ENVIRONMENTAL IMPACT ASSESSMENT FOR RE Capital 10 PV PROJECT, POSTMASBURG, NORTHERN CAPE PROVINCE

VISUAL IMPACT ASSESSMENT SPECIALIST REPORT

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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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APHP accredited VIA Specialist

1 INTRODUCTION

VRM Africa was appointed by Cape EAPrac to undertake a Visual Impact Assessment for the proposed RE Capital 10 Solar Facility on behalf of RE Capital 10 (Pty) Ltd. The site is located near the town of Postmasburg, Northern Cape. A full site survey was undertaken on the6th August 2014.

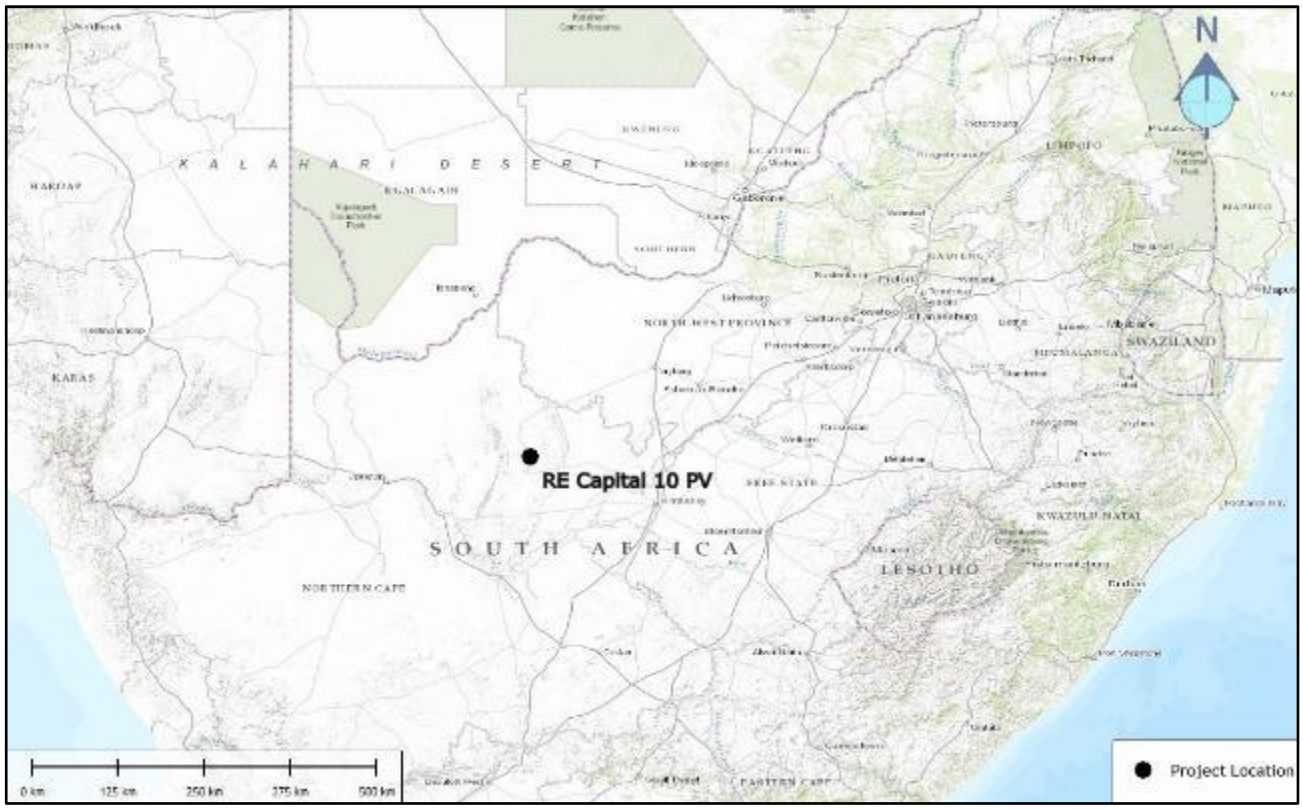


Figure 1: Regional locality map

1.1 Terms of Reference

Landscape significance is assessed by differentiating between those landscapes of recognized 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 viewshed 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.
- Determining visual resources is a subjective process where absolute terms are not achievable. Evaluating a landscape's visual quality is complex, as assessment of the visual landscape applies mainly qualitative standards. Therefore, subjectivity cannot be excluded in the assessment procedure (Lange, 1994). The project deliverables, including electronic copies of reports, maps, data, shape files and photographs are based on the author's professional knowledge, as well as available information. 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 Methodology Summary

The process that VRM Africa follows when undertaking a VIA is based on the United States Bureau of Land Management's (BLM) Visual Resource Management method. This mapping and GIS-based method of assessing landscape modifications allows for increased objectivity and consistency by using standard assessment criteria. This involves the measurement of contrast in the form, line, texture and colour of the proposed landscape modification brought about by a proposed project, against the same elements found in the existing natural landscape (USDI., 2004)

The first step in the VRM process is determining the existing and planned landscape context. A document review is undertaken to identify key plans for the area, and a regional landscape survey is undertaken to define the key landscape features and the visual resources. The landscape character of the proposed project site is then surveyed and mapped to identify areas of similar land use and landscape character. These areas are then rated using the VRM scenic quality criteria.

Individuals, groups or communities who would be subjected to the visual influence of a particular project are referred to as receptors and are identified early on in the VIA process by means of a viewshed analysis. Visual receptors are then screened against VRM receptor sensitivity criteria to define Key Observation Points (KOPs), which are the most significant locations where people or communities make consistent use of the views associated with the proposed site. Preliminary survey using Google Earth has identified tourist related activities in the area. The sensitivity of these points is assessed by applying VRM receptor sensitivity criteria.

The proposed project activities are then finally assessed from the KOPs around the site. Photo montages are generated to represent the expected change in the views as seen from each KOP. The degree of contrast in terms of line, colour, texture and form is measured to determine the extent to which the proposed project meets the Visual Resource Management objectives defined for the site. If contrast generated is high, mitigations and recommendations can be made to assist in meeting the visual objectives.

Please refer to the Appendix for detailed descriptions of the methodology.

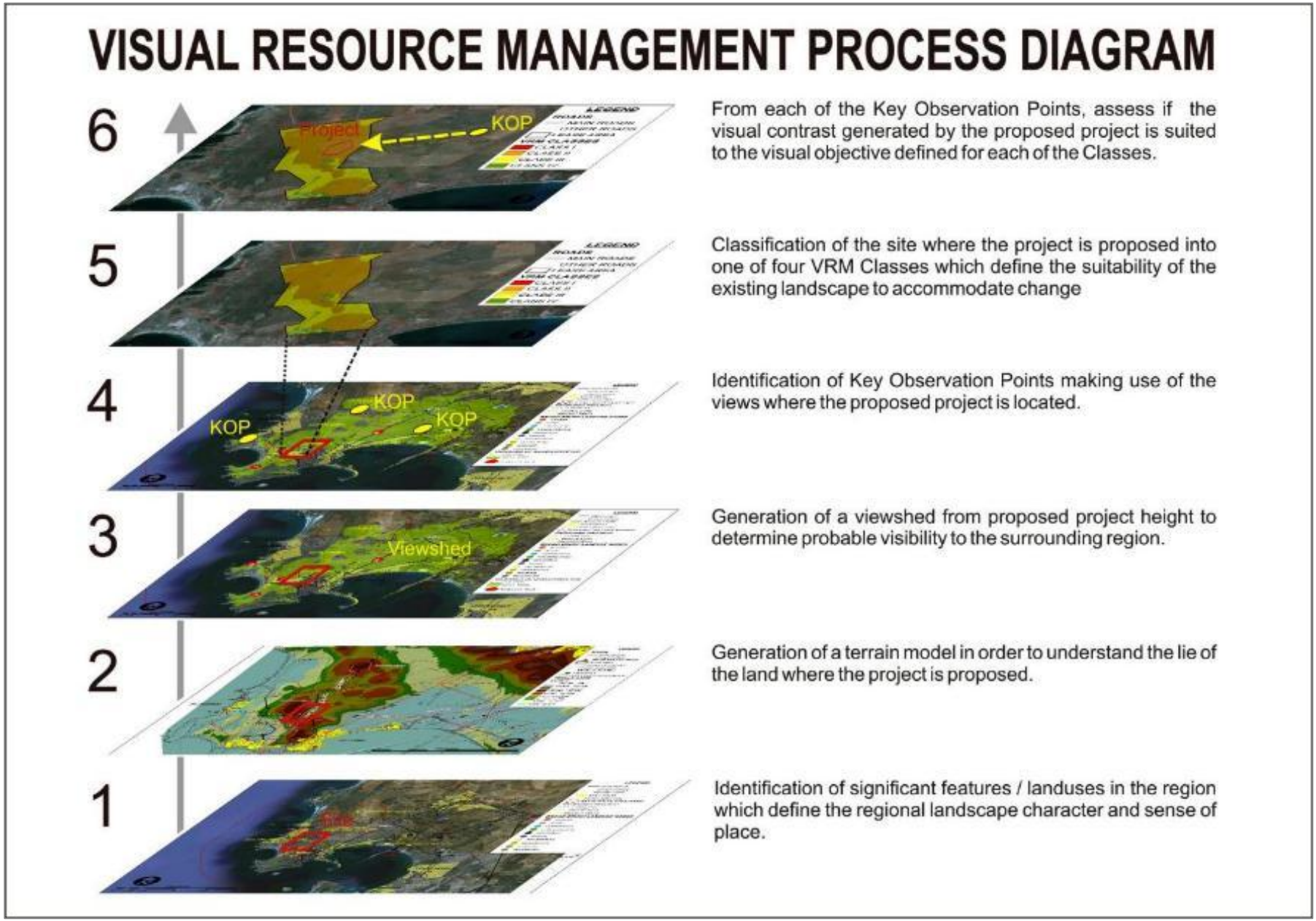


Figure 2: VRM process diagram

2 PROJECT DESCRIPTION

Associated infrastructure will include the following:

- An overhead 132kV transmission line
- An on-site Switching / Sub-station;
- Auxiliary Buildings (Control Centre, Administration offices, Security etc.);
- A network of Inverters, Transformers & Underground Cabling;
- Access roads;
- Perimeter security fencing;
- Rainwater tanks. (Cape_EAPrac, 2014)

The following project alternatives are to be assessed as part of the study:

- Road access
    - Option 1: Access road from main road (current farm entrance gate)
    - Option 2: Access road from main road via the south

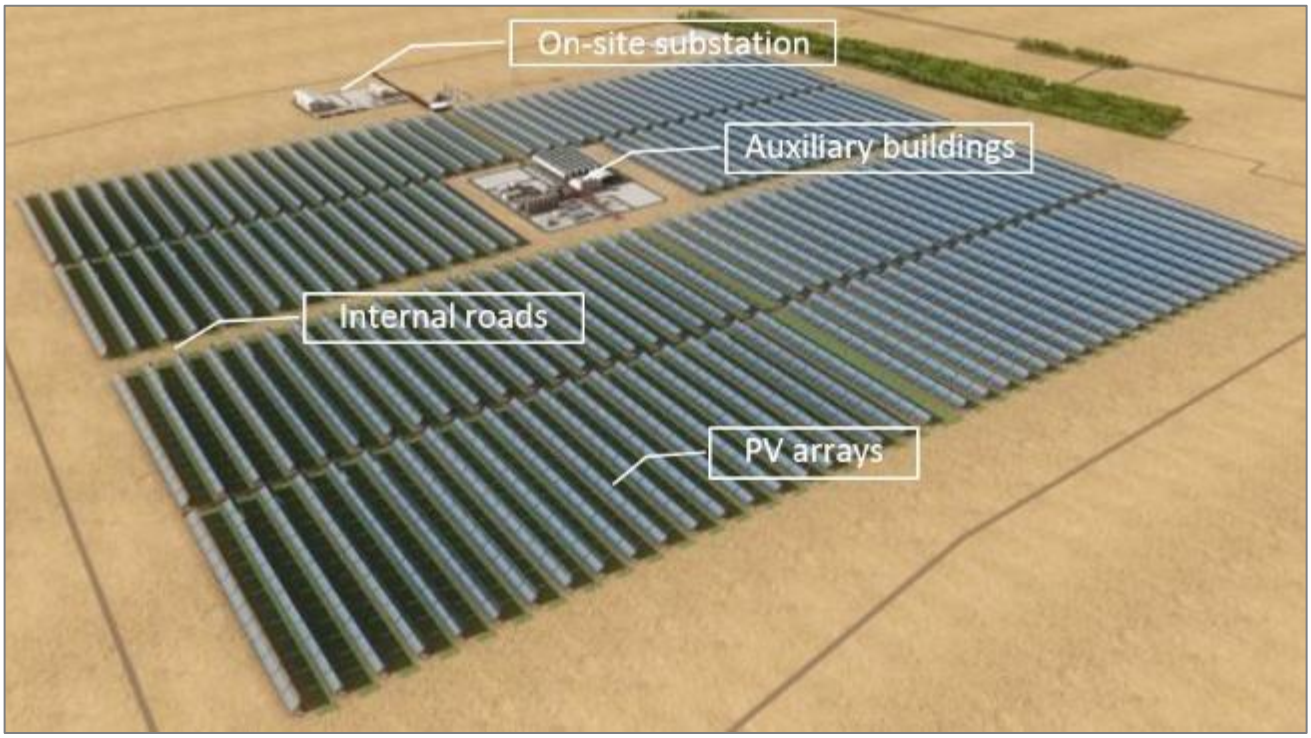
The following photographs below show examples of similar projects and technologies that are included as alternatives:

Fixed solar panels approximately 10m in height (please note the structures proposed for RE Capital 10 Solar Development will not exceed 4m).
((Source: www.hawaiirenewableenergy.org/Villamesias2), n.d.)

Fixed solar panel structures
(VRMA)

Figure 3: Photographic plate depicting examples of solar panels

Typical construction site and laydown with fences (overhead lighting not included)
(Source: VRMA)



Perspective view of typical PV Plant Layout (Van der Merwe, 2013)

Figure 4: Photographic plate depicting examples of typical PV plant and Construction Camp

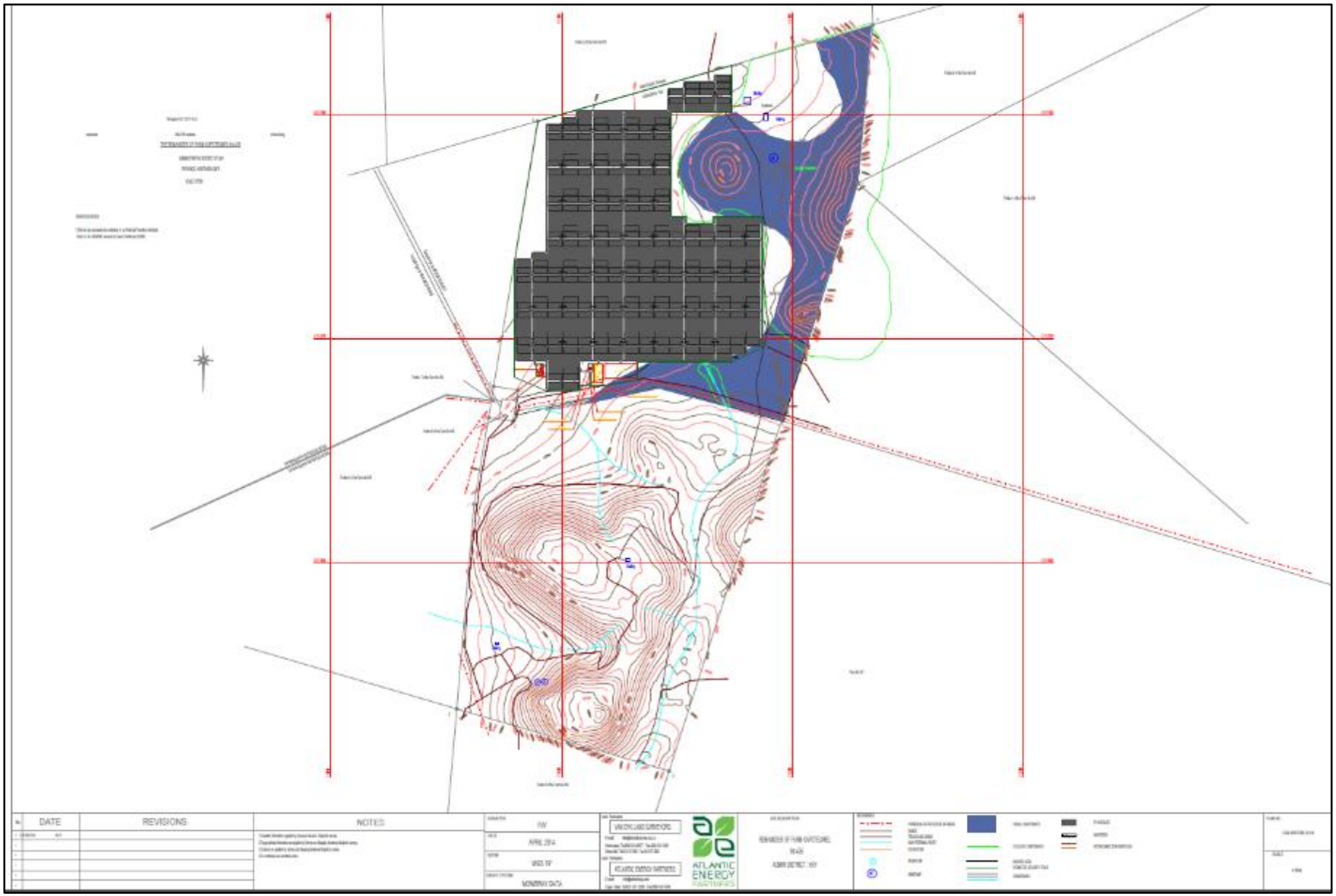


Figure 5: Proposed Project Layout Plan

2.1 Legislative 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 organization guidelines:

International Finance Corporation (IFC)

The IFC prescribes eight performance standards (PS) on environmental and social sustainability. The first is to identify and evaluate the environmental and social risks and impacts of a project, as well as to avoid, minimise or compensate for any such impacts. Under PS 6, ecosystem services are organized into four categories, with visual/aesthetic benefits falling into the category of cultural services, which are the non-material benefits people obtain from ecosystems. (IFC, 2012)

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

As specific Visual Guidelines are not provided by 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.

The Western Cape Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for involving visual and aesthetic specialists in EIA processes was referred to and 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) This reflects the area, or extent, where a landscape modification of a specified height would probably be seen. 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. The extent of the viewshed analysis was restricted to a defined distance that represents the approximate zone of visual influence (ZVI) of the proposed activities. The maps are informative only as visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature. (Hull & Bishop, 1988)

Table 1: Proposed Project Heights Table

Project Phase	Proposed Activity	Approx. Height (m)	Approx. ZVI (km)
Construction and Operation	PV structures and Substation	3.5	12
	Transmission lines	20	2

A viewshed analysis was undertaken from the following locations:

- Proposed PV Site
    - Hill feature
    - West facing grass lands
    - Powerline locality

The ZVI for the proposed PV site was extended to 12km as there is currently no precedent for built PV, no other industrial type structures in the area and no large vegetation. These factors lower the visual absorption capacity of the area.

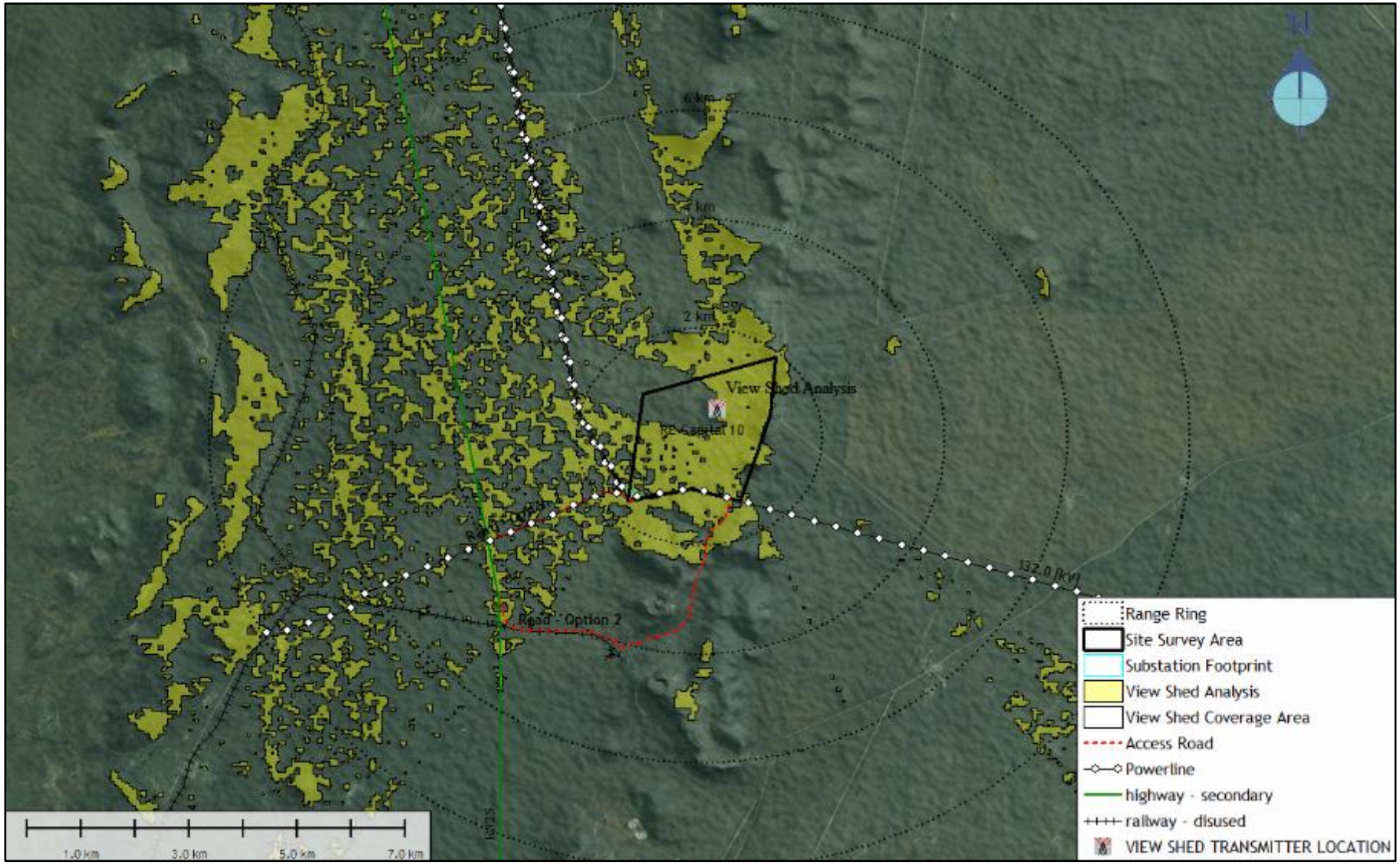


Figure 6: Viewshed from the hill area of the proposed site with a 3.5m offset overlay onto OS Satellite Image Map

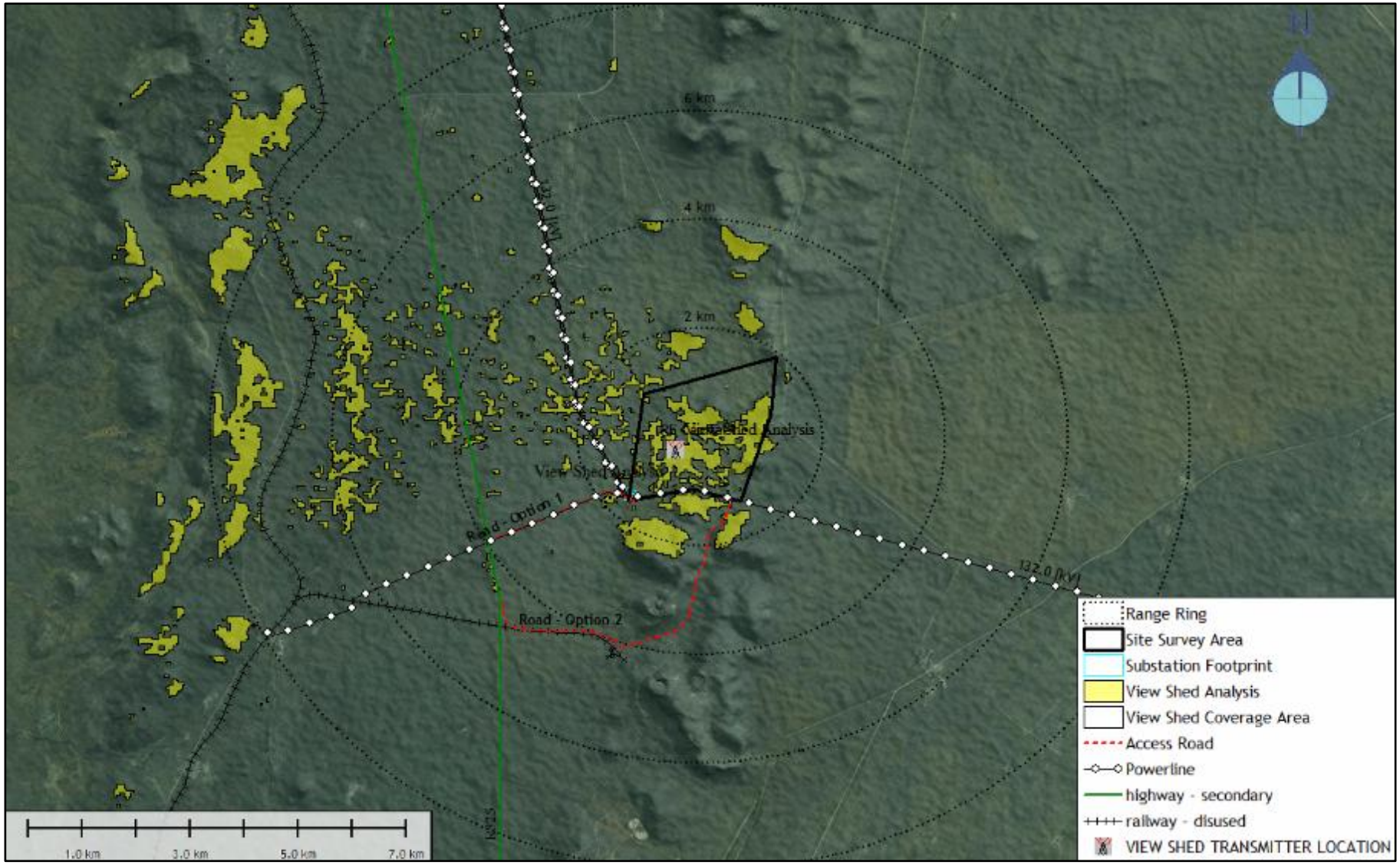


Figure 7: Viewshed from the valley area of the proposed site with a 4m offset overlay onto OS Satellite Image Map

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, land form, soils, vegetation, land use and human settlement'. It creates the specific sense of place or essential character and 'spirit of the place'. (IEMA, 2002) The following landmarks defining the surrounding area's characteristic landscape were identified during the field survey and their significance quantified:

Table 2: Regional Landmark Significance Table

Landmark	**Significance**
R325 National Road	Medium
Low Hills	Medium to High
Powerlines	Low
Abandoned Mine, Haul Road Disused Railroad	Low
Overall Regional Significance	**Medium**

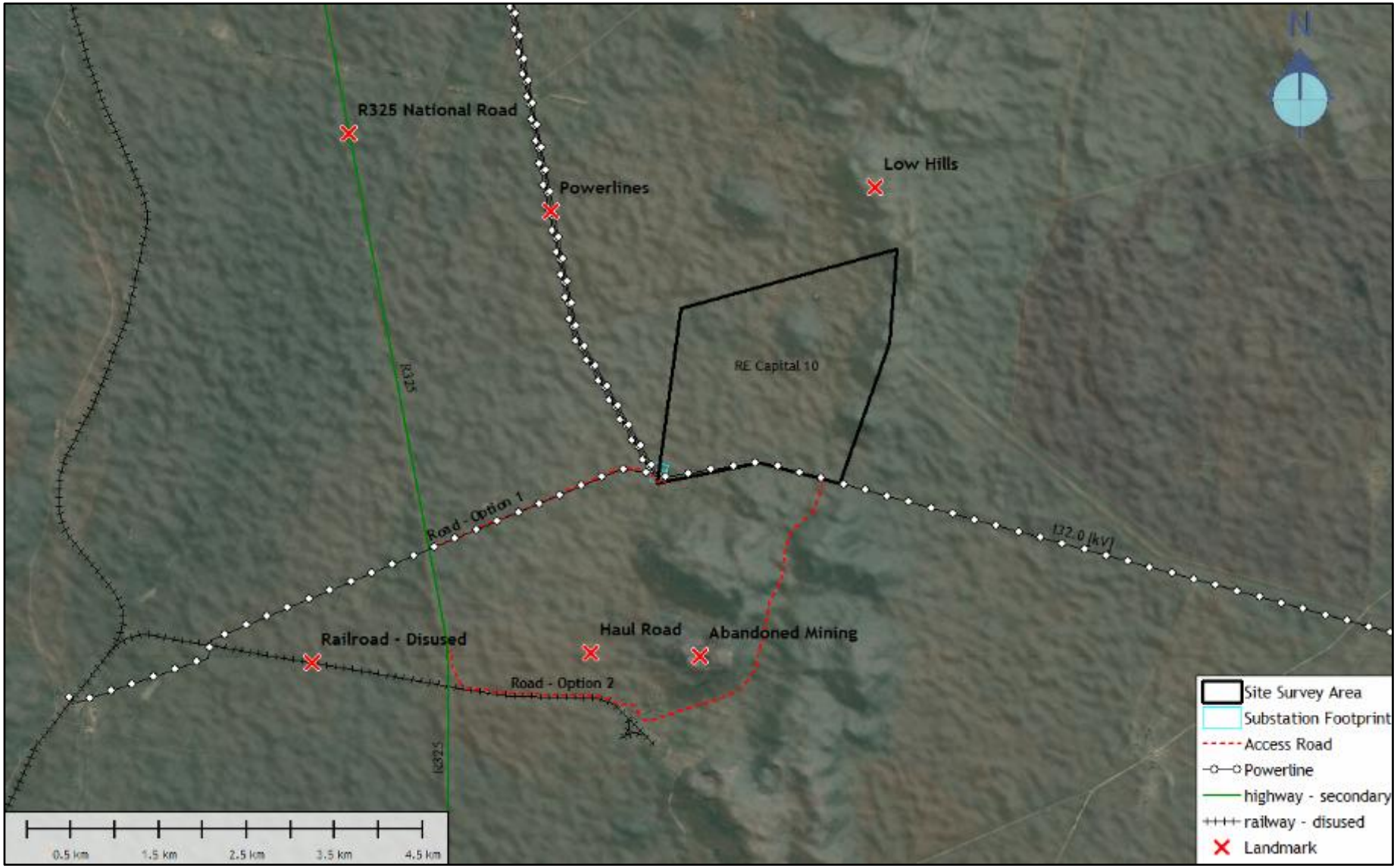


Figure 8: Landscape Context Reference Points overlay onto Satellite Image

R325 National Road

Figure 9: Photograph of the R325 northbound towards Kathu

The R325 is a tarred road linking the towns of Postmasburg in the south with Kathu in the north. Kathu is the town servicing the large Sishen Iron Ore mine. The road context is strongly associated with large mining related trucks. The road is aligned north-south and follows a wide valley with low hills on either side. As depicted in the photograph above, telephone poles run along the road east of the route. Even though parts of the route are degraded, the route is an important regional access route, and hence was rated as having a ***medium*** visual significance. Precautionary measures should be applied to protect the remaining visual resources.

Low Hills

Figure 10: Photograph depicting the low hills to the east of the proposed site

Located to the east and the west of the R325 and aligned in a north-south direction, low hills are a prominent feature in the landscape. The hills are rounded and often covered with medium sized trees which adds to the scenic quality of the area. However, detracting from the scenic quality, evidence of past mining is apparent on many of the hills. Even though certain areas are degraded, the hills are a key regional feature in the greater landscape. This feature was rated as having a ***medium to high*** visual significance and precautionary measure should be applied to protect the remaining visual resources.

Powerlines

Figure 11: Photograph of the existing Eskom 132kv powerline and the small substation located to the east of the project site

The small Manganore Eskom substation is located on the proposed site (indicated on the right of the photograph), and three powerlines converge at the substation, with a 132kv line crossing the site and dominating the attention of the casual observer. The powerlines and the substation do degrade the surrounding landscape.

Abandoned Mine, Haul Road and Disused Railroad

Figure 12: Photograph depicting the abandoned iron ore mine

Figure 13: Photograph depicting the abandoned iron ore mine haul road

"An old opencast iron and manganese ore mine is located against the southern boundary of the farm property, for which Autumn Skies 128 CC has prospecting rights. The 'manganese' railway line, associated with the mining activities on the property and surrounding area, is located directly to the south-west aligned between the farms Portions 2 and 3 and ends at the 'Manganore' load-out station on Portion 5 of Farm 436." (Cape_EAPrac, 2014)

Following the north-south alignment of the valley, the main railway is routed parallel to the R325 but at a distance so as not to dominate the landscape character. To the south a small railroad diverges to the east to service the now disused mine. The railroad is currently not utilised.

The abandoned mine, haul road and disused railway line are not key features adding to the scenic quality of the area and have ***low*** significance. However, it must be noted that these features significantly degrade the landscape and should be rehabilitated where possible.

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.

Vegetation

A Botanical Study for the study area was undertaken by Simon Todd. The key findings of the assessment were that "The broader Re Capital 10 site consists of a variety of landscape and habitat features, of which the rocky hills and sandy plains dominated by Acacia erioloba are identified as being sensitive and unsuitable for development. The majority of the site however consists of Tarchonanthus camphoratus thornveld on shallow calcrete soils and is not considered highly sensitive. The proposed development area is largely restricted to this veld type and within these areas impacts on vegetation and fauna are likely to be relatively low after mitigation. A small proportion of the proposed development area in the north, lies within the Acacia erioloba savannah and approximately 20-30 Acacia erioloba trees are likely to be affected by the development. This is however not considered highly significant given the abundance of this species in the area." (Todd, 2015)

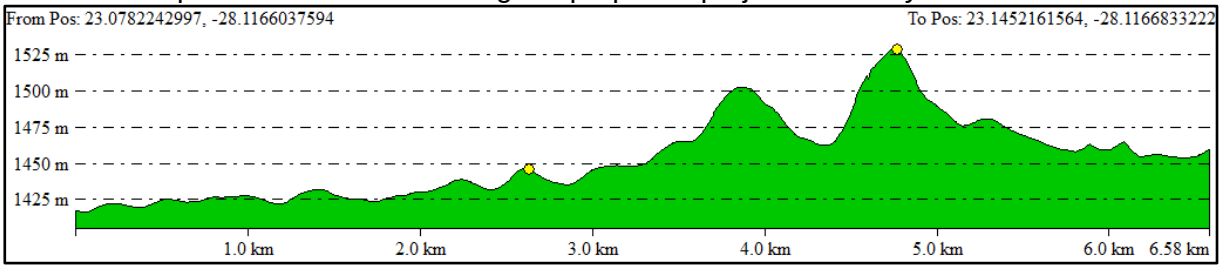
Topography

Elevation profiles were generated making use of ASTER data Digital Elevation Model. The profiles across the study area reflect an undulating terrain with some shallow ridgelines located on the proposed site (see Figure 16). The low and high points on the site are1433 m and 1540 m respectively.

The west to east profile depicts a gradual increase in elevation with the eastern boundary of the proposed site located on a regional high point. Also apparent is the small hill located in the middle of the site which forms a component of the regional hill range.

The north to south profile depicts moderately undulating terrain with the exception of the small hill located on the site. The southern areas of the site, although higher than the northern, would be screened by the elevated hill range to the south.

West to East profile with dots indicating the proposed project boundary



North to South profile with dots indicating the proposed project boundary

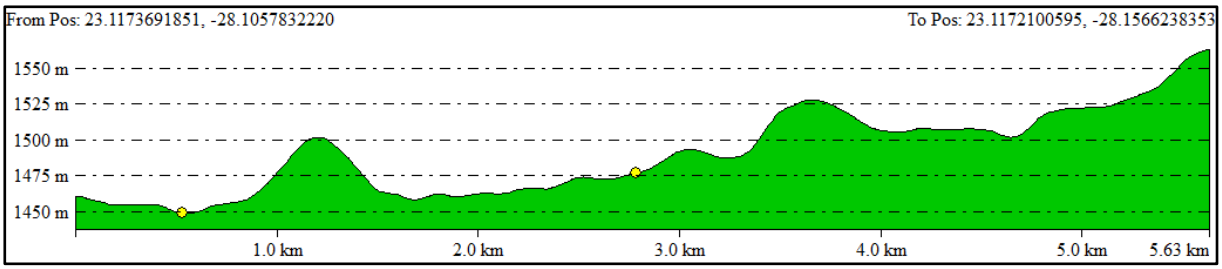


Figure 14: Terrain profiles generated from elevation model

Site Visual Resources

The VRM process requires that visual objectives are defined for each of the main physiographic rating units. The following broad brush Landscapes were identified and surveyed within the study area:

- Dryland agricultural
- Substation and Powerlines
- Prominent Hills

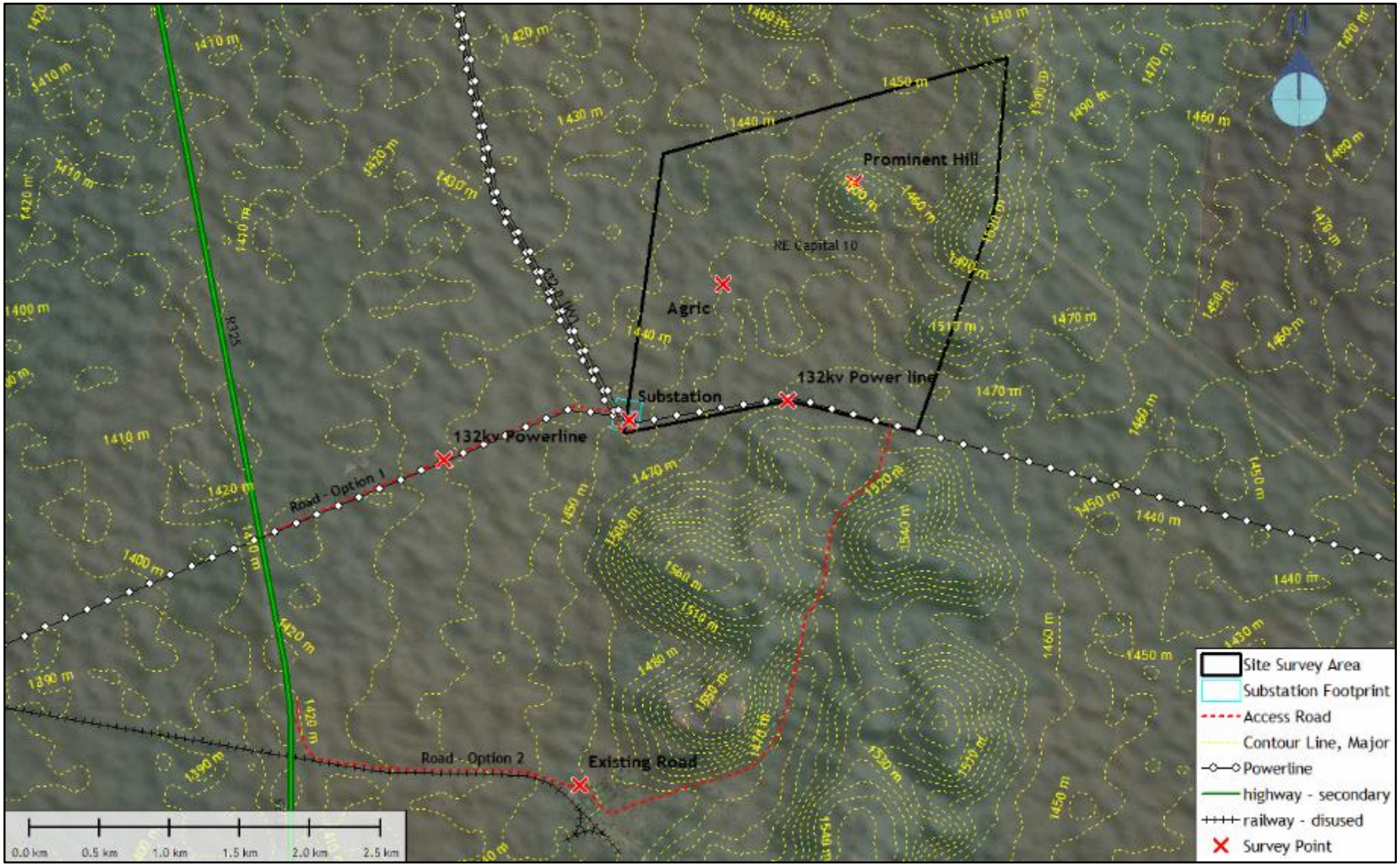


Figure 15: Southern landscape character survey points overlay onto Satellite image map

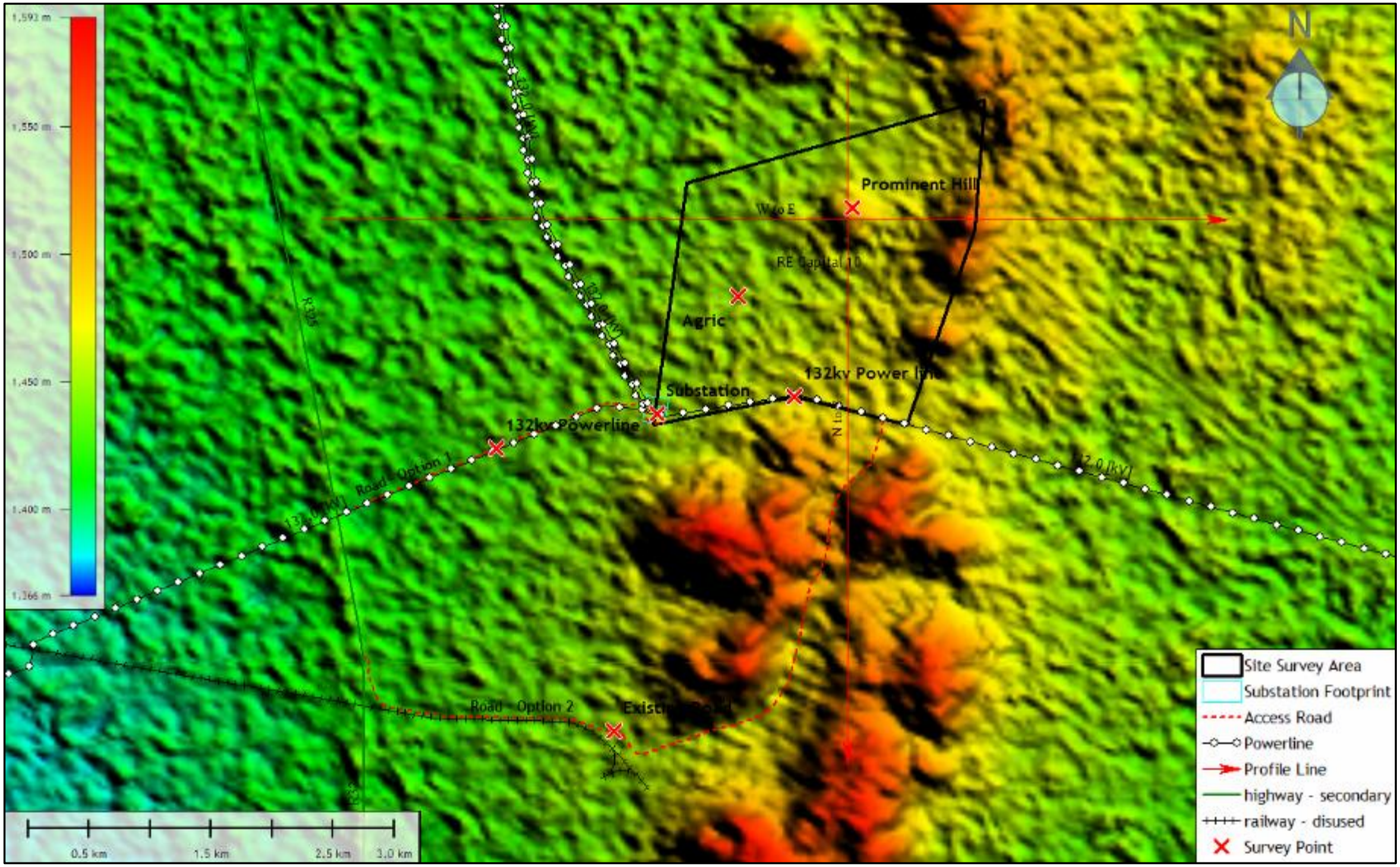


Figure 16: Regional elevation model and profile lines map

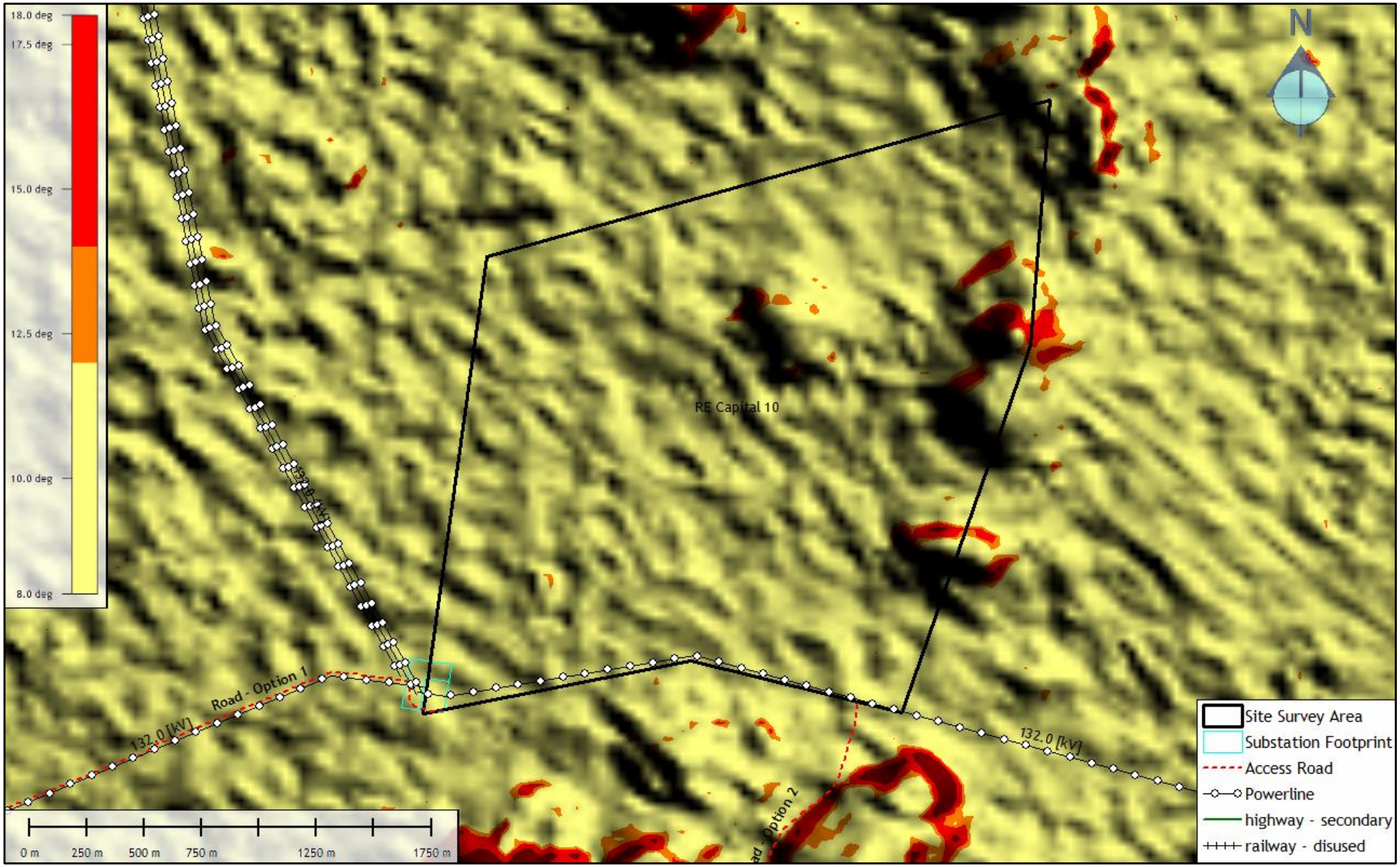


Figure 17: Broad brush slopes degrees map

Table 3: Landuse, Visual Absorption Capacity, Prominence and Receptors Exposure Table

Landscape	Proposed Activity	Landuse	Viewshed	Exposure	VAC	ZVI
Dryland agricultural	PV	Agriculture	Medium	Low	Medium	Fore-ground
Substation and Powerlines	Powerlines	Agriculture	Medium	Low	High	Fore-ground
Prominent Hills	PV	Agriculture / Nature	High	Low	Low	Back-ground
Overall Site Zone of Visual Influence						**Fore-ground**

Table 4: Scenic Quality Table

Landscape	Landform	Vegetation	Water	Colour	Scarcity	Adjacent scenery	Cultural Modif.	Total	Scenic Quality
Dryland agricultural	1	1	1	1	1	2	-1	6	**C**
Substation and Powerlines	1	1	1	1	1	2	-2	5	**C**
Prominent Hills	3	3	1	3	2	2	0	14	**B**
Overall Site Scenic Quality									**Medium to Low**

(Key: A= scenic quality rating of ≥19; B = rating of 12 – 18, C= rating of ≤11)

Table 5: Receptor Sensitivity Table

Landscape	Type user	Amount use	Public interest	Adjacent land users	Special zoning	Receptor sensitivity
Dryland agricultural	Low	Low	Low	Low	Low	**Low**
Substation and Powerlines	Low	Low	Low	Low	Low	**Low**
Prominent Hills	Medium	High	Medium	Low	Low	**Medium**
						Medium to Low

4 RESULTS

4.1 VRM Findings

Visibility and Exposure

Dry land agricultural:
The site is located on shallow gradients, predominantly on NE facing dry grasslands. The viewshed from this location would be moderated by the adjacent hills. The nearest receptor is the R325 which is located approximately 3km to the west and as such the visual exposure is rated ***low***. The VAC level was rated ***medium*** due to the adjacent Eskom powerlines and substation. The ZVI would be experienced mainly in the ***foreground*** area due to the higher VAC levels and lower levels of visual exposure.

Substation and Powerlines:
Similar in prominence and exposure to the above for the same reasons. The VAC level is higher due to the close proximity to the existing medium sized substation and the convergence of three 132kv powerlines which dominate the local visual context. The ZVI would be experienced mainly in the ***foreground*** area due to the higher VAC levels and lower levels of visual exposure.

Prominent Hill:
Elevated above the surrounding valley, the site is strongly prominent and landscape modifications at the site would be visible up to the ***background*** distance zone (approx. 12km). The nearest receptor is located 3.5km to the west and exposure is rated Low. There are no man-made modification on the small hill which is pinnacle shaped, and the VAC was rated ***Low***. The experienced ZVI for landscape modification taking place in close proximity to this location would extend to the ***Background*** area as the unique shape and province would be clearly noticeable to the casual observer from some distance.

Scenic Quality

Dry land agricultural:
Landform, vegetation, water, colour and scarcity were all rated ***one*** due to the limited undulation of the land, uniformity of the grassland vegetation, no visual presence of water and a landscape similar to that of the surrounding landscapes. Adjacent scenery was rated ***moderate to low***, with the undulation of the hills in the valley landscapes increasing value. The associated mining landscapes and activities degrade the landscape. Other cultural modifications were limited to those associated with farming, as well as the adjacent power lines. The VRM scenic quality for this feature was defined as C (***low***) due to the total score of 6.

Substation and Powerlines:
The scenic quality for the substation and power lines location was rated the same as the dry land agricultural landscape, with the exception of the cultural modification category which is rated -2 due to the close proximity of the power station and the converging power lines which

significantly detract from the local landscape character. The VRM scenic quality for this feature was defined as C (***low***) due to the total score of 5.

Prominent Hill:
Value from this landscape was derived from the landform, vegetation, and divergence colours from the fault Grasses and greens of the smaller trees and shrubs located on the low hills. There is no presence of water and scarcity was rated low as the landscape is fairly common in the area. No cultural modifications were identified on the site. The VRM scenic quality was defined as B (***medium***) due to the total score of 14.

Receptor Sensitivity to Landscape Change

Dry land agricultural / Substation and Powerlines:
Receptor sensitivity was rated ***low*** for all categories. The site is not prominent, set back from the main receptor paths. Adjacent land uses have become familiar with mining and industrial landscapes. Hence, the need to maintain visual quality would be ***low***. The site is privately owned agriculture and is not formally protected in any way.

Prominent Hill:
The receptor sensitivity to landscape modifications taking place on the prominent hills located on the site was defined as ***medium***. Although adjacent land uses sensitivity to landscape modifications would be low and due to the mining and industrial landscapes associated with that the areas, and no protective zoning for the site, amount of use as seen from the R3 to five is rated high and is this is an important regional road, it is likely that receptor sensitivity towards landscape change could be ***Moderate***.

4.2 VRM Objectives

The BLM has defined 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 which 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.

Table 6: VRM Class Summary Table

Landscape	Proposed Activity	ZVI	Scenic Quality	Receptor sensitivity	Visual Inventory	Visual Resource Manag.
Dryland agricultural	PV	Fore-ground	C (Low)	Low	**IV**	**III**
Substation and Powerlines	Powerline	Fore-ground	C (Low)	Low	**IV**	**IV**
Prominent Hills	PV	Back-ground	B (Medium)	Medium	**II**	**I**

Class I

Prominent Hills:

The visual invention for the prominent hills landscapes was defined as Class II. This is due to the background zone of visual influence as a result of the prominence of the to the regional locality , the high amount of usage of the hills as seen from the adjacent road receptors, and the high levels of scenic quality associated with the pinnacle form of the hill . However, in order to retain the integrity of the greater hill range scenic resources, the VRM Class I is recommended. The visual objective is to preserve the existing character of the landscape where the level of change to the characteristic landscape should be very low and must not attract attention. I.e. No Go.

Class II

No Class II areas were defined.

Class III

Dry land agricultural:

The visual inventory was rated Class III due to the foreground zone of visual influence, lower levels of scenic quality and lower levels of receptor sensitivity to landscape modification. As the site is currently zoned agriculture, the visual inventory rating was amended from a Class IV to a Class III to ensure that the existing agricultural sense of place is retained and the visual resources associated with the low hills is not further degraded. The visual objective for the dry land agricultural areas is to partially retain the existing character 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

Substation and Powerlines:

The visual inventory for the substation and power lines landscapes was defined as Class IV. This is due to the foreground zone of visual influence, the lower levels of scenic quality due to the existing contrast generated by the substation and the converging power lines, and the lower levels of receptor sensitivity to landscape change due to the existing presence of the substation. As this section of the site is already developed, it is unlikely that further development would take place.

4.3 Key Observation Points

Key Observation Points (KOPs) are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology which requires that the degree of contrast that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations, or receptors, surrounding the property.

To define the KOPs, potential receptor locations are identified in the viewshed analysis, which are screened, based on the following criteria:

- Angle of observation
- Number of viewers
- Length of time the project is in view
- Relative project size
- Season of use
- Critical viewpoints, e.g. views from communities, road crossings
- Distance from property

Two locations were identified as having KOP status. The receptors at these points will have clear views of the proposed project which could result in a change to local visual resources. These KOP's are:

Table 7: KOP and Landscape Table

KOP	Landscape 1	Landscape 2
R325 Southbound	Class I Prominent Hills	Class III Dryland Agriculture
R325 Northbound	Class I Prominent Hill	Class III Dryland Agriculture

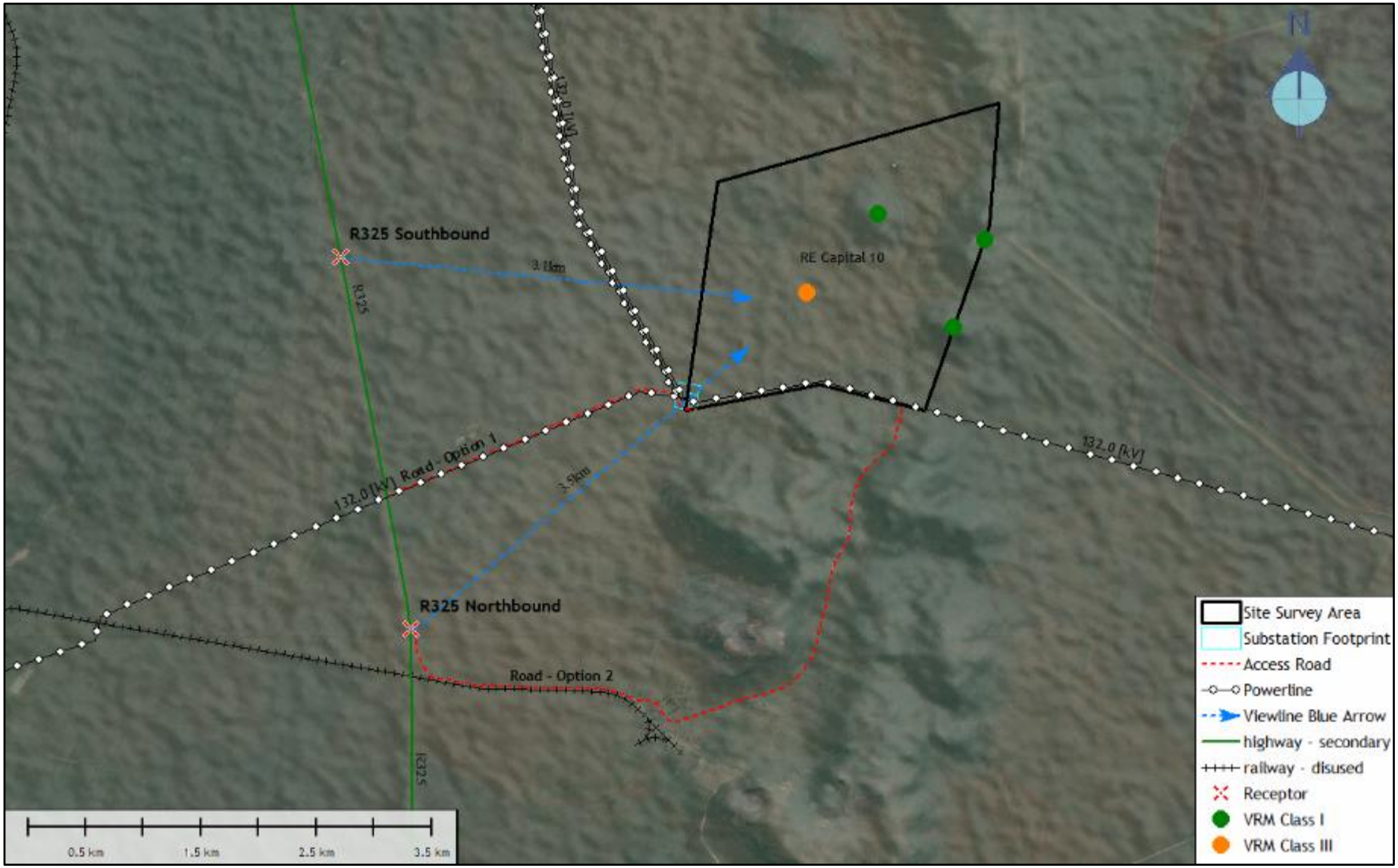


Figure 18: Key Observation Points overlaid onto VRM Classes and Proposed Development Footprint Map

5 IMPACT ASSESSMENT

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.

(DEA&DP)

In the VRM methodology, the magnitude is defined by means of a contrast rating. The assessment of the Degree of Contrast (DoC) is a systematic process undertaken from Key Observation Points (KOPs) surrounding the project site, and is used to evaluate the potential visual impacts associated with the proposed landscape modifications. The degree of contrast generated by the proposed landscape modifications are measured against the existing landscape context in terms of the elements of form, line, colour and texture. Each alternative activity is then assessed in terms of whether it meets the objectives of the established class category, and whether mitigation is possible *(USA Bureau of Land Management, 2004).*

The following criteria are utilised in defining the DoC:

- **None**: The element contrast is not visible or perceived.
- **Weak**: The element contrast can be seen but does not attract attention.
- **Moderate**: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong**: The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

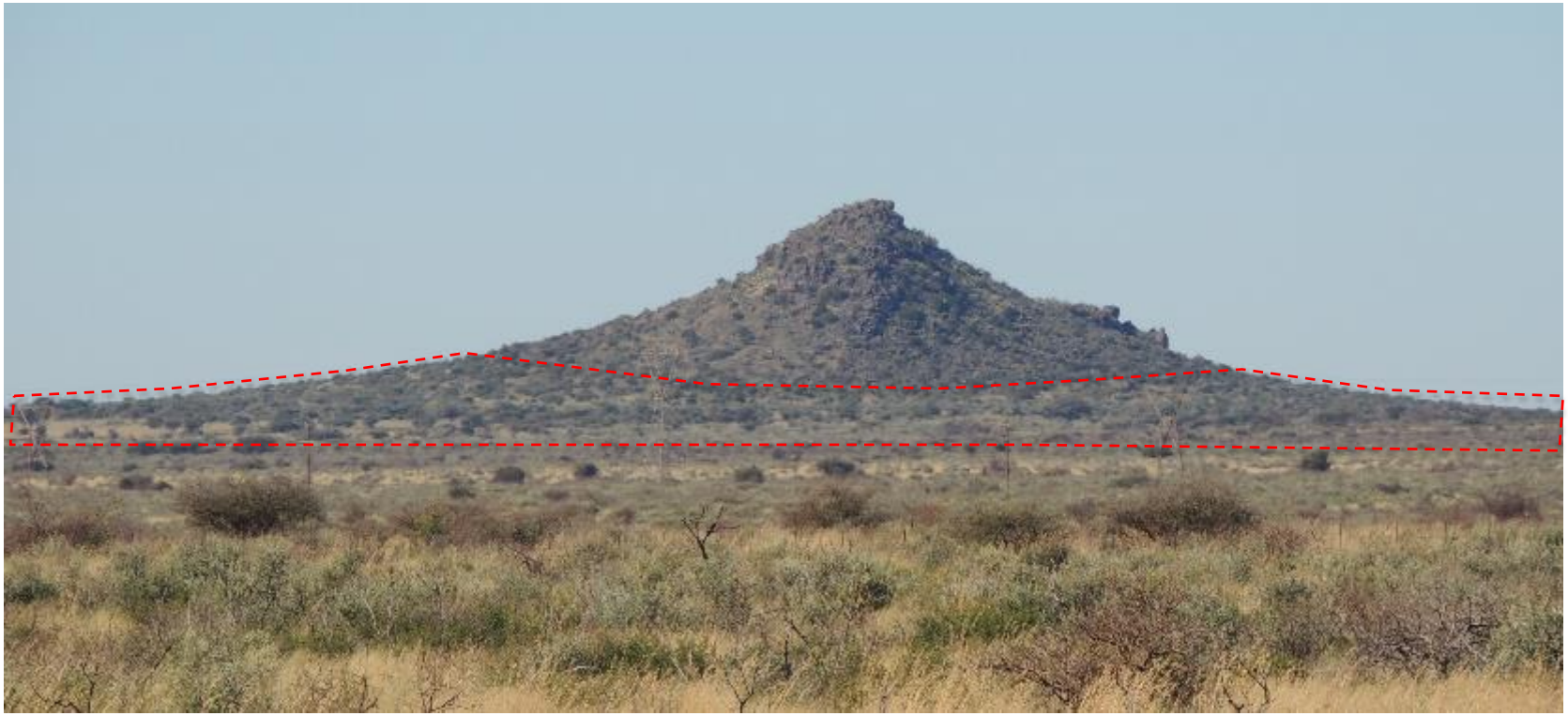


Figure 19: View of proposed PV site as seen from the R325 without mitigation

Table 8: Key Observation Point Contrast Rating Table

KOP	Landscape	Distance (km)	Form	Line	Colour	Texture	DoC	Visual objectives met
R325 Southbound	Class III Dryland Agriculture	3.5km	None	Weak	Medium	Medium	Medium	Yes
R325 Southbound	Class I Hill	4km	Strong	Strong	Strong	Strong	Strong	No
R325 Northbound	Class III Dryland Agriculture	2.5km	No View					Yes
R325 Northbound	Class I Hill	3.5km	Strong	Strong	Strong	Strong	Strong	No

Table 9: Landscape Character Environment Impacts Summary Table

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with mitigation	Mitigation	Mitigation Map Ref No.
PV Solar Facility	Cons.	W/Out	-ve	R	ST	H	HP	H		Retain hills to the east as No-Go areas. Lights at night management.	**1**
		With	-ve	Lo	ST	L	Pr		L		
	Ops.	W/Out	-ve	R	LT	H	HP	H		As above.	
		With	-ve	Lo	LT	L	Pr		L		
	Close	W/Out	-ve	R	LT	H	HP	H		Remove all structures and buildings. Rip compacted surfaces, rehabilitate and restore to grass lands.	
		With	-ve	S	P	VL	Pr		VL		
Access road Option 1	Cons.	W/Out	-ve	Lo	ST	L	Pr	L		Erosion control, dust control with no dominant signage along the rural road.	
		With	-ve	Lo	ST	VL	Pr		VL		
	Ops.	W/Out	-ve	Lo	LT	L	Pr	L		Continued erosion and dust control.	
		With	-ve	Lo	LT	VL	Pr		VL		
	Close	W/Out	-ve	Lo	LT	L	Pr	L		Rip compacted surfaces, rehabilitate and restore to vegetation (unless the road can be incorporated into the subsequent landuse).	
		With	-ve	S	LT	VL	Pr		VL		
Access road Option 2	Cons.	W/Out	-ve	R	ST	M	Pr	MH		Erosion control, dust control with no dominant signage along the rural road.	
		With	-ve	Lo	ST	L	Pr		L		
	Ops.	W/Out	-ve	R	P	M	Pr	MH		Continued erosion and dust control.	
		With	-ve	Lo	LT	L	Pr		L		
	Close	W/Out	-ve	R	P	M	Pr	MH		Rip compacted surfaces, rehabilitate and restore to vegetation (unless the road can be incorporated into the subsequent landuse).	
		With	-ve	S	LT	VL	Pr		VL		

Key: +ve = Positive, -ve = Negative, S = Site, Lo = Local, R = Regional, N = National, ST = Short, LT = Long term, P = Permanent, VL = Very Low, L = Low, M = Medium, H = High, I = Improbable, Pr = Probable, HP = Highly Probable, D = Definite

Impact Activity	Phase	Mitigation	Nature	Extent	Duration	Severity	Probability	Significance without	Significance with mitigation	Mitigation	Mitigation Map Ref No.
Powerline Option	Cons.	W/Out	-ve	Lo	ST	L	Pr	L		Erosion control, dust control	
		With	-ve	Lo	ST	L	Pr		L		
	Ops.	W/Out	-ve	Lo	LT	L	Pr	L		Erosion control	
		With	-ve	Lo	LT	L	Pr		L		
	Close	W/Out	-ve	Lo	LT	L	Pr	L		Remove all structures and buildings. Rip compacted surfaces, rehabilitate and restore to grass lands.	
		With	-ve	Lo	LT	L	Pr		L		
Substation	Cons.	W/Out	-ve	R	ST	M	Pr	MH		Erosion control, dust control with no dominant signage along the rural road.	
		With	-ve	Lo	ST	L	Pr		L		
	Ops.	W/Out	-ve	R	P	M	Pr	MH		Continued erosion and dust control.	
		With	-ve	Lo	LT	L	Pr		L		
	Close	W/Out	-ve	R	P	M	Pr	MH		Rip compacted surfaces, rehabilitate and restore to vegetation (unless the road can be incorporated into the subsequent landuse).	
		With	-ve	S	LT	VL	Pr		VL		
Cumulative Effects	Cons.	W/Out	-ve	Reg.	ST	H	Pr	H		Effective coordination at a municipal level to manage possible negative effects of landscape degradation.	
		With	+ve	Reg.	ST	M	Pr		M		
	Ops.	W/Out	-ve	Reg.	Perm	H	Pr	H		As above.	
		With	+ve	Reg.	Perm	M	Pr		M		
	Close	W/Out	-ve	Reg.	Perm	H	Pr	H		As above.	
		With	+ve	Reg.	Perm	M	Pr		M		

Key: +ve = Positive, -ve = Negative, S = Site, L = Local, R = Regional, N = National, ST = Short, LT = Long term, P = Permanent, VL = Very Low, L = Low, M = Medium, H = High, I = Improbable, Pr = Probable, HP = Highly Probable, D = Definite

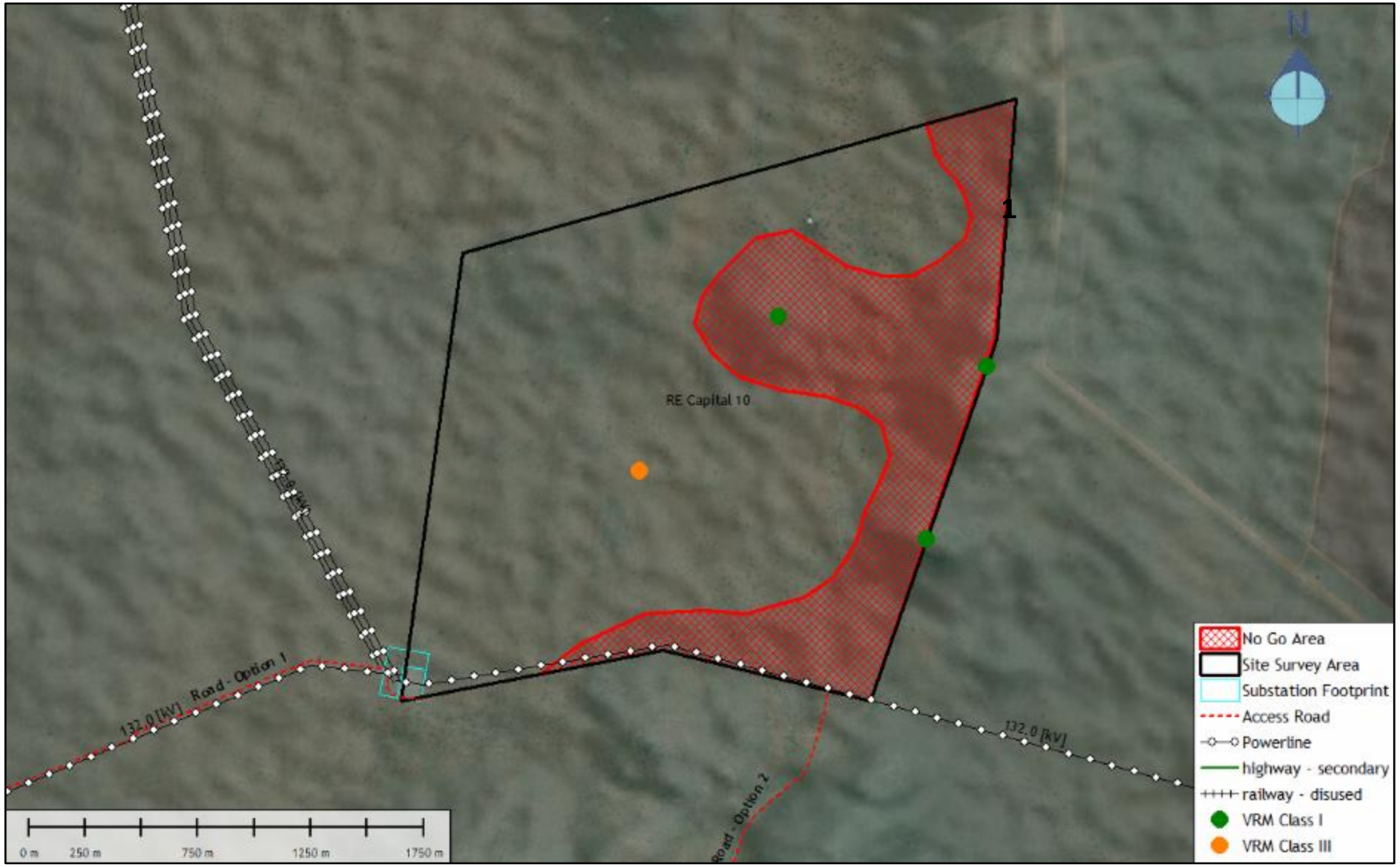


Figure 20: Mitigation reference point locality map

PV Solar Facility

Without mitigation the proposed PV facility has a strong potential to generate *Negative High* visual impacts due to skyline intrusion on the elevated hills to the east of the site.

With mitigation the prominent areas would be excluded and the PV footprint placed on veld grasses of low prominence and low receptor exposure. With mitigation the visual significance would be reduced to *Negative Low* during the project life and *Very Low* once the project is removed and the area rehabilitated.

Once the project life is completed, all structures should be removed, the compact areas ripped and then rehabilitated and restored to indigenous, endemic vegetation. Lights at night have the potential to significantly increase the proposed project ZVI and light management is recommended (refer to generic light mitigations in the Appendix).

Access Roads

Option 1: This routing is along the existing farm access adjacent the Eskom powerline. Without mitigation the impact would be Low as the route is already impacted. With mitigation which would include ripping (if not incorporated into a post PV landuse), the impact would be Very Low.

Option 2: Without mitigation the access road has the potential to generate *Negative Moderate to High* visual impacts due to the routing of the proposed road along an existing farm road through the hill range to the east of the proposed site which is subject to steeper ground and more sensitive vegetation. Mitigation would reduce the impact to *Negative Very Low* once the project is completed. Once the project life cycle is completed, the roads should be ripped and then rehabilitated and restored to indigenous, endemic vegetation (unless the road can be incorporated into a future land-usage). Due to the length of this access option, the cost of continued maintenance to ensure erosion does not take place on steeper slopes areas would become a liability. For this reason, this access route option is not recommended.

Substation

Without and with mitigation the proposed substation has the potential to generate *Negative Low* visual impacts due to low prominence and limited visibility. Once the project life cycle is completed, the structure should be removed and the site rehabilitated and restored to indigenous, endemic vegetation (unless the substation can be incorporated into future land-usage).

Powerlines

The short section of the powerline linkage along an existing farm cadastral line, in conjunction with the low visibility and exposure, significantly reduces the visual impact to Low, with and without mitigation.

Cumulative Effects

Without mitigation the potential for regional landscape degradation from ad hoc planning of new PV solar projects could result in *Negative High* cumulative impacts as landscape resources in the area become degraded from sprawling PV. This effect has the potential to significantly detract from the current agriculture. Effective planning at a municipal level is required to coordinate the expansion of the proposed solar energy projects so as not to detract from existing visual resources. Cumulative significance could then be reduced to a *Moderate Positive* effect by adding an interesting visual experience to the landscape.

6 CONCLUSION

VRM Africa was appointed by *CapeEAPrac* to undertake a Visual Impact Assessment for the proposed RE Capital 10 Solar Development on behalf of RE Capital 10 (Pty) Ltd. The site is located near the town of Postmasburg in the Northern Cape Province. A full site survey was undertaken on the 6th August 2014.

It is the recommendation of this study that the proposed project, with mitigation, would not significantly detract from the current visual resources which has important receptors which should be recognised. A development setback on the eastern prominent hills was recommended as a preferred No-Go area to ensure that the visual resources of the eastern hill range are not further compromised as seen from the R325 receptors. The proposed development area respects the proposed restricted area and as such, is suited for development.

7 REFERENCES

(Source: www.hawaiirenewableenergy.org/Villamesias2). (n.d.).

Cape_EAPrac. (2014). *Final Scoping Report for the proposed RE Capital 10 Solar Development. Report Reference: TSA309/13, George.*

DEA&DP. (n.d.). *Guideline for involving Visual and Aesthetic Specialists in EIA Processes.*

Hull, R. B., & Bishop, I. E. (1988). *Scenic Impacts of Electricity Power Mine: The Influence of Landscape Type and Observer Distance. Journal of Environmental Management.(27) Pg 99-108.*

IEMA. (2002). *U.K Institute of Environmental Management and Assessment (IEMA). 'Guidelines for Landscape and Visual Impact Assessment' Second Edition, Spon Press. Pg 44.*

IFC. (2012). *International Finance Corporation (IFC) prescribes eight performance standards (PS) on environmental and social sustainability. Millennium Ecosystem Assessment. 2005.*

Lange, E. (1994). *Integration of computerized visual Simulation and visual Assessment in environmental Planning. Landscape and Urban Planning. .*

NASA, A. G. (2009). *Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) Global Digital Elevation Model Version 2 (GDEM V2 2011). Ministry of Economy, Trade, and Industry (METI) of Japan and United States National Aeronauti.*

NELPAG. (n.d.). *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.o.*

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

Todd, S. (2015). *ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED RE CAPITAL 10 SOLAR: FAUNA & FLORA SPECIALIST EIA REPORT.*

USDI., B. (2004). *Bureau of Land Management, U.S. Department of Interior. 2004. Visual Resource Management Manual 8400.*

Van der Merwe, E. (2013). *Layout Report for Re Capital 3 Solar Development, Solek Renewable.*

VRMA. (n.d.).

8 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

Name of company (if applicable):

23 JANUARY 2013

Date:

8.1 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
2014	Joram Solar	Solar Energy	Northern Cape
2014	RERE PV Postmasberg	Solar Energy	Northern Cape
2014	RERE CPV Upington	Solar Energy	Northern Cape
2014	Rio Tinto RUL Desalinisation Plant	Industrial	Namibia
2014	NamPower PV	Solar Energy	Namibia
2014	Pemba Oil and Gas Port Expansion	Industrial	Mozambique
2014	Brightsource CSP Upington	Solar Energy	Northern Cape
2013	Cape Winelands DM Regional Landfill	Industrial	Western Cape
2013	Drennan PV Solar Park	PV Solar Energy	Eastern Cape
2013	Eastern Cape Mari-culture	Mari-culture	Eastern Cape
2013	Eskom Pantom Pass Substation	Substation /Tx lines	Knysna
2013	Frankfort Paper Mill	Plant	Free State
2013	Gibson Bay Wind Farm Transmission lines	Tranmission lines	Eastern Cape
2013	Houhoek Eskom Substation	Substation /Tx lines	Western Cape
2013	Mulilo PV Solar Energy Sites (x4)	PV Solar Energy	Northern Cape
2013	Namies Wind Farm	Wind Energy	Northern Cape
2013	Rossing Z20 Pit and WRD	Mining	Namibia
2013	SAPPI Boiler Upgrade	Plant	Mpumalanga

2013	Tumela WRD	Mine	North West
2013	Weskusfleur Substation (Koeburg)	Substation /Tx lines	Western Cape
2013	Yzermyn coal mine	Mine	Mpumalanga
2012	Afrisam	Mine	Saldana
2012	Bitterfontein	PV Energy	N Cape
2012	Bitterfontein slopes	Slopes Analysis	N Cape
2012	Kangnas PV	Energy	N Cape
2012	Kangnas Wind	Energy	N Cape
2012	Kathu CSP Tower	Solar Power	Northern Cape
2012	Kobong Hydro	Hydro & Powerline	Lesotho
2012	Letseng Diamond Mine Upgrade	Mine	Lesotho
2012	Lunsklip Windfarm	Windfarm	Stilbaai
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
2012	Sasol Upington CSP Tower	Solar Power	Northern Cape
2011	Beaufort West PV Solar Power Station	Power Station	Beaufort West
2011	Beaufort West Wind Farm	Wind Energy	Beaufort West
2011	De Bakke Cell Phone Mast	Mast	Western Cape
2011	ERF 7288 PV	PV	Beaufort West
2011	Gecko Industrial park	Industrial	Namibia
2011	Green View Estates	Residential	Mossel Bay
2011	Hoodia Solar	PV expansion	Beaufort West
2011	Kalahari Solar Power Project	Solar Power	Northern Cape
2011	Khanyisa Power Station	Power Station	Western Cape
2011	Laingsburg Windfarm	Level 4	Mpumalanga
2011	Olvyn Kolk PV	Solar Power	Northern Cape
2011	Otjikoto Gold Mine	Mining	Namibia
2011	PPC Rheebieck West Upgrade	Industrial	
2011	Slopes analysis Erf 7288 Beaufort West	Slopes	Beaufort West
2011	Southern Arterial	Road	George
2010	Bannerman Etango Uranium Mine	Mining	Namibia
2010	Bantamsklip Transmission Revision	Transmission	Eastern Cape
2010	Beaufort West Urban Edge	Mapping	Beaufort West
2010	Bon Accord Nickel Mine	Mine	Barbeton
2010	Herolds Bay N2 Development Baseline	Residential	George
2010	MTN Lattice Hub Tower	Structure	George
2010	N2 Herolds Bay Residental	Residential	Herolds Bay
2010	Onifin(Pty) Ltd Hartenbos Quarry Extension	Mining	Mossel Bay
2010	Rossing South Board Meeting	Mining	Namibia
2010	Still Bay East	Mapping	SA, WC

2010	Vale Moatize Coal Mine and Railwayline	Mining_rail	Mozambique
2010	Vodacom Mast	Structure	Reichterbosch
2010	Wadrif Dam	Dam	Beaufort West
2009	Asazani Zinyoka UISP Housing	Residential Infill	Mossel Bay
2009	Bantamsklip GIS Mapping	Mappig	Western Cape
2009	Eden Telecommunication Tower	Structure Tower	George
2009	George Landscape Characterisation	George SDF	George
2009	George Western Bypass	Structure Road	George
2009	Rossing Uranium Mine Phase 2	Mining	Namibia
2009	Sun Ray Wind Farm	Wind Energy	Still Bay
2008	Bantamsklip Transmission Lines Scoping	Transmission	Western Cape
2008	Erf 251 Damage Assessment	Residential VIA	Great Brak
2008	Erongo Uranium Rush SEA	SEA	Namibia
2008	Evander South Gold Mine Preliminary VIA	Mining	Mpumalanga
2008	George Open Spaces System	George SDF	George
2008	GrooteSchuur Heritage Mapping	Mapping	Cape Town
2008	Hartenbos River Park	Residential VIA	Hartenbos
2008	Kaaimans Project	Residential	Wilderness
2008	Lagoon Garden Estate	Residential VIA	Great Brak
2008	Moquini Beach Hotel	Resort	Mossel Bay
2008	NamPower Coal fired Power Station	Power Station	Namibia
2008	Oasis Development	Residential VIA	Plettenberg Bay
2008	RUL Sulpher Handling Facility	Mining	Walvis Bay
2008	Stonehouse Development	Residential VIA	Plettenberg Bay
2008	Walvis Bay Power Station	Structure	Namibia.
2007	Calitzdorp Retirement Village	Residential VIA	Calitzdorp
2007	Calitzdorp Visualisation	Visualisation	Calitzdorp
2007	Camdeboo Estate	Residential VIA	Graaff Reinet
2007	Destiny Africa	Residential	George
2007	Droogfontein Farm 245	Residential VIA	Danabaai
2007	Floating Liquified Natural Gas Facility	Structure tanker	Mossel Bay
2007	George Municipality Densification	George SDF	George
2007	George Municipality SDF	George SDF	George
2007	Kloofsig Development	Residential VIA	Vleesbaai
2007	OCGT Power Plant Extension	Structure Power Plant	Mossel Bay
2007	Oudtshoorn Municipality SDF	Mapping	Oudtshoorn
2007	Oudtshoorn Shopping Complex	Structure Mall	Oudtshoorn
2007	Pezula Infill (Noetzie)	Residential VIA	Knysna
2007	Pierpoint Nature Reserve	Residential VIA	Knysna
2007	Pinnacle Point Golf Estate	Golf/Residential	Mossel Bay
2007	Rheebok Development Erf 252 Apeal	Residential VIA	Great Brak

2007	Rossing Uranium Mine Phase 1	Mining	Namibia
2007	Ryst Kuil/Riet Kuil Uranium Mine	Mining	Beaufort West
2007	Sedgefield Water Works	Structure	Sedgefield
2007	Sulpher Handling Station Walvis Bay Port	Industrial	Namibia
2007	Trekkopje Uranium Mine	Mining	Namibia
2007	Weldon Kaya	Residential VIA	Plettenberg Bay
2006	Fancourt Visualisation Modelling	Visualisation	George
2006	Farm Dwarsweg 260	Residential VIA	Great Brak
2006	Fynboskruin Extention	Residential VIA	Sedgefield
2006	Hanglip Golf and Residential Estate	Golf/Residential	Plettenberg Bay
2006	Hansmoeskraal	Slopes Analysis	George
2006	Hartenbos Landgoed Phase 2	Residential VIA	Hartenbos
2006	Hersham Security Village	Residential VIA	Great Brak
2006	Ladywood Farm 437	Residential VIA	Plettenberg Bay
2006	Le Grand Golf and Residential Estate	Golf/Residential	George
2006	Paradise Coast	Residential VIA	Mossel Bay
2006	Paradyskloof Residential Estate	Residential VIA	Stellenbosch
2006	Riverhill Residential Estate	Residential VIA	Wilderness
2006	Wolwe Eiland Access Route	Road	Victoria Bay
2005	Harmony Gold Mine	Mining	Mpumalanga.
2005	Knysna River Reserve	Residential VIA	Knysna
2005	Kruisfontein Infill	Mapping	Knysna
2005	Lagoon Bay Lifestyle Estate	Residential VIA	Glentana
2005	Outeniquabosch Safari Park	Residential	Mossel Bay
2005	Proposed Hotel Farm Gansevallei	Resort	Plettenberg Bay
2005	Uitzicht Development	Residential VIA	Knysna
2005	West Dunes	Residential VIA	Knysna
2005	Wilderness Erf 2278	Residential VIA	Wilderness
2005	Wolwe Eiland Eco & Nature Estate	Residential VIA	Victoria Bay
2005	Zebra Clay Mine	Mining	Zebra
2004	Gansevallei Hotel	Residential VIA	Plettenberg Bay
2004	Lakes Eco and Golf Estate	Golf/Residential	Sedgefield
2004	Trekkopje Desalination Plant	Structure Plant	Namibia
1995	Greater Durban Informal Housing Analysis	Photogrametry	Durban

9 ANNEXURE 2: QUESTIONNAIRES AND VRM TERMINOLOGY

9.1 Methodology Detail

Viewshed

The visible extent, or viewshed, is 'the outer boundary defining a view catchment area, usually along crests and ridgelines' *(Oberholzer, 2005).* This reflects the area, or extent, where the landscape modification would probably be seen. However, visibility tends to diminish exponentially with distance, which is well recognised in visual analysis literature. Therefore the views of a landscape modification would not necessarily influence the landscape character within all areas of the viewshed. The information for the terrain used in the 3D computer model on which the visibility analysis is based on the Advanced Spaceborne Thermal Emission and Reflection (ASTER) Radiometer Data, a product of Japan's Ministry of Economy, Trade and Industry (METI) and National Aeronautics and Space Administration (NASA) in USA. (NASA, 2009)

Receptor Exposure

The area where a landscape modification starts to influence the landscape character is termed the Zone of Visual Influence (ZVI) and is defined by the U.K. Institute of Environmental Management and Assessment's (IEMA) *'Guidelines for Landscape and Visual Impact Assessment'* as 'the area within which a proposed development may have an influence or effect on visual amenity (of the surrounding areas).'

The inverse relationship of distance and visual impact is well recognised in visual analysis literature *(Hull, R.B. and Bishop, I.E., 1988)*. According to Hull and Bishop, exposure, or visual impact, tends to diminish exponentially with distance. The areas where most landscape modifications would be visible are located within 2 km from the site of the landscape modification. Thus the potential visual impact of an object diminishes at an exponential rate as the distance between the observer and the object increases due to atmospheric conditions prevalent at a location, which causes the air to appear greyer, thereby diminishing detail. For example, viewed from 1000 m from a landscape modification, the impact would be 25% of the impact as viewed from 500 m from a landscape modification. At 2000m it would be 10% of the impact at 500 m. The relationship is indicated in the following graph generated by Hull and Bishop.

The VRM methodology also takes distance from a landscape modification into consideration in terms of understanding visual resource. Three distance categories are defined by the Bureau of Land Management. The distance zones are:

i. ***Foreground / Middle ground***, up to approximately 6km, which is where there is potential for the sense of place to change;
ii. ***Background areas***, from 6km to 24km, where there is some potential for change in the sense of place, but where change would only occur in the case of very large landscape modifications; and
iii. ***Seldom seen areas***, which fall within the Foreground / Middle ground area but, as a result of no receptors, are not viewed or are seldom viewed.

Scenic Quality

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). Seven scenic quality criteria area scored on a 1 (low) to 5 (high) scale. The scores are totalled and assigned a A (High), B (Moderate) or C (low) based on the following split:
A= scenic quality rating of ≥19;
B = rating of 12 – 18,
C= rating of ≤11

The seven scenic quality criteria are defined below:

- **Land Form:** Topography becomes more of a factor as it becomes steeper, or more severely sculptured.
- **Vegetation:** Primary consideration given to the variety of patterns, forms, and textures created by plant life.
- **Water:** That ingredient which adds movement or serenity to a scene. The degree to which water dominates the scene is the primary consideration.
- **Colour:** The overall colour(s) of the basic components of the landscape (e.g., soil, rock, vegetation, etc.) are considered as they appear during seasons or periods of high use.
- **Scarcity:** This factor provides an opportunity to give added importance to one, or all, of the scenic features that appear to be relatively unique or rare within one physiographic region.
- **Adjacent Land Use:** Degree to which scenery and distance enhance, or start to influence, the overall impression of the scenery within the rating unit.
- **Cultural Modifications:** Cultural modifications should be considered, and may detract from the scenery or complement or improve the scenic quality of an area.

Receptor Sensitivity

Sensitivity levels are a measure of public concern for scenic quality. Receptor sensitivity to landscape change is determined by rating the following factors in terms of Low to High:

- **Type of Users:** Visual sensitivity will vary with the type of users, e.g. recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- **Amount of Use:** Areas seen or used by large numbers of people are potentially more sensitive.
- **Public Interest:** The visual quality of an area may be of concern to local, or regional, groups. Indicators of this concern are usually expressed via public controversy created in response to proposed activities.
- **Adjacent Land Uses:** The interrelationship with land uses in adjacent lands. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be as visually sensitive.

- **Special Areas:** Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas, Wild and Scenic Rivers, Scenic Areas, Scenic Roads or Trails, and Critical Biodiversity Areas frequently require special consideration for the protection of their visual values.
- **Other Factors:** Consider any other information such as research or studies that include indicators of visual sensitivity.

Visual Resource Management (VRM) Classes

The VRM Classes represent the relative value of the visual resources of an area and are determined making use of the VRM Class Matrix see Table 8 below:

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

The Classes are not prescriptive and are utilised as a guideline to determine visual carrying capacity. The Visual Inventory Classes are defined using the matrix below and with motivation, can be adjusted to Visual Resource Management Classes:

Table 10: 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 is 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 specialist 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. Management activities 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. 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.
- The Class IV objective is to provide for management activities which require major modifications of the existing character of the landscape. The level of change to the landscape can be high, and these management activities may dominate the view and be the major focus of the viewer's (s') attention.

Key Observation Points (KOPs)

KOPs are defined by the Bureau of Land Management as the people (receptors) located in strategic locations surrounding the property that make consistent use of the views associated with the site where the landscape modifications are proposed. These locations are important in terms of the VRM methodology, which requires that the Degree of Contrast (DoC) that the proposed landscape modifications will make to the existing landscape is measured from these most critical locations, or receptors, surrounding the property.

To define the KOPs, potential receptor locations were identified in the viewshed analysis, and screened, based on the following criteria:
- Angle of observation;
- Number of viewers;
- Length of time the project is in view;
- Relative project size;
- Season of use;
- Critical viewpoints, e.g. views from communities, road crossings; and
- Distance from property.

Contrast Rating

The contrast rating, or impacts assessment phase, is undertaken to determine if the VRM Class Objectives are met. The suitability of landscape modification is assessed by comparing the degree of potential contrast from the proposed activity in comparison to the existing contrast created by the existing landscape. This is done by evaluating the level of change to the existing landscape by assessing the line, colour, texture and form, in relation to the visual objectives defined for the area. The following criteria are utilised in defining the DoC:

- **None**: The element contrast is not visible or perceived.
- **Weak**: The element contrast can be seen but does not attract attention.
- **Moderate**: The element contrast begins to attract attention and begins to dominate the characteristic landscape.
- **Strong**: The element contrast demands attention, will not be overlooked, and is dominant in the landscape.

As an example, in a Class I area, the visual objective is to preserve the existing character of the landscape, and the resultant contrast to the existing landscape should not be notable to the casual observer and cannot attract attention. In a Class IV area example, the objective is

to provide for proposed landscape activities which require major modifications of the existing character of the landscape. Based on whether the VRM objectives are met, mitigations, if required, are defined to avoid, reduce or mitigate the proposed landscape modifications so that the visual impact does not detract from the surrounding landscape sense of place.

Photo Montages and 3D Visualisation

As a component in this contrast rating process, visual representation, such as photo montages are vital in large-scale modifications, as this serves to inform I&APs and decision-making authorities of the nature and extent of the impact associated with the proposed project/development. There is an ethical obligation in this process, as visualisation can be misleading if not undertaken ethically. In terms of adhering to standards for ethical representation of landscape modifications, VRM Africa subscribes to the Proposed Interim Code of Ethics for Landscape Visualisation developed by the Collaborative for Advanced Landscape Planning (CALP) (July 2003)*(Sheppard, S.R.J., 2005)*.This code states that professional presenters of realistic landscape visualisations are responsible for promoting full understanding of proposed landscape changes, providing an honest and neutral visual representation of the expected landscape, by seeking to avoid bias in responses and demonstrating the legitimacy of the visualisation process. Presenters of landscape visualisations should adhere to the principles of:

- Access to Information
- Accuracy
- Legitimacy
- Representativeness
- Visual Clarity and Interest

The Code of Ethical Conduct states that the presenter should:

- Demonstrate an appropriate level of qualification and experience.
- Use visualisation tools and media that are appropriate to the purpose.
- Choose the appropriate level of realism.
- Identify, collect and document supporting visual data available for, or used in, the visualisation process.
- Conduct an on-site visual analysis to determine important issues and views.
- Seek community input on viewpoints and landscape issues to address in the visualisations.
- Provide the viewer with a reasonable choice of viewpoints, view directions, view angles, viewing conditions and timeframes appropriate to the area being visualised.
- Estimate and disclose the expected degree of uncertainty, indicating areas and possible visual consequences of the uncertainties.
- Use more than one appropriate presentation mode and means of access for the affected public.
- Present important non-visual information at the same time as the visual presentation, using a neutral delivery.
- Avoid the use, or the appearance of, ‘sales’ techniques or special effects.
- Avoid seeking a particular response from the audience.
- Provide information describing how the visualisation process was conducted and how key decisions were taken *(Sheppard, S.R.J., 2005)*.

9.2 Questionnaires

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

9.3 VRM Terminology

FORM	LINE	COLOUR	TEXTURE
Simple	Horizontal		Smooth
Weak	Vertical		Rough
Strong	Geometric		Fine
Dominant	Angular		Coarse
Flat	Acute		Patchy
Rolling	Parallel		Even
Undulating	Curved	Dark	Uneven
Complex	Wavy	Light	Complex
Plateau	Strong	Mottled	Simple
Ridge	Weak		Stark
Valley	Crisp		Clustered
Plain	Feathered		Diffuse
Steep	Indistinct		Dense
Shallow	Clean		Scattered
Organic	Prominent		Sporadic
Structured	Solid		Consistent

Simple	Basic, composed of few elements	**Organic**	Derived from nature; occurring or developing gradually and naturally
Complex	Complicated; made up of many interrelated parts	**Structure**	Organised; planned and controlled; with definite shape, form, or pattern
Weak	Lacking strength of character	**Regular**	Repeatedly occurring in an ordered fashion
Strong	Bold, definite, having prominence	**Horizontal**	Parallel to the horizon
Dominant	Controlling, influencing the surrounding environment	**Vertical**	Perpendicular to the horizon; upright
Flat	Level and horizontal without any slope; even and smooth without any bumps or hollows	**Geometric**	Consisting of straight lines and simple shapes
Rolling	Progressive and consistent in form, usually rounded	**Angular**	Sharply defined; used to describe an object identified by angles
Undulating	Moving sinuously like waves; wavy in appearance	**Acute**	Less than 90°; used to describe a sharp angle
Plateau	Uniformly elevated flat to gently undulating land bounded on one or more sides by steep slopes	**Parallel**	Relating to or being lines, planes, or curved surfaces that are always the same distance apart and therefore never meet
Ridge	A narrow landform typical of a highpoint or apex; a long narrow hilltop or range of hills	**Curved**	Rounded or bending in shape
Valley	Low-lying area; a long low area of land, often with a river or stream running through it, that is surrounded by higher ground	**Wavy**	Repeatedly curving forming a series of smooth curves that go in one direction and then another
Plain	A flat expanse of land; fairly flat dry land, usually with few trees	**Feathered**	Layered; consisting of many fine parallel strands
Steep	Sloping sharply often to the extent of being almost vertical	**Indistinct**	Vague; lacking clarity or form
Prominent	Noticeable; distinguished, eminent, or well-known	**Patchy**	Irregular and inconsistent;
Solid	Unadulterated or unmixed; made of the same material throughout; uninterrupted	**Even**	Consistent and equal; lacking slope, roughness, and irregularity
Broken	Lacking continuity; having an uneven surface	**Uneven**	Inconsistent and unequal in measurement irregular
Smooth	Consistent in line and form; even textured	**Stark**	Bare and plain; lacking ornament or relieving features
Rough	Bumpy; knobbly; or uneven, coarse in texture	**Clustered**	Densely grouped
Fine	Intricate and refined in nature	**Diffuse**	Spread through; scattered over an area
Coarse	Harsh or rough to the touch; lacking detail	**Diffuse**	To make something less bright or intense

10 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.

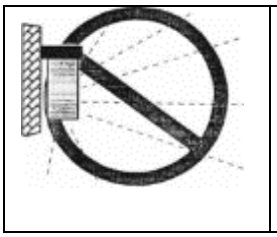
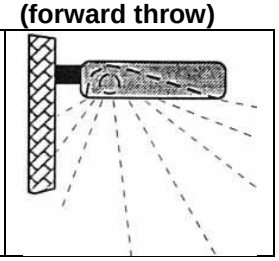
Glare Here’s the basic rule of thumb: If you can see the bright bulb from a distance, it’s a bad light. With a good light, you see lit ground instead of the dazzling bulb. “Glare” is light that beams directly from a bulb into your eye. It hampers the vision of pedestrians, cyclists, and drivers.

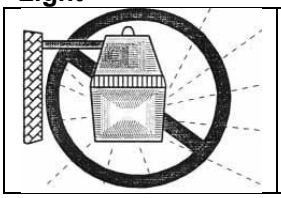
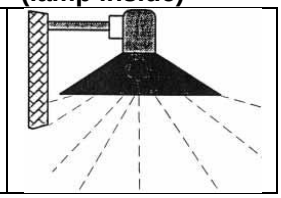
Light Trespass Poor outdoor lighting shines onto neighbours’ properties and into bedroom windows, reducing privacy, hindering sleep, and giving the area an unattractive, trashy look.

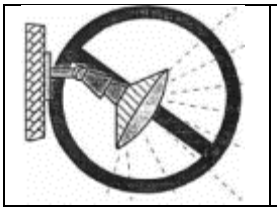
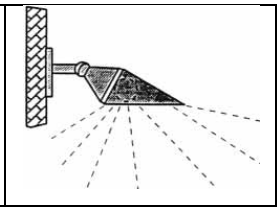
Energy Waste Many outdoor lights waste energy by spilling much of their light where it is not needed, such as up into the sky. This waste results in high operating costs. Each year we waste more than a billion dollars in the United States needlessly lighting the night sky.

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.

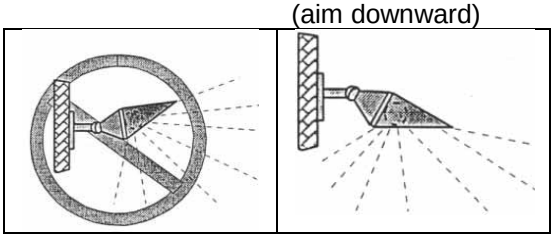
1. Aim lights down. Choose “full-cutoff shielded” fixtures that keep light from going uselessly up or sideways. Full-cutoff fixtures produce minimum glare. They create a pleasant-looking environment. They increase safety because you see illuminated people, cars, and terrain, not dazzling bulbs.

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.

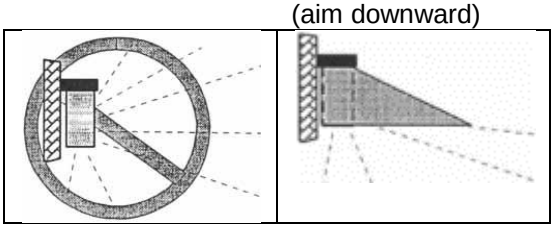
What You Can Do To Modify Existing Fixtures

Change this . . . to this (aim downward)



Floodlight:

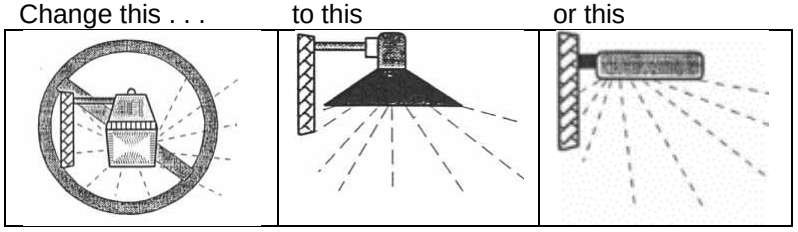
Change this . . . to this (aim downward)



Wall Pack

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!

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.