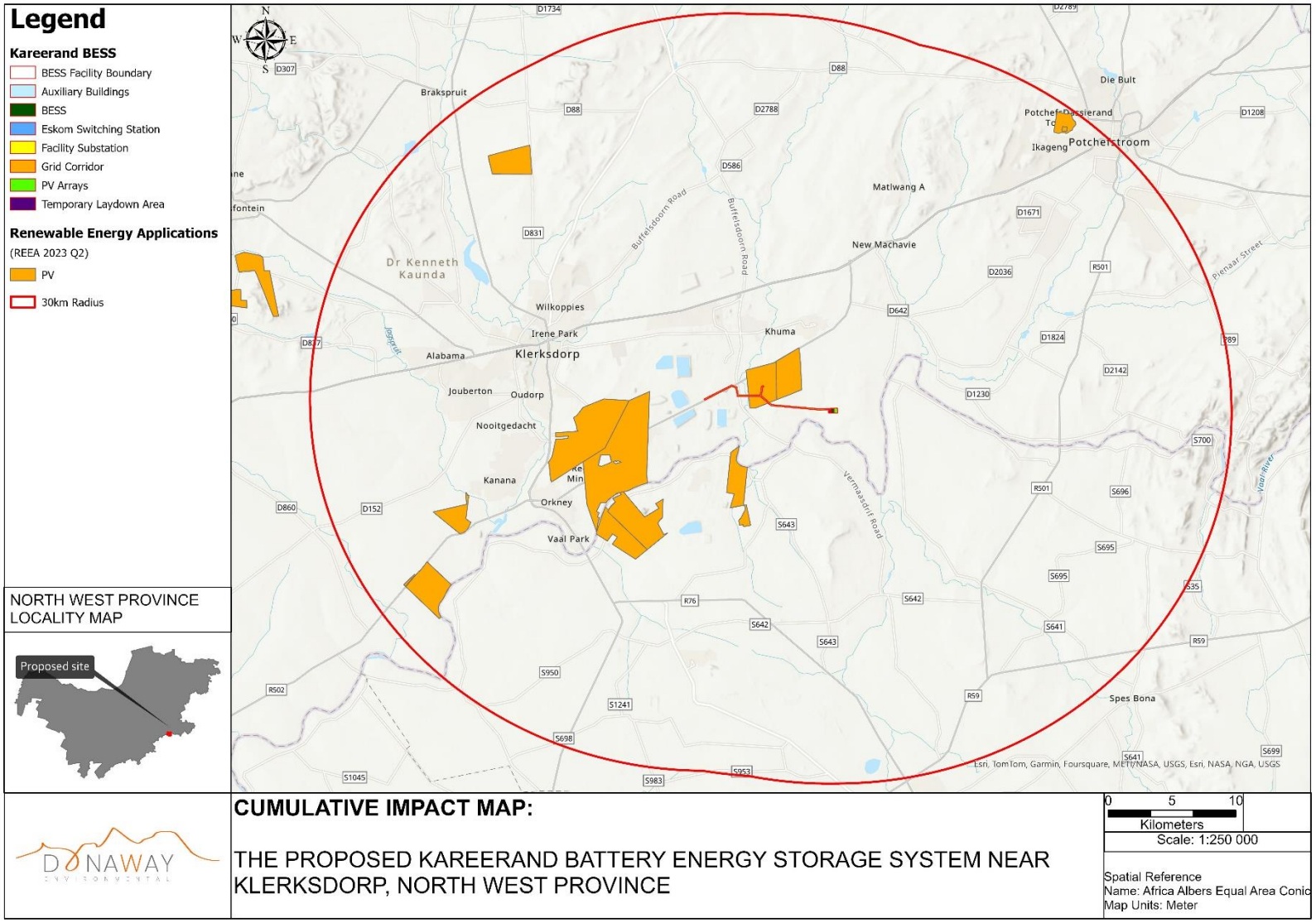


Figure 6.1: Cumulative map showing the location of other PV developments within 30km of the project site

The anticipated cumulative visual impact for the proposed project is expected to include the change in sense of place. The construction and operation of the project in the area is likely to have a negative impact.

Mitigation:

- Retain/re-establish and maintain natural vegetation immediately adjacent to the development, beyond any required firebreaks.

No-Go Alternative:

- The current status quo is maintained due to no impact.

Residual Impacts:

- The visual impact of the project will remain if it's not decommissioned and dismantled after the end of its operational life.

Table 6.7: Visual Impact - Cumulative

Nature of the Impact	Status		Extent	Probability	Reversibility	Irreplaceability	Duration	Cumulative Effect	Magnitude	Impact Significance	Impact Rating	Can impact be mitigated?	Is the impact acceptable?	Proposed Mitigation Measures
Cumulative visual impacts of proposed projects.	Impact in isolation	Negative	2	3	1	2	3	3	2	28	Low (6-28)	Yes	Yes	Retain/re-establish and maintain natural vegetation immediately adjacent to the development, beyond any required firebreaks.
	Cumulative impact	Negative	2	4	2	3	3	3	2	34	Medium (29-50)			

6.5. Decommissioning Phase

The decommissioning phase of the project will result in the same visual impacts experienced during the construction phase of the project. However, it is anticipated that the proposed development will be refurbished and upgraded to prolong its life. No decommissioning of the development is proposed.

6.6. Assessment of Alternatives Sites

The properties proposed for development is considered suitable for the development by the Applicant and therefore the area has been demarcated and indicated as being preferred. No other properties have been identified for the development in the area.

6.7. Assessment of Impacts for the No-Go Alternative

The “no-go” alternative is the option of not constructing the project. The implementation of the development is expected to result in several negative visual impacts, but if the project is not constructed the following positive impacts will be lost:

- Potential direct and indirect employment opportunities.
- Potential economic multiplier effect.
- Development of processing infrastructure to concentrate income locally.

7. MITIGATION MEASURES

The primary visual impact, which is associated with the layout and appearance of the infrastructure is not mitigatable to the point where the visual impact can be eliminated, but it can be reduced by implementing best practice measures. The functionality of the project cannot be changed to reduce the possible visual impact, but the following measures can be put in place to reduce the possible visual impact:

- It is recommended that vegetation cover (i.e., either natural or cultivated) immediately adjacent to the development footprint be maintained during both the construction and operational phases. This will minimise the visual impact through the presence of a buffer screen between the visual receptors and the development.
- Existing roads should be utilised wherever possible. New roads should be planned to take due cognisance of the topography to limit cut and fill requirements. The construction/upgrade of roads should be undertaken properly, with adequate drainage structures in place to minimise the risk of erosion.
- In terms of onsite associated infrastructure and buildings, it is recommended that proper planning is implemented to minimise vegetation clearing. Consolidating infrastructure as much as possible and making use areas that already disturbed, where possible.
- Mitigation of lighting impacts include the pro-active design, planning and specification of lighting for the development. The correct specification and placement of lighting fixtures for the proposed development will go far in containing, rather than spreading the light. As far as practically possible, mitigation measures include:
    - Shielding the sources of light by physical barriers (walls, vegetation, or structures.)
    - Limiting mounting heights of lighting fixtures, or alternatively using footlights or bollard level lights.
    - Making use of minimum lumen or wattage lights.
    - Making use of downlighters, or shielded fixtures.
    - Making use of low-pressure sodium lighting or other types of low impact lighting.
    - Making use of motion detectors for security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.
    - As a recommendation only, the use of night vision or thermal security cameras are very effective and can replace security lighting entirely, except for lighting as per the SACAA regulations.

The following mitigation and monitoring requirements are recommended to ensure the visual impact of the proposed development is limited:

7.1. Mitigation Measures during the Construction and Decommissioning Phases

- An Environmental Control Officer should be appointed during the construction and decommissioning phase to oversee environmental compliance.
- Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
- Reduce the construction period through careful logistical planning and productive implementation of resources.

- Plan the placement of lay-down areas and potential temporary construction camps in order to minimise vegetation clearing (i.e., in already disturbed areas) where possible.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site and existing access roads.
- Implement good housekeeping through the removal of rubble, litter and construction material, if it is not removed daily to a registered landfill site, then it should be stored appropriately until removal can take place.
- Dust suppression should be implemented during construction especially near roads where dust may cause reduced visibility. Due to a scarcity of water in most parts of South Africa, contractors could source alternative ways to implement dust suppression. One such way could be the use of fine gravel stone on roads with heavy traffic.
- Restrict construction activities to daylight hours in order to negate or reduce the visual impact associated with lighting.
- Rehabilitate all disturbed areas outside the construction footprint immediately after the completion of construction works.

7.2. Mitigation Measures during the Operational Phase

- Maintenance and good housekeeping of the development.
- Roads must be maintained to eliminate erosion and suppress dust.
- Rehabilitated areas must be monitored for rehabilitation failure and remedial action must then be implemented as and when required.
- Where sensitive visual receptors are likely to be affected (e.g., residents of homesteads in close proximity to the development), it is recommended that the developer enter into negotiations with property owners, if the owner insist, regarding the potential screening of visual impacts at the receptor site. This may entail the planting of vegetation or trees. Visual screening has been found to be most effective when placed at the receptor itself.
- Similar screening (e.g., vegetation barriers or vegetation berms) may be considered, but is not a requirement, along boundaries of the development that is adjacent to busy roads, mitigating the potential visual impact on observers travelling along the road.

7.3. Monitoring Requirements

The following monitoring requirements are recommended to be included as conditions in the Environmental Authorisation to ensure the visual impact of the proposed development is limited:

- The ECO and / or ELO should monitor the amount of litter on site during construction on a daily basis to ensure litter prevention.
- The ECO and / or ELO should monitor housekeeping during construction to ensure neat and tidy laydown areas.
- The ECO and / or ELO should monitor the amount of dust seen on and surrounding the site during construction. Dust suppression should be implemented as required.
- The ECO and / or ELO should ensure and monitor all rehabilitation after construction for at least the first 6 months to ensure all vegetation is established in a proper and healthy way. This will also depend on the amount of rainfall and season after construction which might shorten the monitoring requirement.

- Permanent workforce should monitor the health and progress of the added vegetation to ensure proper screening is maintained. This monitoring can be implemented for at least the first 3 years after construction **IF** drought tolerant vegetation is added, otherwise on a permanent basis.
- Any other monitoring requirements set out by the EA, EMP and SACAA.

8. KEY FINDINGS AND CONCLUSION

8.1. Key Findings

1. **Diverse Development Types:** The region under consideration exhibits a multifaceted developmental landscape, encompassing industrial, urban, sports and recreational, agricultural, service, and limited tourism developments. Notably, mining plays a pivotal role in the local economy, with associated infrastructure contributing significantly to industrial development.
2. **Urban and Industrial Relationship:** Urban centres like Orkney, Klerksdorp, and Stilfontein are intricately linked with mining activities, highlighting the symbiotic relationship between urban and industrial development. The towns serve as key hubs in the broader mining landscape.
3. **Recreational Features and Tourism Constraints:** The Vaal River stands out as the predominant water feature, offering recreational opportunities such as fishing and boating. However, tourism development remains constrained, as the region prioritises agriculture and mining over tourism. The lack of distinctive attractions hinders significant visitor attention.
4. **Agricultural Dominance:** Agricultural development, predominantly focused on livestock, dryland, and crop irrigation farming, defines a substantial aspect of the region's development. Limited game farming was also observed.
5. **Limited Scenic Features:** The area lacks significant topographic features, with the Vaal River providing the most prominent scenic resource. Vegetation along the Vaal River and specific southern areas contributes to more pleasant views. The project property, utilised for game farming, boasts better vegetation features.
6. **Nature Reserves and Mining Impact:** Two nature reserves, Bushybend Private Nature Reserve and Mispah Game Farm, exist within the 10km PAOI. Mining activities are located within Mispah Game Farm. The visual sensitivity assessment indicates low impact due to the absence of specific scenic quality.
7. **Urban Development within the PAOI:** Stilfontein, Khuma township, and Vaal Reefs, a residential mining development, constitute the urban development within the 10km PAOI. Farmsteads, river homes, and lodging facilities are scattered across the area.
8. **Visual Impact and Sensitivity:** Visual sensitivity in the area is classified as “Low”, influenced by the extensive mining developments. The proposed development's impact might be diminished against the backdrop of mining activities, especially noticeable for those traveling on the R502 regional road. The most sensitive receptors are those along the banks of the Vaal River, but they will have mining developments as a backdrop. This backdrop has been prominent for many years.
9. **Visual Absorption Capacity (VAC):** The area exhibits a moderate VAC, with good screening along the Vaal River. Receptors along the river are less likely to be severely impacted. Private vegetation surrounding farmsteads provides screening potential, but open cultivation fields to the south may expose the proposed development.

A summary of the potential significance is identified in **Table 8.1** below.

Table 8.1: Significance

Impact	Significance Without Mitigation	Significance With Mitigation
Visual Impact – Construction: BESS & PV	(45) Negative Medium	(33) Negative Medium
Visual Impact – Construction: Powerline Corridor	(28) Negative Low	(24) Negative Low
Visual Impact – Operation: BESS & PV	(34) Negative Medium	(28) Negative Low
Visual Impact – Operation: Powerline Corridor	(32) Negative Medium	(28) Negative Low
Visual Impact - Lighting	(28) Negative Low	(20) Negative Low
Visual Impact – Cumulative impact of the project considered in isolation	(28) Negative Low	
Visual Impact – Cumulative impact of the project and other projects in the area	(34) Negative Medium	

8.2. Conclusion

Aesthetic characteristics are subjective, and some people find energy facilities and their associated infrastructure pleasant and optimistic while others may find it visually invasive; It is mostly perceived as symbols of energy independence, and local prosperity. The visual impact is also dependant on the land use of an area and the sensitivity thereof in terms of visual impact, such as protected areas, parks and other tourism related activities.

The proposed development is of a modest scale when compared to other proposed alternative energy initiatives and the existing expansive mining operations in the area. Given the relatively small footprint of the project and the prevailing visual pollution generated by extensive mining activities, coupled with the region's economic reliance on mining and industrial ventures, it is anticipated that the visual impact of the proposed development will be inconspicuous against the backdrop of the dominating mining infrastructure. Therefore, it is recommended that the development proceed, taking into account its minimal visual impact within the context of the prevalent industrial landscape. **PLEASE NOTE** details of the project should be submitted to the South African Civil Aviation Authority (SACAA).

It is therefore Donaway Environmental' s recommendation that the project be approved, provided that the proposed mitigation measures are implemented.

9. REFERENCES

Department of Water Affairs and Forestry, South Africa. 2004. Upper Vaal Water Management Area: Internal Strategic Perspective. Prepared by PDNA, WRP Consulting Engineers (Pty) Ltd, WMB and Kwezi-V3 on behalf of the Directorate: National Water Resource Planning. DWAF Report No P WMA 08/000/00/0304.

Department of Water Affairs and Forestry, South Africa. 2004 Middle Vaal Water Management Area: Internal Strategic Perspective. Prepared by PDNA, WRP Consulting Engineers (Pty) Ltd, WMB and Kwezi-V3 on behalf of the Directorate: Water Resource Planning. DWAF Report No P WMA 09/000/00/0304)

Department of Water Affairs and Forestry, South Africa. 2004. Lower Vaal Water Management Area: Internal Strategic Perspective. Prepared by PDNA, WRP Consulting Engineers (Pty) Ltd, WMB and Kwezi-V3 on behalf of the Directorate: National Water Resource Planning. DWAF Report No P WMA 10/000/00/0304).

Mucina and Rutherford. 2006. The vegetation of South Africa, Lesotho and Swaziland**.** Strelitzia 19, South African National Biodiversity Institute, Pretoria, South Africa (2006).

Oberholzer, B. 2005. *Guideline for involving visual & aesthetic specialists in EIA processes: Edition 1.* CSIR Report No ENV-S-C 2005 053 F. Republic of South Africa, Provincial Government of the Western Cape, Department of Environmental Affairs & Development Planning, Cape Town.

South African Civil Aviation Authority. 2016. Objects affecting air space. Available at: http://www.caa.co.za/Pages/Obstacles/Objects-affecting-airspace.aspx [accessed Jul 19, 2017].

The Landscape Institute. 2002. Guidelines for Landscape and Visual Impact Assessment 2nd ed., New York: Spon Press.

WESSA. 2012. Wind Energy: WESSA Position Statement. Available at: http://wessa.org.za/site17/wp-content/uploads/2017/01/Wind_Energy_Position_Statement_2013.pdf [accessed Jul 23, 2017].

World Bank Group. 2015. Environmental, Health, and Safety Guidelines for Wind Energy. Available at: http://www.ifc.org/wps/wcm/connect/2c410700497a7933b04cf1ef20a40540/FINAL_Aug+2015_Wind+Energy_EHS+Guideline.pdf?MOD=AJPERES. [accessed Jul 19, 2017].

Young, G, Maxibuko, B., and Muller, L. 2009. Visual Impacts of Power Lines in Eskom, Eskom Research and Innovation Department Technology, Strategy and Planning, Research Report, Report Number RES/RR/08/30193.