ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED MOGARA SOLAR PV ENERGY FACILITY, NORTHERN CAPE

SPECIALIST REPORT:
Visual Impact Assessment

DRAFT: 30 Oct 2018

Document prepared for Cape EAPrac (Pty) Ltd;
On behalf of K2018091776 (SOUTH AFRICA) (PTY) Ltd

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GLOSSARY

Best Practicable Environmental Option (BPEO)

This is the option that provides the most benefit, or causes the least damage, to the environment as a whole, at a cost acceptable to society, in the long, as well as the short, term.

Cumulative Impact

The impact on the environment, which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency or person, undertakes such other actions. Cumulative impacts can result from individually minor, but collectively significant, actions taking place over a period of time.

Impact (visual)

A description of the effect of an aspect of a development on a specified component of the visual, aesthetic or scenic environment, within a defined time and space.

Issue (visual)

Issues are concerns related to the proposed development, generally phrased as questions, taking the form of "what will the impact of some activity be on some element of the visual, aesthetic or scenic environment?"

Key Observation Points (KOPs)

KOPs refer to receptors (people affected by the visual influence of a project) located in the most critical locations surrounding the landscape modification, who make consistent use of the views associated with the site where the landscape modifications are proposed. KOPs can either be a single point of view that an observer/evaluator uses to rate an area or panorama, or a linear view along a roadway, trail or river corridor.

Management Actions

Actions that enhance the benefits of a proposed development, or avoid, mitigate, restore or compensate for, negative impacts.

Receptors

Individuals, groups or communities who would be subject to the visual influence of a particular project.

Sense of Place

The unique quality or character of a place, whether natural, rural or urban.

Scenic Corridor

A linear geographic area that contains scenic resources, usually, but not necessarily, defined by a route.

Scoping

The process of determining the key issues, and the space and time boundaries, to be addressed in an environmental assessment.

Viewshed

The outer boundary defining a view catchment area, usually along crests and ridgelines. Similar to a watershed. This reflects the area in which, or the extent to which, the landscape modification is likely to be seen.

Zone of Visual Influence (ZVI)

The ZVI is defined as 'the area within which a proposed development may have an influence or effect on visual amenity.'

LIST OF ACRONYMS

APHP	Association of Professional Heritage Practitioners
BLM	Bureau of Land Management (United States)
BPEO	Best Practicable Environmental Option
CALP	Collaborative for Advanced Landscape Planning
DEA&DP	Department of Environmental Affairs and Development Planning (South Africa)
DEM	Digital Elevation Model
DoC	Degree of Contrast
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
GIS	Geographic Information System
I&APs	Interested and Affected Parties
IEMA	Institute of Environmental Management and Assessment (United Kingdom)
IEMP	Integrated Environmental Management Plan
KOP	Key Observation Point
MAMSL	Metres above mean sea level
NELPAG	New England Light Pollution Advisory Group
PSDF	Provincial Spatial Development Framework
ROD	Record of Decision
SAHRA	South African National Heritage Resources Agency
SDF	Spatial Development Framework
SEA	Strategic Environmental Assessment
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment
VRM	Visual Resource Management
ZVI	Zone of Visual Influence

This document was completed by Silver Solutions 887 cc trading as VRM Africa, a Visual Impact Study and Mapping organisation located in George, South Africa. VRM Africa cc was appointed as an independent professional visual impact practitioner to facilitate this VIA.

This document was undertaken by the following team:

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1 INTRODUCTION

VRM Africa was appointed by Cape EAPrac (PTY) Ltd to undertake a Level 2 Visual Impact Assessment for the proposed Mogara Solar PV energy facility on behalf of *K2018091776 (SOUTH AFRICA) (Pty) Ltd*. The site is located near the town of Kathu in the Northern Cape province.

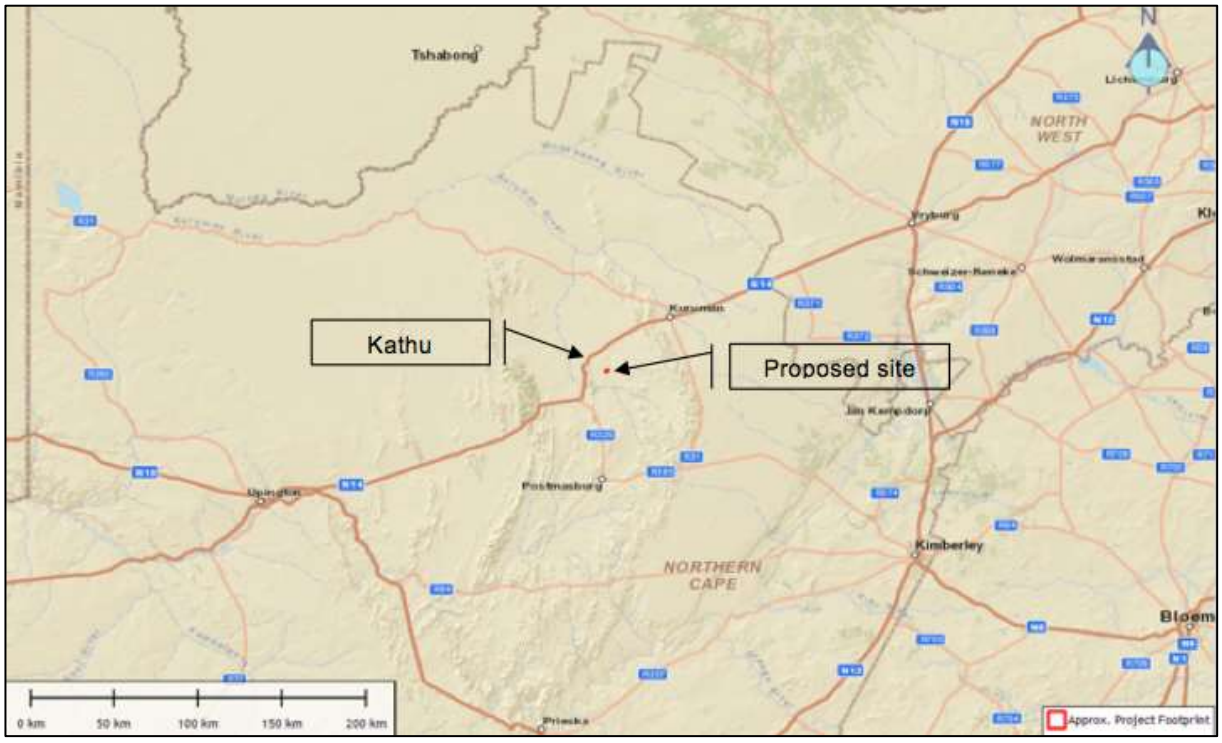

Figure 1: Regional locality map

1.1 Terms of Reference

According to the Bureau of Land Management, U.S. Department of Interior, landscape significance is assessed by differentiating between those landscapes of recognised or potential significance or sensitivity to modification and landscapes that have low sensitivity and scenic value. 'Different levels of scenic values require different degrees of management. For example, management of an area with high scenic value might be focused on preserving the existing character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape. Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency can be greatly increased by using standard assessment criteria to describe and evaluate landscapes, and to also describe proposed projects.'
(USDI., 2004)

The scope of the study is to cover the entire proposed project area, and the terms of reference for the study are as follows:

- Collate and analyse all available secondary data relevant to the affected proposed project area. This includes a site visit of the full site extent, as well as of areas where potential impacts may occur beyond the site boundaries.
- Consider all cumulative effects in all impact reports.
- Specific attention is to be given to the following:
  - Quantifying and assessing existing scenic resources/visual characteristics on, and around, the proposed site.
  - Evaluation and classification of the landscape in terms of sensitivity to a changing land use.
  - Determining viewsheds, view corridors and important viewpoints in order to assess the visual impacts of the proposed project.
  - Determining visual issues, including those identified in the public participation process.
  - Reviewing the legal framework that may have implications for visual/scenic resources.
  - Assessing the significance of potential visual impacts resulting from the proposed project for the construction, operation and decommissioning phases of the proposed project.
  - Assessing the potential cumulative impacts associated with the visual impact.
  - Identifying possible mitigation measures to reduce negative visual impacts for inclusion into the proposed project design, including input into the Environmental Management Plan (EMP).

1.2 Assumptions and Limitations

- Information pertaining to the specific heights of activities proposed for the development was limited and, where required, generic heights will be used to define the visibility of the project.
- Although every effort to maintain accuracy was undertaken, as a result of the Digital Elevation Model (DEM) being generated from satellite imagery and not being a true representation of the earth's surface, the viewshed mapping is approximate and may not represent an exact visibility incidence.
- The use of open source satellite imagery was utilised for base maps in the report.
- The viewsheds were generated using ASTER elevation data (NASA, 2009).
- Some of the mapping in this document was created using Bing Maps (previously *Live Search Maps*, *Windows Live Maps*, *Windows Live Local*, and *MSN Virtual Earth*) and powered by the Enterprise framework.
- This study is based on assessment techniques and investigations that are limited by time and budgetary constraints applicable to the type and level of assessment undertaken. VRM Africa reserves the right to modify aspects of the project deliverables if and when new/additional information may become available from research or further work in the applicable field of practice, or pertaining to this study.

1.3 Approach and Methods

According to the Guidelines for Landscape and Visual Impacts by the Institute of Environmental Management and Assessment (United Kingdom), landscape impacts derive from changes in the physical landscape; which may give rise to changes in its character and how this is experienced. This in turn may affect the perceived value attributed to the landscape. Visual impacts relate to changes that arise in the composition of available views as a result of changes to the landscape, to people's response to any changes, and the overall impacts with respect to visual amenity (U.K Institute of Environmental Management and Assessment (IEMA), 2002).

Approach

A site visit was undertaken on the 12th of May 2015. This site visit was in relation to the proposed Legoko Solar PV project (located adjacent to the site), and during this site visit, the area proposed for the Mogara PV plant was also visited and photographed. Due to the rural zoning, the landscape is fairly stable and not prone to significant agricultural changes. However, other approved PV projects are located within the vicinity and as such cumulative effects will need to be taken into consideration. During the initial site visit, a visual confirmation of the desktop viewshed mapping was undertaken, to determine the anticipated zone of visual influence. From the property, key landforms and receptor points were identified. These local landforms and receptors points were then visited to determine the extent of the property visibility from the receptor locations. Photographs from the receptor locations in the direction of the property were also taken.

The process that VRMA followed when undertaking the VIA is based on the United States Bureau of Land Management's (BLM) Visual Resource Management method (USDI., 2004). This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria. The following key factors determine the suitability of landscape change:

- *"Different levels of scenic values require different levels of management. For example, management of an area with high scenic value might be focused on preserving the existing character of the landscape, and management of an area with little scenic value might allow for major modifications to the landscape. Determining how an area should be managed first requires an assessment of the area's scenic values".*
- *"Assessing scenic values and determining visual impacts can be a subjective process. Objectivity and consistency can be greatly increased by using the basic design elements of form, line, colour, and texture, which have often been used to describe and evaluate landscapes, to also describe proposed projects. Projects that repeat these design elements are usually in harmony with their surroundings; those that don't create contrast. By adjusting project designs so the elements are repeated, visual impacts can be minimized"* (USDI., 2004).

Methods and Activities

The assessment comprises two main sections: firstly, the Visual Inventory to identify the visual resources along the proposed routing; and secondly, the Analysis Stage. This stage requires a Contrast Rating to assess the expected degree of contrast the proposed project would generate within the receiving landscape in order to define the Magnitude of the impact.

In terms of VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change and distance from the proposed landscape change. Scenic Quality and Receptor Sensitivity are defined making use of the BLM check sheets located in the Annexure. These findings are then submitted to a VRM Matrix in Table 1 below. The VRM Classes are not prescriptive and are used as a guideline to determine the carrying capacity of a visually preferred landscape as a basis for assessing the suitability of the landscape change associated with the proposed project.

Table 1: VRM Class Matrix Table

		VISUAL SENSITIVITY LEVELS								
		High			Medium			Low		
SCENIC QUALITY	A (High)	II	II	II	II	II	II	II	II	II
	B (Medium)	II	III	III/ IV *	III	IV	IV	IV	IV	IV
	C (Low)	III	IV	IV	IV	IV	IV	IV	IV	IV
DISTANCE ZONES		Fore/middle ground	Background	Seldom seen	Fore/middle ground	Background	Seldom seen	Fore/middle ground	Background	Seldom seen

* If adjacent areas are **Class III** or lower, assign **Class III**, if higher, assign **Class IV**

The visual objectives of each of the classes are listed below:

- The Class I objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low, and must not attract attention. Class I is assigned when a decision is made to maintain a natural landscape;
- The Class II objective is to retain the existing character of the landscape and the level of change to the characteristic landscape should be low. The proposed development may be seen, but should not attract the attention of the casual observer, and should repeat the basic elements of form, line, colour and texture found in the predominant natural features of the characteristic landscape;
- The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. The proposed development may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape; and
- The Class IV objective is to provide for management activities that require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and the proposed development may dominate the view and be

the major focus of the viewer's (s') attention without significantly degrading the local landscape character.

Should the landscape character be found to be significant, a contrast rating would be undertaken during the impacts phase to inform the impact ratings. A contrast rating is undertaken from the receptor Key Observation Points, where the level of change to the existing landscape is assessed in terms of line, colour, texture and form, in relation to the visual objectives defined for the area. KOPs are defined by the BLM as the people (receptors) located in strategic locations surrounding the property or development that make consistent use of the views associated with the site where the landscape modifications are proposed.

2 PROJECT DESCRIPTION

The following extract from the Mogara Layout Development Report outlines the project context:

K2018091776 (SOUTH AFRICA) (Pty) Ltd is proposing the establishment of a commercial photovoltaic (PV) solar energy facility (SEF), called Mogara Solar, on Portion 1 and Portion 2 of Legoko Farm No 460 and Farm Sekgame No.461, situated in the District of Kuruman Rd, within the jurisdiction area of the Gamagara Local Municipality Northern Cape Province, hereafter referred to as "the property". The following information contained in the Layout Report is of relevance to the visual impact assessment:

The Mogara Solar PV energy facility is to consist of solar PV technology with fixed, single or double axis tracking mounting structures, with a net generation (contracted) capacity of 75MWAC (MegaWatts - Alternating Current), as well as associated infrastructure, which will include:

- *On-site switching-station / substation;*
- *Auxiliary buildings (gate-house and security, control centre, office, warehouse, canteen & visitors centre, staff lockers etc.);*
- *Inverter-stations, transformers and internal electrical reticulation (underground cabling);*
- *Access and internal road network;*
- *Laydown area;*
- *Overhead 132kV electrical transmission line / grid connection connecting to the authorised Sekgame switching station;*
- *Rainwater tanks; and*
- *Perimeter fencing and security infrastructure.*

The following map identifies the proposed Mogara Solar layouts, in relation to the authorised (but not yet built) Legoko and Mogobe Solar facilities, as well as the proposed Gaetsewe Solar PV footprint (EIA in process).

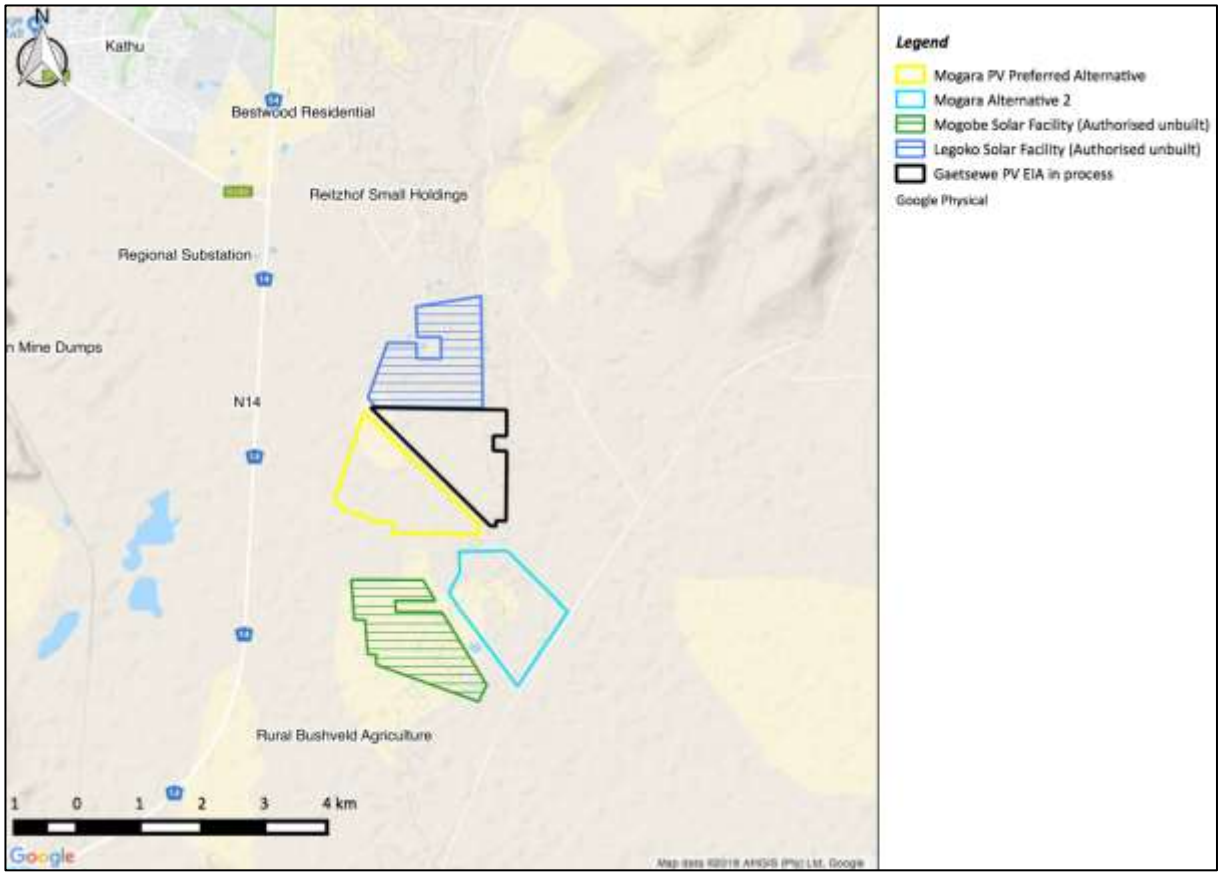

Figure 2: Proposed Mogara Solar and alternative locality map in relation to surrounding authorised, and proposed, PV projects.

Table 2: Technical details for the proposed PV facility.

Component	*Description/ Dimensions*
Location of the site	*Approximately 7km South East of Kathu*
PV Panel area	*200ha with a total project footprint of approximately 225ha*
SG Codes	*C04100000000004600002*
Preferred Site access	*Access to the site will be at the existing access road from the N14 and along the western boundary of Portion 2 of farm 460 Legoko.*
Export capacity	*75 MW*
Proposed technology	*PV with fixed, single or double axis tracking technology.*
Height of installed panels from ground level	*PV Structures not more than 4m*
Width and length of internal roads	*Width: 4 – 5 m* *Length: 6km*

The following map identifies the Mogara Solar Alternative 2 site in relation to the authorised solar projects, and includes the proposed grid connection to the proposed Sekgame Switching Station.

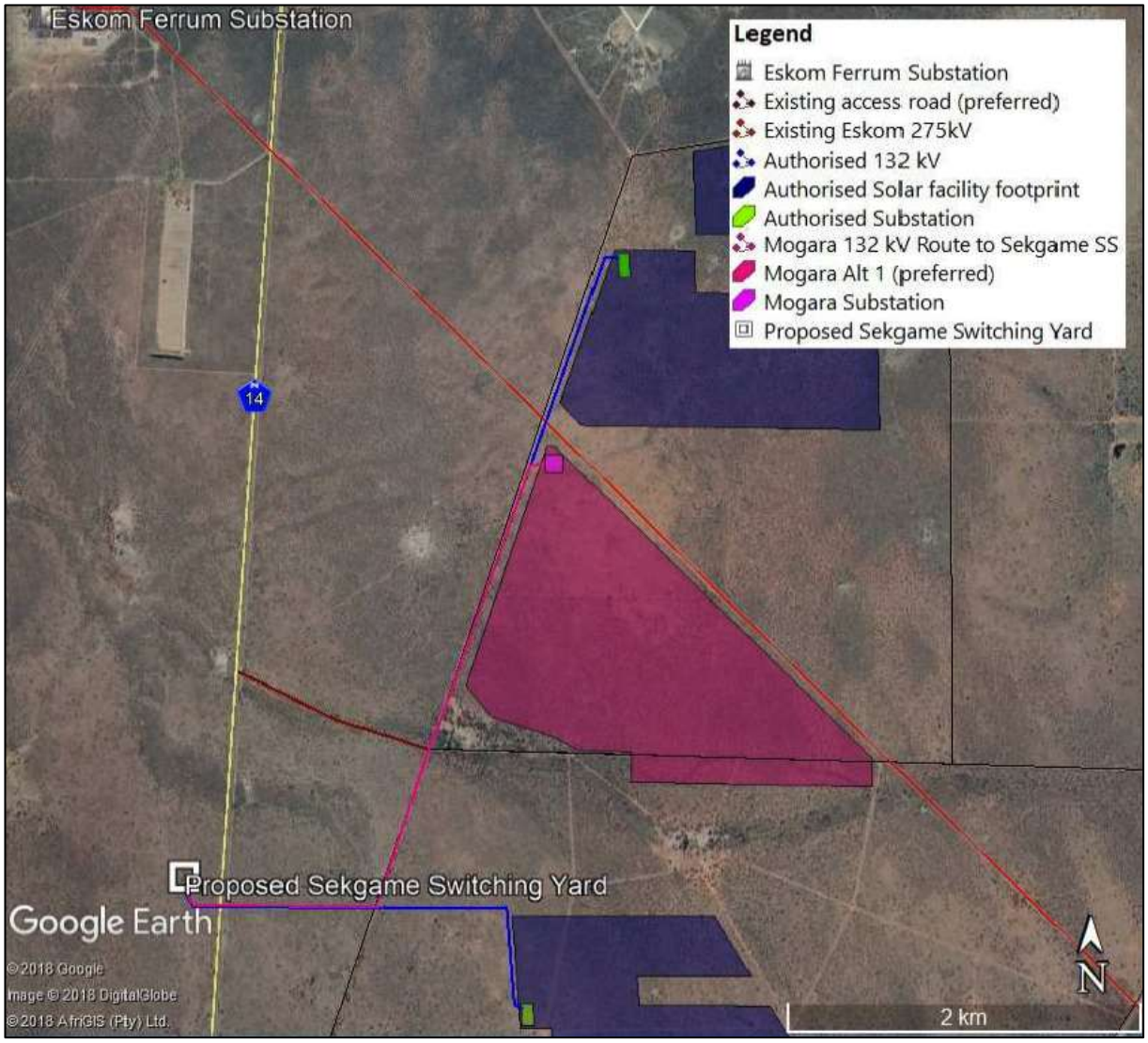

Figure 3: Proposed grid connection. (Atlantic Energy Partners (Pty) Ltd, 2018)

2.1 Legislative and Planning Context

In order to comply with the Visual Resource Management requirements, it is necessary to clarify which planning policies govern the proposed property area to ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The proposed landscape modifications must be viewed in the context of the planning policies from the following organisations' guidelines:

2.1.1 *Gamagara Municipality Spatial Development Framework*

The above mentioned SDF for Kathu was reviewed. No reference was made to the proposed site which is located outside of the urban edge. The report did make the following comment with regard to sufficient energy delivery: "The significant growth in Kathu is placing severe pressure on the electrical capacity of the region, often hindering the provision of electricity to households. It is therefore extremely important that constant inputs of engineering services are used to ensure sufficient energy delivery" (Gamagara Municipality, 2010).

2.1.2 *DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA Processes*

As specific Visual Guidelines are not provided for the area, we have referred to the Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for involving visual and aesthetic specialists in EIA processes. This states that the Best Practicable Environmental Option (BPEO) should address the following:

- Ensure that the scale, density and nature of activities or developments are harmonious and in keeping with the sense of place and character of the area. The BPEO must also ensure that development must be located to prevent structures from being a visual intrusion (i.e. to retain open views and vistas).
- "Long term protection of important scenic resources and heritage sites.
- Minimisation of visual intrusion in scenic areas.
- Retention of wilderness or special areas intact as far as possible.
- Responsiveness to the area's uniqueness, or sense of place." (Oberholzer, 2005)

3 BASELINE ASSESSMENT

3.1 Project Visibility

The visible extent, or viewshed, is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' (Oberholzer, 2005). In order to define the extent of the possible influence of the proposed project, a viewshed analysis is undertaken from the proposed sites at a specified height above ground level as indicated in the below table making use of open source NASA ASTER Digital Elevation Model data (NASA, 2009).

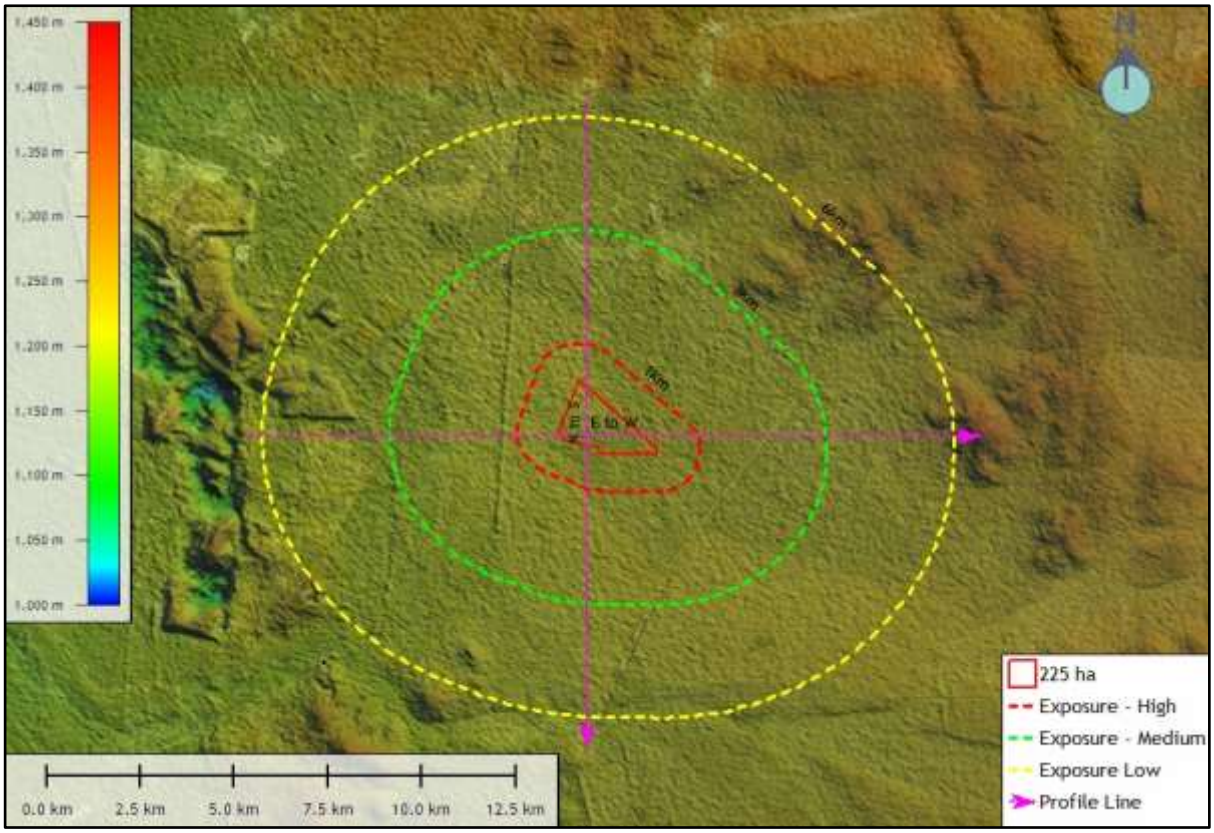

Figure 4: Regional NASA ASTER Digital Elevation Model Map depicting the prominent topographical features associated with the property and surrounding terrain.

The above map depicts an approximate digital elevation model. From the map and the regional North to South and East to West Profiles lines (below), it can be surmised that the terrain surrounding the proposed site is predominantly flat, with low hills to the east which have a height of approximately 80m. Also evident in the terrain model are the excavations and waste dumps of the Sishen Mine to the west. No significant natural topographical features were apparent within the receiving landscape.

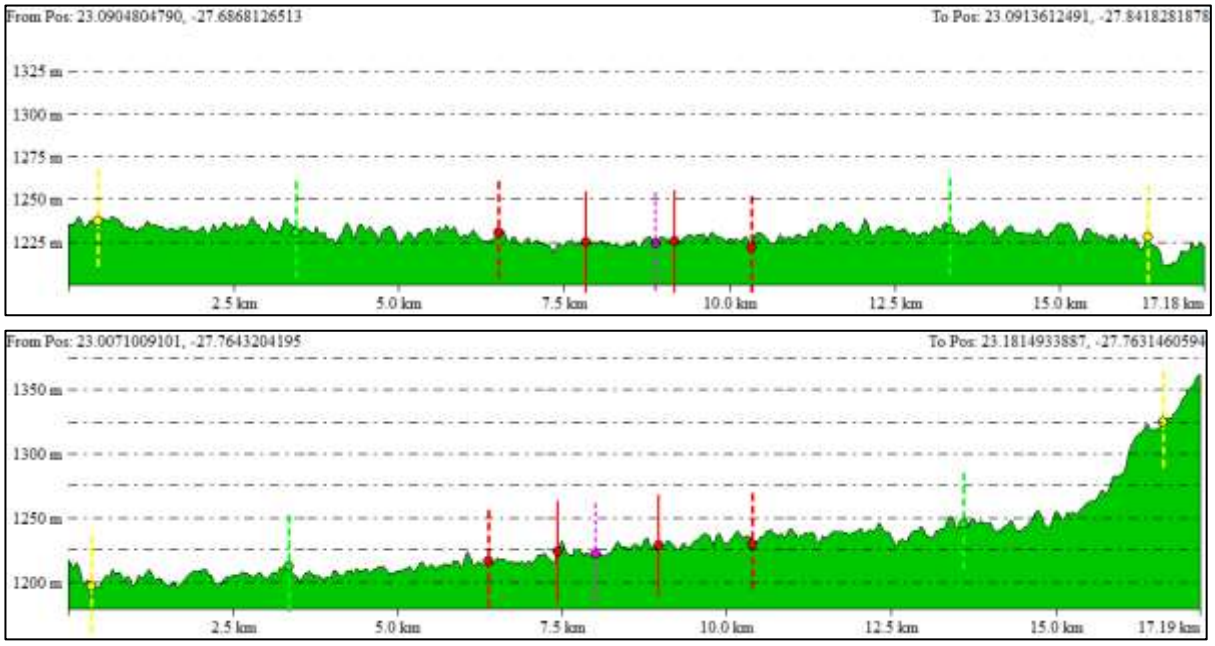

Figure 5: Regional North to South (upper) and West to East (lower) profile lines.

Making use of the DEM, a viewshed for the proposed PV project was generated. The outer extent of the viewshed analysis was restricted to 8km distance and takes the scale, and size of the proposed projects into consideration in relation to the natural visual absorption capacity of the receiving environment. The maps are informative only as visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature (Hull & Bishop, 1988).

A maximum height of 4m was utilised to represent the PV construction and buildings 'offset', or height above ground, from which the five viewshed points within the property boundary were generated. As can be seen in Figure 6 below, the viewshed does have the potential to extend outside of the 6km foreground area, with visual incidence in the Medium to High Exposure areas taking place on the high ground to the eastern 'koppie' as well as the western Sishen mine dumps. The Medium Exposure viewshed areas depict a fairly fragmented distribution pattern, but with clearer views and more intensive visibility within the 1km kilometre High Exposure area.

Although the potential visibility of the proposed facility could extend to the background areas, the surrounding western landscape's visual absorption capacity is relatively high due to the Sishen Mine landforms, the Eskom power lines, and the built environment to the north of the proposed site as well as the Kathu Bushveld vegetation of the area. As such, the expected

zone of visual influence is likely to be contained within the 1km High Exposure area, and described as **Local in extent**.

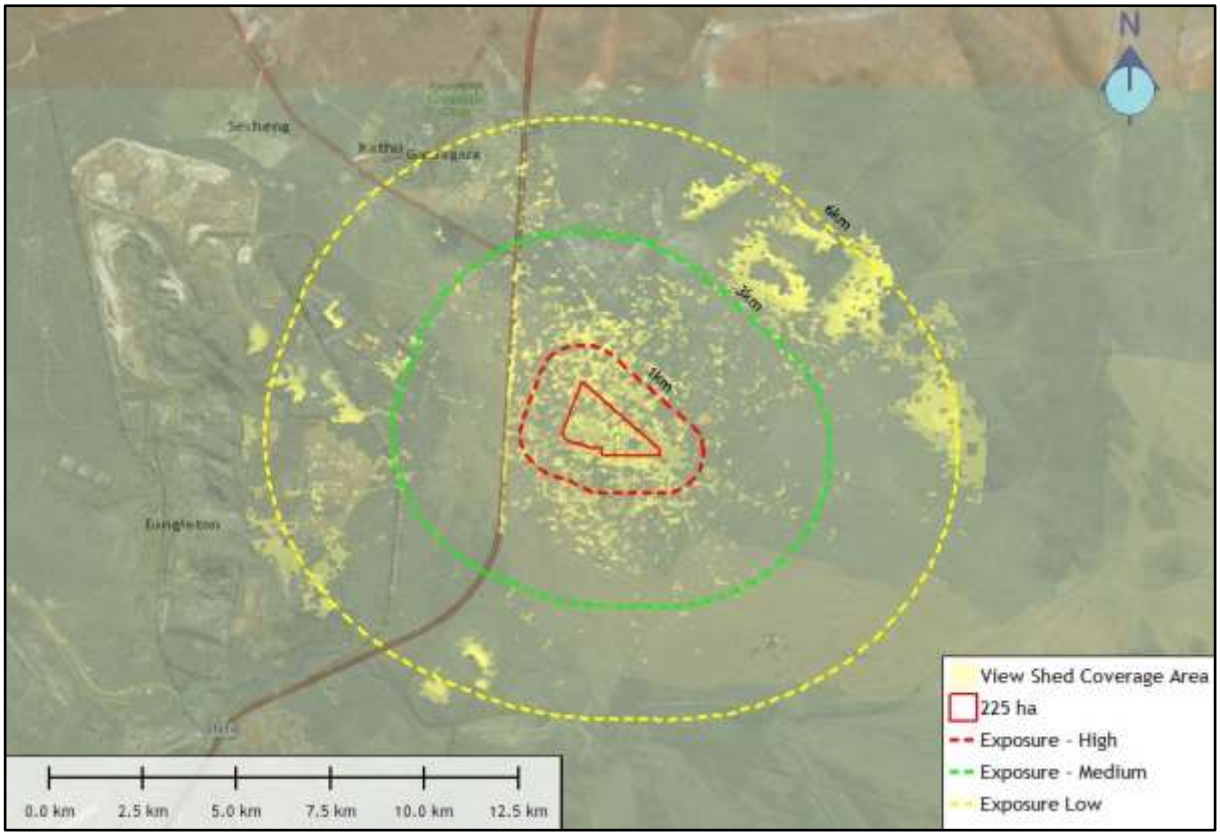

Figure 6: Viewshed from the proposed site with landscape context features indicated overlaid onto OS Satellite Image Map.

3.2 Regional Landscape Character

Landscape character is defined by the U.K. Institute of Environmental Management and Assessment (IEMA) as the 'distinct and recognisable pattern of elements that occurs consistently in a particular type of landscape, and how this is perceived by people. It reflects particular combinations of geology, landform, soils, vegetation, land use and human settlement'. It creates the specific sense of place or essential character and 'spirit of the place' (IEMA, 2002). This section of the VIA identified the main landscape features in the areas surrounding the proposed project that define the surrounding landscape character.

The following landmarks labelled in Figure 7 below, were identified as important in defining the surrounding area's landscape character. These points were photographed during the site visit and described. The surrounding points of interest are:

- The N14 National Road
- Sishen Mine
- Rural agricultural areas
- Reitzhof smallholdings
- Bestwood residential areas
- Eskom regional substation and power lines

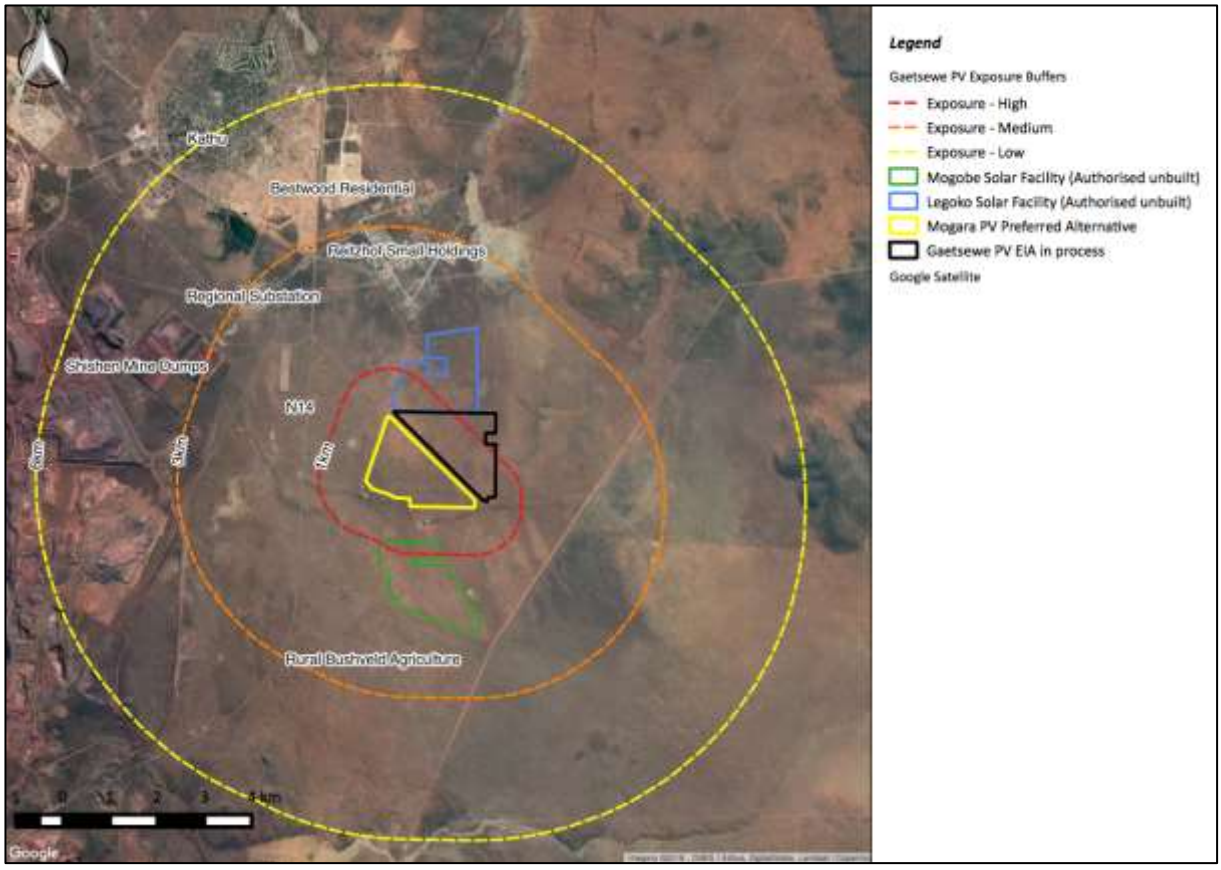

Figure 7: Main regional landscape features map.

3.2.1 *The N14 National Highway*

Figure 8: Photograph in a southerly direction of the N14 National Road

The N14 is a national road located 1.7km to the west of the proposed project boundary. The N14 connects the town of Kathu in the north, to the towns of Upington in the west, and Postmasburg in the south (via the R325). Traffic utilising the road is mainly mining related, but could also include tourist traffic.

3.2.2 *Sishen Mine*

Figure 9: Photograph depicting the Sishen Mine waste rock dumps and factories.

Sishen mine is located approximately 3.5km to the west of the proposed project boundary. The iron ore mine is one of the largest in South Africa and includes large waste rock dump landforms, large infrastructure and buildings. A by-product of processing the iron ore is a red-oxide dust that colours the buildings as can be seen in the photograph above. Visual contrast generated by the large man-made landforms and structures is high and dominates the attention of the casual observer. Although the visual massing of the buildings and infrastructure is reduced by their red colouration against the backdrop of the similarly coloured waste dumps, the overall landscape character of the site and surrounds is influenced negatively by the mine, visually degrading the surrounding landscape context within approximately a four kilometre radius.

3.2.3 *Rural agricultural areas*

The proposed PV site, as well as the areas to the east and south of the site, are currently utilised for agriculture. The main activity is livestock farming with cattle. The proposed site and surroundings (excluding Reitzhof to the north) are zoned for agricultural land uses. Care should be taken to ensure that landuse changes on the site do not negatively influence the viability of the adjacent farming lands.

Figure 10: Photograph of the typical vegetation where livestock are grazed.

3.2.4 *Reitzhof smallholdings*

Figure 11: Photograph of the entrance sign to Reitzhof Smallholdings.

Located approximately 2 km due north of the proposed site is the smallholding area of Reitzhof. As indicated on the photograph above, the triangular area is divided up into approximately 30 medium sized stands, which are serviced by a single internal gravel road. Many of the stands have not been developed, allowing a rural agricultural sense of place. Most of the structures on the developed plots are also of a size and scale that do not dominate the attention of the casual observer. However, some large sheds have been built which are industrial in size and scale. If the practice were to be continued, a semi-industrial sense of place would result. The surrounding bush-veld vegetation, which includes some medium sized trees, would reduce the potential for visual intrusion from these smallholdings.

3.2.5 *Bestwood residential estate*

Figure 12: Photograph of the existing residential dwellings of the Bestwood estate.

Located 3.5km to the north of the proposed site is the new residential area of Bestwood Estate. Stands are small and most of the development appears to be single storey residential, but do include some double storey units which would have more elevated views.

3.2.6 *Eskom regional substation and power lines*

Located 3.5km to the north-west of the proposed site, is the Ferrum substation which is an important regional electrical supply node. Located in close proximity to the proposed site (approx. 1km to the north and adjacent the south-west corner) are two 400kV transmission lines (see the northern transmission line in Figure 12 below). Also of influence within the landscape are the Eskom routing corridors for the 66kV to 132kV network upgrade that have been authorised. As depicted in Figure 13 below, the proposed lines are located in close proximity to the proposed site and the proposed power lines, in conjunction with the existing Eskom lines, could result in negative cumulative visual effects. To avoid this occurrence, care should be undertaken to ensure that as much alignment as possible takes place to the existing and proposed Eskom power line routings.

Figure 13: Photograph of the Ferrum Substation and 400kV powerlines leading to the substation (Source: D. Holder Cape EAPrac 2018).

3.2.7 *Solar Facility Landscape Context*

As indicated on the landscape context map in Figure 7, two authorised PV projects are located within the immediate vicinity. Legoko Solar is located directly north of the proposed PV development site, with Mogobe Solar located approximately 1km to the south of the site. Although authorised, both of the facilities are yet to be constructed and as such, the existing bushveld rural agricultural scenery dominates the local landscape context. Another PV solar facility, Gaetsewe Solar, is also proposed adjacent to the proposed site along the north eastern border. Although the Mogara and Gaetsewe EIA status is yet to be defined, the combined footprint of these proposed PV projects will create a large combined visual footprint.

3.3 Site Landscape Character

In terms of the VRM methodology, landscape character is derived from a combination of scenic quality, receptor sensitivity to landscape change, and distance of the proposed landscape modification from key receptor points. The scenic quality is determined making use of the VRM scenic quality questionnaire (refer to addendum). In order to better understand the visual resources of the site, regional vegetation and terrain influences are described at a broad-brush level.

3.3.1 *Vegetation*

According to the Fauna and Flora Specialist Scoping Report undertaken by Simon Todd, "*The site falls within the Kathu Bushveld vegetation type, which is a relatively localised vegetation type for an arid area, but has not been significantly impacted by transformation and is classified as Least Threatened. The vegetation of the preferred Alternative 1 consists*

of degraded Tachonanthus camphoratus scrub, with few species or features of concern present across most of the site. Impacts on fauna and flora associated with the development on this site are likely to be low and no high post-mitigation impacts are likely. The Alternative 2 option occurs within good condition rangeland with a high abundance of Acacia erioloba and Acacia haematoxylon. This is the less preferred alternative from an ecological perspective and would generate significantly higher impacts on fauna, flora and ecological processes than the preferred alternative".

In terms of cumulative impacts associated with the development, the Todd report flags some concern, but stating that "*the overall cumulative impact of the development is considered likely to be low*". The report states a preference for the preferred development area as *"there are no impacts associated with the development that are considered to be of high significance and which cannot be mitigated to a low level"* (Todd, Environmental Impact Assessment for the Proposed Mogara Solar PV Faciality and Associated Infrastructure, Kathu, Northern Cape: Fauna and Flora Specialist Scoping Report, 2018).

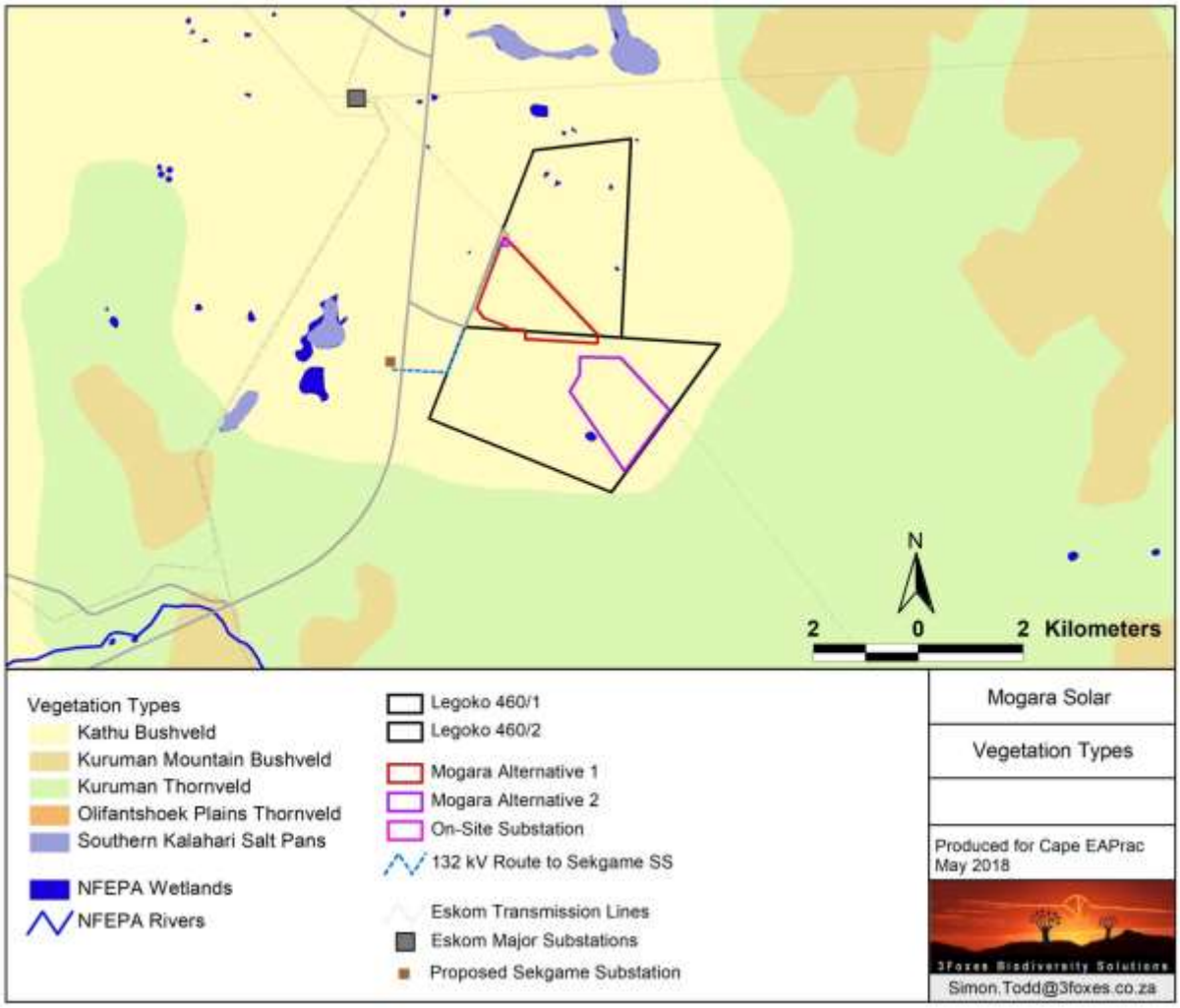

Figure 14: Simon Todd Consulting Figure 2 of the Broad-scale overview of the vegetation in and around the Mogara site. The vegetation map is an extract of the national vegetation map as produced by Mucina and Rutherford (2006/2012), and also includes wetlands delineated by the NFEPA assessment (Nel et al. 2011). (Todd, Environmental Impact Assessment for the Proposed Mogara Solar PV Faciality and Associated Infrastructure, Kathu, Northern Cape: Fauna and Flora Specialist Scoping Report, 2018)

3.3.2 *Site Photographs and Descriptions*

In order to convey the landscape character of the proposed PV site, photographs that characterise the landscape sense of place were taken as mapped in Figure 15 on the following page.

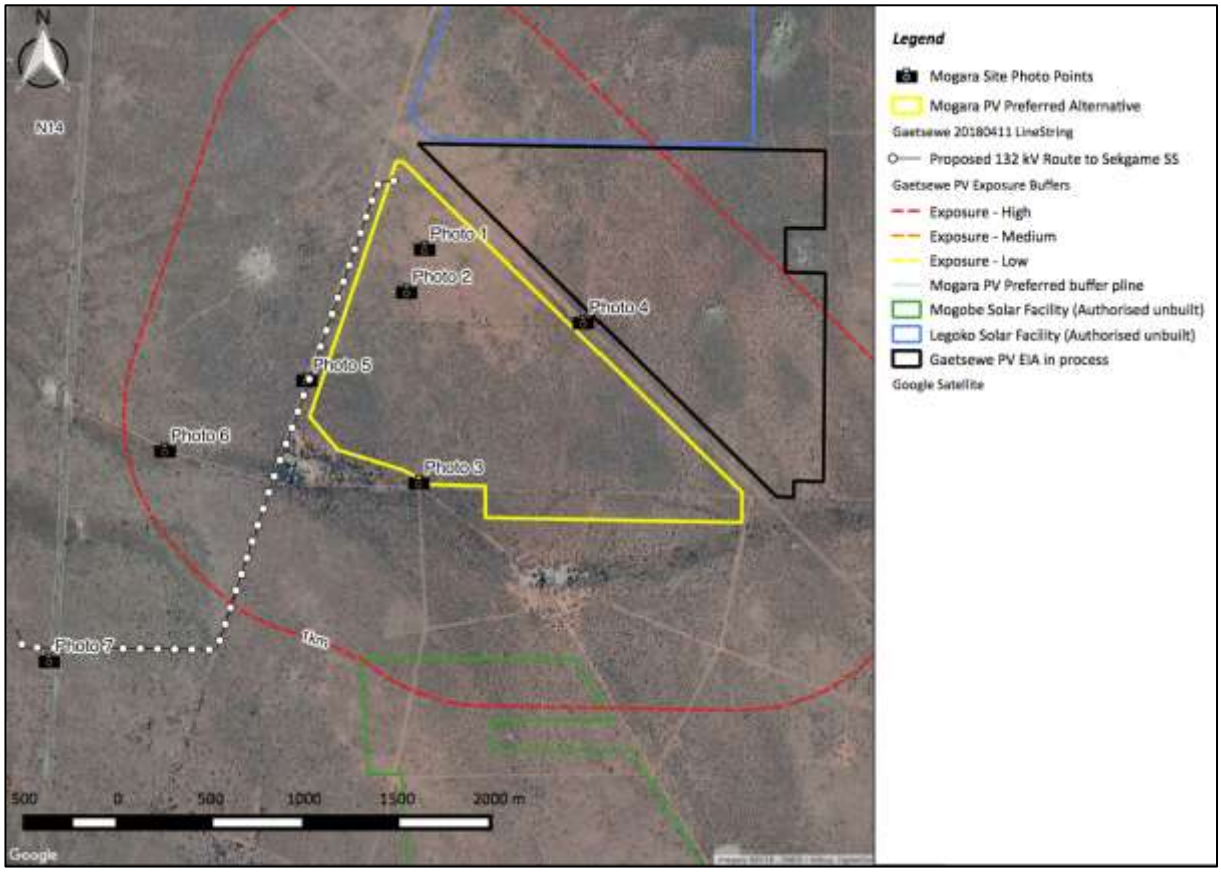

Figure 15: Proposed site photograph locality map.

Figure 16: View west from **Photo 1** of the low bush and the Shishen waste rock dumps visible in the background (Source: D. Holder Cape EAPrac 2018).

Figure 17: View east from **Photo 2** of veld grasses and low vegetation with the Eskom powerline in the background (Source: D. Holder Cape EAPrac 2018).

Figure 18: View from **Photo 3** toward the north of the typical farm tracks used to enter into the site and the medium sized bushveld vegetation (Source: D. Holder Cape EAPrac 2018).

Figure 19: View from **Photo 4** of the 400kV power line routed along the south-western boundary of the proposed site (Source: D. Holder Cape EAPrac 2018).

Figure 20: View from **Photo 5** of the 88kV power line alongside which the proposed PV power line would be routed (Source: D. Holder Cape EAPrac 2018).

Figure 21: View from **Photo 6** location to the west of the existing gravel road where the PV project would be accessed.

Figure 22: View south from **Photo 7** showing the N14 national road crossing point.

3.3.3 *Scenic Quality and Receptor Sensitivity Ratings*

The single landscape type defined as Rural Kathu Bushveld, was subjected to an analysis of its intrinsic value as a visual resource by quantifying Scenic Quality and Receptor Sensitivity to landscape change of the property. This can be viewed in Annexure 3.

The ***Scenic Quality*** scores are totalled and assigned an A (High scenic quality), B (Moderate scenic quality) or C (Low scenic quality) category based on the following split: *A= scenic quality rating of ≥19; B= rating of 12 – 18, C= rating of ≤11* (USDI., 2004). If

applicable, the Cultural Modification can be assigned a negative value if the landscape is significantly degraded by human-made modifications. ***Receptor Sensitivity*** levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined by rating the key factors relating to the perception of landscape change in terms of Low to High.

Table 3: Scenic Quality Rating Table

Aspect	Rating	Motivation
Landform	1	Generally flat terrain that has few or no interesting landscape features.
Vegetation	2	Some variety of vegetation, but only one or two major types.
Water	1	Although there are some pans on the property, the proposed development footprint excludes these areas.
Colour	2	Subtle colour variation created by the grey-green vegetation and the red sands.
Scarcity	2	Interesting within its setting but fairly common within the region.
Adjacent scenery	1	The dominance of the adjacent multiple power lines to the north and south, as well as the clear views of Sishen Mine to the west, reduce the scenic value of the adjacent scenery.
Cultural Modif.	2	Cultural modifications on site are limited to farm tracks and a single disused structure, which maintains the existing rural agricultural sense of place.

Table 4: Receptor Sensitivity Rating Table

Aspect	Rating	Motivation
Type user	Medium	Reitzhof, located approximately 2 km to the north of the proposed development site, does include residential users who could experience concern for the maintenance of visual quality. This would more likely be related to perceived devaluation of property prices, as opposed to a reduction in aesthetic values due to the views being partial and reduced in intensity due to the distance.
Amount use	Low	Current direct views of the property are limited by the surrounding vegetation, which includes some small trees, as well as a slight topographic rise between the N14 users and the site. Thus views of the site from the N14 receptors are limited to partial views of mainly the trees on the property.
Public interest	Low	Given the strong mining landscape context of the site and the domination of mining within the local economy, it is likely that public interest in maintaining visual quality is low.
Adjacent land users	Low	The nearest receptors are from the Reitzhof smallholdings and the N14 road users. The southern section of the Reitzhof area is strongly dominated by the Eskom power lines that cut through this area. The section of N14 from which users see the proposed site, is also strongly influenced by the views of the Sishen Mine to the west (away from the proposed site). Both factors are likely to reduce the concern for the maintenance of visual quality.
Special zoning	Medium	The property is currently zoned rural agricultural, which restricts development to agricultural purposes.

Table 5: Scenic Quality and Receptor Sensitivity Summary Table

Visual Resources	Scenic Quality									Receptor Sensitivity						VRM	
	A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11									H = High; M = Medium; L = Low							
NAME	**Landform**	**Vegetation**	**Water**	**Colour**	**Scarcity**	**Adjacent Landscape**	**Cultural Modifications**	**Sum**	**Rating**	**Type of Users**	**Amount of Use**	**Public Interest**	**Adjacent Land Uses**	**Special Areas**	**Rating**	**Visual Inventory Class**	**Visual Resource Management Class**
Informal peri-urban	1	2	1	2	2	1	2	11	**C**	M	L	L	L	M	**L**	**IV**	**III**

3.3.4 *Site Visual Resources*

The BLM methodology defines four Classes that represent the relative value of the visual resources of an area and are defined making use of the VRM Matrix below:

i. **Classes I and II** are the most valued
ii. **Class III** represent a moderate value
iii. **Class IV** is of least value

The Classes are not prescriptive and are utilised as a guideline to determine the carrying capacity of a visually preferred landscape that is utilised to assess the suitability of the landscape change associated with the proposed project. The Visual Inventory Classes are defined using the matrix below and with motivation, can be adjusted to Visual Resource Management Classes which take zoning and regional planning into consideration if applicable.

Class I & II

Class I is typically assigned when legislation restricts development in certain areas (Class I), or when the Scenic Quality and Receptor Sensitivity is very high (Class II). The visual objective is to preserve the existing character of the landscape, the level of change to the characteristic landscape should be very low, and must not attract attention. As no protected, or significant scenic resources were identified within the area, Class I and Class II Visual Objectives were not assigned.

Class III

Due to the zoning of the property as Agriculture, and the current land use being related to agriculture, the Visual Inventory Class IV was amended to a Visual Resource Management Class III. The Class III objective is to partially retain the existing character of the landscape, where the level of change to the characteristic landscape should be moderate. Management activities may attract attention, but should not dominate the view of the casual observer, and changes should repeat the basic elements found in the predominant natural features of the characteristic landscape.

Class IV

The Class IV objective is to provide for management activities that require major modifications of the existing character of the landscape. Due to the zoning of the property as Agriculture, and the current farming land uses of the surrounding areas, very high levels of visual intrusion could be degrading to the surrounding landscape character. As such, no Class IV areas were defined.

3.4 Preliminary Findings

Visibility

The visibility of the proposed PV and power lines project is rated **Local**. Visibility of the proposed 4m high PV structures would effectively dissipate outside of the 2km high exposure zone. Topographic screening to the north and east, and from Sishen dumps to the west, localise the viewshed.

Exposure

Exposure is rated **Medium to High** with the main receptors, the N14 National Highway, located approximately 1.7km to the west. The proposed power line component is rated **High** due to the crossing over the N14 National Road.

Scenic Quality

Scenic quality for all proposed development areas was rated **Medium** due to the presence of the powerlines running through the property, as well as the negative influence of the Sishen Mine waste rock dumps in the background.

Receptor Sensitivity to Landscape Change

Receptor sensitivity to landscape change for all the proposed development areas was rated **Low**. Current direct usage of the property views are limited by the surrounding vegetation which includes some small trees between the N14 users and the site. Given the strong mining landscape context of the site and the domination of mining within the local economy, it is likely that public interest in maintaining visual quality is low.

Cumulative Effects

Two authorised and one proposed PV projects are located within the immediate vicinity. Legoko Solar is located to the north of the proposed PV development site, with Mogobe Solar located approximately 1km to the south of the preferred Mogara PV site. Although authorised, both of the facilities are yet to be constructed and as such the existing bushveld rural agricultural scenery dominates the local landscape context. Gaetsewe Solar, is also proposed adjacent to the proposed site along the northeast border. Although the Mogara and Gaetsewe EIA's are currently in process, the combined footprint of these proposed PV projects (if authorised), in conjunction with the authorised Legoko and Mogobe Solar facilities, could create a large combined visual footprint.

4 IMPACT ASSESSMENT

4.1 Nature of the visual impact

The following visual impacts could take place during the lifetime of the ***proposed PV*** project:

Construction:

- Loss of site landscape character due to the removal of vegetation and the construction of the PV structures and associated infrastructure.
- Wind-blown dust due to the removal of large areas of vegetation.
- Possible soil erosion from temporary roads crossing drainage lines.
- Windblown litter from the laydown and construction sites.

Operation:

- Massing effect in the landscape from a large-scale modification.
- On-going soil erosion.
- On-going windblown dust.

Decommissioning:

- Movement of vehicles and associated dust.
- Wind-blown dust from the disturbance of cover vegetation / gravel.

Cumulative:

- A long term change in landuse setting a precedent for other similar types of solar energy projects.

The following visual impacts could take place during the lifetime of the proposed ***transmission line***:

Construction

- Possible soil erosion from temporary roads crossing drainage lines.
- Windblown litter from the lay-down and construction sites.

Operation

- On-going soil erosion.
- On-going windblown dust.
- Sunlight glint off cables and structures.

Decommissioning

- Movement of vehicles and associated dust.
- Windblown dust from the disturbance of cover vegetation/gravel.

Cumulative

- Massing effects from numerous power lines converging on the substations.
- Cluttering effects from ad-hoc routings that are not aligned with existing Eskom power line corridors.

4.2 Impact Assessment Rating Criteria

Visual impact significance impacts were defined making use of the DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA processes *(Oberholzer. 2005).*

Extent	**Geographical area of influence.** **Site Related (S):** *extending only as far as the activity* **Local (L):** limited to i*mmediate surroundings.* **Regional (R):** *affecting a larger metropolitan or regional area* **National (N):** *affecting large parts of the country* **International (I):** *affecting areas across international boundaries*
Duration	**Predicted lifespan** **Short term (S):** *duration of the construction phase.* **Medium term (M):** *duration for screening vegetation to mature.* **Long term (L):** *lifespan of the project.* **Permanent (P):** *where time will not mitigate the visual impact.*
Magnitude	**Magnitude of impact on views, scenic or cultural resources** **Low (L):** *where visual and scenic resources are not affected.* **Moderate (M)**: *where visual and scenic resources are affected* **High (H)**: *where scenic and cultural resources are significantly affected.*
Probability	**Degree of possible visual impact:** **Improbable (I):** *possibility of the impact occurring is very low.* **Probable (P):** *distinct possibility that the impact will occur.* **Highly probable (HP):** *most likely that the impact will occur.* **Definite (D):** *impact will occur regardless of any prevention measures.*
Significance	**A synthesis of nature, duration, intensity, extent and probability** **Low (L):** will not have an influence on the decision. **Moderate (M):** should have an influence on the decision unless it is mitigated. **High (H):** would influence the decision regardless of any possible mitigation.
Confidence	Key uncertainties and risks in the VIA process, which may influence the accuracy of, and confidence in, the VIA process.

Source: DEA&DP Guideline for involving Visual and Aesthetic Specialists in EIA Processes

4.3 Mogara Alternative 1 (Preferred)

Table 6: Alternative 1 (Preferred) Impact Table

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with
Mogara Alternative 1 (Preferred)	Cons.	W/Out	-ve	Local	Short	Med	P	Med	
		With	-ve	Local	Short	Low	P		Low
	Ops.	W/Out	-ve	Local	Long	Med	P	Med	
		With	-ve	Local	Long	Low	P		Low
	Close	W/Out	-ve	Local	Short	Med	P	Med	
		With	-ve	Local	Short	Low	P		Low
	Cuml. Risk	W/Out	-ve	Local	Long	Med	P	Med	
		With	-ve	Local	Long	Med	P		Med

The Visual Impact Significance of the Mogara Solar Preferred Alternative 1 is rated **medium** without mitigation for all phases. The relative remoteness of the location, the low receptor sensitivity and the low scenic quality of the landscape (which is currently mine and agriculture landscape related), will reduce the intensity of the landscape change. Mitigation is recommended which would result in **low** visual impact significance for all phases. These mitigation measures would include management of lights at night and continued management of wind blown dust.

The Cumulative visual risk to scenic resources was rated **medium negative** with little opportunity for mitigation due to the close proximity of the proposed site to the authorised Legoko, and the proposed Gaetsewe, solar facilities. The combined views of the three solar facilities once constructed are likely to create a strong, local visual massing effect within the agriculturally zoned area. However, site visual resources are low, and with the proposed Mogara site located on low lying ground, the zone of visual influence will be contained. Retaining the bushveld vegetation around the proposed PV areas will retain the surrounding agricultural sense of place, and further localise the combined zone of visual influence. With successful rehabilitation of the area back to an agricultural land use on closure, the cumulative visual risk could be reduced to **negligible in the long term**.

The following mitigations are recommended per phase:

<u>PV Site and Structure Construction</u>

- Bushveld trees surrounding the proposed PV sites should be retained for visual screening.
- The laydown area should be sited away from the N14.
- Topsoil from the footprints of the road and structures should be dealt with in accordance with EMP.
- The buildings and battery storage facility should be painted a grey-brown colour.
- Fencing should be simple, diamond shaped (to catch wind-blown litter) and appear transparent from a distance. The fences should be checked on a monthly basis for the collection of litter caught on the fence.
- Signage on the N14 should be moderated.

- Lights at night have the potential to significantly increase the visual exposure of the proposed project. It is recommended that mitigations be implemented to reduce light spillage (refer to appendix for general guidelines).

PV Site and Structure Operation

- Control of lights at night to allow only local disturbance to the current dark sky night landscape (refer to appendix for general guidelines).
- Continued erosion control and management of dust.

PV Site and Structures Decommissioning

- All structures should be removed and where possible, recycled.
- Building structures should be broken down (including foundations).
- The rubble should be managed according to NEMWA and deposited at a registered landfill if it cannot be recycled or reused.
- All compacted areas should be rehabilitated according to a rehabilitation specialist.
- Monitoring for soil erosion should be undertaken on a routine basis.

4.4 Mogara Alternative 2

Table 7: Mogara Alternative 2 Impact Table

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with
Mogara Alternative 2	Cons.	W/Out	-ve	Local	Short	Med	P	Med	
		With	-ve	Local	Short	Low	P		Low
	Ops.	W/Out	-ve	Local	Long	Med	P	Med	
		With	-ve	Local	Long	Low	P		Low
	Close	W/Out	-ve	Local	Short	Med	P	Med	
		With	-ve	Local	Short	Low	P		Low
	Cuml. Risk	W/Out	-ve	Local	Long	Med	P	Low	
		With	-ve	Local	Long	Med	P		Low

As with the Mogara Preferred Alternative 1, the Visual Impact Significance of the Mogara Alternative 2 is rated **medium** without mitigation for all phases. This is also due to the relative remoteness of the location, the low receptor sensitivity and the low scenic quality of the landscape (which is currently mine and agriculture related). Mitigation is recommended which would result in **low** visual impact significance for all phases. Refer to the Preferred Alternative 1 assessment for mitigation detail.

The cumulative visual risk to scenic resources was rated **low negative** with little opportunity for mitigation due to the relatively remote location of the proposed site. Although located to the north of the Mogobe Solar site (authorised but not constructed), the gap between the two sites is sufficient to reduce the combined visual massing effects if the bushveld vegetation is retained. The surrounding visual resources are medium to low with limited value for landuse based eco-tourism due to the close proximity of the Sishen Mine. With the proposed alternative site also located on low-lying ground, the zone of visual influence is locally contained. With successful rehabilitation of the area back to agricultural land use on closure, the cumulative visual risk could be reduced to **negligible in the long term**.

4.5 Road Access Impact Assessment

Due to the close alignment of the proposed roads to existing farm roads, the road access impact rating for both road options are rated the same.

Table 8: Road Access Impact Table

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with
Road access (both options)	Cons.	W/Out	-ve	Site	Short	ML	P	ML	
		With	-ve	Site	Short	L	P		L
	Ops.	W/Out	-ve	Site	Long	ML	P	ML	
		With	-ve	Site	Long	VL	P		VL
	Close	W/Out	-ve	Site	Short	ML	P	ML	
		With	-ve	Site	Short	L	P		L
	Cuml.	W/Out	-ve	Site	Long	M	I	M	
		With	+ve	Site	Short	VL	P		L

The Visual Impact Significance without mitigation of the road access routes was rated **medium to low** for all phases. This is because the proposed roads mainly follow existing farm road alignment. Additional factors include the remoteness of the locality in relation to the relatively small visual footprint of the source impact. With mitigation and effective dust management, the Visual Impact Significance was also rated **very low** for construction and closure phases, and **very low** for operation, should effective rehabilitation be implemented.

Without mitigation, Cumulative Visual Significance for road access was rated ***medium***. This is due to the potential of the improved road attracting further development in area. As the road would be a cul-de-suc and on private property, further development is unlikely. With continuation of the existing farming activities taking place on the remainder of the farm, the cumulative effects can be reduced to **low**.

The following mitigations are recommended per phase:

<u>Road Access Construction</u>

- The laydown area should be sited away from the N14.
- If very dry conditions prevail and dust becomes a nuisance, dust suppression measures need to be implemented.
- Topsoil from the footprints of the road and structures should be dealt with in accordance with the EMP.
- Construction should preferably not take place at night-time.

<u>Road Access Operation</u>

- If very dry conditions prevail and dust becomes a nuisance, dust suppression measures need to be implemented.

<u>Road Access Decommissioning</u>

- If very dry conditions prevail and dust becomes a nuisance, dust suppression measures need to be implemented.

- Unless required for on-going farm utilisation, all compacted areas should be rehabilitated according to a rehabilitation specialist recommendations.
- Monitoring for soil erosion should be undertaken on an annual basis until the impacted areas have been successfully rehabilitated.

4.6 PV Alternative 1 Selfbuild Grid Connection and Substation

Table 9: PV Alternative 1 Selfbuild Grid Connection and Substation Impact Table

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with
Selfbuild Grid and Substation	Cons.	W/Out	-ve	Local	Short	L	P	L	
		With	-ve	Local	Short	L	P		VL
	Ops.	W/Out	-ve	Local	Long	L	P	L	
		With	-ve	Local	Long	L	P		VL
	Close	W/Out	-ve	Local	Short	L	P	L	
		With	-ve	Local	Short	VL	P		VL
	Cuml.	W/Out	-ve	Reg.	Long	H	P	M	
		With	-ve	Local	Short	L	P		L

Without mitigation, construction and closure phase impacts were rated ***low*** as the proposed power line mainly follows existing distribution power line / telecommunication lines as well as existing farm access routes. The ZVI for the monopoles is also expected to not exceed two kilometres due to the higher visual absorption capacity created by the existing Eskom power line infrastructure, as well as the surrounding medium sized bushveld trees. The crossing of both power line options is perpendicular to the N14 and in close proximity to the proposed Eskom Sekgame Substation. The proposed on-site substation is located in a remote location, outside of receptor views. Mitigation would essentially be related to soil erosion management that would be limited due to the routing mainly following existing farm roads. With erosion control the visual significance can be reduced to **very low**.

Pre-construction Phase Mitigation

- Integration planning with Eskom if required.

Construction Phase Mitigation

- Strict access control to a single track along the route making use of existing farm tracks for access from the road where possible.
- Soil erosion management to be implemented where required.
- Strict litter control.

Operation Phase Mitigation

- On-going erosion control monitoring by the ECO.

Decommissioning Phase Mitigation

- Removal of all structures and recycling of the structure and cables.
- Removal of any foundations and filling of holes created and shaped to appear natural.
- Rehabilitation and restoration of the footprint and track according to a rehabilitation specialist recommendations.

5 CONCLUSION

VRM Africa was appointed by Cape EAPrac (PTY) Ltd to undertake a Level 2 Visual Impact Assessment for the proposed Mogara Solar PV Energy Facility on behalf of *K2018091776 (SOUTH AFRICA) (Pty) Ltd*. The site is located near the town of Kathu in the Northern Cape province.

The visibility of the proposed PV and power lines project is rated **Local**. Visibility of the proposed 4m high PV structures would effectively dissipate outside of the 2km high exposure zone. Topographic screening to the north and east, and from Sishen dumps to the west, localise the viewshed. Exposure is rated **Medium to Low** with the main receptors, the N14 National Highway, located approximately 1.2km to the west of the proposed PV site. The exposure of the proposed power line is rated **High** due to the crossing over the N14 National Road. Receptor sensitivity to landscape change for all the proposed development areas was rated **Low** due to the mining landscape context where landscape based tourism is limited.

Scenic quality for all proposed development areas was rated **Low**, due to the strong negative influence of the Sishen Mine as well as the two Eskom transmission line corridors located north of the proposed site. No significant scenic resources were identified within the area. As such, the Class I and Class II Visual Objectives that require landscape preservation were not assigned. Due to the zoning of the property as Agriculture, a Class III Visual Objective was assigned to the proposed development site to protect the surround agricultural sense of place.

The cumulative visual assessment found that two authorised PV projects are located within the immediate vicinity, with another proposed adjacent to the proposed Mogara PV site. Legoko Solar is located directly north of the proposed PV development site, with Mogobe Solar located approximately 1km to the south of the site. Although authorised, both of the facilities are yet to be constructed and as such the existing bushveld rural agricultural scenery dominates the local landscape context. Another PV solar facility, Gaetsewe Solar, is also proposed adjacent to the proposed site along the northeast border. Although the Mogara and Getsewe EIA status is yet to be defined, the combined footprint of these proposed PV projects, in conjunction with the authorised Legoko Solar facility, will create a large combined visual footprint. The combined views of the three solar facilities once constructed are likely to create a strong, but localised, visual massing effect within the agriculturally zoned area. Retaining the bushveld vegetation around the proposed PV areas, will retain the agricultural sense of place. Due to the close proximity to the Sishen Mine, the visual resources of the area are not utilised for landscape-based tourism. As such, the cumulative visual impact is rated Low Risk.

As visual resources are ***low***, receptor sensitivity to landscape change is ***low***, and the zone of visual influence can be ***locally contained***, it is recommended that the proposed Mogara PV project be authorised as visual resources will not be significantly impacted. With the contained zone of visual influence of the site, the consolidation of the three PV projects into the triangular portion of property would be visually preferred to fragmentation of larger portions of land to the south. As such, the Mogara Preferred Alternative 1 would be marginally preferred over the southern alternative layout.

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7 ANNEXURE 1: SPECIALIST DECLARATION OF INDEPENDENCE

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

Specialist:	VRM AFRICA CC		
Contact person:	STEPHEN STEAD		
Postal address:	P.O BOX 7233, BLANCO		
Postal code:	6531	Cell:	083 560 9911
Telephone:	044 874 0020	Fax:	086 653 3738
E-mail:	steve@vrma.co.za		
Professional affiliation(s) (if any)	Association of Professional Heritage Practitioners South Africa (APHP)		

The specialist appointed in terms of the Regulations

I, **STEPHEN STEAD**, declare that ---

General declaration:

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

Signature of the specialist:

SILVER SOLUTIONS TRADING AS VRM AFRICA

7.1 Curriculum Vitae

Curriculum Vitae (CV)

1. **Position**: Owner / Director
2. **Name of Firm**: Visual Resource Management Africa cc *(www.vrma.co.za)*
3. **Name of Staff**: Stephen Stead
4. **Date of Birth**: 9 June 1967
5. **Nationality:** South African
6. **Contact Details:** **Tel: +27 (0) 44 876 0020**
   Cell: +27 (0) 83 560 9911
   Email: steve@vrma.co.za

7. **Educational qualifications**:
   - University of Natal (Pietermaritzburg):
   - Bachelor of Arts: Psychology and Geography
   - Bachelor of Arts (Hons): Human Geography and Geographic Information Management Systems

8. **Professional Accreditation**
   - Association of Professional Heritage Practitioners (APHP) Western Cape
     - Accredited VIA practitioner member of the Association (2011)

9. **Association involvement:** :
   - International Association of Impact Assessment (IAIA) South African Affiliate
     - Past President (2012 - 2013)
     - President (2012)
     - President-Elect (2011)
     - Conference Co-ordinator (2010)
     - National Executive Committee member (2009)
     - Southern Cape Chairperson (2008)

10. **Conferences Attended:**
    - IAIAsa 2012
    - IAIAsa 2011
    - IAIA International 2011 (Mexico)
    - IAIAsa 2010
    - IAIAsa 2009
    - IAIAsa 2007

11. **Continued Professional Development:**
    - Integrating Sustainability with Environment Assessment in South Africa (IAIAsa Conference, 1 day)
    - Achieving the full potential of SIA (Mexico, IAIA Conference, 2 days 2011)

- Researching and Assessing Heritage Resources Course (University of Cape Town, 5 days, 2009)

12. Countries of Work Experience:

- South Africa, Mozambique, Malawi, Lesotho, Kenya and Namibia

13. Relevant Experience:

Stephen gained six years of experience in the field of Geographic Information Systems mapping and spatial analysis working as a consultant for the KwaZulu-Natal Department of Health and then with an Environmental Impact Assessment company based in the Western Cape. In 2004 he set up the company Visual Resource Management Africa which specializes in visual resource management and visual impact assessments in Africa. The company makes use of the well documented Visual Resource Management methodology developed by the Bureau of Land Management (USA) for assessing the suitability of landscape modifications. In association with ILASA qualified landscape architect Liesel Stokes, he has assessed of over 100 major landscape modifications through-out southern and eastern Africa. The business has been operating for eight years and has successfully established and retained a large client base throughout Southern Africa which include amongst other, Rio Tinto (Pty) Ltd, Bannerman (Pty) Ltd, Anglo Coal (Pty) Ltd, Eskom (Pty) Ltd, NamPower and Vale (Pty) Ltd, Ariva (Pty) Ltd, Harmony Gold (Pty) Ltd, Mellium Challenge Account (USA), Pretoria Portland Cement (Pty) Ltd

14. Languages:

- English – First Language
- Afrikaans – fair in speaking, reading and writing

15. Projects:

A list of ***some*** of the large scale projects that VRMA has assessed has been attached below with the client list indicated per project (Refer to www.vrma.co.za for a full list of projects undertaken).

YEAR	NAME	DESCRIPTION	LOCATION
2018	Mogara PV	Solar Energy	Northern Cape (SA)
2018	Gaetsewe PV	Solar Energy	Northern Cape (SA)
2017	Kalungwishi Hydroelectric (2) and power line	Hydroelectric	Zambia
2017	Mossel Bay Informal Settlement Relocation	Settlement	Western Cape (SA)
2017	Pavua Dam and HEP	Hydroelectric	Mozambique (SA)
2017	Penhill Settlement	Settlement	Western Cape (SA)
2016	Kokerboom WEF * 3	Wind Energy	Northern Cape (SA)
2016	Hotazel PV	Solar Energy	Northern Cape (SA)
2016	Eskom Sekgame Bulkop Power Line	Infrastructrue	Northern Cape (SA)
2016	Ngonye Hydroelectric	Hydroelectric	Zambia
2016	Levensdal Infill	Settlement	Western Cape (SA)
2016	Arandis CSP	Solar Energy	Namibia
2016	Bonnievale PV	Solar Energy	Western Cape (SA)
2015	Noblesfontein 2 & 3 WEF (Scoping)	Wind Energy	Eastern Cape (SA)
2015	Ephraim Sun SEF	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip and Sirius Grid TX	Solar Energy	Nothern Cape (SA)
2015	Dyasonsklip PV	Solar Energy	Nothern Cape (SA)

2015	Zeerust PV and transmission line	Solar Energy	North West (SA)
2015	Bloemsmond SEF	Solar Energy	Nothern Cape (SA)
2015	Juwi Copperton PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 14 PV	Solar Energy	Nothern Cape (SA)
2015	Humansrus Capital 13 PV	Solar Energy	Nothern Cape (SA)
2015	Spitzkop East WEF (Scoping)	Solar Energy	Western Cape (SA)
2015	Lofdal Rare Earth Mine and Infrastructure	Mining	Namibia
2015	AEP Kathu PV	Solar Energy	Nothern Cape (SA)
2014	AEP Mogobe SEF	Solar Energy	Nothern Cape (SA)
2014	Bonnievale SEF	Solar Energy	Western Cape (SA)
2014	AEP Legoko SEF	Solar Energy	Northern Cape (SA)
2014	Postmasburg PV	Solar Energy	Northern Cape (SA)
2014	Joram Solar	Solar Energy	Northern Cape (SA)
2014	RERE PV Postmasberg	Solar Energy	Northern Cape (SA)
2014	RERE CPV Upington	Solar Energy	Northern Cape (SA)
2014	Rio Tinto RUL Desalinisation Plant	Industrial	Namibia
2014	NamPower PV * 3	Solar Energy	Namibia
2014	Pemba Oil and Gas Port Expansion	Industrial	Mozambique
2014	Brightsource CSP Upington	Solar Energy	Northern Cape (SA)
2014	Witsand WEF (Scoping)	Wind Energy	Western Cape (SA)
2014	Kangnas WEF	Wind Energy	Western Cape (SA)
2013	Cape Winelands DM Regional Landfill	Industrial	Western Cape (SA)
2013	Drennan PV Solar Park	Solar Energy	Eastern Cape (SA)
2013	Eastern Cape Mari-culture	Mari-culture	Eastern Cape (SA)
2013	Eskom Pantom Pass Substation	Substation /Tx lines	Western Cape (SA)
2013	Frankfort Paper Mill	Plant	Free State (SA)
2013	Gibson Bay Wind Farm Transmission lines	Tranmission lines	Eastern Cape (SA)
2013	Houhoek Eskom Substation	Substation /Tx lines	Western Cape (SA)
2013	Mulilo PV Solar Energy Sites (x4)	Solar Energy	Northern Cape (SA)
2013	Namies Wind Farm	Wind Energy	Northern Cape (SA)
2013	Rossing Z20 Pit and WRD	Mining	Namibia
2013	SAPPI Boiler Upgrade	Plant	Mpumalanga (SA)
2013	Tumela WRD	Mine	North West (SA)
2013	Weskusfleur Substation (Koeburg)	Substation /Tx lines	Western Cape (SA)
2013	Yzermyn coal mine	Mining	Mpumalanga (SA)
2012	Afrisam	Mining	Western Cape (SA)
2012	Bitterfontein	Solar Energy	Northern Cape (SA)
2012	Kangnas PV	Solar Energy	Northern Cape (SA)
2012	Kangnas Wind	Solar Energy	Northern Cape (SA)
2012	Kathu CSP Tower	Solar Energy	Northern Cape (SA)
2012	Kobong Hydro	Hydro & Powerline	Lesotho

2012	Letseng Diamond Mine Upgrade	Mining	Lesotho
2012	Lunsklip Windfarm	Wind Energy	Western Cape (SA)
2012	Mozambique Gas Engine Power Plant	Plant	Mozambique
2012	Ncondezi Thermal Power Station	Substation /Tx lines	Mozambique
2012	Sasol CSP Tower	Solar Power	Free State (SA)
2012	Sasol Upington CSP Tower	Solar Power	Northern Cape (SA)
2011	Beaufort West PV Solar Power Station	Solar Energy	Western Cape (SA)
2011	Beaufort West Wind Farm	Wind Energy	Western Cape (SA)
2011	De Bakke Cell Phone Mast	Structure	Western Cape (SA)
2011	ERF 7288 PV	Solar Energy	Western Cape (SA)
2011	Gecko Industrial park	Industrial	Namibia
2011	Green View Estates	Residential	Western Cape (SA)
2011	Hoodia Solar	Solar Energy	Western Cape (SA)
2011	Kalahari Solar Power Project	Solar Energy	Northern Cape (SA)
2011	Khanyisa Power Station	Power Station	Western Cape (SA)
2011	Olvyn Kolk PV	Solar Energy	Northern Cape (SA)
2011	Otjikoto Gold Mine	Mining	Namibia
2011	PPC Rheebieck West Upgrade	Industrial	Western Cape (SA)
2011	George Southern Arterial	Road	Western Cape (SA)
2010	Bannerman Etango Uranium Mine	Mining	Namibia
2010	Bantamsklip Transmission	Transmission	Eastern Cape (SA)
2010	Beaufort West Urban Edge	Mapping	Western Cape (SA)
2010	Bon Accord Nickel Mine	Mining	Mapumalanga (SA)
2010	Etosha National Park Infrastructure	Housing	Namibia
2010	Herolds Bay N2 Development Baseline	Residential	Western Cape (SA)
2010	MET Housing Etosha	Residential	Namibia
2010	MET Housing Etosha Amended MCDM	Residential	Namibia
2010	MTN Lattice Hub Tower	Structure	Western Cape (SA)
2010	N2 Herolds Bay Residental	Residential	Western Cape (SA)
2010	Onifin(Pty) Ltd Hartenbos Quarry Extension	Mining	Western Cape (SA)
2010	Still Bay East	GIS Mapping	Western Cape (SA)
2010	Vale Moatize Coal Mine and Railway	Mining / Rail	Mozambique
2010	Vodacom Mast	Structure	Western Cape (SA)
2010	Wadrif Dam	Dam	Western Cape (SA)
2009	Asazani Zinyoka UISP Housing	Residential Infill	Western Cape (SA)
2009	Eden Telecommunication Tower	Structure	Western Cape (SA)
2009	George SDF Landscape Characterisation	GIS Mapping	Western Cape (SA)
2009	George SDF Visual Resource Management	GIS Mapping	Western Cape (SA)
2009	George Western Bypass	Road	Western Cape (SA)
2009	Knysna Affordable Housing Heidevallei	Residential Infill	Western Cape (SA)
2009	Knysna Affordable Housing Hornlee Project	Residential Infill	Western Cape (SA)

2009	Rossing Uranium Mine Phase 2	Mining	Namibia
2009	Sun Ray Wind Farm	Wind Energy	Western Cape (SA)
2008	Bantamsklip Transmission Lines Scoping	Transmission	Western Cape (SA)
2008	Erf 251 Damage Assessment	Residential	Western Cape (SA)
2008	Erongo Uranium Rush SEA	GIS Mapping	Namibia
2008	Evander South Gold Mine Preliminary VIA	Mining	Mpumalanga (SA)
2008	George SDF Open Spaces System	GIS Mapping	Western Cape (SA)
2008	Hartenbos River Park	Residential	Western Cape (SA)
2008	Kaaimans Project	Residential	Western Cape (SA)
2008	Lagoon Garden Estate	Residential	Western Cape (SA)
2008	Moquini Beach Hotel	Resort	Western Cape (SA)
2008	NamPower Coal fired Power Station	Power Station	Namibia
2008	Oasis Development	Residential	Western Cape (SA)
2008	RUL Sulpher Handling Facility Walvis Bay	Mining	Namibia
2008	Stonehouse Development	Residential	Western Cape (SA)
2008	Walvis Bay Power Station	Structure	Namibia
2007	Calitzdorp Retirement Village	Residential	Western Cape (SA)
2007	Calitzdorp Visualisation	Visualisation	Western Cape (SA)
2007	Camdeboo Estate	Residential	Western Cape (SA)
2007	Destiny Africa	Residential	Western Cape (SA)
2007	Droogfontein Farm 245	Residential	Western Cape (SA)
2007	Floating Liquified Natural Gas Facility	Structure tanker	Western Cape (SA)
2007	George SDF Municipality Densification	GIS Mapping	Western Cape (SA)
2007	Kloofsig Development	Residential	Western Cape (SA)
2007	OCGT Power Plant Extension	Structure Power Plant	Western Cape (SA)
2007	Oudtshoorn Municipality SDF	GIS Mapping	Western Cape (SA)
2007	Oudtshoorn Shopping Complex	Structure	Western Cape (SA)
2007	Pezula Infill (Noetzie)	Residential	Western Cape (SA)
2007	Pierpoint Nature Reserve	Residential	Western Cape (SA)
2007	Pinnacle Point Golf Estate	Golf/Residential	Western Cape (SA)
2007	Rheebok Development Erf 252 Apeal	Residential	Western Cape (SA)
2007	Rossing Uranium Mine Phase 1	Mining	Namibia
2007	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Western Cape (SA)
2007	Sedgefield Water Works	Structure	Western Cape (SA)
2007	Sulpher Handling Station Walvis Bay Port	Industrial	Namibia
2007	Trekkopje Uranium Mine	Mining	Namibia
2007	Weldon Kaya	Residential	Western Cape (SA)
2006	Farm Dwarsweg 260	Residential	Western Cape (SA)
2006	Fynboskruin Extention	Residential	Western Cape (SA)
2006	Hanglip Golf and Residential Estate	Residential	Western Cape (SA)
2006	Hansmoeskraal	Slopes Analysis	Western Cape (SA)

2006	Hartenbos Landgoed Phase 2	Residential	Western Cape (SA)
2006	Hersham Security Village	Residential	Western Cape (SA)
2006	Ladywood Farm 437	Residential	Western Cape (SA)
2006	Le Grand Golf and Residential Estate	Residential	Western Cape (SA)
2006	Paradise Coast	Residential	Western Cape (SA)
2006	Paradyskloof Residential Estate	Residential	Western Cape (SA)
2006	Riverhill Residential Estate	Residential	Western Cape (SA)
2006	Wolwe Eiland Access Route	Road	Western Cape (SA)
2005	Harmony Gold Mine	Mining	Mpumalanga (SA)
2005	Knysna River Reserve	Residential	Western Cape (SA)
2005	Lagoon Bay Lifestyle Estate	Residential	Western Cape (SA)
2005	Outeniquabosch Safari Park	Residential	Western Cape (SA)
2005	Proposed Hotel Farm Gansevallei	Resort	Western Cape (SA)
2005	Uitzicht Development	Residential	Western Cape (SA)
2005	West Dunes	Residential	Western Cape (SA)
2005	Wilderness Erf 2278	Residential	Western Cape (SA)
2005	Wolwe Eiland Eco & Nature Estate	Residential	Western Cape (SA)
2005	Zebra Clay Mine	Mining	Western Cape (SA)
2004	Gansevallei Hotel	Residential	Western Cape (SA)
2004	Lakes Eco and Golf Estate	Residential	Western Cape (SA)
2004	Trekkopje Desalination Plant	Structure Plant	Namibia (SA)
1995	Greater Durban Informal Housing Analysis	Photogrametry	KwaZulu-Natal (SA)

8 ANNEXURE 2: VRM CHECK SHEETS

Scenic Quality Rating Questionnaire

KEY FACTORS	RATING CRITERIA AND SCORE		
SCORE	**5**	**3**	**1**
Land Form	High vertical relief as expressed in prominent cliffs, spires or massive rock outcrops, or severe surface variation or highly eroded formations or detail features that are dominating and exceptionally striking and intriguing.	Steep-sided river valleys, or interesting erosion patterns or variety in size and shape of landforms; or detail features that are interesting, though not dominant or exceptional.	Low rolling hills, foothills or flat valley bottoms; few or no interesting landscape features.
Vegetation	A variety of vegetative types as expressed in interesting forms, textures and patterns.	Some variety of vegetation, but only one or two major types.	Little or no variety or contrast in vegetation.
Water	Clear and clean appearing, still or cascading white water, any of which are a dominant factor in the landscape.	Flowing, or still, but not dominant in the landscape.	Absent, or present but not noticeable.
Colour	Rich colour combinations, variety or vivid colour: or pleasing contrasts in the soil, rock, vegetation, water.	Some intensity or variety in colours and contrast of the soil, rock and vegetation, but not a dominant scenic element.	Subtle colour variations contrast or interest: generally mute tones.
Adjacent Scenery	Adjacent scenery greatly enhances visual quality.	Adjacent scenery moderately enhances overall visual quality.	Adjacent scenery has little or no influence on overall visual quality.
Scarcity	One of a kind: unusually memorable, or very rare within region. Consistent chance for exceptional wildlife or wildflower viewing etc.	Distinctive, though somewhat similar to others within the region.	Interesting within its setting, but fairly common within the region.
SCORE	**2**	**0**	**-4**
Cultural Modification	Modifications add favourably to visual variety, while promoting visual harmony.	Modifications add little or no visual variety to the area, and introduce no discordant elements.	Modifications add variety but are very discordant and promote strong disharmony.

Sensitivity Level Rating Questionnaire

FACTORS	QUESTIONS	
Type of Users	**Maintenance of visual quality is:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Amount of use	**Maintenance of visual quality becomes more important as the level of use increases:**	
	A high level of use	High
	Moderately level of use	Moderate
	Low level of use	Low
Public interest	**Maintenance of visual quality:**	
	A major concern for most users	High
	A moderate concern for most users	Moderate
	A low concern for most users	Low
Adjacent land Users	**Maintenance of visual quality to sustain adjacent land use objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low
Special Areas	**Maintenance of visual quality to sustain Special Area management objectives is:**	
	Very important	High
	Moderately important	Moderate
	Slightly important	Low

9 ANNEXURE 3: GENERAL LIGHTS AT NIGHT MITIGATIONS

Mitigation:

- Effective light management needs to be incorporated into the design of the lighting to ensure that the visual influence is limited to the mine, without jeopardising mine operational safety and security (See lighting mitigations by The New England Light Pollution Advisory Group (NELPAG) and Sky Publishing Corp in 14.2).
- Utilisation of specific frequency LED lighting with a green hue on perimeter security fencing.
- Directional lighting on the more exposed areas of operation, where point light source is an issue.
- No use of overhead lighting and, if possible, locate the light source closer to the operation.
- If possible, the existing overhead lighting method utilised at the mine should be phased out and replaced with an alternative lighting using closer to source, directed LED technology.

Mesopic Lighting

Mesopic vision is a combination of photopic vision and scotopic vision in low, but not quite dark, lighting situations. The traditional method of measuring light assumes photopic vision and is often a poor predictor of how a person sees at night. The light spectrum optimized for mesopic vision contains a relatively high amount of bluish light and is therefore effective for peripheral visual tasks at mesopic light levels. *(CIE, 2012)*

The Mesopic Street Lighting Demonstration and Evaluation Report by the Lighting Research Centre (LRC) in New York found that the 'replacement of white light sources (induction and ceramic metal halide) were tuned to optimize human vision under low light levels while remaining in the white light spectrum. Therefore, outdoor electric light sources that are tuned to how humans see under mesopic lighting conditions can be used to reduce the luminance of the road surface while providing the same, or better, visibility. Light sources with shorter wavelengths, which produce a "cooler" (more blue and green) light, are needed to produce better mesopic vision. Based on this understanding, the LRC developed a means of predicting visual performance under low light conditions. This system is called the unified photometry system. Responses to surveys conducted on new installations revealed that area residents perceived higher levels of visibility, safety, security, brightness, and colour rendering with the new lighting systems than with the standard *High-Purity Standards* (HPS) systems. The new lighting systems used 30% to 50% less energy than the HPS systems. These positive results were achieved through tuning the light source to optimize mesopic vision. Using less wattage and photopic luminance also reduces the reflectance of the light off the road surface. Light reflectance is a major contributor to light pollution (sky glow).' *(Lighting Research Center. New York. 2008)*

‘Good Neighbour – Outdoor Lighting’

Presented by the New England Light Pollution Advisory Group (NELPAG) http://cfa/ www.harvard .edu /cfa/ps/nelpag.html) and Sky & Telescope http://SkyandTelescope.com/). NELPAG and Sky & Telescope support the International Dark-Sky Association (IDA) *(http://www.darksky.org/).* (NELPAG)

What is good lighting? Good outdoor lights improve visibility, safety, and a sense of security, while minimizing energy use, operating costs, and ugly, dazzling glare.

Why should we be concerned? Many outdoor lights are poorly designed or improperly aimed. Such lights are costly, wasteful, and distractingly glary. They harm the night-time environment and neighbours’ property values. Light directed uselessly above the horizon creates murky skyglow — the “light pollution” that washes out our view of the stars.

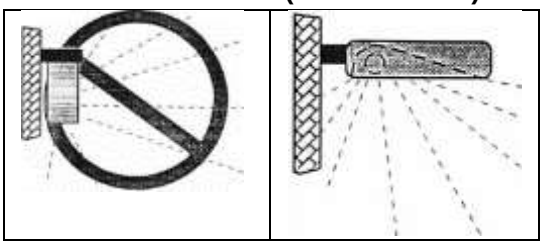
Glare Here’s the basic rule of thumb: If you can see the bright bulb from a distance, it’s a bad light. With a good light, you see lit ground instead of the dazzling bulb. “Glare” is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

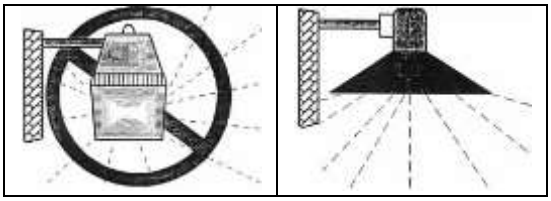
Light Trespass Poor outdoor lighting shines onto neighbours’ properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

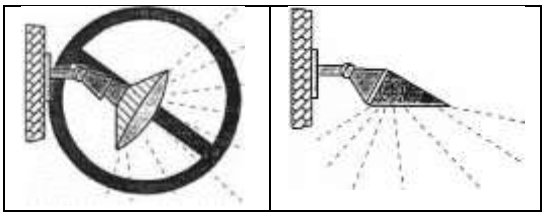
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

Excess Lighting Some homes and businesses are flooded with much stronger light than is necessary for safety or security.

Good and Bad Light Fixtures

Typical “Wall Pack”	**Typical “Shoe Box” (forward throw)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Typical “Yard Light”	**Opaque Reflector (lamp inside)**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

Area Flood Light	**Area Flood Light with Hood**
	
BAD Waste light goes up and sideways	**GOOD** Directs all light down

How do I switch to good lighting?

Provide only enough light for the task at hand; don’t over-light, and don’t spill light off your property. Specifying enough light for a job is sometimes hard to do on paper. Remember that a full Moon can make an area quite bright. Some lighting systems illuminate areas 100 times more brightly than the full Moon! More importantly, by choosing properly shielded lights, you can meet your needs without bothering neighbours or polluting the sky.

1. Aim lights down. Choose “full-cutoff shielded” fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.

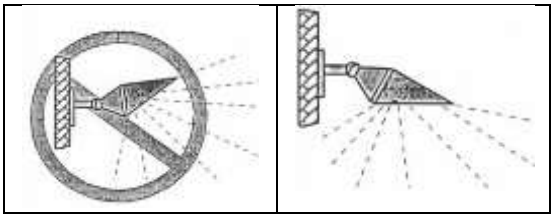
2. Install fixtures carefully to maximize their effectiveness on the targeted area and minimize their impact elsewhere. Proper aiming of fixtures is crucial. Most are aimed too high. Try to install them at night, when you can see where all the rays actually go. Properly aimed and shielded lights may cost more initially, but they save you far more in the long run. They can illuminate your target with a low-wattage bulb just as well as a wasteful light does with a high-wattage bulb.

3. If colour discrimination is not important, choose energy-efficient fixtures utilising yellowish high-pressure sodium (HPS) bulbs. If “white” light is needed, fixtures using compact fluorescent or metal-halide (MH) bulbs are more energy-efficient than those using incandescent, halogen, or mercury-vapour bulbs.

4. Where feasible, put lights on timers to turn them off each night after they are no longer needed. Put home security lights on a motion-detector switch, which turns them on only when someone enters the area; this provides a great deterrent effect!

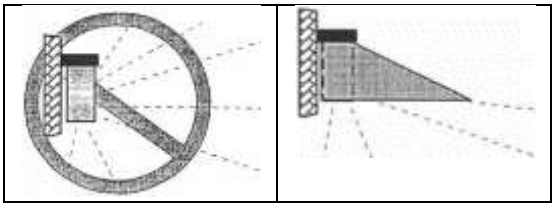
What You Can Do To Modify Existing Fixtures

Change this . . . to this (aim downward)



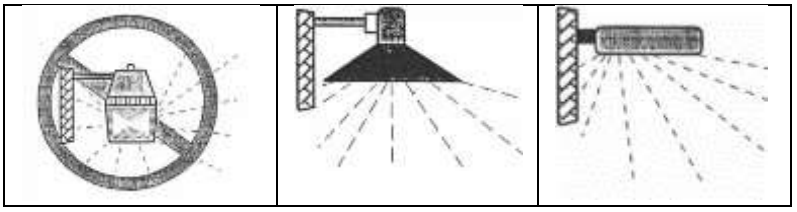
Floodlight:

Change this . . . to this (aim downward)



Wall Pack

Change this . . . to this or this



Yard Light | Opaque Reflecter | Show Box

Replace bad lights with good lights.
You’ll save energy and money. You’ll be a good neighbour. And you’ll help preserve our view of the stars.