

**PROPOSED KWARTELSPAN PV POWER STATION I AND
ASSOCIATED INFRASTRUCTURE**

Pixley ka Seme District Municipality, Northern Cape Province.

NEAS REF NO: DEA/EIA/0001020/2012

DEA REF NO: 14/12/16/3/3/1/484

VISUAL IMPACT ASSESSMENT

PREPARED FOR:

VAN ZYL



ENVIRONMENTAL CONSULTANTS cc

2009/073037/23

CONTACT PERSON: I.B. VAN ZYL

MOBILE: 072 222 6194

EMAIL: IBVANZYL@TELKOMSA.NET

ON BEHALF OF:



Suntrace Africa (Pty.) Ltd.

6th Floor, Fredman Towers

13, Fredman Drive

Sandton, 2196

Johannesburg

PREPARED BY:

AXIS LANDSCAPE ARCHITECTS (CC)

226 Odendaal Street

Meyerspark

Pretoria



June 2012

AXIS REF: KWA2012

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EXECUTIVE SUMMARY

Van Zyl Environmental Consultants, was appointed by Suntrace Africa (Pty.) Ltd, as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed development of the Kwartelspan Photovoltaic Power Station I and associated infrastructure, Pixley ka Seme District Municipality, Northern Cape Province.

Axis Landscape Architecture cc was appointed by Van Zyl Environmental Consultants as a sub-consultant to complete a Visual Impact Assessment. This Visual Impact Assessment (VIA) is a specialist study that forms part of the EIA and address the visual effects of the proposed power stations on the receiving environment.

The study area contains the extent of the proposed positions and includes an approximate 5 km buffer area. The methodology of this assessment is structured according to the following main headings:

- Project description
- Description of the receiving environment
- Significance of Landscape and Visual impacts
- Mitigation measures

PROJECT DESCRIPTION

The proposed development entails the construction of a photovoltaic power station with an electricity generation capacity of approximately 15 MWp, and a size of less than 20 ha. The proposed power station will have an area less than 20ha. The proposed components and associated infrastructure would include:

- internal electrical reticulation approximately 500 mm below ground;
- concentration boxes with inspection covers, transformation centres and a distribution centre;
- a 22 kV overhead power line with a length of less than 1 km will connecting the distribution centre to the relevant Eskom substation, in order to supply the generated electricity to the substation;
- internal access roads;
- lightning conductor masts with a height of 25 m;
- electric perimeter fencing;
- furrows, which might be constructed around the premises to prevent vehicles from entering the sites anywhere except at the main entrance; and
- guardrooms, toilets, showers, washbasins, security systems, lampposts, a storeroom and a workshop

DESCRIPTION OF THE AFFECTED ENVIRONMENT

The study area is characterised by gentle undulating plains and low-lying valleys dominate the regional topography. The lines are smooth, extending into the horizon.

The color of the landscape is dictated by seasonal change. It cycles between lush green and rich colors during summer and dull yellow and browns during winter.

The region is relatively undeveloped, with the exception of the existing agricultural activities which is a dominant feature in the landscape.

The study area is also recognised for low and moderate intensity agricultural activities, sparsely spaced farmsteads and dirt roads traversing the landscape. The visual character of the landscape is exclusively rural

FINDINGS AND RECOMMENDATIONS

LANDSCAPE CHARACTER SENSITIVITY

The sensitivity of the landscape character is an indication of "...the degree to which a particular landscape can accommodate change from a particular development, without detrimental effects on its character" (GLVIA, 2002).

The majority of the study area is considered to have a *moderate* landscape character sensitivity due to the undeveloped and low topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. Low terrain variability occurs through of the study area where a moderate VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees. It will provide little visual screening for the proposed PV Power Station.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

SIGNIFICANCE OF LANDSCAPE IMPACTS

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types.

The following table provides a summary of the anticipated landscape impacts that may occur as a result of the construction of the project.

Landscape impact – Altering the landscape character

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	High	Definite	High	Moderate	High	High
Change in surface cover				High	Definite	High	Moderate	High	High
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Impacting on the visual quality of the landscape due the presence of a PV Power Station.	Regional	Permanent	Moderate	Definite	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Definite	Moderate	Low	High	Moderate

Construction phase

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of the construction camps, construction of roads and the clearance of large areas of grassland. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil. The extent of the disturbances will generally affect a relative large footprint area.

Due to the topography, homogeneous vegetation and existing land-use the area has a low Visual Absorption Capacity (VAC).

The removal of parts of the shrub land during the construction stage as well as the low VAC of the area will result in a high landscape impact.

The *severity of the landscape impact* can however be mitigated to a moderate severity. Sensitive placement of the construction camp, limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

Operational phase

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be substantially mitigated if treated appropriately during the construction phase.

The operational phase will introduce alternative land uses to the site that will alter the existing shrub land character. The exposed soil, roads and PV modules will replace most of the shrub land.

The associated openness of the study area are considered as a landscape amenity that provides the study area with a unique and valued sense of place.

The topography and vegetation have a low VAC and *high* landscape character sensitivity but the surrounding substation reduce the landscape character sensitivity will result in a *moderate* significance of landscape impact.

VIEWER SENSITIVITY

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project. The visual receptors are grouped according to their similarities. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

To determine visual receptor sensitivity a commonly used rating system is utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys. The sensitivity of the identified visual receptors is discussed in Section 5.2.1.

SIGNIFICANCE OF VISUAL IMPACTS

Empirical research indicates that the visibility of a PV Power Station and hence the severity of visual impact, decreases as the distance between the observer and the plant increases. The landscape type, in which the PV Station would be situated, could mitigate the severity of visual impact through vegetative screening. Bishop *et al* (1988) noticed that in some cases the plant may dominate the view for example, silhouetted against the skyline, or in some cases be absorbed in the landscape. A complex landscape setting with a diverse land cover and topographical variation has the ability to decrease the severity of visual impact more than a mundane landscape (Bishop *et al*, 1985).

The following tables summarise the visual impacts on residents, tourists and motorists.

VISUAL IMPACTS ON RESIDENTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Moderate	Definite	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Definite	Moderate	Low	High	Moderate
Operational phase									
Loss of shrub lands and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Low	Definite	Low	Low	High	Low
Change in surface cover				Low	Definite	Low	Low	High	Low

Generally, the study area is sparsely populated with the exception of the surrounding farms.

Figure 11 indicate that due to the scale of the project, the only sections of the proposed development will be visible throughout of the study area. The topography provides little VAC to visually screen the components of the project and it can therefore be stated that the general visibility of the project will be high.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yard. The visual exposure to the construction activity will initially be limited and only local residents will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.

The duration of the potential visual impact will be temporary which will result in an anticipated *moderate* significance.

The residents outside the 5 km radius zone will not experience the full extent of the development and may only be exposed to fragmented views of the construction phase to the topography that screens most of the site.

The visual intrusion is considered to be moderate and the distance between the observers and the proposed development is in itself a mitigating factor. The severity of visual impact for all stages of the development will be *moderate*. The cleared site, construction camp and material lay-down yard will appear unsightly and out of character. Large scale construction elements such as cranes, will be highly visible and increase awareness of the construction activity over a considerable area.

Operational phase

The residents of the farming communities next to the substation and power lines may experience a high degree of visual intrusion due to their proximity to the site. These residents are within 5 km and in some instances within 1 km from the proposed locations. This is considered the zone of highest visibility in which a moderate degree of visual intrusion can be expected.

The presence of a PV station in the visual field of the residents in this part of the study area will spoil the uncluttered panoramic views they currently experience. The silhouette of a PV station and power lines on the horizon will be visible from a great distance and thus increase the ZVI considerably, potentially impacting on more residents.

VISUAL IMPACTS ON TOURISTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Moderate	Probable	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Probable	Moderate	Low	High	Moderate
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Moderate	Probable	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Probable	Moderate	Low	High	Moderate

The entire study area is considered to have moderate tourism potential.

Construction phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location and size of the construction camp and lay-down yard will be crucial in regulating the impact. Detail information is not available and it is anticipated that the visual impact will occur localised and that a small number of tourists will be adversely affected by these project components during construction.

Their exposure to possible unsightly views of the construction camp and the associated activity will however be minimal and localised.

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camp out of potential views that may be experienced from scenic routes or tourist hotspots.

Operational phase

The visual exposure and intrusion of the proposed activities will be low due to the limited viewers and the times spend in the area. The severity of the visual impact will be *low*, causing a *low* significant visual impact.

VISUAL IMPACTS ON MOTORISTS

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Low	Probable	Low	Low	High	Low
Change in surface cover				Low	Probable	Low	Low	High	Low
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Low	Definite	Low	Low	High	Low
Change in surface cover				Low	Definite	Low	Low	High	Low

The major route in the study area is the R357. The secondary and tertiary roads are a loose network of gravel roads linking smaller settlements and farms. These road networks in the study area carries a much lower volume of motorists. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low. For this report only motorists using the main routes will be considered as there are many countless smaller roads within the study area.

Construction phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available and the location and size of the construction camp and lay-down yard that are essential for accurately assessing the visual impact. It is anticipated that views of the construction camp and lay-down yard will be visible from the R357.

The presence of the construction camp and lay-down yard may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The significance of potential visual impact is expected to be *low*.

Operational phase

The severity and significance of visual impact for the proposed development on motorists will be low. The speed at which motorists travel also has a moderating effect on the severity of the visual impact and further reduces visual exposure.

RECOMMENDED MITIGATION MEASURES

In most cases, the landscape and visual impacts occurring during the construction phase can be mitigated relatively effectively. Rehabilitation of the disturbed areas will prevent the exposure of soil, which may cause a reduction in the visual quality of the study area. Sensitive positioning of the construction camps and lay-down yards should take advantage of the natural screening capacity of the study area by locating the camps outside of the views of sensitive visual receptors.

CONCLUSION

The assessment of the various landscape impacts has indicated that the most significant impacts will occur during the construction phase of the project. This will come about when grassland areas are cleared to make way for construction areas, roads and stock piles. The change in surface cover from shrub land to exposed soil will diminish the shrub land character of the area and cause a highly severe impact. The impacts will abate as the project reaches completion and the disturbed areas are rehabilitated.

The visual receptors that will be mostly affected are the residents within a 5 km distance from the site. The visual impact will be during the construction of the development when unsightly views of the construction activity will be visible. The residents will experience a high level of visual exposure due to their proximity and the exposed soil, construction equipment and material stockpiles will cause severe visual intrusion.

Mitigation is proposed to lower the significance of the impacts to acceptable standards. Mitigation addresses predictable impacts that should be addressed in the design phase as well as potential impacts during the construction and operational phase of the development.

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LIST OF ABBREVIATIONS

EIA	Environmental Impact Assessment.
FHWA	Federal Highway Administration of the United States Department of Transportation. The publishers of the guide " <i>Visual Impact Assessment for High Projects</i> " 1981.
LCA	Landscape Character Assessment.
LT	Landscape Type
VAC	Visual Absorption Capacity
VIA	Visual Impact Assessment.
ULI	Urban Land Institute
ZVI	Zone of Visual Influence.

1. INTRODUCTION

Van Zyl Environmental Consultants, was appointed by Suntrace Africa (Pty.) Ltd, as the independent environmental consultant to undertake the Environmental Impact Assessment (EIA) for the proposed development of the Kwartelspan Photovoltaic Power Station I and associated infrastructure, Pixley ka Seme District Municipality, Northern Cape Province.

Axis Landscape Architecture cc was appointed by Van Zyl Environmental Consultants as a sub-consultant to complete a Visual Impact Assessment. This Visual Impact Assessment (VIA) is a specialist study that forms part of the EIA and address the visual effects of the proposed power stations on the receiving environment.

The study area contains the extent of the proposed positions and includes an approximate 5 km buffer area.

1.1. BACKGROUND AND BRIEF

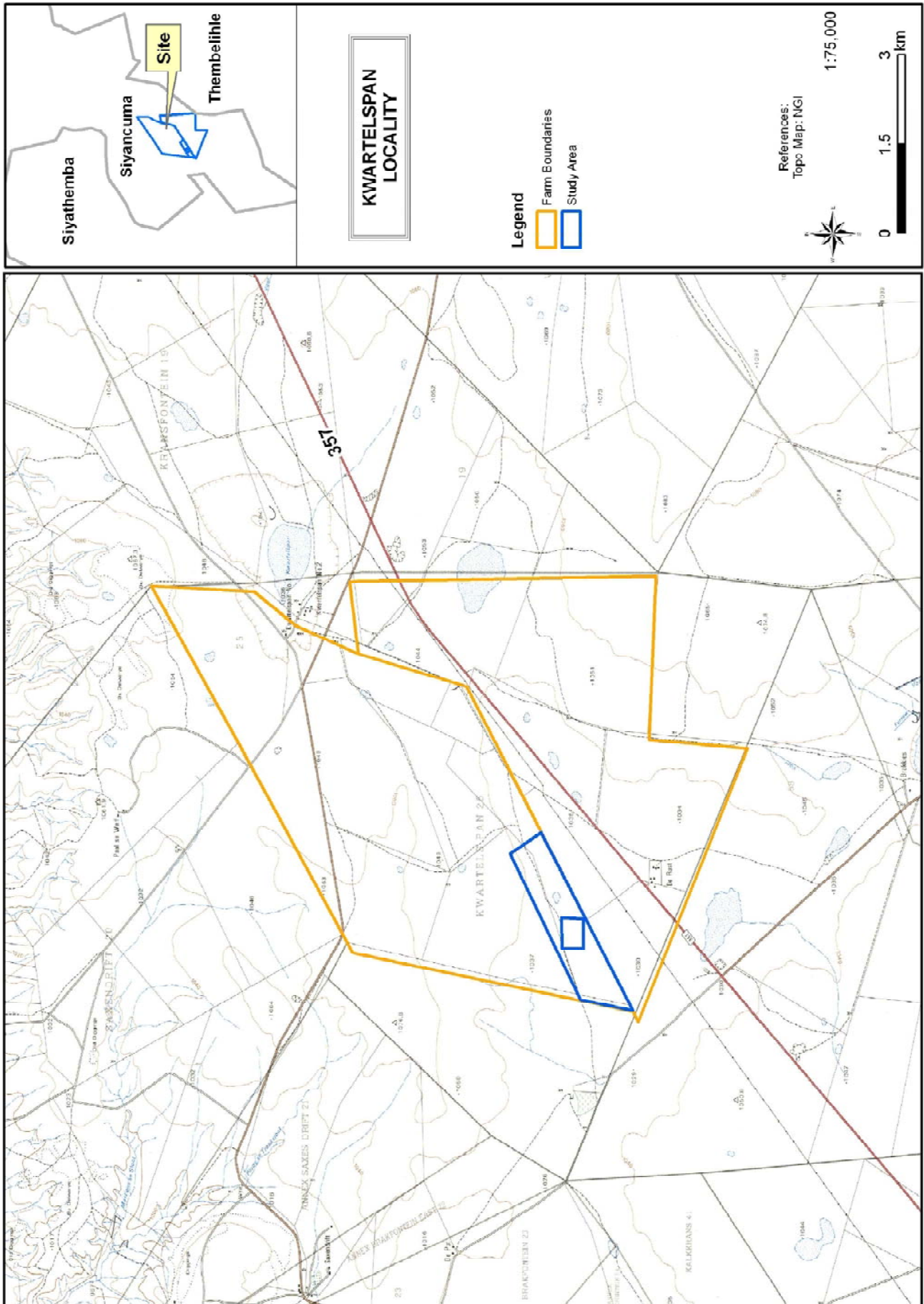
This VIA will conform to the requirements of a level three assessment, which requires the realisation of the following objectives (Adapted from Oberholzer (2005)):

- Determination of the extent of the study area;
- Description of the proposed project and the receiving environment;
- Identification and description of the landscape character of the study area;
- Identification of the elements of particular visual value and -quality that could be affected by the proposed project;
- Identification of landscape- and visual receptors in the study area that will be affected by the proposed project and assess their sensitivity;
- Indication of potential landscape- and visual impacts;
- Assessment of the significance of the landscape- and visual impacts; and
- Recommendations of mitigation measures to reduce and/or alleviate the potential adverse landscape- and visual impacts.

1.2. STUDY AREA

The study area includes the entire area covered by the proposed PV Power Station. It is situated on the extent of Farm Kwartelspan Nr. 25, 60 km south of Douglas off the R357, close to the Eskom Greefspan Substation, within the Pixley ka Seme District Municipality in the Northern Cape (Figure 1)

Figure 1: Locality Plan



2. STUDY APPROACH

2.1. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town and ECOGIS (2012) respectively;
- Observations made and photographs taken during site visits;
- Technical information received from the client;
- Professional judgement based on experience gained from similar projects; and
- Literature research on similar projects.

2.2. ASSUMPTIONS AND LIMITATIONS

This assessment was undertaken during the conceptual stage of the project and is based on information available at the time.

- An exact commencement date for the construction phase is unknown. Construction is expected to commence as soon as public participation is complete and approval is received from the relevant authorities; and
- The exact location and size of the construction camp and material lay-down yard are not yet specified at this stage of the project. The construction camp will consist of temporary structures such as tents or temporary buildings. Ablution facilities will also be associated with the construction camp and is expected to be portable toilets and temporary shower facilities.

2.3. LEVEL OF CONFIDENCE

The level of confidence assigned to the findings of this assessment is based on:

- The level of information available and/or understanding of the study area (rated 2); and
- The information available and/or knowledge and experience of the project (rated 3).

This visual impact assessment is rated with a general confidence level of 6. This rating indicates that the author's general confidence in the accuracy of the findings is *high* (Table 10). Where the confidence level of specific findings is not regarded as high, it is noted in the last column of each impact assessment table.

2.4. METHOD

A broad overview of the approach and methodology used in this assessment is provided below:

- The extent of the study area is determined and indicated in Figure1;
- The site was visited to establish a photographic record of the site, views and areas of particular visual quality and or -value;
- The project components and activities are described and assessed as potential elements of visual and landscape impacts;
- The receiving environment is described in terms of its prevailing landscape- and visual character;
- Landscape- and visual receptors that may be affected by the proposed project are identified and described;
- The sensitivity of the landscape- and visual receptors is assessed;
- The severity of the landscape- and visual impacts is determined;

- The significance of the visual and landscape impacts is assessed;
- Mitigation measures are proposed to reduce adverse impacts; and
- The findings of the study are documented in this Visual Impact Assessment.

3. PROJECT DESCRIPTION

3.1. OVERVIEW OF DEVELOPMENT

The proposed development entails the construction of a photovoltaic power station with an electricity generation capacity of approximately 15 MWp. and a size of less than 20 ha. The proposed power station will have an area less than 20ha. The proposed components and associated infrastructure would include:

- internal electrical reticulation approximately 500 mm below ground;
- concentration boxes with inspection covers, transformation centres and a distribution centre;
- a 22 kV overhead power line with a length of less than 1 km will connecting the distribution centre to the relevant Eskom substation, in order to supply the generated electricity to the substation;
- internal access roads;
- lightning conductor masts with a height of 25 m;
- electric perimeter fencing;
- furrows, which might be constructed around the premises to prevent vehicles from entering the sites anywhere except at the main entrance; and
- guardrooms, toilets, showers, washbasins, security systems, lampposts, a storeroom and a workshop.

3.2. PROJECT COMPONENTS AND ACTIVITIES

Each project stage and activity will affect the receiving environment differently and is therefore discussed separately. The development process will be divided up into three stages, the construction stage, operational stage and the decommissioning stage. These three stages are characterised by specific activities, components and time frames.

3.2.1. CONSTRUCTION STAGE

Construction activity will fluctuate in intensity during the construction stages of the entire site. The preparation of the site is anticipated to undergo the following chronological construction activities with minor deviations:

- Establishment of construction camp;
- Clearing site of vegetation;
- Grading the site;
- Off-loading and stockpiling;
- Construction of the roads and services;
- Footing Execution, positioning and assembly of support structures, and ancillary Infrastructure;
- Construction of the PV modules; and
- Removing building rubble and cleaning remainder of site.

Parcels of exposed soil will define the construction areas and will be a dominant feature during the construction stage. The construction site will appear disorganised and dispersed with construction equipment, material stockpiles and supporting facilities. Large construction equipment may be used. Extensive earthworks will be necessary to grade the sites and possible dust clouds may be generated by the activities.

3.2.2. OPERATIONAL STAGE

Electricity would be generated by the PV modules, transferred to the concentration boxes and transformation centres and then to the distribution centre. It would then be transferred via the 22kV transmission power line to the Welcome Wood Substation from where it would be fed into the Eskom electricity network.

The operational stage will consist of the following activities:

- Full-time security personnel, maintenance and control room staff would remain on the site;
- Electrical and mechanical maintenance of the PV structures; and
- Sewage storage and removal.

3.2.3. DECOMMISSIONING STAGE

The expected lifespan of each PV power station is expected to be approximately 25 years. Should it be upgraded at the end of this period, its lifespan might possibly be extended to 50 years. The infrastructure would only be decommissioned once it has reached the end of its economic life. Should it be economically feasible or desirable, the following activities would be applicable:

- Physical removal of all infrastructure and
- Rehabilitation.

4. DESCRIPTION OF THE AFFECTED ENVIRONMENT

Landscape and visual impacts may result from changes to the landscape. A distinction should be made between impacts on the visual resource (landscape) and on the viewers. The former are impacts on the physical landscape that may result in changes to landscape character while the latter are impacts on the viewers themselves and the views they experience.

4.1. VISUAL RESOURCE

Visual resource is an encompassing term relating to the visible landscape and its recognisable elements, which, through their co-existence, result in a particular landscape character.

4.1.1. LANDSCAPE CHARACTER

Landscape Character Assessment (LCA) is concerned primarily with the observable elements, components or features within a landscape that individually and collectively define the landscape characteristics.

Topography: The study area is characterised by a gentle undulating landscape with relatively little topographic variation. Small drainage lines meander through the landscape and cause shallow incisions.

Vegetation: The study area falls within the Nama-Karoo biome and the NKu 3 Northern Upper Karoo vegetation type. The sensitivity of this veld type is low to very low. The vegetation in the study area consists of a mixed grass and low dwarf-shrub component with a very open medium shrubveld layer.

Land use: The study area is dominated by mixed grasslands and stock farming. Isolated farmsteads are scattered across the landscape and are usually associated with a group of large trees.

4.1.2. VISUAL CHARACTER

Visual character is based on human perception and the observer's response to the relationship between and composition of the landscape, the land uses and identifiable elements in the landscape. The description of the visual character includes an assessment of the scenic attractiveness regarding those landscape attributes that have aesthetic value and contribute significantly to the visual quality of the views, vistas and/or viewpoints of the study area.

Gentle undulating plains and low-lying valleys dominate the regional topography. The lines are smooth, extending into the horizon.

The color of the landscape is dictated by seasonal change. It cycles between lush green and rich colors during summer and dull yellow and browns during winter.

The study area is also recognised for low and moderate intensity agricultural activities, sparsely spaced farmsteads and dirt roads traversing the landscape. The visual character of the landscape is exclusively rural.

4.1.2.1 *Visual Quality*

Visual quality is a qualitative evaluation of the composition of landscape components and their excellence in scenic attractiveness. Many factors contribute to the visual quality of the landscape and are grouped under the following main categories (

Table 1) that are internationally accepted indicators of visual quality (FHWA, 1981):

Table 1: Criteria of Visual Quality (FHWA, 1981)

INDICATOR	CRITERIA
Vividness	The memorability of the visual impression received from contrasting landscape elements as they combine to form a striking and distinctive visual pattern.
Intactness	The integrity of visual order in the natural and man-built landscape, and the extent to which the landscape is free from visual encroachment.
Unity	The degree to which the visual resources of the landscape join together to form a coherent, harmonious visual pattern. Unity refers to the compositional harmony of inter-compatibility between landscape elements.

The landscape is allocated a rating from an evaluation scale of 1 to 7 and divided by 3 to get an average. The evaluation scale is as follows: Very Low =1; Low =2; Moderately Low =3; Moderate =4; Moderately High =5; High =6; Very High =7;

The regional landscape is assessed against each indicator separately. All three indicators should be *high* to obtain a *high* visual quality. The evaluation is summarised in Table 2.

Table 2: Visual Quality of the regional landscape

VIVIDNESS	INTACTNESS	UNITY	VISUAL QUALITY
5	3	5	Moderate

A visual quality can be attributed to areas with less human intervention and with natural features. In this case, the natural drainage lines and isolated rocky outcrops can be classified as higher quality features which contribute to both ecological importance and visual interest in the landscape.

4.1.2.2 Visual absorption capacity

Visual Absorption Capacity (VAC) signifies the ability of the landscape to accept additional human intervention without serious loss of character and visual quality or value. VAC is founded on the characteristics of the physical environment such as:

- Degree of visual screening:
 - A degree of visual screening is provided by landforms, vegetation cover and/or structures such as buildings. For example, a high degree of visual screening is present in an area that is mountainous and is covered with a forest compared to an undulating and mundane landscape covered in grass;
- Terrain variability:
 - Terrain variability reflects the magnitude of topographic elevation and diversity in slope variation. A highly variable terrain will be recognised as one with great elevation differences and a diversity of slope variation creating talus slopes, cliffs and valleys. An undulating landscape with a monotonous and repetitive landform will be an example of a low terrain variability;
- Land cover:
 - Land cover refers to the perceivable surface of the landscape and the diversity of patterns, colours and textures that are presented by the particular land cover (i.e. urbanised, cultivated, forested, etc.);

A basic rating system is used to evaluate the three VAC parameters. The values are relative and relate to the type of project that is proposed and how it may be absorbed in the landscape (Table 3). A three value range is used; three (3) being the highest potential to absorb an element in the landscape and one (1) being the lowest potential. The values are counted together and categorised in a *high*, *medium* or *low* VAC rating.

Table 3: Regional Visual Absorption Capacity evaluation

VISUAL SCREENING	TERRAIN VARIABILITY	LAND COVER	VAC
1	2	1	low

The VAC of the study area is considered low and provides a little screening capacity for this project. The low VAC relates to the varied topography and medium growing vegetation. The regular forms and associated vertical posture of the proposed PV modules are unlike the undulating and horizontal appearance of the topography.

The less prominent project components such as access roads are expected to be visually absorbed to a greater degree in the landscape. The relative modest scale and extent of the project components are more readily accepted and will not create major alterations to the landscape character.

Figure 2: Landscape character of study area



GREEFSPAN SUBSTATION



STOCK FARMING


<p>LANDSCAPE CHARACTER</p>	<p>Compiled for: Van Zyl Environmental Consultants</p> <p>Reference:KWA2012- LANDS TYPES-A4.cdr</p> <p>Date: 2012-06-29</p>	 <p>LANDSCAPE ARCHITECTURE</p>
<p>PROPOSED DEVELOPMENT OF THE KWARTELSPAN I PV POWER STATION</p>		

Figure 3: Landscape character of study area



FARMSTEADS



VEGETATION AND TOPOGRAPHY

LANDSCAPE CHARACTER

PROPOSED DEVELOPMENT OF THE KWARTELSPAN I PV POWER STATION

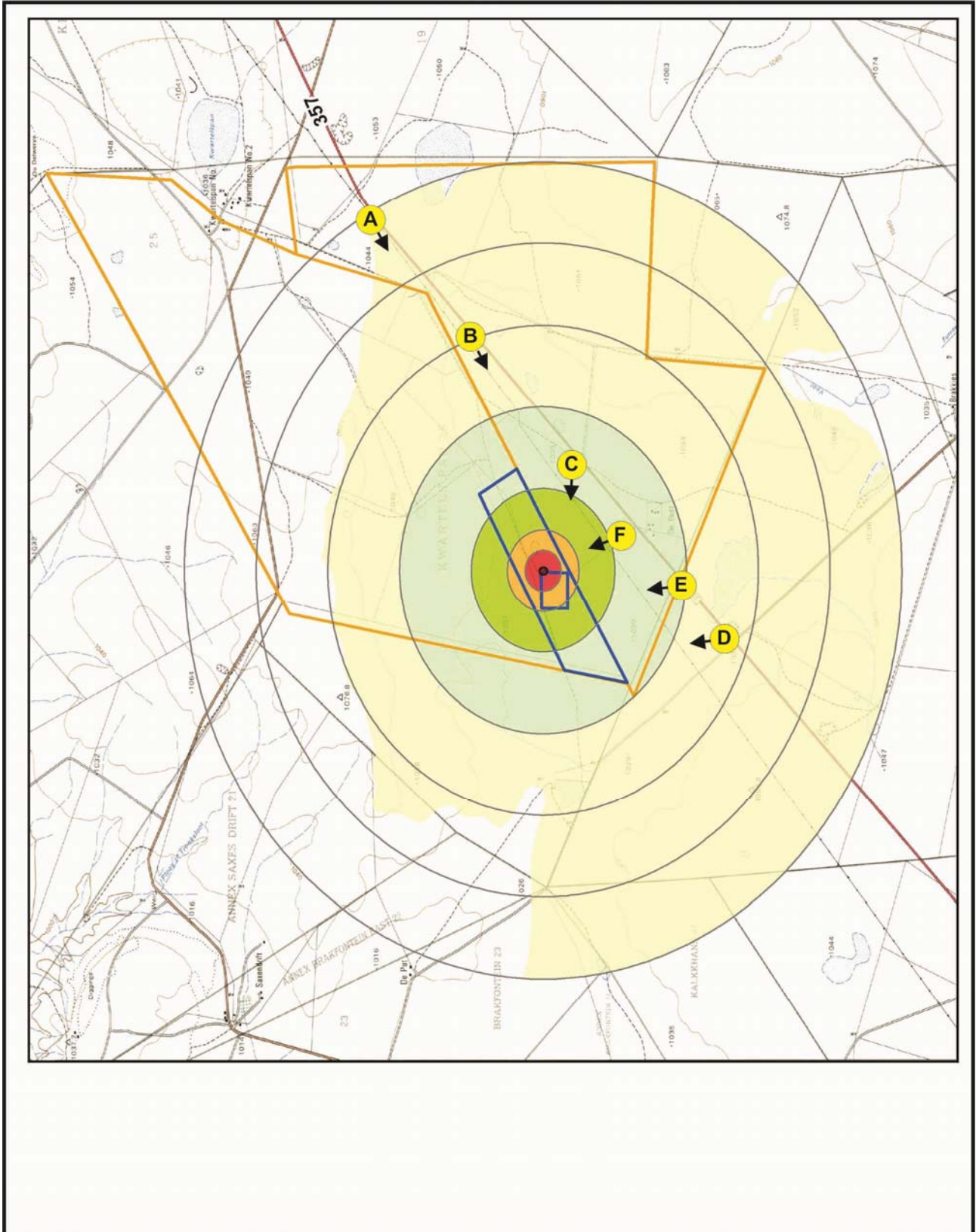
Compiled for: Van Zyl Environmental Consultants

Reference:KWA2012- LANDS TYPES-A4.cdr

Date: 2012-06-29



Figure 4: Photo Reference Map

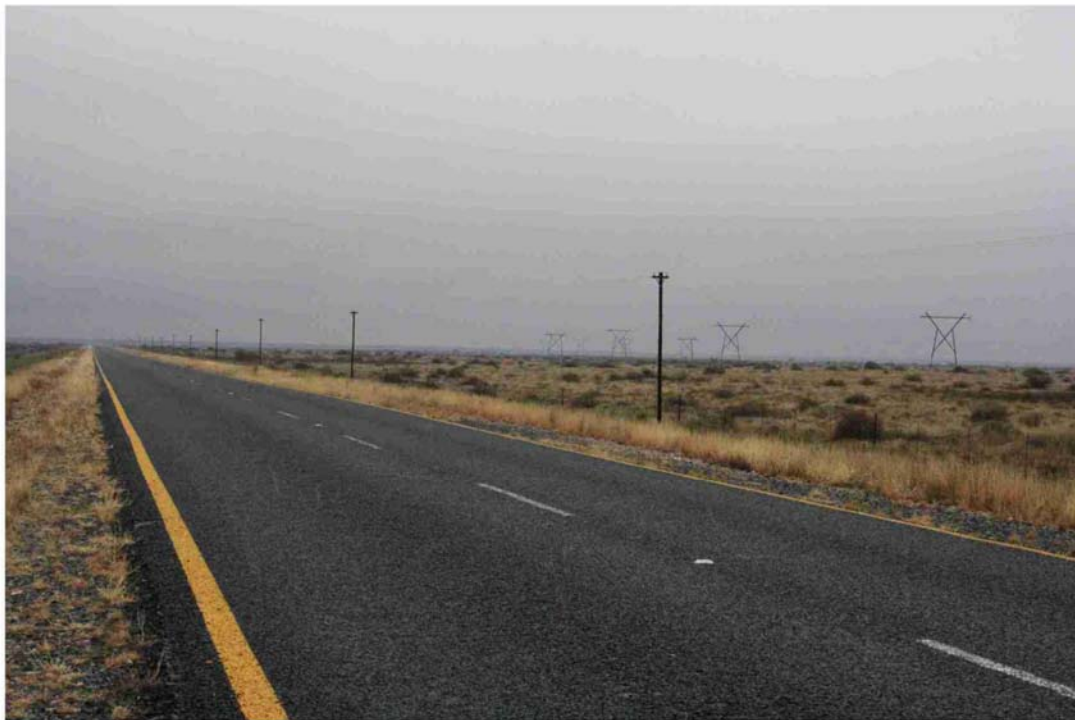


<p>SITE CONTEXT PHOTO'S REFERENCE MAP</p>	<p>Compiled for: Van Zyl Environmental Consultants</p>	
<p>PROPOSED DEVELOPMENT OF THE KWARTELSPAN I PV POWER STATION</p>	<p>Reference:KWA2012- LANDS TYPES-A4.cdr</p> <p>Date: 2012-06-29</p>	

Figure 5: Photo plate 1



VIEW A: FROM THE R357, APPROXIMATELY 5KM TOWARDS THE SITE



VIEW B: FROM THE R357, APPROXIMATELY 3KM TOWARDS THE SITE


<p>SITE CONTEXT PHOTO'S</p>	<p>Compiled for: Van Zyl Environmental Consultants</p> <p>Reference:KWA2012- LANDS TYPES-A4.cdr</p> <p>Date: 2012-06-29</p>	
<p>PROPOSED DEVELOPMENT OF THE KWARTELSPAN I PV POWER STATION</p>		

Figure 6: Photo plate 2



VIEW C: FROM THE R357, APPROXIMATELY 1KM TOWARDS THE SITE



VIEW D: FROM THE R357, APPROXIMATELY 2KM TOWARDS THE SITE

SITE CONTEXT PHOTO'S

PROPOSED DEVELOPMENT OF THE
KWARTELSPAN I PV POWER STATION

Compiled for: Van Zyl
Environmental Consultants

Reference:KWA2012- LANDS
TYPES-A4.cdr

Date:
2012-06-29




Figure 7: Photo plate 3



VIEW E: VIEW FROM THE R357, APPROXIMATELY 1KM TOWARDS THE SITE



VIEW F: VIEW FROM THE R357 TOWARDS THE SITE

<p>SITE CONTEXT PHOTO'S</p>	<p>Compiled for: Van Zyl Environmental Consultants</p> <p>Reference:KWA2012- LANDS TYPES-A4.cdr</p> <p>Date: 2012-06-29</p>	
<p>PROPOSED DEVELOPMENT OF THE KWARTELSPAN I PV POWER STATION</p>		

PROPOSED DEVELOPMENT OF THE KWARTELSPAN 1 PV POWER STATION

5. IMPACT ASSESSMENT

The significance of impacts is a comparative function relating to the severity of the identified impacts on the respective receptors. The significance of an impact is considered *high* should a *highly* sensitive receptor be exposed to a *highly* severe impact (Table 4).

Table 4: Significance of impacts

RECEPTOR SENSITIVITY	IMPACT SEVERITY		
	LOW	MEDIUM	HIGH
LOW	No significance	Low	Low
MEDIUM	Low	Medium	Medium
HIGH	Low	Medium	High

5.1. SIGNIFICANCE OF LANDSCAPE IMPACT

5.1.1. LANDSCAPE CHARACTER SENSITIVITY

The sensitivity of the landscape character is an indication of "...the degree to which a particular landscape can accommodate change from a particular development, without detrimental effects on its character" (GLVIA, 2002). A landscape with a *high* sensitivity would be one that is greatly valued for its aesthetic attractiveness and/or have ecological, cultural or social importance through which it contributes to the inherent character of the visual resource.

The assessment of the landscape is substantiated through professional judgement and informed reasoning which is based on the landscape character assessment in Section 4. A landscape sensitivity rating was adapted from GOSW (2006) (Table 5) and applied in the classification of the study area into different sensitivity zones.

Table 5: Landscape character sensitivity rating (Adapted from GOSW, 2006)

	DESCRIPTION
Low sensitivity	<p>These landscapes are likely to:</p> <ul style="list-style-type: none"> ◦ Have distinct and well-defined landforms; ◦ Have a strong sense of enclosure; ◦ Provide a high degree of screening; ◦ Have been affected by extensive development or man-made features; ◦ Have reduced tranquillity; ◦ Are likely to have little inter-visibility with adjacent landscapes; and ◦ Exhibit no or a low density of sensitive landscape features that bare visual value.
Moderately sensitivity	<p>These landscapes are likely to:</p> <ul style="list-style-type: none"> ◦ Have a moderately elevated topography with reasonably distinct landforms that provides some sense of enclosure; ◦ Have been affected by several man-made features; ◦ Have limited inter-visibility with adjacent landscapes; and ◦ Exhibit a moderate density of sensitive landscape features that bare visual value.
Highly sensitivity	<p>These landscapes are likely to:</p> <ul style="list-style-type: none"> ◦ Consist mainly of undulating plains and poorly defined landforms; ◦ Be open or exposed with a remote character and an absence of man-made features; ◦ Are often highly visible from adjacent landscapes; and ◦ Exhibit a high density of sensitive landscape features that bare visual value.

The majority of the study area is considered to have a *moderate* landscape character sensitivity due to the undeveloped and low topographic variation of the landscape, the generally high visual quality and the related tourism value that is placed on the visual resource. Low terrain variability occurs through of the study area where a low VAC can be expected. Generally the vegetation varies from medium to low shrubs and trees. It will provide little visual screening for the proposed PV Power Station.

The landscape character is considered moderately susceptible to change, whether it is a low intensity change over an extensive area or an acute change over a limited area. Generally, the vegetation occurring in the study area is resilient and recovers very quickly from surface disturbances.

Previous human induced activities and interventions have negatively impacted the original landscape character of the different landscape types. In this case the existing infrastructure, including transmission lines, roads, etc., can be classified as landscape disturbances and elements that cause a reduction in the condition of the affected landscape type and detrimentally affect the quality of the visual resource.

5.1.2. SEVERITY OF POTENTIAL LANDSCAPE IMPACTS

Landscape impacts are alterations to the fabric, character, visual quality and/or visual value which will either positively or negatively affect the landscape character. During the construction and operational phases, the project components are expected to impact on the landscape character of the landscape types. The magnitude/severity of this intrusion is measured against the scale of the project, the permanence of the intrusion and the loss in visual quality, -value and/or VAC.

Table 6: Landscape impact – Altering the landscape character

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Impacting on the visual quality of the landscape due to the presence of foreign elements and a loss of vegetation cover.	Local	Permanent if not mitigated	High	Definite	High	Moderate	High	High
Change in surface cover				High	Definite	High	Moderate	High	High
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Impacting on the visual quality of the landscape due the presence of a PV Power Station.	Regional	Permanent	Moderate	Definite	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Definite	Moderate	Low	High	Moderate

Construction phase

The activities that are expected to cause landscape impacts and that are associated with the construction phase, are the establishment of the construction camps, construction of roads and the clearance of large areas of grassland. These activities will create surface disturbances which will result in the removal of vegetation and the exposure of the underlying soil. The extent of the disturbances will generally affect a relative large footprint area.

Due to the topography, homogeneous vegetation and existing land-use the area has a low Visual Absorption Capacity (VAC).

The removal of parts of the shrub land during the construction stage as well as the low VAC of the area will result in a high landscape impact.

The *severity of the landscape impact* can however be mitigated to a moderate severity. Sensitive placement of the construction camp, limited surface disturbance and prompt rehabilitation are prerequisite conditions if the severity of impact is to be reduced.

Operational phase

Surface disturbances created during construction may remain for an extended period during the operational phase. These are seen as residual affects carried forward from the construction phase and can be substantially mitigated if treated appropriately during the construction phase.

The operational phase will introduce alternative land uses to the site that will alter the existing shrub land character. The exposed soil, roads and PV modules will replace most of the shrub land.

The associated openness of the study area are considered as a landscape amenity that provides the study area with a unique and valued sense of place.

The topography and vegetation have a low VAC and *high* landscape character sensitivity but the surrounding substation reduce the landscape character sensitivity will result in a *moderate* significance of landscape impact.

5.2. SIGNIFICANCE OF VISUAL IMPACTS

5.2.1. VIEWER SENSITIVITY

Within the receiving environment, specific viewers (visual receptors) experience different views of the visual resource and value it differently. They will be affected because of alterations to their views due to the proposed project. The visual receptors are grouped according to their similarities. The visual receptors included in this study are:

- Residents;
- Tourists; and
- Motorists.

To determine visual receptor sensitivity a commonly used rating system is utilised. This is a generic classification of visual receptors and enables the visual impact specialist to establish a logical and consistent visual receptor sensitivity rating for viewers who are involved in different activities without engaging in extensive public surveys.

5.2.1.1 Residents

Residents of the affected environment are classified as visual receptors of *high* sensitivity owing to their sustained visual exposure to the proposed development as well as their attentive interest towards their living environment.

5.2.1.2 Tourists

Tourists are regarded as visual receptors of exceptional *high* sensitivity. Their attention is focused towards the landscape which they essentially utilise for enjoyment purposes and appreciation of the quality of the landscape.

5.2.1.3 Motorists

Motorists are generally classified as visual receptors of *low* sensitivity due to their momentary view and experience of the proposed development. As a motorist's speed increases, the sharpness of lateral vision declines and the motorist tends to focus on the line of travel (USDOT, 1981). This adds weight to the assumption that under normal conditions, motorists will show *low* levels of sensitivity as their attention is focused on the road and their exposure to roadside objects is brief.

Motorists on the scenic routes in the study area will present a higher sensitivity. Their reason for being in the landscape is similar to that of the tourists and they will therefore be categorised as part of the tourist viewer group.

5.2.2. SEVERITY OF POTENTIAL VISUAL IMPACTS

Severity of visual impact refers to the magnitude of change to specific visual receptor's views and/or experience of the landscape. Severity of visual impact is influenced by the following factors:

- The **viewer's exposure** to the project:
 - Distance of observers from the proposed project;
 - The visibility of the proposed project (ZVI);
 - Number of affected viewers; and
 - Duration of views to development experienced by affected viewers.
- Degree of **visual intrusion** created by the project.

Empirical research indicates that the visibility of a PV Power Station and hence the severity of visual impact, decreases as the distance between the observer and the PV Power Station increases. The landscape type, in which the PV Station sits, can mitigate the severity of visual impact through vegetative screening. Bishop *et al* (1988) noticed that in some cases the PV Power Station may dominate the view for example, silhouetted against the skyline, or in some cases be absorbed in the landscape. A complex landscape setting with a diverse land cover and topographical variation has the ability to decrease the severity of visual impact more than a mundane landscape (Bishop *et al*, 1985).

The Zone of Visual Influence (ZVI) is determined through a Geographical Information System (GIS). The result reflects a shaded pattern which identifies the areas that are expected to experience views of the proposed development. The ZVI is limited to 5 km from the proposed development.

A visibility analysis has been completed for the proposed development (APPENDIX 1). According to Bishop *et al* (1988), visual receptors within 1 km from the alignment are most likely to experience the highest degree of visual intrusion, hence contributing to the severity of the visual impact. This is considered as the zone of highest visibility after which the degree of visual intrusion decreases rapidly at distances further away.

In order to assess the extent and degree of visibility in the visual envelope, a Geographical Information System (GIS) was utilised. A visibility analysis was performed which provides the following information Figure 10:

- The areas within the visual envelope that may experience views of the proposed project; and
- The degree of visibility in terms of the percentage of the proposed project that will be visible from a specific location.

The GIS performs an analysis for a series of elevated observer points which represents the height of the PV Power Station in a digital elevation model (DEM). This results in a visibility map with the degree of visibility illustrated by a colour.

The visibility analyses consider worst-case scenarios, using line-of-sight, based on topography alone. The screening capability of vegetation is not captured in the base model of the DEM and is therefore not considered in these results.

5.2.2.1 Potential visual impacts on residents

Table 7: Potential visual impact on residents

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Moderate	Definite	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Definite	Moderate	Low	High	Moderate
Operational phase									
Loss of shrub lands and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Low	Definite	Low	Low	High	Low
Change in surface cover				Low	Definite	Low	Low	High	Low

Generally, the study area is sparsely populated with the exception of the surrounding farms.

Figure 11 indicate that due to the scale of the project, the only sections of the proposed development will be visible throughout of the study area. The topography provides little VAC to visually screen the components of the project and it can therefore be stated that the general visibility of the project will be high.

Construction phase

During the construction phase, unsightly views may be created by the presence of the construction camp and the lay-down yard. The visual exposure to the construction activity will initially be limited and only local residents will experience views of the site preparation activity. As the structures increase in scale and height, the ZVI increases, resulting in a greater number of affected viewers and a subsequent increase in visual exposure.

The duration of the potential visual impact will be temporary which will result in an anticipated *moderate* significance.

The residents outside the 5 km radius zone will not experience the full extent of the development and may only be exposed to fragmented views of the construction phase to the topography that screens most of the site.

The visual intrusion is considered to be moderate and the distance between the observers and the proposed development is in itself a mitigating factor. The severity of visual impact for all stages of the development will be *moderate*. The cleared site, construction camp and material lay-down yard will appear unsightly and out of character. Large scale construction elements such as cranes, will be highly visible and increase awareness of the construction activity over a considerable area.

Operational phase

The residents of the farming communities next to the substation and power lines may experience a high degree of visual intrusion due to their proximity to the site. These residents are within 5 km and in some instances within 1 km from the proposed locations. This is considered the zone of highest visibility in which a moderate degree of visual intrusion can be expected.

The presence of a PV station in the visual field of the residents in this part of the study area will spoil the uncluttered panoramic views they currently experience. The silhouette of a PV station and power lines on the horizon will be visible from a great distance and thus increase the ZVI considerably, potentially impacting on more residents.

5.2.2.2 Potential visual impacts on tourists

Table 8: Potential visual impact on tourists

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Moderate	Probable	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Probable	Moderate	Low	High	Moderate
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Moderate	Probable	Moderate	Low	High	Moderate
Change in surface cover				Moderate	Probable	Moderate	Low	High	Moderate

The entire study area is considered to have moderate tourism potential.

Construction phase

The temporary duration of the construction phase is not expected to cause major visual impacts. The location and size of the construction camp and lay-down yard will be crucial in regulating the impact. Detail information is not available and it is anticipated that the visual impact will occur localised and that a small number of tourists will be adversely affected by these project components during construction.

Their exposure to possible unsightly views of the construction camp and the associated activity will however be minimal and localised.

The potential visual impact on tourists during the construction phase of the proposed project can be mitigated with relative ease. The greatest factor to consider is the location of the construction camp out of potential views that may be experienced from scenic routes or tourist hotspots.

Operational phase

The visual exposure and intrusion of the proposed activities will be low due to the limited viewers and the times spend in the area. The severity of the visual impact will be *low*, causing a *low* significant visual impact.

5.2.2.3 Potential visual impacts on motorists

Table 9: Potential visual impact on motorists

Activity	Nature of Impact	Extent of Impact	Duration of Impact	Severity of Impact	Probability of Impact	Significance without Mitigation	Significance with Mitigation	Cumulative Impact	Level of Confidence
Construction phase									
Loss of shrub land and vegetation patterns	Negative – Construction activities may cause unsightly views of construction activities.	Local	Temporary	Low	Probable	Low	Low	High	Low
Change in surface cover				Low	Probable	Low	Low	High	Low
Operational phase									
Loss of shrub land and vegetation patterns	Negative – Altering the visual character of the site due to the introduction of new land uses on the site.	Local	Permanent	Low	Definite	Low	Low	High	Low
Change in surface cover				Low	Definite	Low	Low	High	Low

The major route in the study area is the R357. The secondary and tertiary roads are a loose network of gravel roads linking smaller settlements and farms. These road networks in the study area carries a much lower volume of motorists. Their duration of views will be temporary and it is expected that the visual intrusion that they will experience will be low. For this report only motorists using the main routes will be considered as there are many countless smaller roads within the study area.

Construction phase

The potential visual impact that may be experienced by motorists during the construction phase is considered to be minimal. Limited information is available and the location and size of the construction camp and lay-down yard that are essential for accurately assessing the visual impact. It is anticipated that views of the construction camp and lay-down yard will be visible from the R357.

The presence of the construction camp and lay-down yard may create unsightly views. Motorists' visual exposure to the impact will be brief and the severity of visual impact will be *low*. The significance of potential visual impact is expected to be *low*.

Operational phase

The severity and significance of visual impact for the proposed development on motorists will be low. The speed at which motorists travel also has a moderating effect on the severity of the visual impact and further reduces visual exposure.

6. RECOMMENDED MITIGATION MEASURES

The aim of mitigation is to reduce or alleviate the intrusive contrast between the proposed project components and activities, and the receiving landscape to a point where it is acceptable to visual and landscape receptors.

6.1. GENERAL

- Proceed with construction of the development during the off peak tourism season;
- Where areas are going to be disturbed through the destruction of vegetation, for example the establishment of the construction camp, the vegetation occurring in the area to be disturbed must be salvaged and kept in a controlled environment such as a nursery, for future re-planting in the disturbed areas as a measure of rehabilitation;

6.1.1. DESIGN STAGE

- All project facilities, fences and sign boards should be painted with a muted earth-toned colour that will blend with the background colour of the vegetation. All surface treatments shall be non-reflective.
- Minimise roads around the perimeter of the site;
- Avoid light trespass and glare originating from street and security lighting. Fit "full cut-off" luminaires to limit the amount of light trespass and to control light output and restrain glare (
- Figure 8) (Shaflik, 1997);

Figure 8: Luminaire fixtures (Shaflik, 1997)

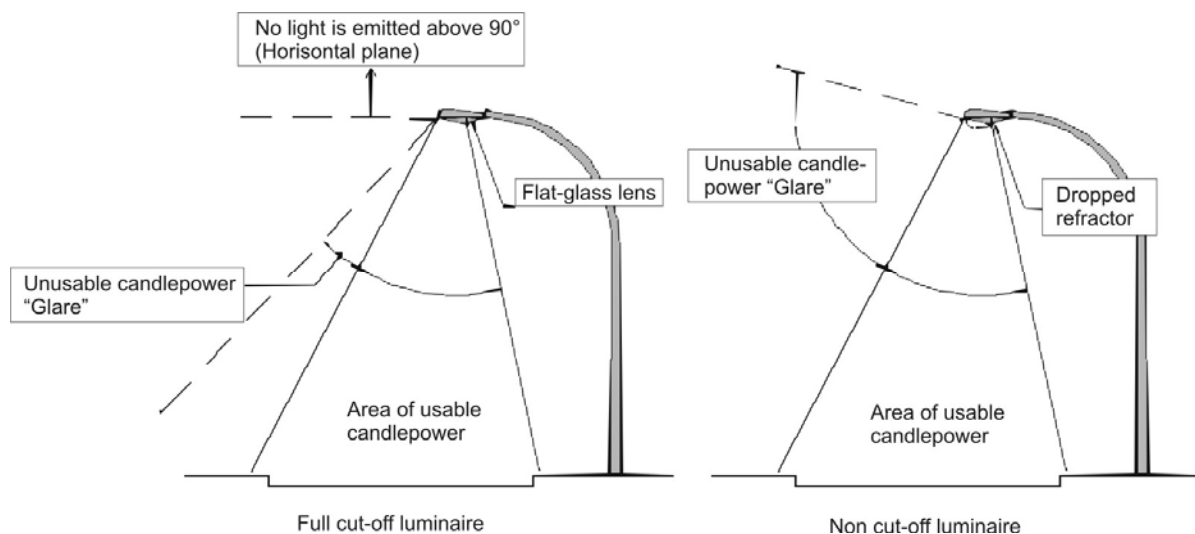
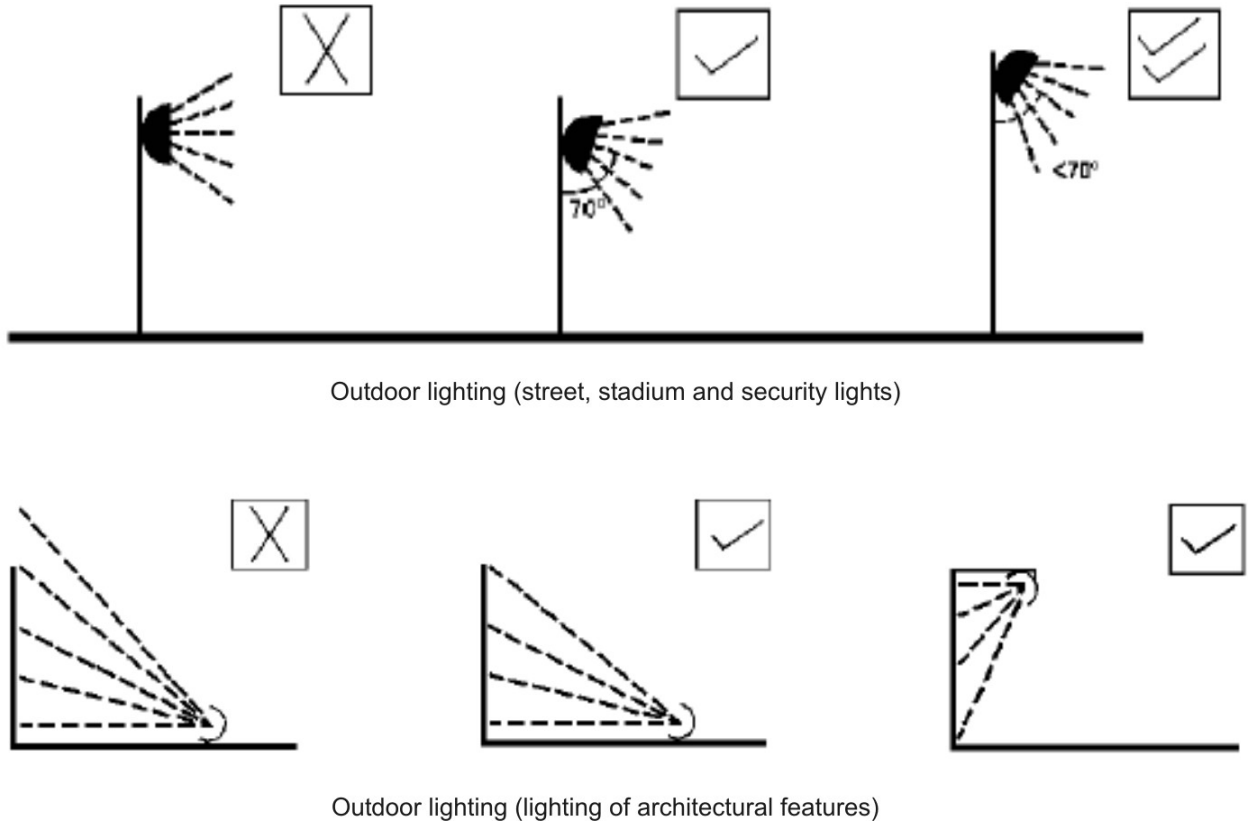
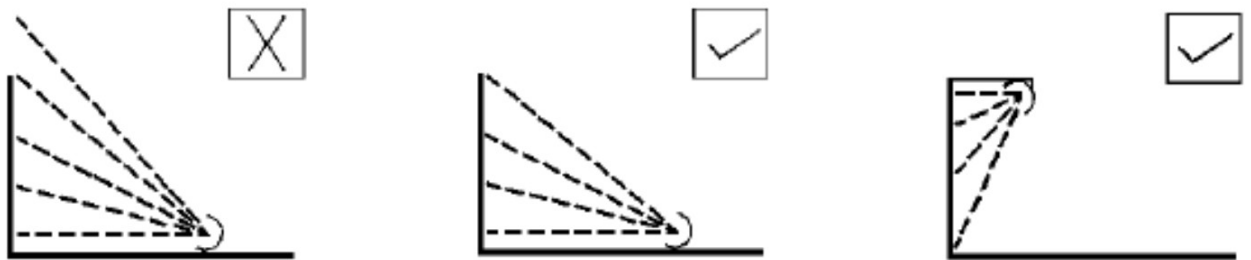


Figure 9: Directing outdoor luminaries (ILE, 2005)



Outdoor lighting (street, stadium and security lights)



Outdoor lighting (lighting of architectural features)

6.1.2. CONSTRUCTION STAGE

- If practically possible, locate construction camp in areas that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;
- Keep the site and camp neat, clean and organised in order to portray a tidy appearance;
- Remove rubble off site as soon as possible or place it in a container in order to keep the site free from additional unsightly elements;
- Rehabilitate or revegetate disturbed areas as soon as practically possible after construction. This should be done to restrict long periods of exposed soil and possible erosion that will result in indirect landscape and visual impacts;
- Dust suppression procedures should be implemented especially on windy days; and
- Screen the construction camp and lay-down yards by enclosing the entire area with a dark green or black shade cloth of no less than 2 m in height.

6.1.3. OPERATIONAL STAGE

- Maintain the landscape to a high aesthetic standard to retain a high visual quality for visitors and observers; and
- Refrain from installing permanent lighting where light is required intermittently; and
- Dust suppression procedures should be implemented especially on windy days.

6.2. PV POWER STATION

- The use of stepping in the building platform to minimise cut-and fill areas and the lowering of structures into the site as much as possible;
- The sculpting of the cut and fill slopes to create a visually more natural building platform;

- The re-establishment of grassland species on the existing land use, i.e. the land must not just be allowed to lie fallow and become a breeding ground for invasive species; and
- The establishment of endemic trees on the outside of the perimeter fencing. This is subject to safety and security considerations. Such planting should be done with a specific viewpoint in mind and be used to break the monolithic nature or reduce the visual impact.

6.3. ACCESS ROUTES

- Make use of existing access roads where possible;
- Where new access roads are required, the disturbance area should be kept as small as possible. A two-track dirt road will be the most preferred option;
- Locate access routes so as to limit modification to the topography and to avoid the removal of established vegetation;
- Avoid crossing over or through ridges, rivers, pans or any natural features that have visual value. This also includes centres of floral endemism and areas where vegetation is not resilient and takes extended periods to recover;
- Maintain no or minimum cleared road verges;
- Access routes should be located on the perimeter of disturbed areas such as cultivated/fallow lands as not to fragment intact vegetated areas; and
- If it is necessary to clear vegetation for a road, avoid doing so in a continuous straight line. Alternatively, curve the road in order to reduce the visible extent of the cleared corridor.

6.4. CONSTRUCTION CAMP AND LAY DOWN YARD

- If practically possible, locate the construction camp in an area that are already disturbed or where it isn't necessary to remove established vegetation like for example, naturally bare areas;
- Utilise existing screening features such as dense vegetation stands or topographical features to place the construction camp and lay-down yard out of the view of sensitivity visual receptors;
- Keep the construction site and camp neat, clean and organised in order to portray a tidy appearance; and
- Screen the construction camp and lay-down yard by enclosing the entire area with a dark green or black shade cloth of no less than 2 m height.

7. CONCLUSION

The assessment of the various landscape impacts has indicated that the most significant impacts will occur during the construction phase of the project. This will come about when grassland areas are cleared to make way for construction areas, roads and stock piles. The change in surface cover from shrub land to exposed soil will diminish the shrub land character of the area and cause a highly severe impact. The impacts will abate as the project reaches completion and the disturbed areas are rehabilitated.

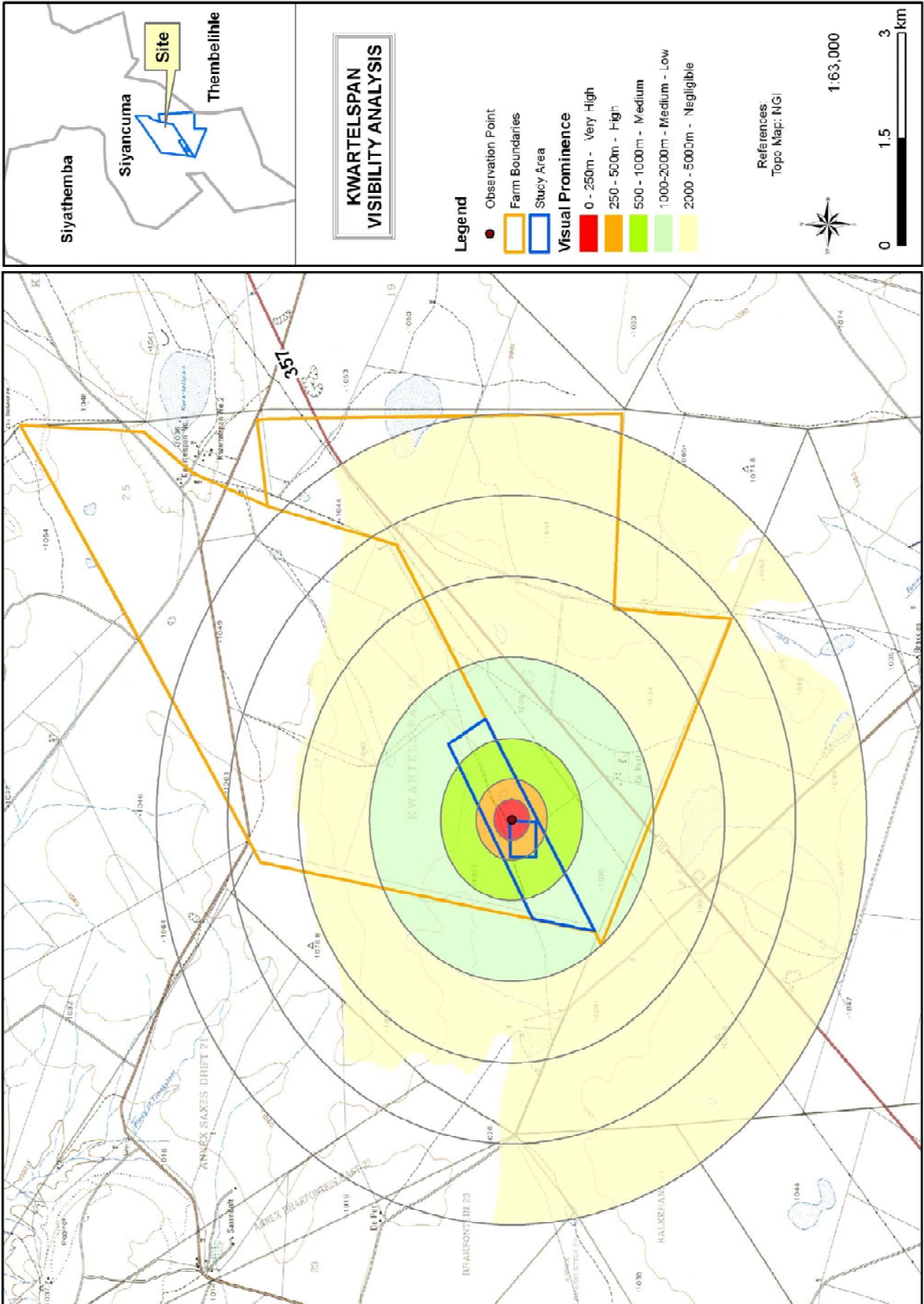
The visual receptors that will be mostly affected are the residents within a 5 km distance from the site. The visual impact will be during the construction of the development when unsightly views of the construction activity will be visible. The residents will experience a high level of visual exposure due to their proximity and the exposed soil, construction equipment and material stockpiles will cause severe visual intrusion.

Mitigation is proposed to lower the significance of the impacts to acceptable standards. Mitigation addresses predictable impacts that should be addressed in the design phase as well as potential impacts during the construction and operational phase of the development.

APPENDIX 1

Figure 10 reflects the results of a visibility assessment, carried out using GIS software. The results provide a clear interpretation of the extent of the visual influence and also provide an indication of the land use that can be expected in the affected areas.

Figure 10: Visibility Analysis



GLOSSARY OF TERMS

Aesthetics	The science or philosophy concerned with the quality of sensory experience. (ULI, 1980)
Horizon contour	A line that encircles a development site and that follows ridgelines where the sky forms the backdrop and no landform is visible as a background. This is essentially the skyline that when followed through the full 360-degree arc as viewed from a representative point on the site defines the visual envelope of the development. This defines the boundary outside which the development would not be visible.
Landscape characterisation/ character	This covers the gathering of information during the desktop study and field survey work relating to the existing elements, features, and extent of the landscape (character). It includes the analysis and evaluation of the above and the supporting illustration and documentary evidence.
Landscape condition	Refers to the state of the landscape of the area making up the site and that of the study area in general. Factors affecting the condition of the landscape can include the level of maintenance and management of individual landscape elements such as buildings, woodlands etc and the degree of disturbance of landscape elements by non-characteristic elements such as invasive tree species in a grassland or car wrecks in a field.
Landscape impact	Changes to the physical landscape resulting from the development that include; the removal of existing landscape elements and features, the addition of new elements associated with the development and altering of existing landscape elements or features in such as way as to have a detrimental effect on the value of the landscape.
Landscape unit	A landscape unit can be interpreted as an “outdoor room” which are enclosed by clearly defined landforms or vegetation. Views within a landscape unit are contained and face inward.
Sense of place	That distinctive quality that makes a particular place memorable to the visitor, which can be interpreted in terms of the visual character of the landscape. A more emotive sense of place is that of local identity and attachment for a place “ <i>which begins as undifferentiated space [and] becomes place as we get to know it better and endow it with value</i> ” (Tuan 1977) ¹ .
Viewer exposure	The extent to which viewers are exposed to views of the landscape in which the proposed development will be located. Viewer exposure considers the visibility of the site, the viewing conditions, the viewing distance, the number of viewers affected, the activity of the viewers (tourists or workers) and the duration of the views.
Viewer sensitivity	The assessment of the receptivity of viewer groups to the visible landscape elements and visual character and their perception of visual quality and value. The sensitivity of viewer groups depend on their activity and awareness within the affected landscape, their preferences, preconceptions and their opinions.
Visual absorption capacity (VAC)	The inherent ability of a landscape to accept change or modification to the landscape character and/or visual character without diminishment of the visual quality or value, or the loss of visual amenity. A high VAC rating implies a high ability to absorb visual impacts while a low VAC implies a low ability to absorb or conceal visual impacts.

¹ Cited in Climate Change and Our 'Sense of Place', <http://www.ucsus.org/greatlakes/glimpactplace.html>

Visual amenity	The notable features such as hills or mountains or distinctive vegetation cover such as forests and fields of colour that can be identified in the landscape and described. Also included are recognised views and viewpoints, vistas, areas of scenic beauty and areas that are protected in part for their visual value.
Visual character	This addresses the viewer response to the landscape elements and the relationship between these elements that can be interpreted in terms of aesthetic characteristics such as pattern, scale, diversity, continuity and dominance.
Visual contour	The outer perimeter of the visual envelope determined from the site of the development. The two dimensional representation on a plan of the horizon contour.
Visual contrast	The degree to which the physical characteristics of the proposed development differ from that of the landscape elements and the visual character. The characteristics affected typically include: <ul style="list-style-type: none"> • Volumetric aspects such as size, form, outline and perceived density; • Characteristics associated with balance and proportion such as scale, diversity, dominance, continuity; • Surface characteristics such as colour, texture, reflectivity; and • Luminescence or lighting.
Visual envelope	The approximate extent within which the development can be seen. The extent is often limited to a distance from the development within which views of the development are expected to be of concern.
Visual impact	Changes to the visual character of available views resulting from the development that include: obstruction of existing views; removal of screening elements thereby exposing viewers to unsightly views; the introduction of new elements into the view shed experienced by visual receptors and intrusion of foreign elements into the view shed of landscape features thereby detracting from the visual amenity of the area.
Visual impact assessment	A specialist study to determine the visual effects of a proposed development on the surrounding environment. The primary goal of this specialist study is to identify potential risk sources resulting from the project that may impact on the visual environment of the study area, and to assess their significance. These impacts include landscape impacts and visual impacts.
Visual quality	An assessment of the aesthetic excellence of the visual resources of an area. This should not be confused with the value of these resources where an area of low visual quality may still be accorded a high value. Typical indicators used to assess visual quality are vividness, intactness and unity. For more descriptive assessments of visual quality attributes such as variety, coherence, uniqueness, harmony, and pattern can be referred to.
Visual receptors	Includes viewer groups such as the local community, residents, workers, the broader public and visitors to the area, as well as public or community areas from which the development is visible. The existing visual amenity enjoyed by the viewers can be considered a visual receptor such that changes to the visual amenity would affect the viewers.
Zone of visual influence	The extent of the area from which the most elevated structures of the proposed development could be seen and may be considered to be of interest (see visual envelope).

LEVEL OF CONFIDENCE

Table 10: Confidence level chart and description

CONFIDENCE LEVEL CHART				
		Information, knowledge and experience of the project		
		3b	2b	1b
Information, and knowledge of the study area	3a	9	6	3
	2a	6	4	2
	1a	3	2	1

3a – A *high* level of information is available of the **study area** in the form of recent aerial photographs, GIS data, documented background information and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.

2a – A *moderate* level of information is available of the **study area** in the form of aerial photographs GIS data and documented background information and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.

1a – *Limited* information is available of the **study area** and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

3b – A *high* level of information and knowledge is available of the **project** in the form of up-to-date and detailed engineering/architectural drawings, site layout plans etc. and the visual impact assessor is well experienced in this type of project and level of assessment.

2b – A *moderate* level of information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.

1b – *Limited* information and knowledge is available of the **project** in the form of conceptual engineering/architectural drawings, site layout plans etc. and/or the visual impact assessor has a low experience level in this type of project and level of assessment. (Adapted from Oberholzer. B, 2005)

VISUAL RECEPTOR SENSITIVITY

Table 11: Visual receptor sensitivity

VISUAL RECEPTOR SENSITIVITY	DEFINITION (BASED ON THE GLVIA 2ND ED PP90-91)
Exceptional	Views from major tourist or recreational attractions or viewpoints promoted for or related to appreciation of the landscape, or from important landscape features.
High	Users of all outdoor recreational facilities including public and local roads or tourist routes whose attention or interest may be focussed on the landscape; Communities where the development result in changes in the landscape setting or valued views enjoyed by the community; Residents with views affected by the development.
Moderate	People engaged in outdoor sport or recreation (other than appreciation of the landscape);
Low	People at their place of work or focussed on other work or activity; Views from urbanised areas, commercial buildings or industrial zones; People travelling through or passing the affected landscape on transport routes.
Negligible (Uncommon)	Views from heavily industrialised or blighted areas

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