GEELSTERT SOLAR FACILITY 2 (PTY) LTD

THE PROPOSED GEELSTERT 2– 125MW SOLAR PV FACILITY NEAR AGGENEYS IN THE NORTHERN CAPE PROVINCE

LANDSCAPE & VISUAL IMPACT ASSESSMENT

May 2020

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1 INTRODUCTION

1.1 GENERAL

Geelstert Solar Facility 2 (Pty) Ltd is proposing the development of a solar photovoltaic (PV) facility, known as Geelstert 2, near the town of Aggeneys in the Northern Cape.

In terms of the National Environmental Management Act (NEMA) Act No. 107 of 1998, as amended, the proposed development requires environmental authorisation. Savannah Environmental (Pty) Ltd has been appointed by Geelstert Solar Facility 2 (Pty) as the independent environmental assessment practitioner to undertake the necessary Basic Assessment (BA).

One on the significant potential environmental issues identified during the planning phase of the BA was the visual impact that the facility will have on surrounding areas. This Landscape and Visual Impact (LVIA) Report will therefore provide specialist visual input into the BA Process.

It is the Developer's intention to bid the solar PV facility under the Department of Mineral Resources and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). Ultimately, it is intended for Geelstert 2 to form part of South Africa's renewable energy portfolio, as contemplated in the Integrated Resources Plan (IRP).

A separate Basic Assessment process will be undertaken for the Geelstert Grid Connection to connect Geelstert 2 to the Aggeneis Main Transmission Substation.

1.2 PROJECT LOCATION AND PROPERTY DESCRIPTION

The proposed solar PV facility will be located on the Remaining Extent of Farm Bloemhoek 61. The Surveyor-General 21-digit code for the property is C05300000000006100000.

The site is located approximately 14km east south-east of Aggeneys. **(Map 1: Site Location Map).**

No site alternatives are under consideration for the proposed development.

The project development area within the property is approximately 527ha.

1.3 BACKGROUND OF SPECIALIST

Jon Marshall qualified as a Landscape Architect in 1978. He also has extensive experience of Environmental Impact Assessments in South Africa. He has been involved in Landscape and Visual Impact Assessment (LVIA) over a period of approximately 30 years. He has developed the necessary computer skills to prepare viewshed analysis and three dimensional CAD modelling to illustrate impact assessments. He has undertaken visual impact assessments for tourism development, major buildings, mining projects, industrial development, infrastructure and renewable energy projects. He has also been involved in the preparation of visual guidelines for large scale developments.

A brief Curriculum Vitae outlining relevant projects is included as **Appendix I.**

1.4 BRIEF AND RELEVANT GUIDELINES

The brief is to assess the impact that the proposed development will have on the character of the surrounding landscape as well as the impact on views of affected receptors.

The assessment has been undertaken in accordance with the following guideline documents;

a. The Government of the Western Cape Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (Western Cape Guideline), which is the only local relevant guideline, setting various levels of assessment subject to the nature of the proposed development and surrounding landscape, and

b. The Landscape Institute and Institute of Environmental Management and Assessment (UK) Guidelines for Landscape and Visual Impact Assessment which provides detail of international best practice (UK Guidelines).

Refer to **Appendix II** for the Western Cape Guideline.

Together these documents provide a basis for the level and approach to LVIA as well as the necessary tools for assessment and making an assessment legible to stakeholders.

1.5 LIMITATIONS AND ASSUMPTIONS

The following limitations and assumptions should be noted:

In the assessment tables the subjective judgement as to whether an impact is negative or positive is based on the assumption that most people are likely to prefer views of a natural or a rural landscape than an industrial landscape.

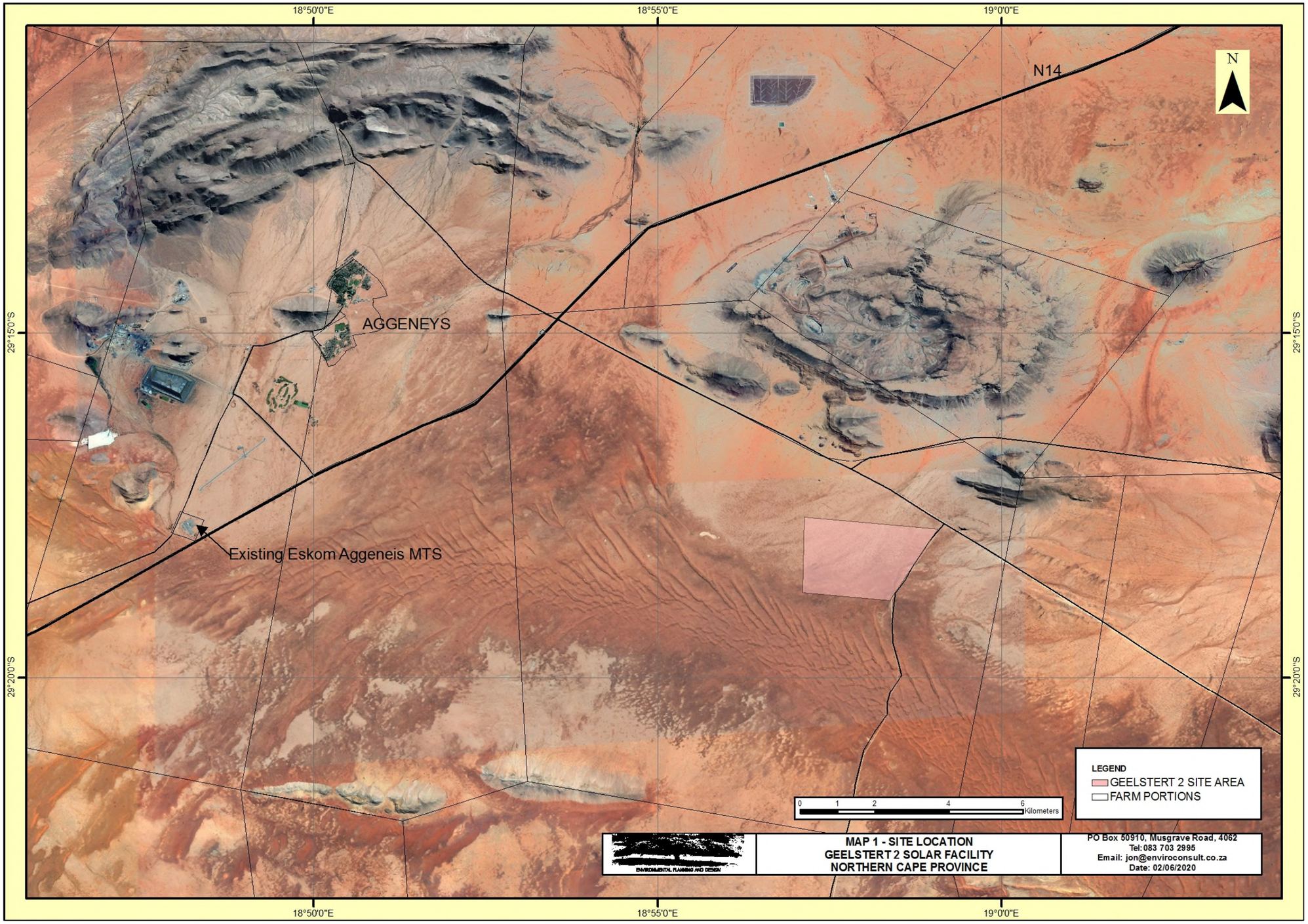
Although no site visit was undertaken specifically for the proposed project, a site visit was previously undertaken for the same study area for immediately adjacent solar PV development (Aggeneys PV 1 and 2 solar PV facilities and the associated grid connection) on the 5th January 2019. Work undertaken during this site visit included confirmation of sensitive receptors, landscape character and the preparation of a comprehensive photo survey of the affected landscape. This work is all relevant to the proposed project.

The timing of photography was planned to ensure that the sun was as far as possible behind the photographer to ensure that as much detail as possible was recorded in the photographs.

The approximate extent of the development visible from each viewpoint, as indicated in Section 5.3, has been approximated by measuring on plan the angle of the view that the development occupies given that each view was taken with a 28mm lens which has an approximate angle of vision of just over 74°. This has been cross referenced with known land marks.

Visibility of the proposed elements has been assessed using Arcview Spatial Analyst. The visibility assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as online mapping.

Calculation of visibility is based purely on the Digital Elevation Model and does not take into account the screening potential of vegetation.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AGGENEYS
Existing Eskom Aggeneis MTS
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Date: 02/06/2020

2. PROJECT DESCRIPTION

2.1 MOTIVATION AND CONTEXT

In response to the Department of Mineral Resources and Energy's (DMRE) Integrated Resources Plan, 2019, the applicant is proposing the establishment of a photovoltaic (PV) solar energy generation facility with a generating capacity of up to 125MW to generate electricity for input into the national grid to augment Eskom's power supply.

The project is proposed to be part of the DMRE's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP).

The area within which the project is proposed has been identified as a key area for renewable energy generation by the South African Department of Environmental Affairs (DEA) in their strategic assessment which identifies eight Renewable Energy Development Zones (REDZ). The area in which this project is located is the Springbok REDZ 8.

The objective of these REDZ is to focus renewable energy projects within the most suitable areas.

2.2 DESCRIPTION

Refer to Map 2, Site Layout

The application is for construction of a commercial photovoltaic (PV) solar energy facility as well as associated infrastructure. The contracted capacity of the proposed solar energy facility will be up to 125 MW.

Geelstert 2 is one of two solar projects (Geelstert 1 and 2) that are currently proposed within the property.

In addition to Geelstert 1 and 2, there are also two proposed solar PV facilities (Aggeneys 1 and 2) on the same property, which have been granted environmental authorisations by the DEA.

Separate assessments have been prepared for the proposed Geelstert 1 PV project and the Geelstert Grid Connection, which will be required to establish a connection from the two (2) solar PV facilities to the existing Aggeneis Main Transmission Substation (MTS).

Both proposed projects will be comprised of the following components:

- Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- Centralised inverter stations or string inverters;
- A temporary laydown area;
- Cabling between the panels, to be laid underground where practical;
- An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- An access road to the development with a maximum width of 8m;

- Internal access roads within the PV panel array area with a maximum width of 5m;
- Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre; and
- Site security fencing.

As indicated above, it is possible that the facilities could either be developed as static, fixed mounted PV systems or tracking PV systems.

Tracking systems can utilise single axis or dual axis trackers. A 'single axis tracker' will track the sun from east to west, while a dual axis tracker will in addition be equipped to account for the seasonal waning of the sun. These systems utilise moving parts and complex technology, including solar irradiation sensors to optimise the exposure of PV panels to sunlight.

Should a tracking system be used this could slightly increase the height of the PV array when maximum tilt of the panels occurs during early morning and late afternoon. This could make a difference in terms of the ZTV analysis. However this difference will be marginal and will not significantly affect the analysis.

Site access will be directly from the un-surfaced road to the east of the site.

2.3 MAIN PROJECT COMPONENTS

A solar energy facility typically uses the following primary components:

2.3.1 Photovoltaic Panels

Solar photovoltaic (PV) panels consist primarily of glass and various semiconductor materials and in a typical solar PV project, will be arranged in rows to form solar arrays. The PV panels are designed to operate continuously for more than 20 years with minimal maintenance required.

2.3.2 Support Structure

The photovoltaic (PV) modules will be mounted on steel support structures. As indicated above, these can either be mounted at a fixed tilt angle, optimised to receive the maximum amount of solar radiation and dependent on the latitude of the proposed facility, or a tracking mechanism with a maximum tilt angle of 60°.

2.3.3 Inverters

The photovoltaic effect produces electricity in direct current (DC). Inverters must be used to convert DC to alternating current (AC) for transmission in the national grid.

A "Power Block" is a set of solar panels that feed a dedicated inverter station inclusive of medium voltage transformer. The size of Power Blocks will depend on the detailed design of the plant and final inverter selection. A Power Block is typically in the range of ± 2 – 4MW. This however could vary according to detailed design.

The PV combining switchgear (PVCS), which is dispersed among the arrays, collects the power from the arrays for transmission to the facility substation.

If centralised inverters are used, these are likely to have a height of approximately 3.0m which is lower than the surrounding PV panel height. This will mean that from outside the site they will be hidden behind solar panels.

2.3.4 Transformer and Grid Connection

The inverters feed AC current to the onsite facility substation which steps it up for transmission of the power to the national grid.

It is understood that the facility will be connected to a facility substation which will have a capacity of either 22 or 33 kV, stepping up to either 132 kV or 220 kV to the collector substation. The collector substation will be connected to the Eskom Aggeneis MTS via a 220kV double-circuit power line. This Aggeneis MTS is located approximately 14.3km to the west of the project boundary.

The on-site facility substation is considered as part of this assessment.

The Geelstert Grid Connection which includes the double-circuit power line of up to 220kV and the Collector Substation will be subject to a separate Basic Assessment process.

2.3.5 Other Infrastructure

Other infrastructure will include a gate house and security, an office building, a control centre, warehouses, a staff canteen, a visitors centre, a staff locker room, a boundary fence, rainwater storage tanks and a permanent access road linking to the adjacent Gamoep Road.

2.3.5 Temporary Works

A temporary lay down area of approximately 5.0ha will be required during the construction phase.

2. 4 PROJECT CONTEXT

The project is proposed within an area that is a focus for both mining and renewable energy developments.

The town of Aggeneys was founded to service the Black Mountain Mine which is an underground base-metalzinc/lead/copper/silver mine and is located to the west of the town.

A major zinc deposit is being mined in the Gamsberg inselberg which is located immediately to the north of the proposed site. This mine is one of the largest mining operations in South Africa[1].

The ore from the mine is transported by truck to the nearest railway line, located 150 km to the south-east along a virtually straight gravel (dirt) road.

Due to the focus for solar energy projects within the REDZ 8 area, there have been numerous projects proposed in this area, some of which have been constructed and authorised. Authorised projects within the vicinity of the study area for Geelstert 2 include the Aggeneys 1 and 2 solar PV facilities (located immediately to the north of the

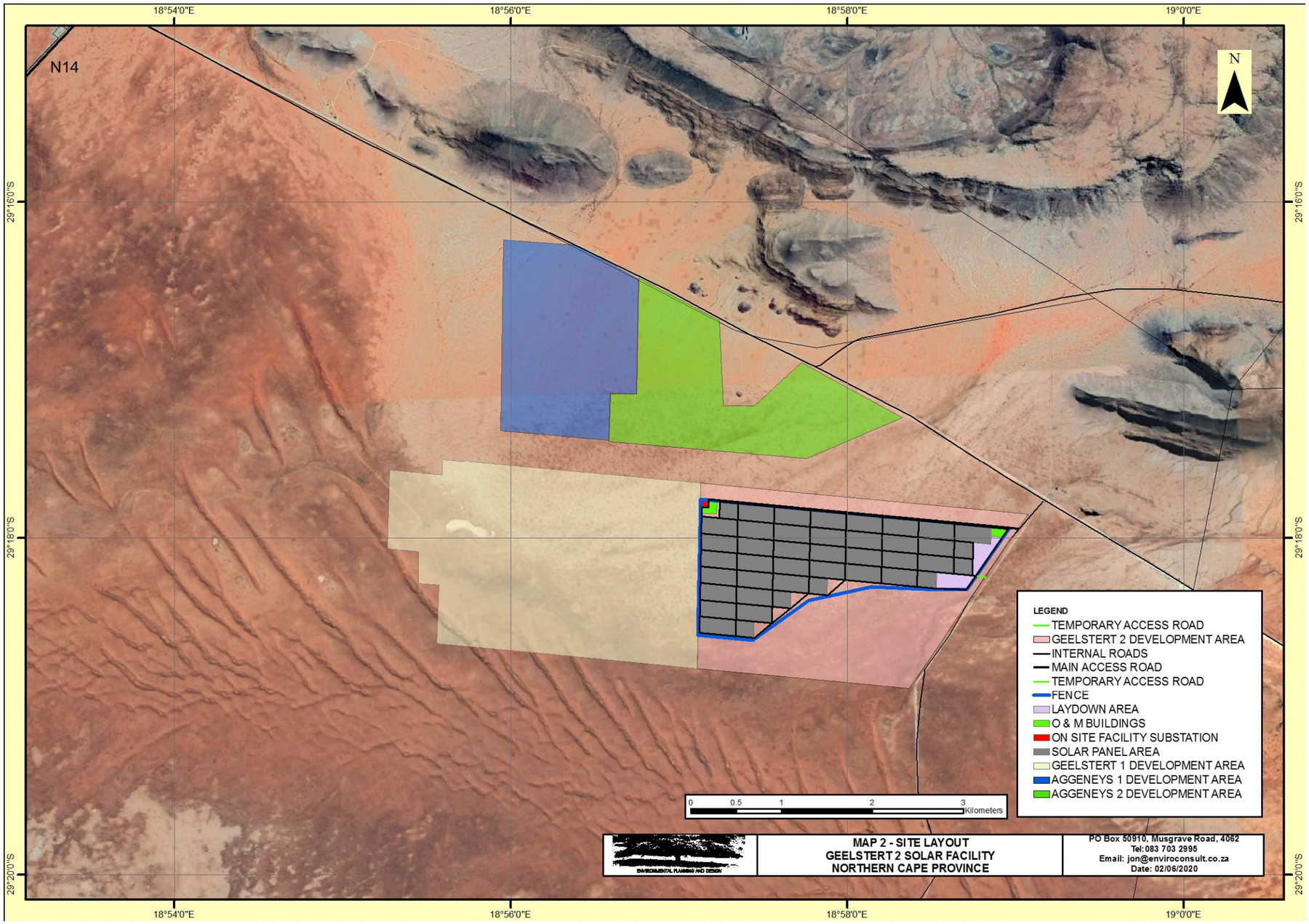
[1] Engineering News, October 2017.

development area for Geelstert 2), which area proposed on the same property, the Remaining Extent of the Farm Bloemhoek 61.

Map 3, Development Context, indicates the properties within 30km of the proposed site on which other renewable energy projects are proposed.

Plate 1. Fixed mounted PV system. Each unit is fixed in place orientated towards the sun's mid-day position

Plate 2, View of tracking PV array with central inverter station in the foreground.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LEGEND
TEMPORARY ACCESS ROAD
GEELSTERT 2 DEVELOPMENT AREA
INTERNAL ROADS
MAIN ACCESS ROAD
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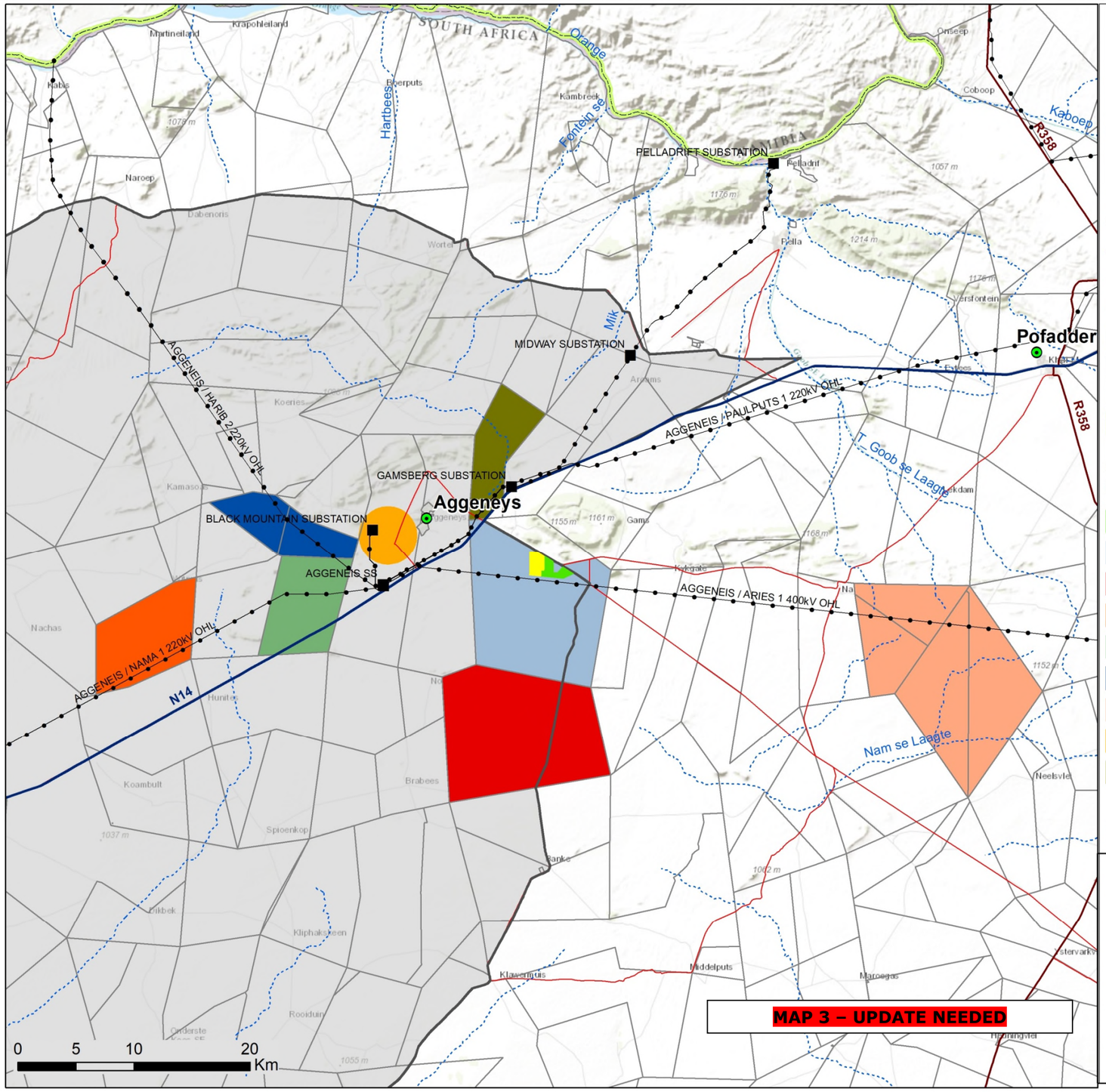
Aggeneys 1 – 100MW Solar Facility and associated infrastructure, Northern Cape

Cumulative Map



Legend

- Town
- Eskom Substation
- Existing Power Line
- National Route
- Non-perennial River
- Main Road
- Aggeneys 1 – 100MW Solar Facility
- Springbok REDZ 8
- Farm Portion
- National Boundary

Other known renewable energy facilities:

(Illustrations based on affected properties and not project site)

- ABO Wind Aggeneys 2 (1x 100MW PV) - EIA In Process
- Solar Capital Blomhoek (16 x 75MW PV)
- Biotherm Enamandla (4 x 75MW PV) & Letsoai (2 x 150MW CSP)
- Building Energy Sol Invictus (2 x 150MW PV & 4x 75MW)
- Sato Zuurwater (5 x 75MW PV & 1x 60MW PV)
- Boesmanland Solar (1 x 75MW PV)
- Mainstream Solar (1 x 250MW PV/CPV)
- Aurora Power Solution Black Mountain Mine Solar (1 x 19MW PV)
- Biotherm Aggeneys PV Solar Energy Facility (1x 40MW PV) PB4 - Under Construction

Scale: 1:321 345
Projection: LO19
Map Ref: Aggeneys PV 1 - Cumualtive Map - 27.03.19

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3 DESCRIPTION OF RECEIVING ENVIRONMENT AND RECEPTORS

3.1 LANDSCAPE CHARACTER

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another"[2].

The proposed site is located within the floor of a broad valley system that generally falls from the east to the west towards the Orange River. Beside the Orange River there is a near continuous range of rocky hills.

The landscape surrounding the site is arid, comprising relatively flat drainage plains with inselbergs or rocky outliers such as the Aggeneys Mountains, Black Mountain and Gamsberg rising above wide plains.

Areas to the south of the proposed site appear relatively natural, whilst to the north, east and west there are extensive areas of mining. The small town of Aggeneys lies approximately 8.8km west north-west of the proposed site.

Landscape Character is a composite of a number of influencing factors including:

- Landform and drainage;
- Nature and density of development; and
- Vegetation patterns.

3.1.1 Landform and Drainage

The site is located south of the Kalahari Basin. The landscape is sparsely vegetated and covered by pale red aeolian sands of the Quaternary Gordonia Formation (Kalahari Group)[3].

The Orange River flows from north-west to south-east approximately 37 km north of the proposed development site. The Orange River is a major regional river system that has its source in the mountains on the western edge of Lesotho, is joined by the Vaal and flows into the Atlantic Ocean on the west coast where it forms the border between South Africa and Namibia.

The site is located within a broad valley that drains towards the Orange River. The site is set at an elevation of 840 – 850 m above mean sea level (amsl). Most of the affected area comprises fairly flat-lying terrain between inselbergs. The inselbergs in the vicinity of the site are concentrated to the north, north-west, and north-east of the project area where they form the upper valley slopes and ridgelines. To the north and north-west, a large rocky outcrop (Gamsberg) rises to approximately 1100 m amsl.

There are also two isolated areas of rocky outcrop within the valley floor to the south of the proposed site.

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[22] UK Guidelines

[3] Almond

This landform is likely to have a number of implications for visibility of the proposed development:

- Given the relatively low nature of the proposed development, the small changes in elevation within the generally flat landscape could help provide screening of the proposed facility or could open up views over the proposed arrays; and
- The scattered inselbergs and particularly the Gamsberg will provide screening for the proposed development.

Refer to Map 4 for analysis of the landform and drainage.

3.1.2 Nature of Development and Land Uses

Landcover information has been extracted from the latest (2005) SANBI landcover survey. Landcover can be divided into the following types:

- **Natural Area**; the main landcover type surrounding the proposed development is natural area. This area is likely to be used largely for stock rearing and low intensity grazing. As this has not resulted in mass clearance of vegetation, the majority of the area retains a relatively natural appearance. Situated within this landcover are occasional homesteads that are scattered sparsely throughout the area. The low density of development is no doubt a product of the low agricultural potential / carrying capacity of the area.
- **Urban development** in the small town of Aggeneys, includes housing, sports grounds and commercial uses. Particularly within the well-established sections of this settlement, streets are relatively broad and are lined with street trees. Gardens generally have mature woody ornamental plants. The density of development and the extent of vegetation is likely to screen most external views from the urban area.
- **Degraded areas** are also evident. From reference to online aerial photography, these appear to be associated with mining.
- **Mining developments** including the Black Mountain Mine and the Gamsberg Mine are underground and open cast mining operations located to the west and north of the proposed development, respectively. The Black Mountain Mine is located directly west of the town of Aggeneys.

Refer to Map 5 for Landcover.

3.1.3 Vegetation Patterns

The majority of the landscape is covered by low sparse grass and herbaceous vegetation. During much of the year this vegetation lies dormant and is brown due to the lack of rainfall. However, during summer and autumn rains, the landscape rapidly becomes green and colourful, as plants use this period to regenerate and reproduce.

Mucina and Rutherford[4] indicate that the natural vegetation types within the study area include:

- Bushmanland Sandy Grassland
- Bushmanland Arid Grassland
- Bushmanland Inselberg Shrubland; and
- Aggeneys Gravel Vygieveld

[4] Vegetation of South Africa, Lesotho and Swaziland,2006

Vegetation and landscape features associated with **Bushmanland Sandy Grassland** are described as dense, sandy grassland plains with dominating white grasses (*Stipagrostis, Schmidtia*)and abundant drought-resistant shrubs. After rainy winters rich displays of ephemeral spring flora (*Grielum humifusum, Gazania lichtensteinii*) can occur.

Vegetation and landscape features associated with **Bushmanland Arid Grassland** are described as extensive to irregular plains on a slightly sloping plateau sparsely vegetated by grassland dominated by white grasses (*Stipagrostis* species) giving this vegetation type the character of semi desert 'steppe'. In places, low shrubs of *Salsola* change the vegetation structure. In years of abundant rainfall rich displays of annual herbs can be expected.

Vegetation and landscape features associated with **Bushmanland Inselberg Shrubland** are described as Shrubland with both succulent (*Aizoaceae, Asphodelaceae, Crassulaceae, Didiereaceae, Euphorbiaceae, Zygophyllaceae*) as well as non-succulent (mainly Asteraceae) elements and with sparse grassy undergrowth (*Aristida, Eragrostis, Stipagrostis*) on steep slopes of the Inselbergs.

Vegetation and landscape features associated with **Aggeneys Gravel Vygieveld** are described as flat or slightly sloping plains (appearing as distinctly white surface quartz layers against the background of red sand or reddish soil) and supporting sparse, low-growing vegetation dominated by small to dwarf leaf-succulents of the families *Aizoaceae, Crassulaceae, Euphorbiaceae, Portulacaceae and Zygophyllaceae*, with some perennial component. The resurrection grass *Eragrostis nindensis*is the dominant perennial graminoid.

Whilst there are obvious botanical differences, in terms of visual considerations all vegetation types are relatively low in nature and are comprised largely of grass species. They are therefore unlikely to provide significant Visual Absorption Capacity (VAC) and will contribute to an open landscape character within which long distance views of the solar PV facility and associated infrastructure are possible.

The uniformity of the vegetation cover and its transformation after rainfall events is a major constituent of the current landscape. Major disturbance of this could have implications for landscape character.

In addition to the natural vegetation types highlighted above, taller woody vegetation occurs in limited areas including:

- The town of Aggeneys where dense tree and shrub planting has occurred around houses and on the town's golf course;
- Homesteads around which trees and tall woody vegetation has been allowed to develop. This vegetation often contrasts with the surrounding barren landscape making the location of homesteads obvious from a distance. It can also provide a degree of shelter and screening for the immediate area around buildings; and
- Water points for livestock that are spotted around local farms. Water is generally provided by wind pumps to a surface trough for animals. The availability of water has allowed trees and tall woody vegetation to develop. This also has the benefit of providing shelter and shade for livestock. The contrast between this vegetation and surrounding areas makes the location of water points obvious from a distance.

Refer to Map 6 for Vegetation Types.

3.1.4 Landscape Character Areas and, Visual Absorption Capacity (VAC)

Landscape Character Areas (LCAs) are defined by the UK Guidelines as "single unique areas which are the discrete geographical areas of a particular landscape type"[5].

Visual Absorption Capacity (VAC) is defined as "the landscape's ability to absorb physical changes without transformation in its visual character and quality"[6].

Where elements that contrast with existing landscape character are proposed, VAC is dependent on elements such as landform, vegetation and other development to provide screening of a new element.

The scale and texture of a landscape is also critical in providing VAC; for example, a new large scale industrial development located within a rural small scale field pattern is likely to be all the more obvious due to its scale.

The over-riding character of the area is comprised of wide open plains and shallow valleys that are clothed with natural low grasslands and backed by dramatic ridgelines that are made up of inselbergs and the continuous rocky ridgeline beside the Orange River.

In areas, mining and other development overlaid onto this natural pattern has further influenced landscape character. Particularly around Aggeneys, the degree and scale of development is such that it is has a visual dominance within its relatively simplistic natural setting.

In terms of the definition of LCAs, the inselbergs and the rocky ridgeline that borders the southern side of the Orange River provide a large degree of visual containment that structures the way in which the landscape is experienced in the area.

The Gamsberg, consisting of a large group of inselbergs to the north-west and west of Aggeneys and minor inselbergs to the south west of the settlement all help to limit views of the developed sections of the landscape from those directions.

To the west, views of the developed areas around Aggeneys are largely limited by distance and limitations of human vision.

The tallest elements that are likely to be visible over the longest distance include existing electrical infrastructure and mine dumps, including a dump on the northern side of the Gamsberg where spoil is effectively dumped from the top of the landform. This currently forms an obvious addition to the landform as the dump is terraced and is viewed largely in profile from the N14. Currently mining of the Gamsberg is focused on the northern edge and within the centre of the landform. There is no sign of it extending to the southern side of the escarpment facing towards the proposed site. This section of the landform still appears relatively natural.

From the east, the most obvious mine dump (waste rock dump) is located to the north of the N14 and approximately 12.5km to the west of the proposed site. This dump is

[5] UK Guidelines

[6] Western Cape Guidelines

approximately 20m high meaning that in a flat landscape, it could be visible for up to approximately 16km.

The influence of urban development and mining is therefore limited to the north, west and south by landform and to the east by distance. Outside of these limitations, the landscape is generally experienced as relatively natural although, occasional homesteads, roads and power lines are obvious.

Landscape Character Areas therefore include:

- The **Developed Landscape Character Area** around Aggeneys, that is defined by surrounding inselbergs and by distance; and
- The **Rural Landscape Character Area** that surrounds the developed area.

Rural Landscape Character Area; this LCA is largely protected from the influence of major development around Aggeneys by landform.

Throughout this LCA, VAC of the landscape is only likely to be provided by landform which includes minor ridgelines and isolated inselbergs. The inselbergs are often located close to and across the line of the N14. This creates the feeling for the traveller along the road of passing through a series of discrete landscape areas with each one being enclosed by the tall rocky landforms.

Within the discrete landscape areas indicated above, any structure that extends above the grass / herbaceous vegetation is likely to be obvious. The higher and bulkier a structure is, the more obvious it is likely to be in the landscape. Bright colours are also likely to exacerbate visibility within a landscape that for much of the year is mono-tonal.

Developed Landscape Character Area; this LCA is largely enclosed by landform consisting of the Gamsberg and the inselbergs to the north, west and south of Aggeneys.

Whilst it is possible that minor undulations in topography could provide a degree of screening, due to the relatively flat topography between inselbergs, only the lowest development is likely to be afforded any degree of screening.

However, views of new development within the LCA are likely to be limited by the same landform features that largely define its extent. The exception to this is likely to include any development that occurs towards the eastern extremity of the LCA. Development in this area is likely to extend the influence of development into the Rural LCA.

The LCAs are indicated on **Map 7, Landscape Character Areas.**

As indicated in Section 2.1, in the near future, the potential implementation of several renewable energy projects is likely to influence this landscape pattern. These projects are likely to create a cohesive character area that is largely driven by development.

Plate 3, Inselbergs are often located close to and across the line of the N14. This creates the feeling for the traveller along the road of passing through a series of discrete landscape areas with each one being enclosed by the tall rocky landforms.

Plate 4, Mine dump on the north west facing slope of the Gamsberg.

3.2 LANDSCAPE QUALITY AND IMPORTANCE

3.2.1 General.

There are currently no statutory protected areas in the study area; however, the Vedanta Black Mountain Mine has a conservation agreement covering the approximately 23 000 ha of mine holdings around Aggeneys. This is a significant area for biodiversity and a very important private conservation initiative. This area is indicated on **Map 6**.

The entire study area is located within the Riemvasmaak Community Conservancy (RCC). This conservancy is 74 000 ha in extent and is overseen by local Nama and Xhosa tribes. The RCC is reported to have been one of post-Apartheid South Africa's first land restitution projects. It belongs to the local Nama and Xhosa descendants of the people who were resettled from the area in 1974.

The area is therefore highly important to local communities and for this reason it is critical to ensure that future potential use of the land for agriculture and tourism is not compromised by development.

The area is also a corridor for tourism related traffic using the N14 for access from the south-west into the Kalahari region.

3.2.2 Rural Landscape Character Area.

This LCA is primarily important as a productive agricultural area.

The low intensity grazing regimes that appear to be adopted has also resulted in a relatively natural outlook that is typical of the area. The low density of development combines with relatively pristine vegetation to provide an outlook that is perhaps close to wilderness. The only elements that currently detract from this natural appearance are the occasional farmsteads, wind pumps, roads, overhead power lines and sub stations. As the viewer moves away from existing infrastructure, the natural character of the area becomes stronger. This natural outlook no doubt helps to contribute to the general attraction of the area for local and regional tourism.

The inselbergs provide structure and focal points within the landscape. When travelling through the landscape, they compartmentalise the valley floor, foreshortening views and screening adjacent areas.

It is the contrast between what appears to be a planar natural valley floor and dramatic steep land forms as well as this compartmentalisation provided by the inselbergs that maintains the interest of the viewer in the dramatic and ever changing scene.

3.2.3 Developed Landscape Character Area.

This LCA is primarily important as a productive mining area as well as a settlement area which largely accommodates people that are working at the mine.

Whilst mining development is highly obvious within the LCA from public areas and particularly from the N14, the various elements are seen within the context of natural vegetation and against the backdrop that is provided by the inselbergs. This is important as it provides visual continuity with the surrounding rural area.

3.2.4 Future Landscape Change.

The properties on which renewable energy projects are currently proposed have been overlaid onto **Map 7** which indicates the likely visual influence of proposed Aggeneys 1 and 2 projects together with the properties on which renewable energy projects are

proposed. This indicates that renewable energy projects are likely to significantly influence landscape character change around Aggeneys, should all proposed projects be developed. This change is likely to affect both the Developed and the Rural LCAs.

It is noted in 3.1.4 that the northern side of the Gamsberg escarpment has been heavily modified by mining operations. Because of this, mining operations influence the landscape character of Aggeneys and the N14 corridor. However, the southern side of the escarpment that faces on to the proposed site remains relatively natural. From reference to the Environmental Management Programme for the mine[7] it is obvious that the southern edge of the escarpment will remain largely undisturbed. However, the Waste Rock Dump will wrap around the western extremity of the landform and will modify the western end of the southern escarpment face. Refer to **Appendix III**.

3.3 VISUAL RECEPTORS

3.3.1 Definition

Visual Receptors are defined as "individuals and / or defined groups of people who have the potential to be affected by the proposal"[8].

It is also possible that an area might be sensitive due to an existing use. The nature of an outlook is generally more critical to areas that are associated with recreation, tourism and in areas where outlook is critical to land values.

3.3.2 Possible visual receptors and sensitivities

This section is intended to highlight possible visual receptors within the landscape which due to use could be sensitive to landscape change. They include;

Area Receptors

Within the vicinity of the proposed project, the only potential area receptor is the urban area of Aggeneys. Areas associated with this use are likely to be the most sensitive to possible changes in outlook associated with the proposed development. However, due to the already highly industrialised landscape around the settlement associated with the mining in the area, it is unlikely that residents would object unless the proposed project is likely to significantly increase existing impacts.

Linear Receptors

Linear receptors include:

- The N14 that at its closest runs approximately 8.0 km to the north west of the proposed project area. Because this route carries a high proportion of recreational and tourism related traffic it is considered sensitive to potential change in outlook.
- An un-surfaced local road that runs roughly parallel to and at its closest, approximately 0.4km from the northern boundary of the proposed site. This road joins the N14 approximately 8.0km to the north west of the site. Whilst it is un-surfaced, it serves as the only east – west route in the region, linking a number of regional routes all of which run in a general north – south direction. This road runs for more than 200 km. In this distance there appear to be few settlements or farmsteads that are served by it. It is likely that it is used mainly by local people and mining operators. However it is also likely to be used by more

[7] ERM
[8] UK Guidelines

adventure minded tourists. This local road is however not considered to be a scenic route.

- A second un-surfaced road runs immediately adjacent to the eastern boundary of the site. This road is also mainly used by local people and mine operators.

Point Receptors

Four small buildings have been identified within the Approximate Limit of Visibility of the proposed project. These include two homesteads and two minor industrial operations. The homesteads are likely to be used by local stock farmers who probably will be more concerned with the productivity of the land rather than the outlook. Should either of these homesteads be used for tourism related activities, this will increase sensitivity to landscape change.

The closest homestead is approximately 0.4km from the proposed project.

Visual receptors were ground truthed during the site visit. The main receptors that have been identified are indicated on **Map 7(Landscape Character Areas)**.

LANDSCAPE CHARACTER AREAS

Plate 5, Rural LCA - This LCA appears relatively natural with indigenous grass covering the relatively flat topography backed by steep inselbergs and few man-made elements visible. Thearea is largely used for low intensity livestock grazing.

Plate 6, Developed LCA - This LCA is largely enclosed by the inselbergs to the north, west and east of Aggeneys. Mining infrastructure and settlement is obvious within the context of natural vegetation.

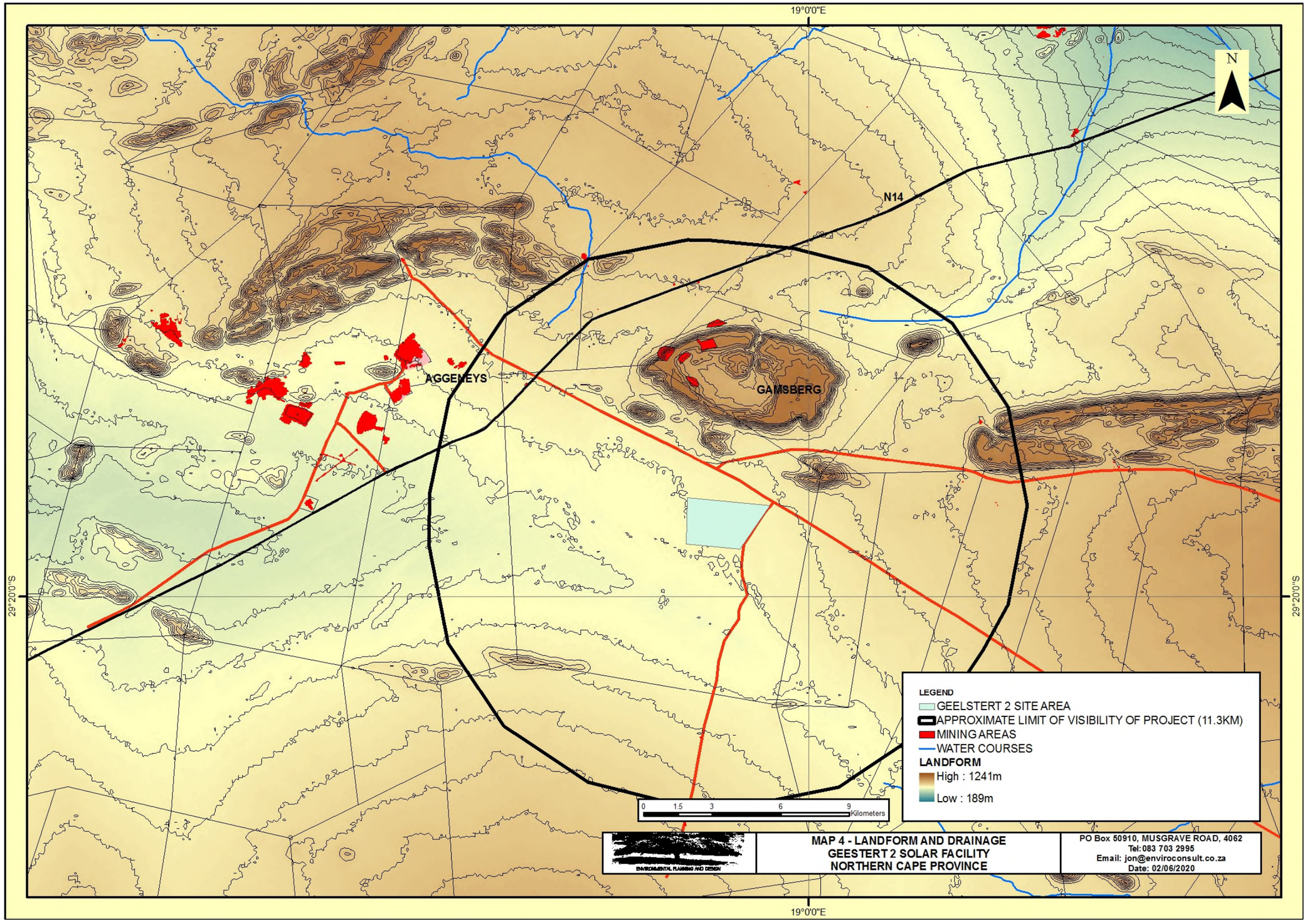
SENSITIVE RECEIVERS

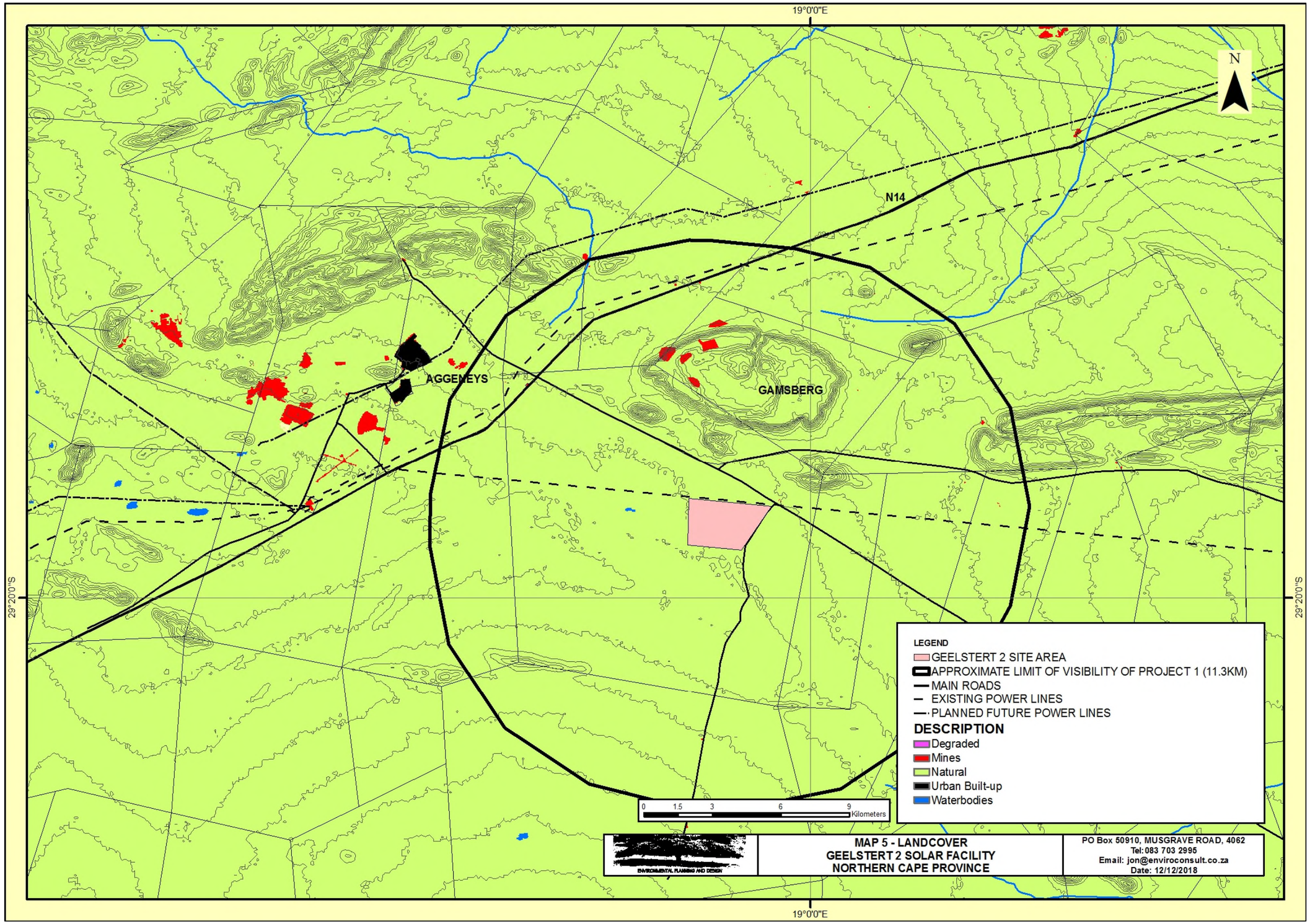
Plate 7, The urban edge of Aggeneys. The density of vegetation and development means that views are largely inward looking.

Plate 8, Isolated Homesteads. These are largely related to the agricultural use of the land.

Plate 9, The N14. This is a major regional route that runs to the west of the proposed project area. It is an important regional tourism route.

Plate 10, Local un-surfaced roads. Classified as a local roads that are likely to largely be used by local people and mining operators.


19°0'0"E
N
N14
AGGENEYS
GAMSBERG
29°20'0"S
LEGEND
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY OF PROJECT (11.3KM)
MINING AREAS
WATER COURSES
LANDFORM
High : 1241m
Low : 189m
0 1.5 3 6 9 Kilometers
ENVIRONMENTAL PLANNING AND DESIGN
MAP 4 - LANDFORM AND DRAINAGE
GEESTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel:083 703 2995
Email: jon@enviroconsult.co.za
Date: 02/06/2020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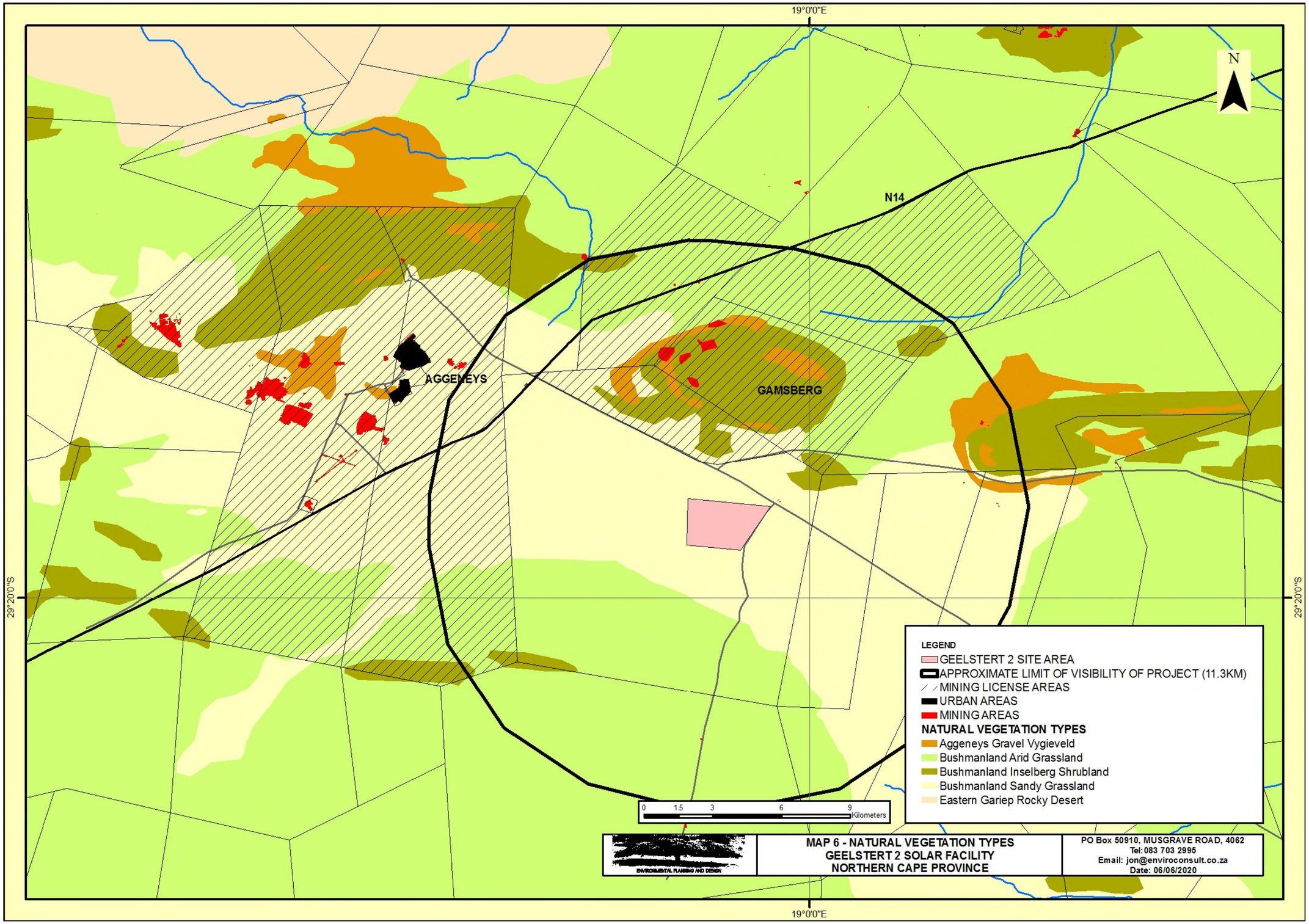
N14
AGGENEYS
GAMSBERG
29°20'0"S
LEGEND
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY OF PROJECT 1 (11.3KM)
MAIN ROADS
EXISTING POWER LINES
PLANNED FUTURE POWER LINES
DESCRIPTION
Degraded
Mines
Natural
Urban Built-up
Waterbodies
0 1.5 3 6 9 Kilometers
MAP 5 - LANDCOVER
GEELSTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 12/12/2018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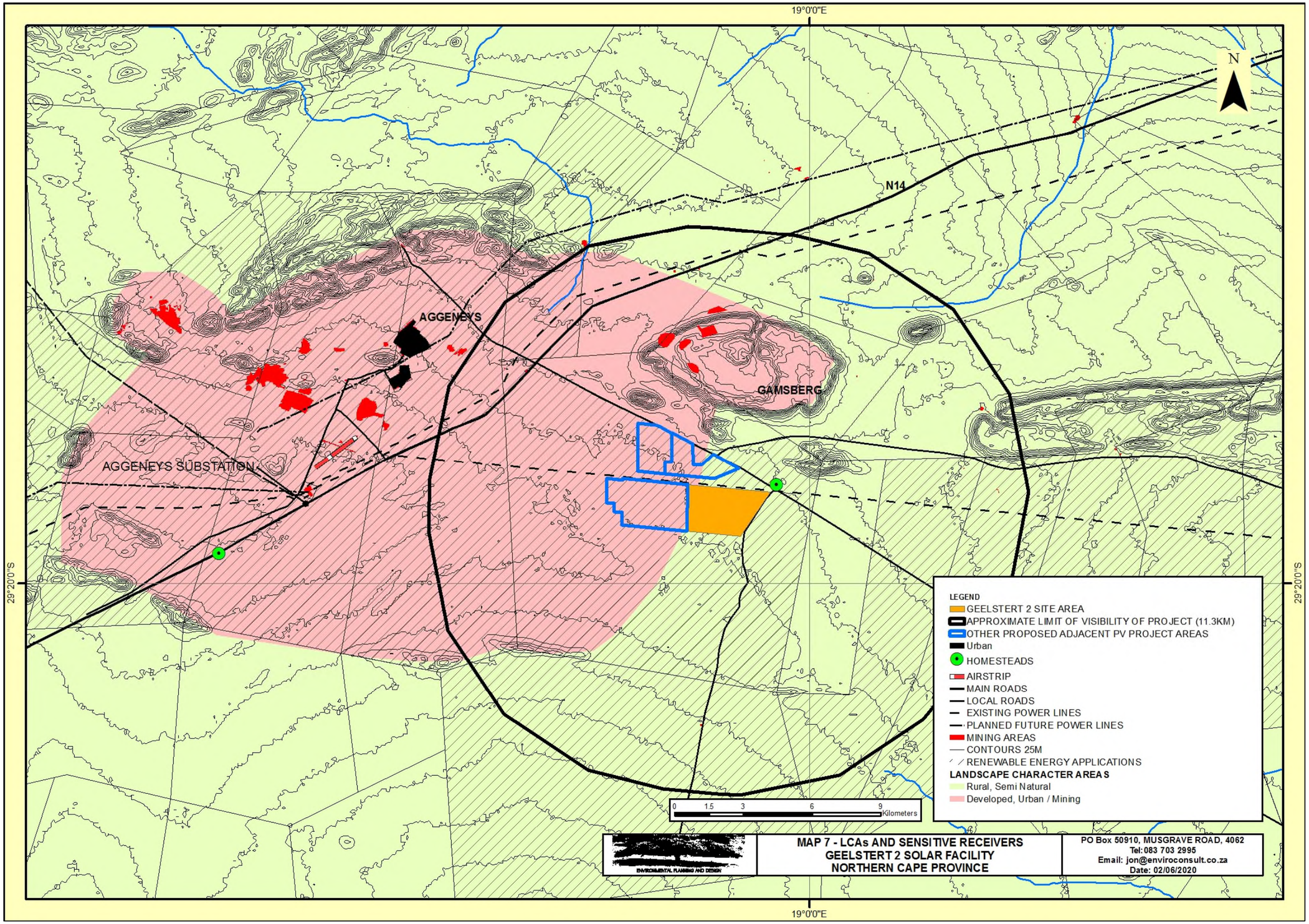
N14
AGGENEYS
GAMSBERG
29°20'0"S
LEGEND
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY OF PROJECT (11.3KM)
MINING LICENSE AREAS
URBAN AREAS
MINING AREAS
NATURAL VEGETATION TYPES
Aggeneys Gravel Vygieveld
Bushmanland Arid Grassland
Bushmanland Inselberg Shrubland
Bushmanland Sandy Grassland
Eastern Gariep Rocky Desert
0 1.5 3 6 9 Kilometers
ENVIRONMENTAL PLANNING AND DESIGN
MAP 6 - NATURAL VEGETATION TYPES
GEELSTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 06/06/2020


19°0'0"E
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N14
AGGENEYS
GAMSBERG
AGGENEYS SUBSTATION
29°20'0"S
LEGEND
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY OF PROJECT (11.3KM)
OTHER PROPOSED ADJACENT PV PROJECT AREAS
Urban
HOMESTEADS
AIRSTRIP
MAIN ROADS
LOCAL ROADS
EXISTING POWER LINES
PLANNED FUTURE POWER LINES
MINING AREAS
CONTOURS 25M
RENEWABLE ENERGY APPLICATIONS
LANDSCAPE CHARACTER AREAS
Rural, Semi Natural
Developed, Urban / Mining
0 1.5 3 6 9 Kilometers
MAP 7 - LCAs AND SENSITIVE RECEIVERS
GEELSTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 02/06/2020

4 THE NATURE OF POTENTIAL VISUAL IMPACTS

4.1 GENERAL

Impacts could include general degradation of the relatively natural landscape in which the development is proposed, as well as change of view for affected people and / or activities;

a. General landscape change or degradation. This is particularly important for protected areas where the landscape character might be deemed to be exceptional or rare. However it can also be important in non-protected areas particularly where landscape character is critical to a specific broad scale use such as tourism areas or for general enjoyment of an area. This is generally assessed by the breaking down of a landscape into components that make up the overall character and understanding how proposed elements may change the balance of the various elements that are visible. The height, mass, form and colour of new elements all help to make new elements more or less obvious as does the structure of an existing landscape which can provide screening ability or texture that helps to assimilate new elements.
b. Change in specific views for specific receptors for which the character of a view may be important for a specific use or enjoyment of the area.
    - Visual intrusion is a change in a view of a landscape that reduces the quality of the view. This can be a highly subjective judgement. Subjectivity has however been removed as far as is possible by classifying the landscape character of each area and providing a description of the change in the landscape that will occur due to the proposed development. The subjective part of the assessment is to define whether the impact is negative or positive. Again to make the assessment as objective as possible, the judgement is based on the level of dependency of the use in question on existing landscape characteristics.
    - Visual obstruction is the blocking of views or foreshortening of views. This can generally be measured in terms of extent.

Due to the nature of the proposed development, visual impacts for receptors are likely to relate to visual intrusion.

4.2 TYPICAL VISUAL EFFECTS ASSOCIATED WITH PV PROJECTS

4.2.1 Timing of Impacts

During the construction phase, it is expected that traffic will be slightly higher than normal as trucks will be required to transport materials and equipment such as PV panels and frames to the site.

Site preparation will generally include the following activities:

- vegetation clearance will be comprised of brush cutting only, no complete clearance will be undertaken;
- levelling and grading of areas where the array will be sited would normally occur, the assessment indicates that the land is relatively flat so only minor grading will be required under exceptional circumstances;

- levelling of hard-standing areas, e.g. for temporary lay down and storage areas, as indicated above only minor grading is likely to be necessary;
- erection of site fencing; and
- construction of a temporary construction camp which will occur within a lay down area within the overall site.

These activities are only likely to be visible from the immediate vicinity of the site.

As the site is developed, concrete bases will be constructed (if required), the support structures will then be assembled and PV panels attached, ancillary structures and minor buildings will also be constructed.

The development will therefore appear on a progressive basis in the landscape, however once the concrete bases are constructed, the structures are likely to be assembled rapidly.

The construction phase is programmed to take approximately 12-18 months.

By the end of the construction process, the array will be assembled, minor buildings constructed and the full visual impact of the project will be experienced.

The operational phase is highly unlikely to result in any significant additional impact. It is possible however, that crews will be visible from time to time undertaking maintenance within the facility.

The main visible elements therefore are likely to include:

1. The solar array including minor buildings and structures located within a fence line with an associated on-site substation that is slightly taller than surrounding elements; and

2. Possible night time lighting which may be required for operations, security and maintenance purposes.

4.2.2 The likely Nature of Views of the Proposed Solar Array

The proposed project layout is indicated on **Map 2**. If a fixed array is used then the PV panels will be mounted on continuous mounting structures and orientated to face north.

Continuous mounting structures aligned in rows are generally used when the PV panels are fixed tilt and are set at a certain angle and direction to maximise the average efficiency during the day.

From areas to the north a solar array, whether constructed on individual supports or continuous rows, the PV array is likely to appear as a relatively continuous structure in the landscape.

A single-axis tracking array is constructed in rows where the PV panels face east in the morning and turn to west towards late afternoon. Each row is divided into units that can be manoeuvred by actuators to follow the solar azimuth and altitude. Visually, this results in greater variety in the nature of the view of the facility with the dark face of the panels being more obvious from the east in the morning and the west in the afternoon. This also means that the outline of the array appears as a jagged edge particularly from close views and the supporting structure may also be more or less exposed depending on the time of day.

The nature of the impact is also likely to vary with location and elevation;

- If the array is located on a hillside or if it is viewed from a higher level, the rows of PV units are likely to visually combine and will be read as a single unit. From a distance this results in a PV array having a similar appearance as a large industrial structure when viewed from above. It should be noted that the proposed project is unlikely to be viewed from a higher elevation due to the fact that the inselbergs are located on private land and so this type of view will not be possible for the majority of people;
- From the north and if the project is viewed from a similar level, the front row of PV units associated with a fixed tilt system will be seen in elevation. For a single axis tracking array the elevation will move from east, through north, to west during the day. This is likely to result in the project being seen as a continuous dark line in the landscape possibly with slightly higher elements such as the on-site substation extending above the line. How obvious the dark line is, is likely to be dependent on the distance of the viewer from the project as well as the extent to which the view of the elevation is broken by other elements such as vegetation and landform.
- From the south, east and west the dark face of the PV units associated with a fixed tilt system is not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. With distance however, the shadow cast by the structures is likely to be more obvious and the facility will probably appear much as views of the northern face, a long dark structure. If the sun should reflect of the rear face of PV panels which is most likely during early morning and late afternoon however, it is likely that the light coloured face of the rear of the panels will make the array obvious. For a single axis tracking array this effect will move from the west, through north to the east during the day;
- If the landscape does not have significant Visual Absorption Capacity (VAC), because of the contrast in colour with the surrounding landscape, the array could be visible to the limit of visibility. Subject to the colour and reflectivity of the underside of the PV units and supporting structure, it is possible that a similar level of impact could also be experienced from the south, east and west. It should be noted that the VAC of the landscape surrounding the proposed development is largely dependent on minor undulations in the surrounding landform.
- Mitigation or screening of views is possible at least from close views. This can be achieved either by earthworks and berms by constructing an opaque screen fence and/or planting. From a distance and particularly from elevated view points, mitigation is likely to be less feasible as the height of any screen is likely to cast shadow over the PV units.
- In addition to the way that a solar array may change a landscape, the nuisance factor associated with resulting glare is often raised by stakeholders on similar projects. The front faces of PV units, however, are designed to absorb as much energy as possible. It needs to be borne in mind that the key factor of reflectance is the position of PV modules relative to the sun. A panel that absorbs 90% of direct sunlight may reflect up to 60% when not directly facing the sun. This situation is common for low-tilt panels during sunset and sunrise. **The often repeated claim that PV panels reflect less than 5% of sunlight only holds true when the panels directly face the sun. This means that glare from the front face of PV panels is likely to be less problematic for tracking systems where the angle of panels is optimised throughout the day and**

is more likely for a fixed array particularly during the early morning and late evening when the sun is lowest.

The site and surrounding area is relatively flat. This means that the array is likely to be viewed largely in elevation or at a low level oblique angle. With the exception of adjacent inselbergs, which are all located on private property, there will be no areas from which an overview of the facility will be possible.

Because the proposed PV panels will be set at a maximum height of 3.5m, it is likely that minor buildings, stored equipment within lay down areas and inverters will largely be screened by the array or will be seen below the level of the PV panels.

A new solar array has been developed adjacent to Upington Airport. This array has been developed in two sections on either side of the airport runway. It is somewhat smaller than the subject project, covering approximately 25ha and the longest edge of the array being approximately 500m long. The PV panels are mounted on fixed frames approximately 2m high. Despite obvious differences compared with the proposed project, it does illustrate the effect of distance in mitigating the visibility of the solid line of solar panels.

Plate 11 indicates the location of the existing array at the Upington Airport. **Plates 12, 13 and 14**, illustrate how the array is seen from distances of approximately 700m, 1500m and 5000m respectively.

The following effects are noted;

- From 700m the array is clearly visible. For the same effect relative to a 3.5m high array, this distance will be approximately 1225m.
- From 1500m, the array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is visible but might be missed by a casual viewer. For the same effect relative to a 3.5m high array, this distance will be approximately 2625m.
- From 5000m, the line of panels is indistinguishable from the horizon. For the same effect relative to a 3.5m high array, this distance will be approximately 8750m.

A single axis tracking system could slightly increase the height of structures particularly during late afternoon and early morning when the units are tilted to their fullest extent.

Plate 11, Existing solar arrays at the Upington Airport as seen from the air

Plate 12, Existing array seenin a flat landscape from approximately 700m. The array is clearly visible.

Plate 13, Existing array seenin a flat landscape from approximately 1500m. The array is visible but even with the minimal vegetation providing screening at the airport, the dark line of panels is starting to blend into the background. The array is clearly visible but might be missed by a casual viewer who was not aware of its existence.

Plate 14,**Existing array seenin a flat landscape from approximately 5000m**. The line of panels is barely distinguishable. The viewer would have to know where to look to be able to differentiate the array from surrounding landscape features.

4.2.3 The likely Nature of Views of the Proposed On-Site Substation

The proposed on-site facility substation is reported to have solid elements up to 10m high. These are likely to be comprised of transformers and will appear as solid elements over the height of the adjacent array. These will be viewed as an isolated higher section of the development. It is likely that other taller elements will largely be comprised of steel lattice structures such as bus bars that will facilitate the connection between the onsite substation and the grid connection infrastructure.

4.2.4 The likely Nature of Views of the Proposed Site Access Road

With the exception of road junctions, in a relatively flat landscape where minimal cut and fill is required, the site access road is likely to be most obvious from a distance due to traffic on the road.

It is anticipated that, other than during the construction phase, traffic is likely to be comprised of infrequent light vehicles that are used by operational personnel.

During construction, it is anticipated that regular deliveries will be required by goods vehicles.

From a distance therefore, the access road is likely to be most obvious during the construction phase. During the operation phase it is unlikely to be obvious.

The actual road surface is only likely to be visible to people from when they are close to the road junction with the public road. Subject to the elevation of the viewer on approach to the road junction, as the surface will be viewed at an acute angle, it will largely be screened by existing low vegetation until the viewer is immediately adjacent to it. It is estimated that neither the actual road surface nor the corridor of cleared vegetation will be highly obvious from a distance exceeding 50m from the junction.

4.2.5 Glare from the PV array

With a fixed array, glare generally occurs when the sun is low in the sky and the angle of incidence is such that light is reflected rather than refracted through the panel surface. The risk of this occurring generally occurs during early morning and late afternoon when the sun hits the PV panels at an acute angle.

A tracking system on the other hand realigns receptors to capture as much energy as possible between sunrise and sunset. Because of this the sun doesn't hit the PV panels at acute angles and the risk of glare is significantly reduced.

In South Africa, affected areas due to a fixed array during the early morning will generally vary from the west of the array during summer months to the north west of the array during winter months when the rising sun is further north. Affected areas during the late afternoon will generally vary from the east of the array during summer months to the north east of the array during winter months when the setting sun is further north.

4.2.6 Security Lighting

The applicant has confirmed that only the O&M buildings and the on-site facility substation will be lit. The PV array will not be lit (with the exception of a small red LED on top of weather stations within the facility (usually placed next to the inverters).

This means that the O&M buildings and the on-site facility substation are likely to be obvious at night whilst the majority of the development will not be obvious.

Plate 15 - PV array viewed from above. Note the array rows are read as one and have a similar impact as the roof of a large industrial building.

Plate 16 - PV array viewed from behind and the side. The dark face of the PV units are not obvious and subject to the colour of the undersides of the units, the supporting structures are likely to become more apparent. This might appear as a long industrial structure from close quarters. From a distance however, the shadow cast by the structure will be read and will probably appear similar in nature to the front view of the array.

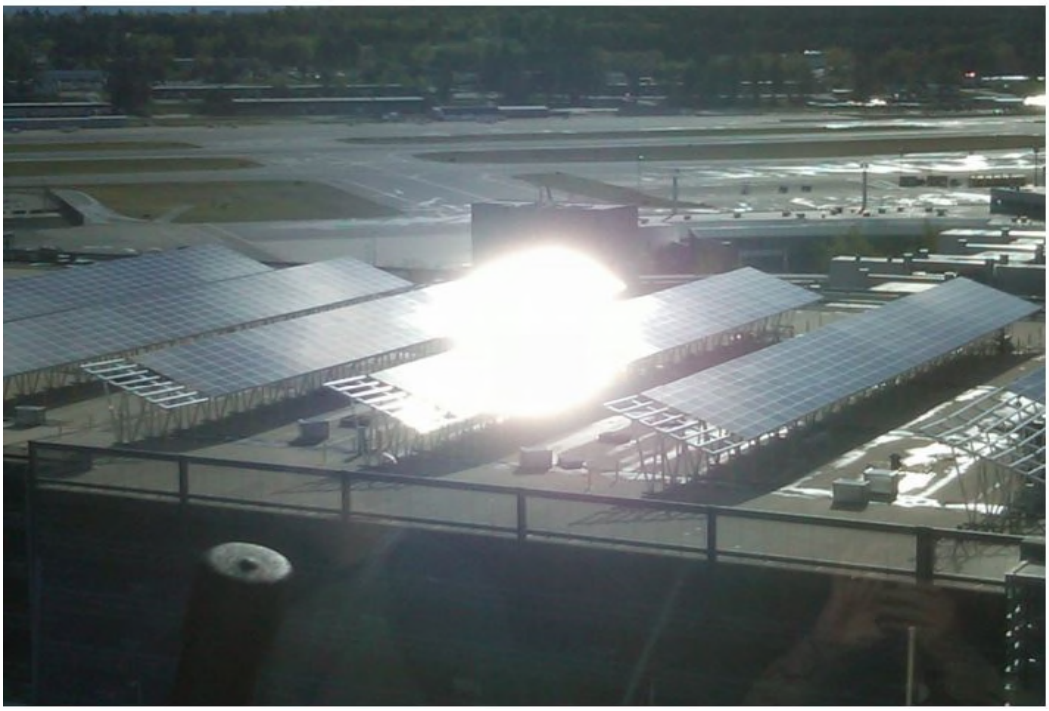


Plate 17 - Glare experienced in the Control Tower at Boston Regional Airport from a PV array

5 VISIBILITY OF THE PROPOSED DEVELOPMENT AND THE LIKELY NATURE OF VISUAL IMPACTS

5.1 ZONES OF THEORETICAL VISIBILITY

Zones of Theoretical Visibility (ZTV) are defined as "a map, usually digitally produced, showing areas of land within which a development is theoretically visible".

ZVTs of the proposed development have been assessed using Arc Spatial Analyst GIS.

The assessment is based on terrain data that has been derived from satellite imagery. This data was originally prepared by NASA and is freely available on the CIAT-CCAFS website (http://www.cgiar-csi.org). This data has been ground truthed using a GPS as well as an online mapping programme.

Whilst the ZTV has been calculated from terrain data only, existing vegetation could have a modifying effect on the areas indicated.

5.2 ASSESSMENT LIMIT

The GIS based assessment of Zones of Theoretical Visibility does not take the curvature of the earth or reduction in scale due to distance into account. In order to provide an indication of the likely limit of visibility due to this effect a universally accepted navigational calculation (**Appendix IV**) has been used to calculate the likely distance that the proposed structures might be visible over. This indicates that, in a flat landscape, the main bulk of the proposed development which consists of the solar array and the higher elements associated with the substation could be visible over the following distances.

Approximate limit of Visibility

ELEMENT	APPROXIMATE LIMIT OF VISIBILITY
Array solar PV panels 3.5m high	6.7 kilometres
Facility Substation 10m high	11.3 kilometres

In reality these distances could be reduced by:

- Weather conditions that limit visibility. This could include hazy conditions during fine weather as well as mist and rain;
- Scale and colour of individual elements making it difficult to differentiate structures from the background; and
- The fact that as the viewer gets further away, the apparent height of visible elements reduces. At the limit of visibility it will only be possible that the very tip of an object may be visible. This reducing scale means that an object will become increasingly more difficult to see as the distance from it increases

These distances have been used to define an initial study area and are indicated on mapping.

5.3 APPROACH TO THE ASSESSMENT

The detailed location and layout of the proposed array has been provided by the developer **(Maps 1and 2)**.

In order to generate the ZTV for the proposed array, it has been assumed that entire area of the array will be set at a uniform maximum height of 3.5m. Points have been set at each change in direction of the array boundary, an additional point at the centre of the array and a high points in the development footprint all with 3.5m offsets for generation of the ZTV using the Viewshed option in Arc Spatial Analyst.

Similar methodology was adopted for the onsite substation for which a 10m offset has been used to produce the ZTV.

A 2.0m offset has been used in the analysis in order to approximate the eye level of receptors.

Whilst the ZTV has been calculated from terrain data only, existing vegetation could have a modifying effect on the areas indicated. However, given the limited height of surrounding vegetation, this modifying effect is likely to be small and may only be relevant in marginally increasing the screening effect of ridgelines.

The ZTV analysis is indicated on the following maps:

- **Map 8** indicates the ZTV for the proposed PV array; and
- **Map 9** indicates the ZTV the on-site substation.

5.4 VISIBILITY

5.4.1 Zones of Theoretical Visibility (ZTV)

The bulk of the development that is comprised of the array and the higher elements that are comprised of electrical infrastructure are likely to be visible over a similar area.

The visual impact of the proposed project will be limited by both minor undulations in topography as well as the larger inselbergs that enclose the landscape to the north, south and east.

The limited height of the bulk of the proposed development which is comprised of the arrays not exceeding 3.5m also helps to limit visibility. The exception to this is the facility substation which includes equipment up to 10m high. However, this equipment is likely to be relatively transparent being comprised largely of lattice structures and bus bars. From closer views this equipment will be seen above the array. From distances greater than approximately 3km however, it is unlikely to be highly obvious.

The development is located on the northern side of a broad NE – SW running shallow valley. Due to the fact that the project is located on a relatively flat area on the upper valley slope from which the valley side slopes away, the development is largely screened from the valley floor. Visibility is focused on the northern and southern upper valley slopes. Within the approximate limit of visibility of the array, the main area of impact is focused on the band of visibility on the upper northern slopes.

This band of visibility is loosely centred on an un-surfaced local road that runs along the upper valley slope linking into the N14 near Aggeneys close to the Approximate Limit of Visibility of the array.

At its widest this band of visibility is approximately 5km in width, it tapers to the northwest to nothing towards the N14 and is relatively consistent in width to the south east.

To the west and northwest the character of the affected area is influenced by large scale mining operations and settlement. To the south and south east the character of the landscape becomes progressively more natural as the viewer moves away from these areas of large scale development.

Map 8 indicates the ZTV for the proposed PV array and internal infrastructure.

The assessment indicates that;

i. The array may be visible intermittently over approximately 3.6km of the N14. However at a distance of 8.0km, the array is unlikely to be visually obvious. Should the Aggeneys PV 1 and 2 and the Geelstert PV 1 projects be constructed, Geelstert 2 will be screened from this road;
ii. The array is unlikely to be visible to the settlement of Aggeneys or the Aggeneys airstrip at a distance of approximately 11.6km and 12.8km respectively;
iii. The array is likely to be visible to approximately 12.8km of the un-surfaced local road that runs past the northern boundary of the site (Loop Road 10) and approximately 3km of the un-surfaced road that runs adjacent to the eastern boundary of the site(Gamoep Road);
iv. The development is likely to be visible to one homestead within the approximate limit of Visibility. This homestead is located approximately 0.4km to the north of the proposed project;
v. Visibility of the proposed project is largely contained to the north, west and south by the Gamsberg and inselbergs. In these directions the landscape is already affected by mining development and settlement (Developed LCA). Due to the relatively open landscape to the west of the site, the project is likely to be visible across the relatively natural landscape in this direction (Rural LCA).

Map 9 indicates the ZTV for the proposed facility substations. The ZTV for the substations is near identical so this map is representative of the impact area of both alternatives. The assessment indicates that;

i. The substation may be visible intermittently over approximately 3km of the N14. Should the Aggeneys PV 1 and 2 and the Geelstert PV 1 projects be constructed, Geelstert 2 will be screened from this road although taller elements may be visible over the array associated with these projects.
ii. The substation is unlikely to be visible to the settlement of Aggeneys or the Aggeneys airstrip at a distance of approximately 11.6km and 12.8km respectively.
iii. The project is likely to be visible to the un-surfaced local road (Loop Road 10) that runs roughly parallel with the northern boundary of the site. The substation could be visible to approximately 18.7km of this road. The project which could be partially screened by the possible Aggeneys 1 and 2 projects and could therefore be significantly less obvious if these projects are constructed.

iv. The substation is likely to be obvious to approximately the same extent (3km) of the un-surfaced road to the east of the site as the array.

vi. The substation is likely to be visible to one homestead within the approximate limit of Visibility. This homestead is located approximately 0.4km to the north of the proposed project.

vii. Visibility of the proposed array and substation will be largely contained to the north, west and south by the Gamsberg and inselbergs. In these directions the landscape is already affected by mining development and settlement (Developed LCA). Due to the relatively open landscape to the west of the site, the project is likely to be visible across the relatively natural landscape in this direction (Rural LCA).

5.5 MODIFYING EFFECT DUE TO VAC OF THE LANDSCAPE AND THE NATURE OF THE DEVELOPMENT

The Visual Absorption Capacity (VAC) of the landscape is relatively low. Landform is the main element that limits the extent of views of the proposed development. This screening effect is taken into account in the ZTV analysis.

Within the Developed LCA, views of development are relatively obvious. Whilst views over solar projects are currently not present in the area, this is likely to change soon as REDZ 8 becomes more developed. The proposed development is therefore likely to appear relatively normal within the area.

5.6 THE LIKELY NATURE OF VISUAL IMPACTS ASSOCIATED WITH THE PROPOSED PROJECT

5.6.1 General

The fact that the terrain is relatively flat will mean that the project is likely to be viewed in profile by all identified receptors. It will therefore be seen as a dark line in the landscape. Distance will dictate how obvious the dark line is.

The surrounding landscape has been shown to generally have a relatively low level of VAC. This is likely to mean that relatively unbroken views of the project are likely to be possible.

The fact that the proposed project is located in a REDZ means that a number of additional solar energy projects are likely to be developed in the vicinity. The strategic nature of the REDZ should ensure that there is less demand for similar development in other perhaps more sensitive landscape areas. It is therefore highly likely that solar energy projects will become a common sight in the vicinity of the site. Whilst the current outlook is natural, this is therefore likely to change relatively rapidly and become progressively more industrialised.

5.6.2 Views from the N14

Due to its tourism importance, the N14 is likely to be one of the most sensitive visual receptors.

Due to distance (8km) neither the proposed array nor the proposed substation are likely to be obvious from the N14.

5.6.3 Views from the adjacent local un-surfaced roads

Local un-surfaced roads are likely to be largely used by local people and mine operators but it may also be used by a small percentage of tourism related traffic.

One road (Loop 10 Road) runs parallel to and approximately 1.7km from the northern boundary of the project site. This impact will be slightly greater than the impact indicated on **Plate 12.**

The PV array and onsite substation could possibly be largely screened from this road by Aggeneys PV 1 and 2 projects. The ZTV analysis indicates that, without this screening, the proposed development may be visible over approximately 18.7km of this road. However, with screening provided by these other projects the Gellstert 2 array will only be visible to approximately 7.5km of this road immediately to the north and east of the project. The adjacent Aggeneys PV 1 and 2 projects will be visible over a similar area as Geelster 2 and views of these projects will also be possible along the road extending to the west to its junction with the N14.

There is a second un-surfaced road (Gamoep Road) that runs immediately adjacent to the eastern boundary of the site. The ZTV analysis indicates that the proposed development may be visible over approximately 3.0km of this road. This impact will be slightly greater than the impact indicated on **Plate 13.**

5.6.4 Views from Adjacent Homesteads

Both the proposed array and substation will be highly obvious to affected homestead. However they will be seen in the context of the two authorised projects (Aggeneys PV 1 and 2) within the same site and possibly the other project that is currently under application (Geelstert PV 1). Views of the project will therefore be in keeping with future development in the area.

This impact will be slightly greater than the impact indicated on **Plate 12.**

5.6.5 Views from Settlement areas

Settlement areas are outside the ALV of the proposed project. The ZTV analysis also indicates that the project will not be visible from Aggeneys. It is therefore highly unlikely that the project will be visible. Given the density of the development and vegetation within the settlement, even if it were visible from the settlement, it is unlikely to be obvious.

5.6.6 Glare from the PV array potentially affecting adjacent roads and the flight path into the Aggeneys airstrip

There are four areas where glare may be a concern for stakeholders including:

- The Aggeneys aerodrome;
- The N14
- The un-surfaced road to the north of the project (Loop Road 10); and
- The un-surfaced road to the east of the project (Gamoep Road).

The following geometric assessment has been undertaken for a fixed tilt array. It should be noted that should a single axis tracking system be used, this should reduce the risk of glare.

Aggeneys aerodrome is located approximately 12.8km to the west of the proposed array. Due to the location of the facility relative to the aerodrome it would only be possible for reflected light from the array to affect pilots on the northern flight path into the aerodrome.

The sun would have to be a considerable way north in order to create reflected light that would impact on the northern flight path. The worst case scenario would be at sunrise during mid-winter. At sunrise on the 22nd June, the sun has an azimuth of approximately 63°T in the Aggeneys area.[9] Given that, for a fixed system, the solar panels will be orientated to the north, light would reflect at approximately 296°T. At touchdown at the northern end of the runway, an aircraft would be located at an approximate bearing of 280°T relative to the array. This means that during the most likely period for glare to impact, reflected light from the facility may affect an area south of approximately 16°. This relates to approximately 3km of the northern flight path. The reflection will be at an angle such that it will be behind the pilot's vision on the approach to the runway. However, the reflected light could be in a pilot's peripheral vision on take-off.

Given the distance, and given that there is only potential for a pilot to see reflected light from the array in his / her peripheral vision which will not affect the straight ahead view or the view of instruments, it can be concluded that the proposed facility is highly unlikely to have any significant effect on the aerodrome.

The US Federal Aviation Authority (US FAA) have led the way in terms of assessing the impacts of glare created by solar projects around airports. Because the US FAA has no specific standards for airport solar facilities and potential glare, the type of glare analysis that they require varies. Depending on site specifics (e.g., existing land uses, location and size of the project) an acceptable evaluation could involve one or more of the following levels of assessment:

a) A qualitative analysis of potential impact in consultation with the Air Traffic Control Tower, pilots, and airport officials;
b) A demonstration field test with solar panels at the proposed site in coordination with Air Traffic Control Tower personnel; or
c) A geometric analysis to determine days and times when there may be an ocular impact[10].

The information provided above provides a basic geometric analysis.

From reference to the ZTV, the project could be visible intermittently over a small section of the N14. This section of road is set at a bearing of approximately 330°T from the proposed project. It is possible that the N14 will be affected by glare from the proposed project, however, given the elevation and distance (approximately 8km), this is unlikely.

If the un-surfaced local road that runs roughly parallel to the northern boundary (Loop 10 Road) could be largely screened from the road by the proposed Aggeneys PV 1 and 2 projects, this would negate the potential for glare to affect this road. However, should Aggeneys PV 1 and 2 projects not be constructed, the proposed array could however affect the western most section of this road during early mornings. Should glare prove problematic, mitigation might include the implementation of a screen fence along the western most section of the northern edge of the array.

[9] Sun angle calculator https://www.suncalc.org
[10] US FAA

It is possible that glare could affect the un-surfaced road that runs approximately immidiately to the east of the project (Gamoep Road) particularly during late afternoons and early evenings. This road is very lightly used and only approximately 1.5km of the road could be affected. Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the eastern edge of the array.

both these roads during late afternoon. Should glare prove problematic, mitigation might include the implementation of a screen fence along the eastern most sections of the array.

5.6.7 Lighting Impacts

The facility will be lit by low level lighting at night around the O & M buildings and the substation. The lighting around the O & M buildings is unlikely to be highly obvious however floodlighting of the substation could be. Mitigation measures might be used to ensure that lighting levels are further limited by ensuring that lighting is only on when necessary through the use of motion sensors.

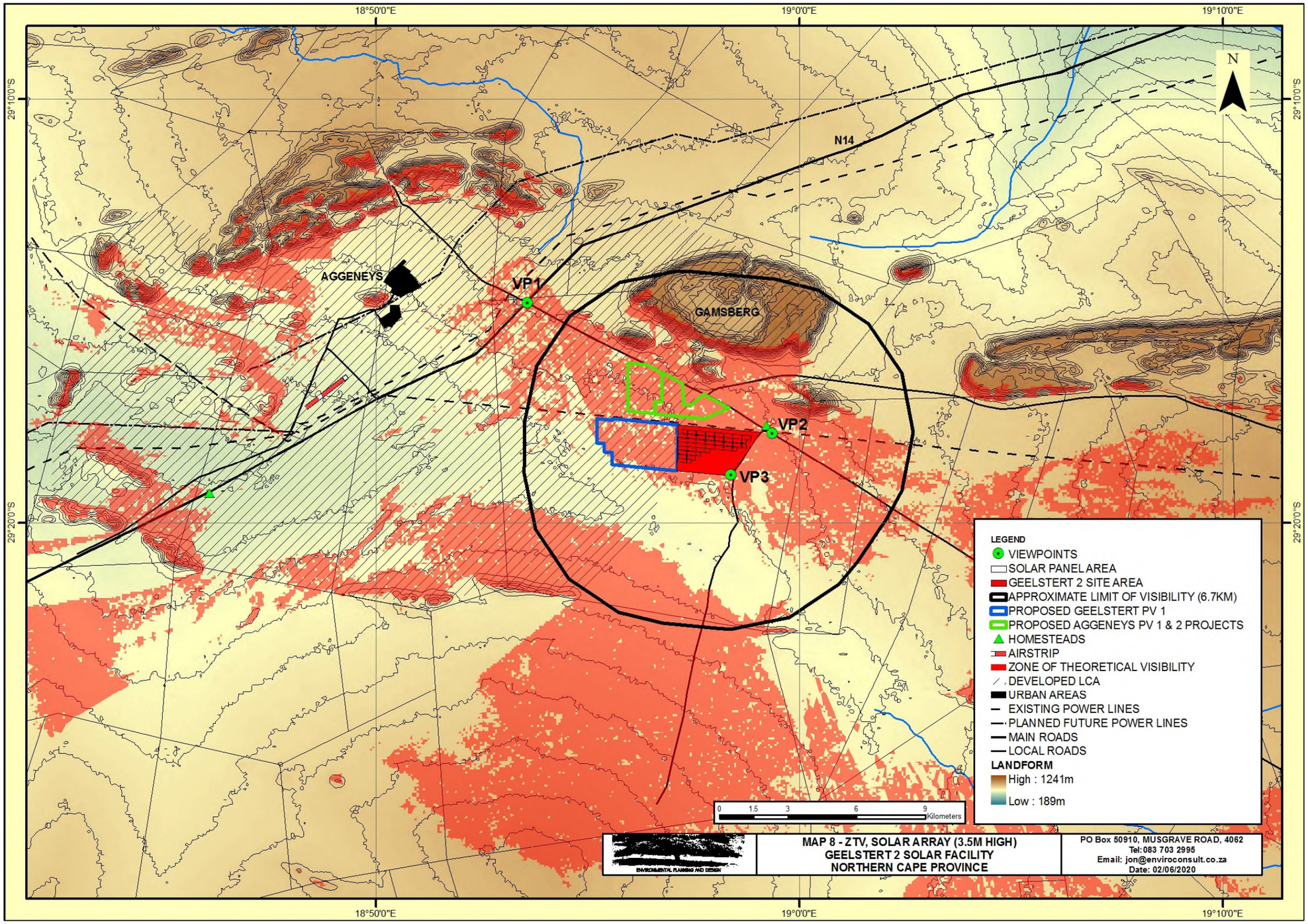
5.7 SITE SENSITIVITY

The overview of likely impacts indicates that the main receptor that is likely to be affected by the proposed project are the un-surfaced local roads that run to the north and east of the site.

These roads are likely to be mainly used by local people. They are therefore not likely to be highly sensitive to landscape change associated with the proposed project.

Considering the location of the proposed project on the project site, it is likely to be visible from these roads.

Whilst these roads may not be highly sensitive, it is still important to protect the general visual amenity of the area. The key consideration is locating the project as far from the road as possible. An undeveloped natural buffer area should be maintained between the site and the roads.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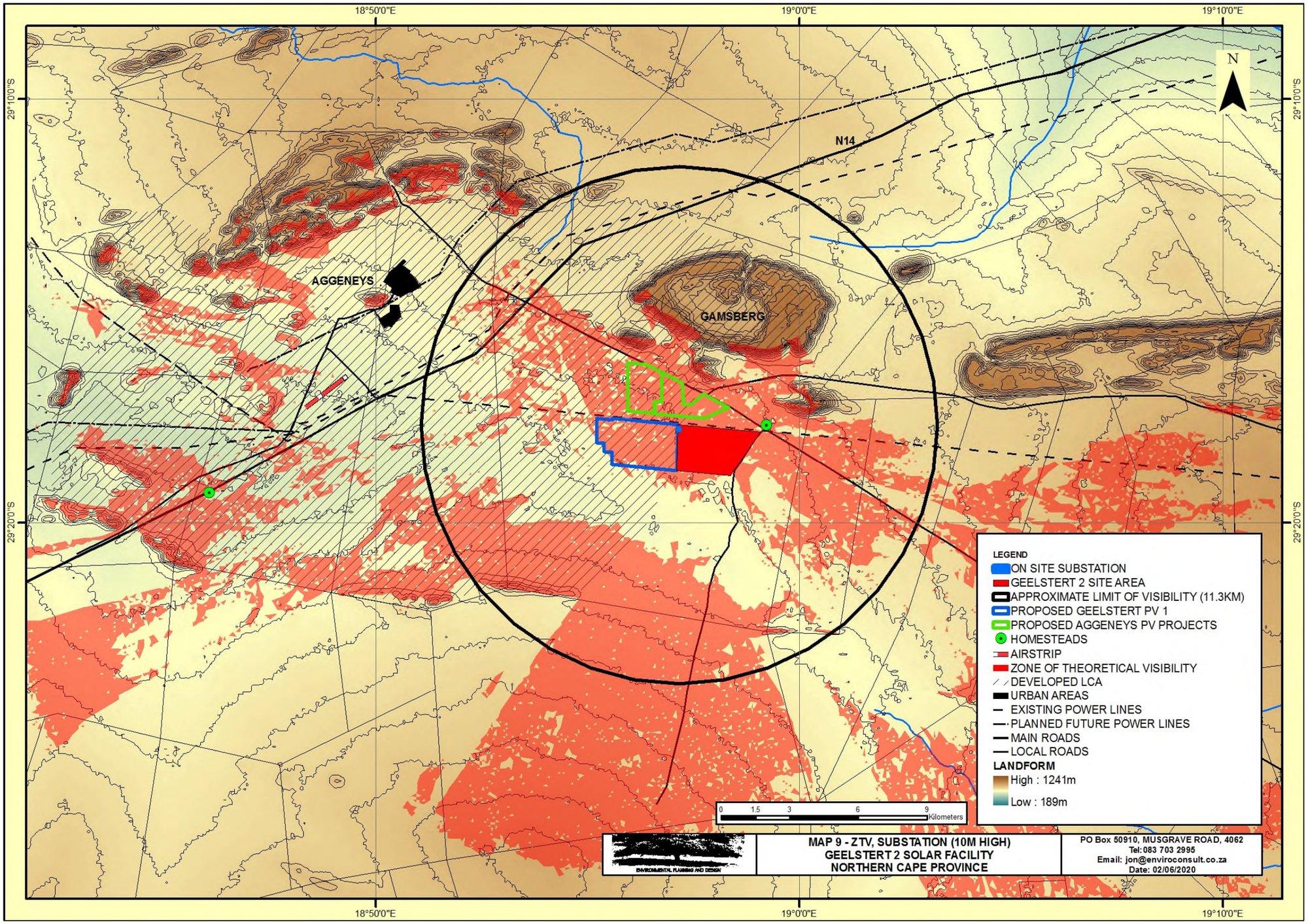
N14
AGGENEYS
VP1
GAMSBERG
VP2
VP3
LEGEND
VIEWPOINTS
SOLAR PANEL AREA
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY (6.7KM)
PROPOSED GEELSTERT PV 1
PROPOSED AGGENEYS PV 1 & 2 PROJECTS
HOMESTEADS
AIRSTRIP
ZONE OF THEORETICAL VISIBILITY
DEVELOPED LCA
URBAN AREAS
EXISTING POWER LINES
PLANNED FUTURE POWER LINES
MAIN ROADS
LOCAL ROADS
LANDFORM
High : 1241m
Low : 189m
0 1.5 3 6 9 Kilometers
ENVIRONMENTAL PLANNING AND DESIGN
MAP 8 - ZTV, SOLAR ARRAY (3.5M HIGH)
GEELSTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 02/06/2020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19°10'0"E
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N
N14
AGGENEYS
GAMSBERG
LEGEND
ON SITE SUBSTATION
GEELSTERT 2 SITE AREA
APPROXIMATE LIMIT OF VISIBILITY (11.3KM)
PROPOSED GEELSTERT PV 1
PROPOSED AGGENEYS PV PROJECTS
HOMESTEADS
AIRSTRIP
ZONE OF THEORETICAL VISIBILITY
DEVELOPED LCA
URBAN AREAS
EXISTING POWER LINES
PLANNED FUTURE POWER LINES
MAIN ROADS
LOCAL ROADS
LANDFORM
High : 1241m
Low : 189m
0 1.5 3 6 9 Kilometers
ENVIRONMENTAL PLANNING AND DESIGN
MAP 9 - ZTV, SUBSTATION (10M HIGH)
GEELSTERT 2 SOLAR FACILITY
NORTHERN CAPE PROVINCE
PO Box 50910, MUSGRAVE ROAD, 4062
Tel: 083 703 2995
Email: jon@enviroconsult.co.za
Date: 02/06/2020

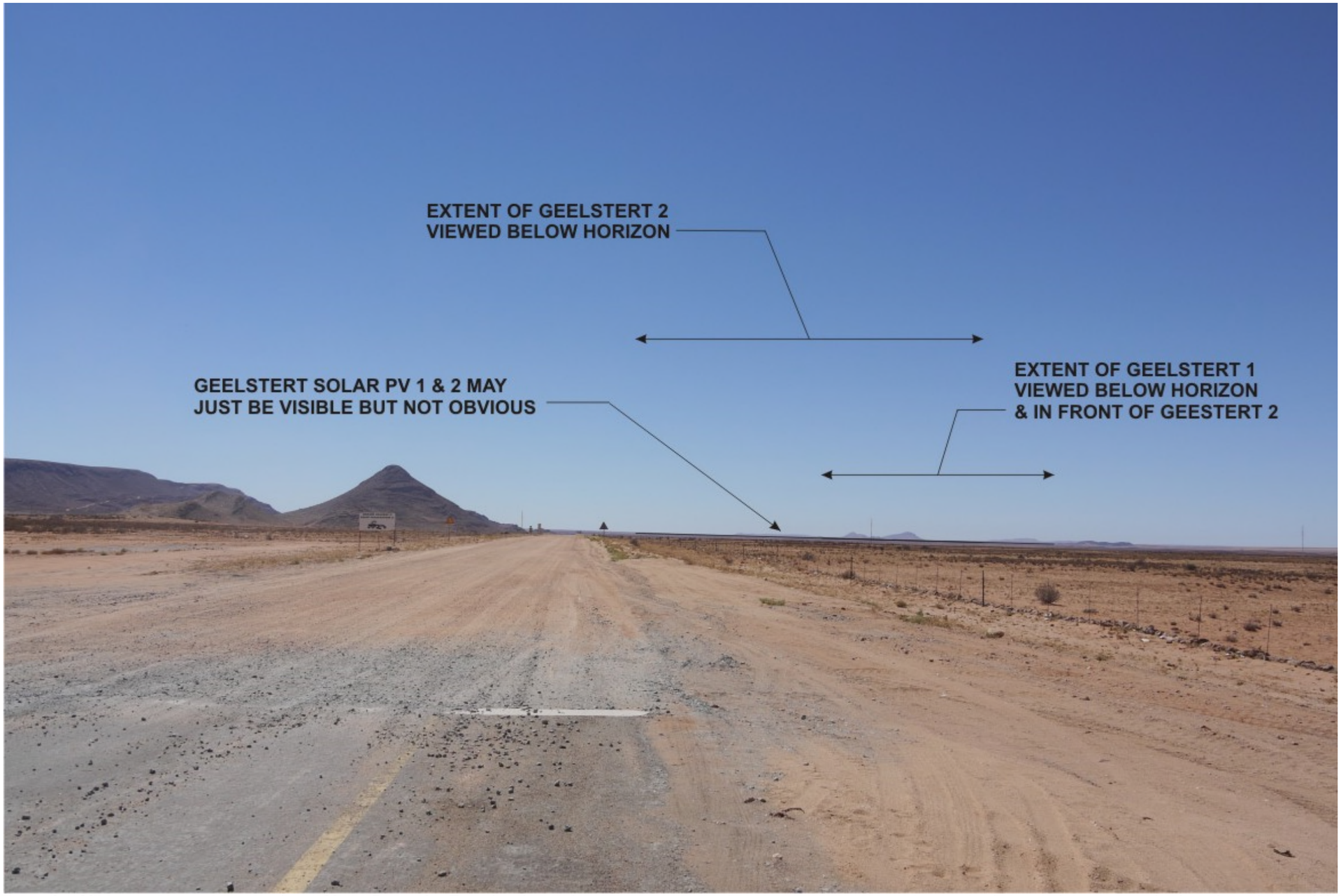

Figure 1 – View to the south-east from View Point 1 - The view is looking along the un-surfaced road that runs to the north of the project close to its junction with the N14. Note that Geelstert Solar PV projects 1 and 2 may be visible. However, from this viewpoint they will be seen below the horizon line. They are unlikely to be highly obvious.

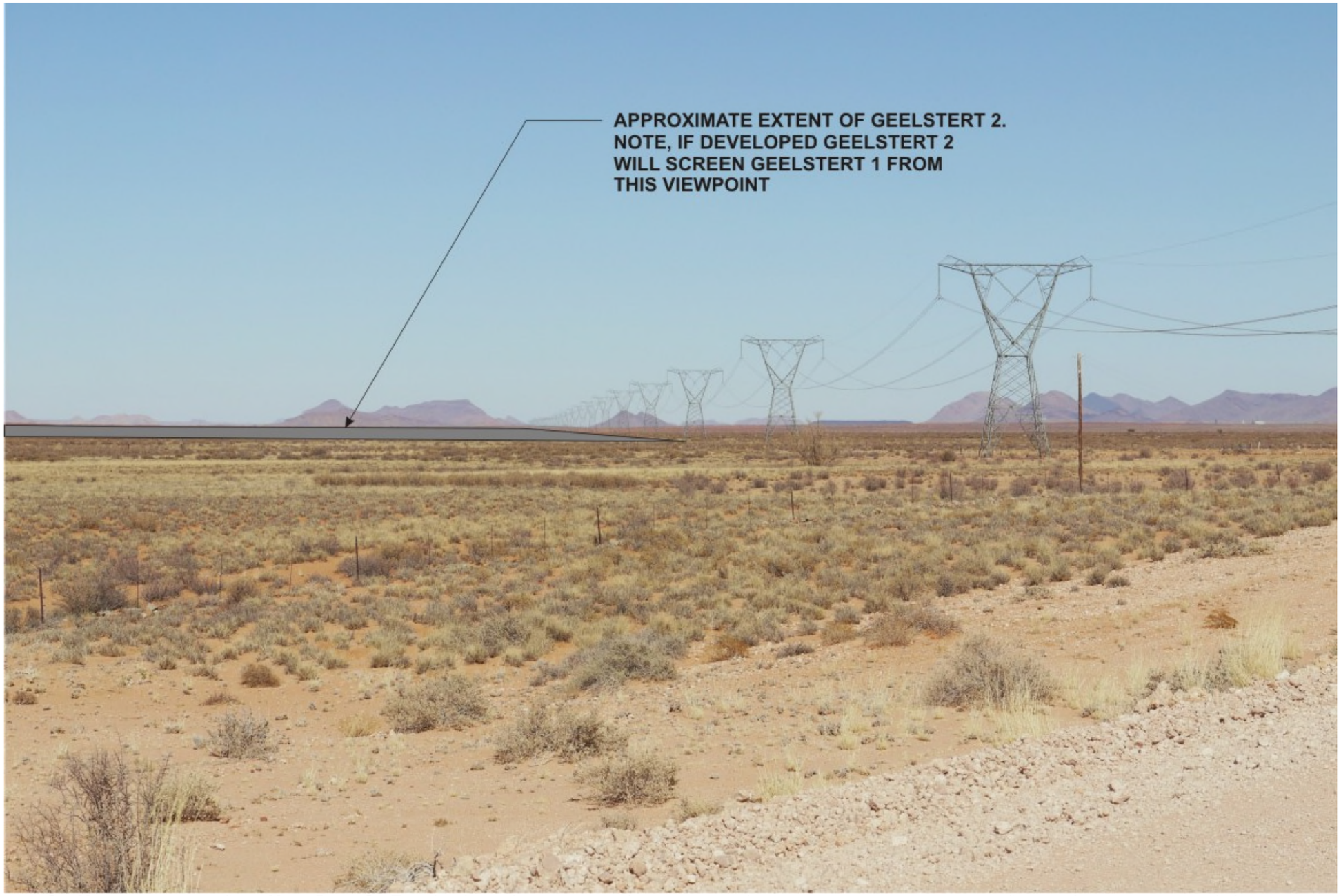

Figure 2 – View to the west from View Point 2 - The view is looking to the east from the un-surfaced road that runs to the north of the project close to the existing homestead. Note: Should Geelstert Solar PV project 2 be constructed, it will totally hide Geelstert Solar PV project 1 from this viewpoint. The authorised Aggeneys Solar PV projects 1 and 2 will be seen at a similar distance and to the right of the power line.

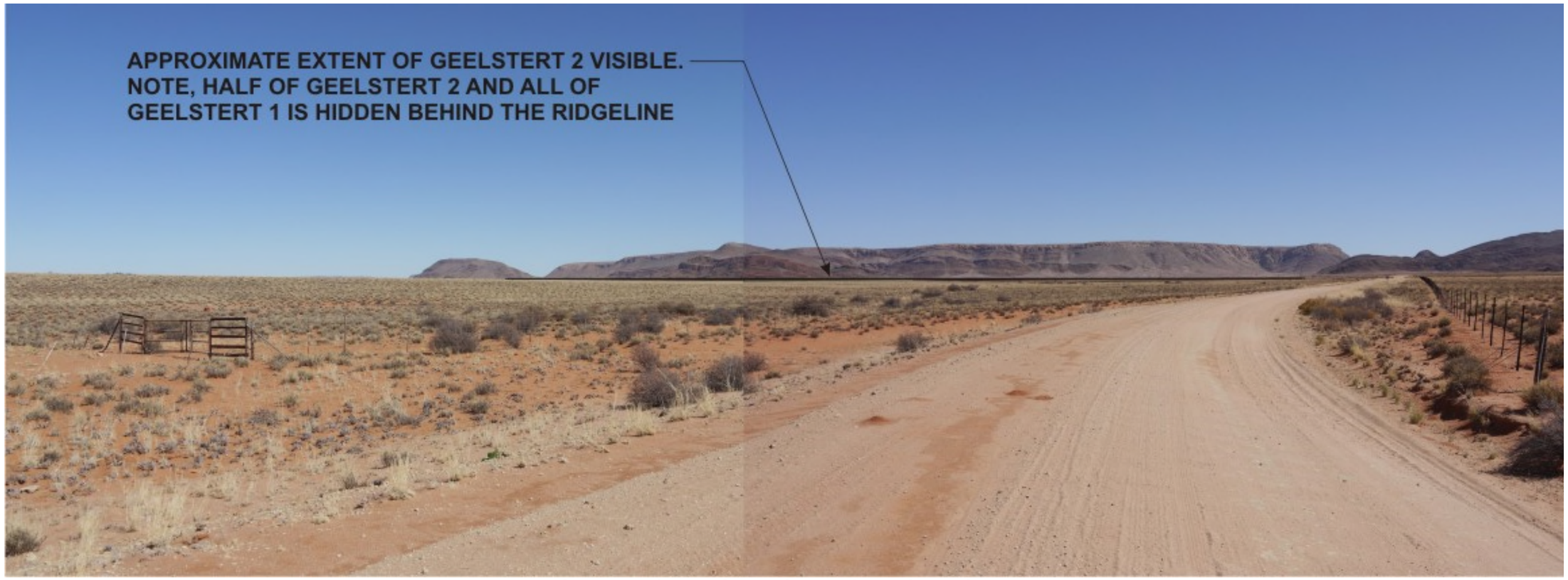

Figure 3 – View to the north-west from View Point 3

VISUAL IMPACT ASSESSMENT

6.1 ISSUES TO BE ADDRESSED

The following list of possible impacts were identified and need to be addressed in the assessment;

a) The proposed development could change the character of a relatively natural area to the south and east of the proposed site;
b) The proposed development could change the character of the landscape as seen from the N14;
c) The proposed development could change the character of the landscape as seen from the un-surfaced local road that runs to the north of the site;
d) The proposed development could change the character of the landscape as seen from local homesteads;
e) The proposed development could change the character of the landscape as seen from local settlement areas;
f) Glare could affect travellers on the un-surfaced local road that runs to the north of the site;
g) Glare could affect the northern flightpath of Aggeneys Aerodrome; and
h) Lighting impacts.

6.2 ASSESSMENT METHODOLOGY

The previous section of the report identified specific areas where likely visual impacts may occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues.

The methodology for the assessment of potential visual impacts includes:

- The **nature**, which shall include a description of what causes the effect, what will be affected and how it will be affected.
- The **extent**, wherein it will be indicated whether the impact will be local (limited to the immediate area or site of development) or regional:
    - local extending only as far as the development site area – assigned a score of 1;
    - limited to the site and its immediate surroundings (up to 10 km) – assigned a score of 2;
    - will have an impact on the region – assigned a score of 3;
    - will have an impact on a national scale – assigned a score of 4; or
    - will have an impact across international borders – assigned a score of 5.
- The **duration**, wherein it will be indicated whether:
    - the lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
    - the lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
    - medium-term (5–15 years) – assigned a score of 3;
    - long term (> 15 years) - assigned a score of 4; or
    - permanent - assigned a score of 5.

- The **magnitude**, quantified on a scale from 0-10, where a score is assigned:
    - 0 is small and will have no effect on the environment;
    - 2 is minor and will not result in an impact on processes;
    - 4 is low and will cause a slight impact on processes;
    - 6 is moderate and will result in processes continuing but in a modified way;
    - 8 is high (processes are altered to the extent that they temporarily cease); and
    - 10 is very high and results in complete destruction of patterns and permanent cessation of processes.
- The **probability** *of occurrence*, which shall describe the likelihood of the impact actually occurring. Probability will be estimated on a scale, and a score assigned:
    - Assigned a score of 1–5, where 1 is very improbable (probably will not happen);
    - Assigned a score of 2 is improbable (some possibility, but low likelihood);
    - Assigned a score of 3 is probable (distinct possibility);
    - Assigned a score of 4 is highly probable (most likely); and
    - Assigned a score of 5 is definite (impact will occur regardless of any prevention measures).
- The **significance**, which shall be determined through a synthesis of the characteristics described above (refer formula below) and can be assessed as low, medium or high.
- The **status**, which will be described as either positive, negative or neutral.
- The degree to which the impact can be reversed.
- The degree to which the impact may cause irreplaceable loss of resources.
- The *degree* to which the impact can be *mitigated.*
- The **significance** is determined by combining the criteria in the following formula:
    - S=(E+D+M)P; where S = Significance weighting, E = Extent, D = Duration, M = Magnitude, P = Probability

The **significance weightings** for each potential impact are as follows:

- < 30 points: Low (i.e. where this impact would not have a direct influence on the decision to develop in the area),
- 30-60 points: Medium (i.e. where the impact could influence the decision to develop in the area unless it is effectively mitigated),
- > 60 points: High (i.e. where the impact must have an influence on the decision process to develop in the area).

6.3 VISUAL IMPACT ASSESSMENT

6.3.1 The proposed development could change the character of a relatively natural area to the south and east of the proposed site (Landscape Change)

Nature of impact:

Geelstert 2 is located on the eastern edge of a landscape character area that is influenced by development. To the south and east, the landscape becomes increasingly less influenced by development. There is a possibility that the proposed development will extend the influence of development into this relatively natural area.

The proposed project is relatively low with the bulk of the development not exceeding 3.5m in height. This could be visible for up to 6.7km and could extend the influence of development into the more natural area to the east by up to approximately 6km.

No high level overview of the project is possible. The array will be seen in profile as a dark line on the horizon which will start to visually blend with the background around 2.7km from the development.

Electrical infrastructure relating to the on-site substation will be in the order of 10m high that could potentially be visible for approximately 11.3km, however, this is likely to be comprised of relatively slim structures that are unlikely to be obvious at this distance.

The above factors will result in the project being seen as an obvious hard geometric form extending the visual influence of development to the east. It is obvious therefore that the rural character of the landscape is likely to be affected. This is only likely to modify the Rural LCA over a relatively small area extending the visual influence of development approximately 2km into the Rural LCA.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings, **(2)**	Site and immediate surroundings, **(2)**
Duration	Long term,**(4)**	Long term,**(4)**
Magnitude	Minor, **(2)**	Small to Minor,**(1)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Low, **(24)**	Low,**(21)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase.	**No irreplaceable loss**

	There will therefore be **no irreplaceable loss**. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	
Can impacts be mitigated?	**Yes**	**N/A**

Mitigation / Management:

Planning:

- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area;

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The proposed project will extend the general influence of development and specifically solar projects into a relatively natural rural area to the south and east of the proposed site.

The overall cumulative impact is assessed as having a medium significance, however, the contribution of the proposed project to this cumulative impact is assessed as low.

See appendix V.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

6.3.2 The proposed development could change the character of the landscape as seen from the N14.

Nature of impact:

The ZTV analysis indicates that the proposed PV array could be visible intermittently over approximately 3.0km of the road at a distance of approximately 8.0km. The proposed array forming the bulk of the development is relatively low not exceeding 3.5m in height. At this distance the array is unlikely to be visible.

Taller electrical infrastructure may be visible. It is however not likely to be highly obvious.

No high level overview of the project is possible. Therefore, whilst the development is likely to be visible from a short section of the N14, it is highly unlikely to be obvious.

It also needs to be understood that the section of the N14 in question is located within an area where the landscape character is heavily influenced by development. This influence is likely to increase due to expanding mining operations and the possibility that other solar projects are likely to be obvious from this section of the road. An intermittent view of the proposed project that is unlikely to be obvious will therefore not change the character of the view from the road in any significant way.

There is likely to be a relatively high proportion of tourism related traffic on this road which elevates the sensitivity to the possible change in view.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small **(0)**	Small **(0)**
Probability	Very improbable **(1)**	Very improbable **(1)**
Significance	Low **(6)**	Low **(6)**
Status	The character of the rural outlook from the road is highly unlikely to be modified in any significant way. **Neutral**	**Neutral**
Reversibility	High	High

Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	**Yes** but this is highly unlikely to change the level of impact.	

Mitigation / Management:

Planning:

- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

The proposed project is unlikely to have any significant impact on the N14.

A detailed visual analysis of other solar projects in the area has not been undertaken However, it is possible that other solar projects may be closer to the N14 in which case they could have a significantly higher impact.

The overall cumulative impact is assessed as having a medium significance, however, the contribution of the proposed project to this cumulative impact is assessed as low.

See Appendix V.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

6.3.3 The proposed development could change the character of the landscape as seen from the un-surfaced local roads that run to the north and east of the site.

Nature of impact:

Both the proposed array and on site facility substation will be highly obvious to these roads. However they will possibly be seen in the context of two authorised projects (Aggeneys PV 1and 2) within the same site and possibly the other project that is currently under application (Geelstert PV 1). Views of the project are therefore likely to be in keeping with future development in the area.

The majority of affected travellers are likely to be local people as well as people working and transporting equipment to and from the adjacent mine. These people are unlikely to be sensitive to the change in view associated with the development. There is however likely to be a small proportion of tourism related travellers on the road who will be sensitive.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low to Moderate **(5)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Medium **(33)**	Low **(30)**
Status	It is unlikely that all travellers on the road will consider the change in view as negative. It is likely however that a proportion of local people as well as tourists may consider the change as a negative impact. **Neutral / Negative**	**Neutral / Negative**
Reversibility	High	High
Irreplaceable loss	The proposed development can be dismantled and	**No irreplaceable loss.**

	removed at the end of the operational phase. There will therefore be **no irreplaceable loss**.	
Can impacts be mitigated?	**Yes** but this will not hide the proposed development. It should however result in the development being slightly less visually imposing when viewed from the road.	

Mitigation / Management:

Planning:

- Plan to maintain a strip of natural vegetation between the array and the road;
- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:

Whilst a detailed visual analysis of other solar projects in the area has not been undertaken, it is possible that the proposed and the neighbouring projects (Aggeneys 1 & 2) within the same property could have a similar or lower impact than those projects further to the east. This will be subject to the location of the other projects relative to the road.

The overall cumulative impact could have a medium significance. The proposed project is likely to result in a relatively low contribution to this overall impact.

See Appendix V.

Residual Risks:

The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.

6.3.4 The proposed development could change the character of the landscape as seen from local homesteads.

Nature of impact:

Only one homestead could potentially be affected. The homestead does not appear to be inhabited although the stock pens around it appear to be used. There is certainly no secondary tourism use associated with the structure. Therefore the owners / inhabitants are unlikely to be sensitive to the possible landscape change.

There are other structures apparent on on-line mapping;

- One group of structures approximately 8.5km to the south; and
- A number of structures to the north of the N14.

From the site visit it was confirmed that the structures to the south are comprised of a number of stock pens and the structures to the north of the N14 are all associated with construction or industrial activities.

The homestead is located approximately 0.4km to the north of the proposed project. It is set at a slightly higher level than the site but not so high that an overview of the project will be possible.

Both the array and the on-site facility substation will be obvious and will possibly be viewed in the context of other solar PV projects including Aggeneys 1, Aggeneys 2 and possibly Geelstert 1 solar PV facilities.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low to Moderate **(5)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Medium **(33)**	Low **(30)**
Status	It is unlikely that people using the homestead will consider the change as a negative impact. **Neutral**	**Neutral**
Reversibility	High	High

Irreplaceable loss	The proposed development can be dismantled and removed at the end of the operational phase. There will therefore be no irreplaceable loss. However, given the likely long term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	**No irreplaceable loss**
Can impacts be mitigated?	**Yes** but this will not hide the proposed development. It should however result in the development being slightly less visually imposing when viewed from the homestead.	

Mitigation / Management:

Planning:

- Plan to maintain a buffer of natural vegetation on the northern side of the development
- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Cumulative Impacts:
Whilst a detailed assessment of the impact of other projects has not been undertaken, from review of online mapping, there appear to be a limited number homesteads that are likely to be affected by potential projects.

The cumulative impact is therefore also likely to be probable with a medium significance.

Because the majority are likely to be used for agricultural purposes only, the impact status is likely to be neutral.

See appendix V.

Residual Impacts:
The residual risk relates to the infrastructure being left in place on decommissioning of the solar project. It is therefore critical that effective rehabilitation is undertaken.

6.3.5 The proposed development could change the character of the landscape as seen from local settlement areas.

Nature of impact:

The only settlement area that might be affected is the small town of Aggeneys.

The analysis indicates that the project will not be visible from Aggeneys. It is therefore anticipated that there will be no visual impact.

6.3.6 Glare could affect travellers on the un-surfaced local roads that run to the north and east of the proposed site.

Nature of impact:

The proposed array could result in glare affecting the two un-surfaced roads to the north and east of the site. This is only likely to occur to the east of the site during late afternoons and to the west during early mornings. Should Aggeneys 1 and 2 be developed, there will be no impact to the west.

Due to the light usage of the roads this is unlikely to be problematic, however, should it prove to be otherwise mitigation in the form of screen fencing can be used to screen glare.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small**(0)**
Probability	Probable**(3)**	Very improbable **(1)**
Significance	Low **(24)**	Low **(6)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	**No irreplaceable loss**.	**No irreplaceable loss.**
Can impacts be mitigated?	Yes	

Mitigation / Management: Operations: Should glare prove problematic on these roads mitigation might include the implementation of a screen fence along the northern / eastern edge of the array.
Cumulative Impacts: It is possible that glare associated with the proposed project could add to glare associated with other projects. However, with mitigation, glare associated with this project is highly unlikely to impact. The likely contribution to cumulative impacts is therefore assessed as **low**. **See appendix V.**
Residual Risks: There are no residual risks.

6.3.7 Glare could affect the northern flight path of Aggeneys Aerodrome.

Nature of impact:

The Aggeneys Aerodrome is approximately 12.8km to the west of the proposed project.

It is possible but given the distance unlikely that reflected light from the array could be visible from the northern flight path particularly during early mornings particularly during winter months. It will however not affect the straight ahead pilot's view or the view of instruments.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Small**(0)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(16)**	Low **(6)**
Status	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss	**No irreplaceable loss**.	**No irreplaceable loss.**

Can impacts be mitigated?	Yes

Mitigation / Management:

Operations:

As indicated, if glare does occur it will only affect the peripheral vision of a pilot and it is therefore not anticipated to be problematic (low significance). However, the applicant is consulting with the mine (the owner of the landing strip) and with CAA on this matter and they will aim to find a practical solution with the mine such as screen fencing, should glint and glare be a problem.

Cumulative Impacts:

It is possible that glare associated with the proposed project could add to glare associated with other projects, however, this will only affect a pilot's peripheral vision. The likely contribution to cumulative impacts is therefore assessed as **low**.

See appendix V.

Residual Risks:

There are no residual risks.

6.3.8 The potential visual impact of operational, safety and security lighting of the facility at night on observers.

Nature of impact:

Planned lighting levels of O & M buildings are low and will be sufficient for the use of these areas during night time.

It is also planned to light the substation for security reasons.

To the south and east of the proposed site there is no lighting obvious at night whereas to the west the town of Aggeneys and the existing mining operations are well lit. Lighting from passing traffic on the N14 is also obvious.

Therefore there is potential for the project to slightly extend the influence of lighting into an area that would otherwise be relatively dark at night.

With mitigation that might include the use of motion sensors, this impact is anticipated as being negligible.

	Without mitigation	**With mitigation**
Extent	Site and immediate surroundings **(2)**	Site and immediate surroundings **(2)**
Duration	Long term **(4)**	Long term **(4)**

Magnitude	Minor **(2)**	Small **(0)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Low **(24)**	Low **(12)**
Status	The appearance of lighting that is likely to be similar to local homesteads is unlikely to be seen as a negative impact particularly given that local mining operations are relatively well lit. **Neutral**	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**
Irreplaceable loss	No irreplaceable loss	No irreplaceable loss
Reversibility	High	High
Can impacts be mitigated?	Yes	

Mitigation / Management:

- Use low key lighting around buildings and operational areas that is triggered only when people are present;
- Ensure that lighting is focused on the development with no light spillage outside the site; and
- Keep lighting low, no tall mast lighting should be used.

Cumulative Impact:

There is potential for security lighting and operational lighting associated with solar energy projects to further impact on the area but with or without mitigation the contribution of this project to possible cumulative impacts is likely to be of low significance.

See appendix V.

Residual Risks:

No residual risk has been identified.

7 IMPACT STATEMENT

7.1 VISIBILITY

The visual impact of the proposed project will be limited by both minor undulations in topography as well as the larger inselbergs that enclose the landscape to the north, south and east.

The limited height of the bulk of the proposed development which is comprised of the arrays not exceeding 3.5m also helps to limit visibility. The exception to this is the on-site facility substation which includes equipment up to 10m high. However, this equipment is likely to be relatively transparent as it is comprised largely of lattice structures and bus bars. From closer views this equipment will be seen above the array. From distances greater than approximately 3km however, it is unlikely to be highly obvious.

The development is located on the northern side of a broad NE – SW running shallow valley. Due to the fact that the project is located on a relatively flat area on the upper valley slope from which the valley side slopes away, the development is largely screened from the valley floor. Visibility is focused on the northern and southern upper valley slopes. Within the approximate limit of visibility of the array, the main area of impact is focused on the band of visibility on the upper northern slopes.

This band of visibility is loosely centred on an un-surfaced local road that runs along the upper valley slope linking into the N14 near Aggeneys close to the Approximate Limit of Visibility of the array.

At its widest this band of visibility is approximately 5km in width, it tapers to the northwest to nothing towards the N14 and is relatively consistent in width to the south east.

To the west and northwest the character of the affected area is influenced by large scale mining operations and settlement. To the south and south east the character of the landscape becomes progressively more natural as the viewer moves away from these areas of large scale development.

7.2 LANDSCAPE CHARACTER AREAS AND VISUAL ABSORPTION CAPACITY

The landscape character of the study area can be divided into two distinct Landscape Character Areas (LCAs);

- **Rural Landscape Character Area.** This LCA is largely protected from the influence of major development around Aggeneys by landform and distance.

  Throughout this LCA, VAC of the landscape is only likely to be provided by landform which includes minor ridgelines and tall inselbergs. The inselbergs provide enclosure creating a series of discrete landscape areas enclosed by the tall rocky landforms.

  Within these enclosed landscapes, any structure that extends above the grass / herbaceous vegetation is likely to be obvious. The higher and bulkier a structure is, the more obvious it is likely to be in the landscape. Bright colours are also likely to exacerbate visibility within a landscape that for much of the year is mono-tonal.

This LCA is centred on a broad shallow valley between the Gamsberg to the north and a series of minor inselbergs to the south. To the east the valley runs into an un-enclosed and relatively natural area.

- **Developed Landscape Character Area.** This LCA is largely enclosed by landform consisting of the Gamsberg and the inselbergs to the north, west and south of Aggeneys.

  The character of this area is heavily influenced by development including major mining operations, infrastructure and settlement. The extent is limited to areas from where these elements are visible.

  Whilst it is possible that minor undulations in topography could provide a degree of screening, due to the relatively flat topography between inselbergs, only the lowest development is likely to be afforded a degree of screening.

  Views of development within this LCA are largely limited by the same landform features that define its extent.

  The exception to this includes any development that occurs towards the eastern extremity of the LCA. Development in this area is likely to extend the influence of development into the Rural LCA.

7.3 VISUAL IMPACT

Possible landscape and visual impacts are likely to include;

a) The general change in character of the landscape due to the proposed development was assessed as low significance with and without mitigation. This is due to the fact the project will largely impact an area within which the character is already largely impacted by development including industry. The proposed project may extend this Developed Landscape Character Area by approximately 2km into the current Rural Character Area to the south and east of the proposed project site. However, this is considered relatively marginal change given the low nature of the development and the fact that some areas of mining may also be visible.
b) The possible change in view as seen from the N14 was assessed as improbable with a low significance. This is due to the fact that the project is unlikely to be visible from the road.
c) Visual impacts on the un-surfaced roads that run the north and east of the proposed site were assessed as having a medium significance without mitigation and a low significance with mitigation. The project will be obvious from the roads.
d) Visual impact on homesteads is also assessed as having a medium significance without mitigation and a low significance with mitigation. The impact is also likely to have a neutral significance due to the only possible affected homestead being uninhabited.
e) Visual impact on the settlement of Aggeneys is highly unlikely to occur.
f) The impact of glare on travellers on travellers using the un-surfaced roads to the north and east of the proposed site was assessed as a probable impact with a

low significance without mitigation and a very improbable impact with a low significance with mitigation.

g) The impact of glare on the northern flight path into the Aggeneys Aerodrome was also assessed as an improbable impact with a low significance.
h) The impact of lighting is assessed as possibly having a low significance without mitigation. With mitigation which includes the use of motion sensors is likely to further reduce this impact.

7.4 CUMULATIVE IMPACTS

Due to the fact that the proposed project and other proposed projects to the north and east will extend the visual influence of development into an area that currently appears relatively natural, the cumulative impact on landscape character is assessed as having a medium significance. However, the cumulative contribution that can be attributed to the proposed project is low due to the relatively small extent of its impact.

Cumulative visual impacts affecting the N14 are also assessed as likely to have a medium significance due to the location of other proposed projects. The cumulative contribution of the project is assessed as low due to the fact that it is unlikely to be visible from this road.

Cumulative visual impacts affecting the un-surfaced roads to the north and east of the project are assessed as likely to have a medium significance. The cumulative contribution of the project is assessed as likely to have a medium level contribution without mitigation and a low level contribution with mitigation.

Cumulative visual impacts affecting homesteads are assessed as likely to have a medium significance due to the location of this and other proposed projects. The cumulative contribution of the project is assessed as likely to have a medium level contribution without mitigation and a low level contribution with mitigation.

Cumulative visual impacts that are likely to be experienced within the settlement of Aggeneys, from local homesteads as well as impacts associated with lighting and glare are assessed as having a low significance.

7.5 CONCLUSION

Because this development will largely impact visually on an area where there currently is strong influence of urban and industrial development, changes to the landscape quality are unlikely to be problematic.

Visual impacts that are likely to be experienced by receptors are likely to have a low significance.

There is no reason from a landscape and visual impact perspective why the proposed development should not proceed.

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APPENDIX I

SPECIALIST'S BRIEF CV

ENVIRONMENTAL PLANNING AND DESIGN

Name	JONATHAN MARSHALL
Nationality	British
Year of Birth	1956
Specialisation	Landscape Architecture / Landscape & Visual Impact Assessment / Environmental Planning / Environmental Impact Assessment.
Qualifications	
Education	Diploma in Landscape Architecture, Gloucestershire College of Art and Design, UK (1979) Environmental Law, University of KZN (1997)
Professional	Registered Professional Landscape Architect (SACLAP) Chartered Member of the Landscape Institute (UK) Member of the International Association of Impact Assessment, South Africa
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General

Jon qualified as a Landscape Architect (Dip LA) at Cheltenham (UK) in 1979. He has been a chartered member of the Landscape Institute UK since 1986. He is also a Registered Landscape Architect and has extensive experience of environmental impact assessment processes in South Africa (2009).

During the early part of his career (1981 - 1990) He worked with Clouston (now RPS) in Hong Kong and Australia. During this period he was called on to undertake visual impact assessment (VIA) input to numerous environmental assessment processes for major infrastructure projects. This work was generally based on photography with line drawing superimposed to illustrate the extent of development visible.

He has worked in the United Kingdom (1990 - 1995) for major supermarket chains including Sainsbury's and prepared CAD based visual impact assessments for public enquiries for new store development. He also prepared the VIA input to the environmental statement for the Cardiff Bay Barrage for consideration by the UK Parliament in the passing of the Barrage Act (1993).

His more recent VIA work (1995 to present) includes a combination of CAD and GIS based work for a new international airport to the north of Durban, new heavy industrial operations, overhead electrical transmission lines, mining operations in West Africa and numerous commercial and residential developments.

VIA work undertaken during the last eighteen months includes assessments for several proposed tourism developments in National Parks, solar power projects, numerous telecommunications masts as well as an amendment application for an authorised wind energy project.

Select List of Visual Impact Assessment Projects

- **Geelkop Solar PV projects –** Landscape and Visual Impact Assessment for seven proposed solar PV projects near Upington in the Northern Cape Province for Atlantic Renewable Energy Partners.
- **Makapanstad Agri- Hub –** Landscape and Visual Impact Assessment for proposed Agri-Hub development at Makapanstad in the North West Province for the Department of Rural Development and Land Reform.
- **Madikwe Sky Bubble -** Landscape and Visual Impact Assessment for proposed development of up-market accommodation at the Molori concession within the Madikwe Game Reserve.
- **Hartebeest Wind Energy Facility** – Landscape and Visual Impact Assessment Addendum Report for the proposed upgrading of turbine specifications for an authorised WEF near Mo0rreesburg in the Western Cape Province for a private client.
- **Selati Railway Bridge** - Landscape and Visual Impact Assessment for proposed development of up-market accommodation on a railway bridge at Skukuza in the Kruger Park.
- **Kangala Mine Extension -** Landscape and Visual Impact Assessment for a proposed extension to the Kangala Mine in Mpumalanga for Universal Coal.
- **Khunab Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for a private client.
- **Sirius Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Upington in the Northern Cape Province for Sola Future Energy.
- **Aggeneys Solar Developments** – Landscape and Visual Impact Assessment for two proposed solar PV projects near Aggeneys in the Northern Cape Province for a private client.
- **Hyperion Solar Developments** – Landscape and Visual Impact Assessment for four proposed solar PV projects near Kathu in the Northern Cape Province for Building Energy South Africa.
- **Eskom Combined Cycle Power Plant** - Landscape and Visual Impact Assessment for proposed gas power plant in Richards Bay, KwaZulu Natal Province.
- **N2 Wild Coast Toll Road, Mineral Sources and Auxiliary Roads –** VIA for the Pondoland Section of this project for the South African National Roads Agency.
- **Mpushini Park Ashburton –** VIA for a proposed amendment to an authorised development plan which included residential, office park and light industrial uses to logistics and warehousing.
- **Moedeng PV Solar Project -** VIA for a solar project near Vrybury in the North West Province for a private client.
- **Establishment of Upmarket Tourism Accommodation on the Selati Bridge, Kruger National Park** – Assessment of visual implications of providing tourism accommodation in 12 railway carriages on an existing railway bridge at the Skukuza Rest Camp in the Kruger Park.
- **Jozini TX Transmission Tower** – Assessment of visual implications of a proposed MTN transmission tower on the Lebombo ridgeline overlooking the Pongolapoort Nature reserve and dam.
- **Bhangazi Lake Development** – Visual Impact Assessment for a proposed tourism development within the iSimangaliso Wetlend Park World Heritage Site.
- **Palesa Power Station** - VIA for a new 600MW power station near Kwamhlanga in Mpumalanga for a private client.
- **Heuningklip PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Kruispad PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Doornfontein PV Solar Project** – VIA for a solar project in the Western Cape Province for a private client.
- **Olifantshoek Power Line and Substation** – VIA for a new 10MVA 132/11kV substation and 31km powerline, Northern Cape Province, for Eskom.

- **Noupoort Concentrating Solar Plants -** Scoping and Visual Impact Assessments for two proposed parabolic trough projects.
- **Drakensberg Cable Car –** Preliminary Visual Impact Assessment and draft terms of reference as part of the feasibility study.
- **Paulputs Concentrating Solar Plant (tower technology)** – Visual Impact Assessment for a new CSP project near Pofadder in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5** – Scoping and Visual Impact Assessments for the proposed extension of five authorised CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Ilanga Concentrating Solar Plants 1, 2, 3, 4 & 5 Shared Infrastructure** –Visual Impact Assessment for the necessary shared infrastructure including power lines, substation, water pipeline and roads for these projects.
- **Ilanga Concentrating Solar Plants 7, 8 & 9** - Scoping and Visual Impact Assessments for three new CSP projects including parabolic trough and tower technology within the Karoshoek Solar Valley near Upington in the Northern Cape.
- **Sol Invictus Solar Plants** - Scoping and Visual Impact Assessments for three new Solar PV projects near Pofadder in the Northern Cape.
- **Gunstfontein Wind Energy Facility** – Scoping and Visual Impact Assessment for a proposed WEF near Sutherland in the Northern Cape.
- **Moorreeesburg Wind Energy Facility** – Visual Impact Assessment for a proposed WEF near Moorreeesburg in the Western Cape.
- **Semonkong Wind Energy Facility** - Visual Impact Assessment for a proposed WEF near Semonkong in Southern Lesotho.
- **Great Karoo Wind Energy Facility** – Addendum report to the Visual Impact Assessment Report for amendment to this authorised WEF that is located near Sutherland in the Northern Cape. Proposed amendments included layout as well as rotor diameter.
- **Perdekraal East Power Line** – Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Sutherland in the Northern Cape.
- **Tshivhaso Power Station** – Scoping and Visual Impact Assessment for a proposed new power station near Lephalale in Limpopo Province.
- **Saldanha Eskom Strengthening** – Scoping and Visual Impact Assessment for the upgrading of strategic Eskom infrastructure near Saldanha in the Western Cape.
- **Eskom Lethabo PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Lethabo Power Station in the Free State.
- **Eskom Tuthuka PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Thutuka Power Station in Mpumalanga.
- **Eskom Majuba PV Installation** - Scoping and Visual Impact Assessment for the development of a solar PV plant within Eskom's Majuba Power Station in Mpumalanga.
- **Golden Valley Power Line** - Visual Impact Assessment for a proposed power line to evacuate power from a wind energy facility near Cookhouse in the Eastern Cape.
- **Mpophomeni Shopping Centre** – Visual impact assessment for a proposed new shopping centre close to the southern shore of Midmar Dam in KwaZulu Natal.
- **Rheeboksfontein Power Line** - Addendum report to the Visual Impact Assessment Report for amendment to this authorised power line alignment located near Darling in the Western Cape.
- **Woodhouse Solar Plants** – Scoping and Visual Impact Assessment for two proposed solar PV projects near Vryburg in the North West Province.
- **AngloGold Ashanti, Dokyiwa (Ghana)** – Visual Impact Assessment for proposed new Tailings Storage Facility at a mine site working with SGS as part of their EIA team.
- **Gateway Shopping Centre Extension (Durban)** – Visual Impact Assessment for a proposed shopping centre extension in Umhlanga, Durban.

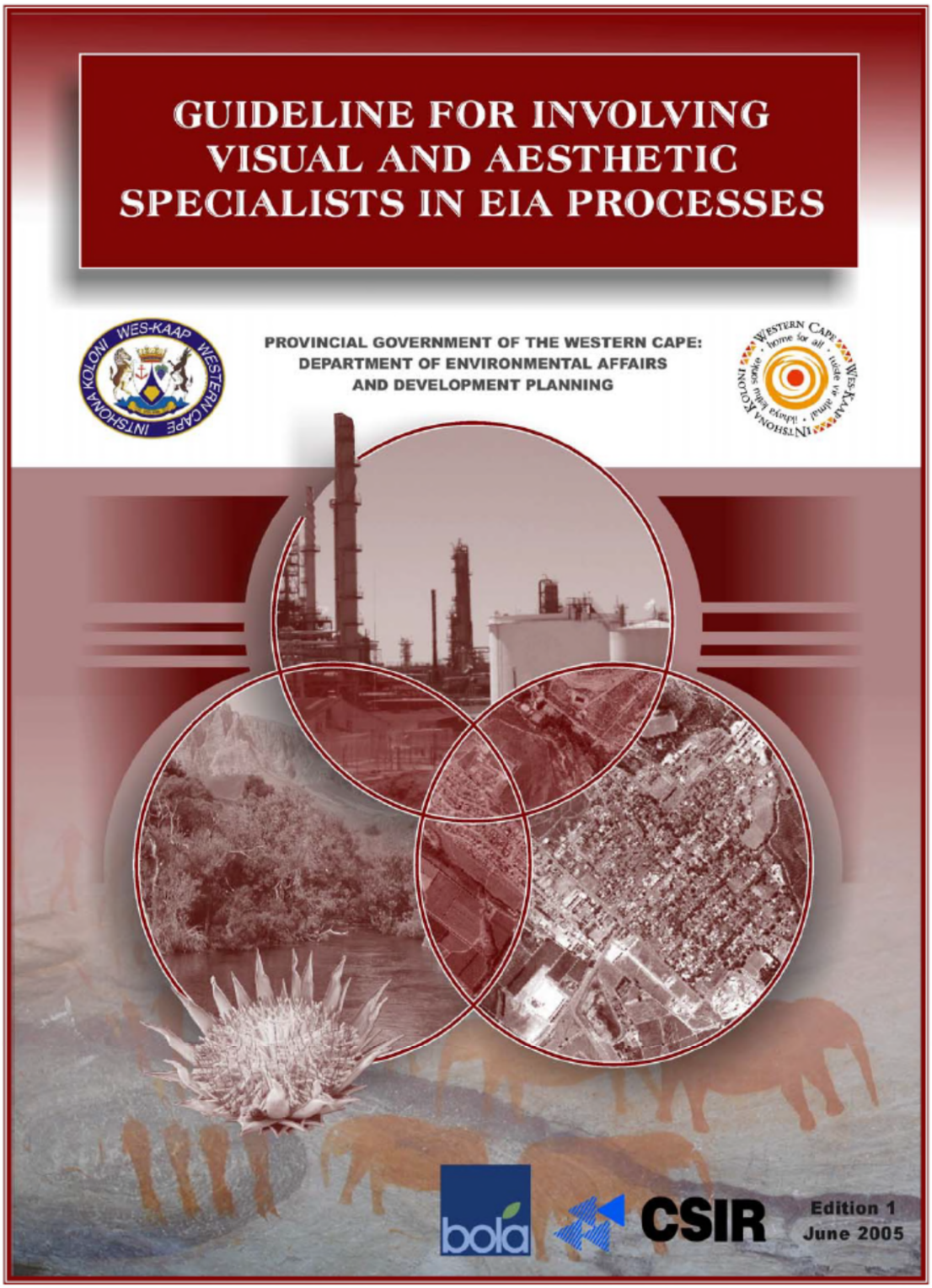
- **Kouroussa Gold Mine (Guinea)** – Visual impact assessment for a proposed new mine in Guinea working with SGS as part of their EIA team.
- **Mampon Gold Mine (Ghana)** - Visual impact assessment for a proposed new mine in Ghana working with SGS as part of their EIA team.
- **Telkom Towers** – Visual impact assessments for numerous Telkom masts in KwaZulu Natal.
- **Eskom Isundu Substation** – Visual Impact Assessment for a proposed major new Eskom substation near Pietermaritzburg in KwaZulu Natal.
- **Eskom St Faiths Power Line and Substation** – Visual Impact Assessment for a major new substation and associated power lines near Port Shepstone in KwaZulu Natal.
- **Eskom Ficksburg Power Line** – Visual Impact Assessment for a proposed new power line between Ficksburg and Cocolan in the Free State.
- **Eskom Matubatuba to St Lucia Power Line** – Visual Impact Assessment for a proposed new power line between Mtubatuba and St Lucia in KwaZulu Natal.
- **Dube Trade Port, Durban International Airport** – Visual Impact Assessment
- **Sibaya Precinct Plan** – Visual Impact Assessment as part of Environmental Impact Assessment for a major new development area to the north of Durban.
- **Umdloti Housing** – Visual Impact Assessment as part of Environmental Impact Assessment for a residential development beside the Umdloti Lagoon to the north of Durban.
- **Tata Steel Ferrochrome Smelter** - Visual impact assessment of proposed new Ferrochrome Smelter in Richards Bay as part of EIA undertaken by the CSIR.
- **Durban Solid Waste Large Landfill Sites –** Visual Impact Assessment of proposed development sites to the North and South of the Durban Metropolitan Area. The project utilised 3d computer visualisation techniques.
- **Hillside Aluminium Smelter, Richards Bay -** Visual Impact Assessment of proposed extension of the existing smelter. The project utilised 3d computer visualisation techniques.
- **Estuaries of KwaZulu Natal Phase 1 –** Visual character assessment and GIS mapping as part of a review of the condition and development capacity of eight estuary landscapes for the Town and Regional Planning Commission. The project was extended to include all estuaries in KwaZulu Natal.
- **Signage Assessments** – Numerous impact assessments for proposed signage developments for Blast Media.
- **Signage Strategy** – Preparation of an environmental strategy report for a national advertising campaign on National Roads for Visual Image Placements.
- **Zeekoegatt, Durban** - Computer aided visual impact assessment. EDP acted as advisor to the Province of KwaZulu Natal in an appeal brought about by a developer to extend a light industrial development within a 60 metre building line from the National N3 Highway.
- **La Lucia Mall Extension** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed extension to shopping mall for public consultation exercise.
- **Redhill Industrial Development** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed new industrial area for public consultation exercise.
- **Avondale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Hammersdale Reservoir** - Visual impact assessment using three dimensional computer modelling / photo realistic rendering and montage techniques for proposed hilltop reservoir as part of Environmental Impact Assessment for Umgeni Water.
- **Southgate Industrial Park, Durban** - Computer Aided Visual Impact Assessment and Landscape Design for AECI.

- **Sainsbury's Bryn Rhos** - Computer Aided Visual Impact Assessment/ Planning Application for the development of a new store within the Green Wedge North of Swansea.
- **Ynyston Farm Access** - Computer Aided Impact Assessment of visual intrusion of access road to proposed development of Cardiff for the Land Authority for Wales.
- **Cardiff Bay Barrage** – Preparation of the Visual Impact Statement for inclusion in the Impact Statement for debate by parliament (UK) prior to the passing of the Cardiff Bay Barrage Bill.
- **A470, Cefn Coed to Pentrebach** - Preparation of landscape frameworks for the assessment of the impact of the proposed alignment on the landscape for The Welsh Office.
- **Sparkford to Illchester Bye Pass** - The preparation of the landscape framework and the draft landscape plan for the Department of Transport.
- **Green Island Reclamation Study** - Visual Impact Assessment of building massing, Urban Design Guidelines and Masterplanning for a New Town extension to Hong Kong Island.
- **Route 3** - Visual Impact Assessment for alternative road alignments between Hong Kong Island and the Chinese Border.
- **China Border Link** - Visual Impact Assessment and initial Landscape Design for a new border crossing at Lok Ma Chau.
- **Route 81, Aberdeen Tunnel to Stanley** - Visual Impact Assessment for alternative highway alignments on the South side of Hong Kong Island.

APPENDIX II

GUIDELINES FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

(Preface, Summary and Contents for full document go to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning web site, http://eadp.westerncape.gov.za/your-resource-library/policies-guidelines)


GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES
PROVINCIAL GOVERNMENT OF THE WESTERN CAPE:
DEPARTMENT OF ENVIRONMENTAL AFFAIRS
AND DEVELOPMENT PLANNING
WES-KAAP
WESTERN CAPE
INTSHONA KOLONI
WESTERN CAPE
home for all
WES-KAAP
ilizwe lili-nye
INTSHONA KOLONI
bola
CSIR
Edition 1
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GUIDELINE FOR INVOLVING VISUAL AND AESTHETIC SPECIALISTS IN EIA PROCESSES

Edition 1

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Stakeholders engaged in the guideline development process:

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PREFACE

The purpose of an Environmental Impact Assessment (EIA) is to provide decision-makers (be they government authorities, the project proponent or financial institutions) with adequate and appropriate information about the potential positive and negative impacts of a proposed development and associated management actions in order to make an informed decision whether or not to approve, proceed with or finance the development.

For EIA processes to retain their role and usefulness in supporting decision-making, the involvement of specialists in EIA needs to be improved in order to:

- Add greater value to project planning and design;
- Adequately evaluate reasonable alternatives;
- Accurately predict and assess potential project benefits and negative impacts;
- Provide practical recommendations for avoiding or adequately managing negative impacts and enhancing benefits;
- Supply enough relevant information at the most appropriate stage of the EIA process to address adequately the key issues and concerns, and effectively inform decision-making in support of sustainable development.

It is important to note that not all EIA processes require specialist input; broadly speaking, specialist involvement is needed when the environment could be significantly affected by the proposed activity, where that environment is valued by or important to society, and/or where there is insufficient information to determine whether or not unavoidable impacts would be significant.

The purpose of this series of guidelines is to improve the efficiency, effectiveness and quality of specialist involvement in EIA processes. The guidelines aim to improve the capacity of roleplayers to anticipate, request, plan, review and discuss specialist involvement in EIA processes. Specifically, they aim to improve the capacity of EIA practitioners to draft appropriate terms of reference for specialist input and assist all roleplayers in evaluating whether or not specialist input to the EIA process is appropriate for the type of development and environmental context. Furthermore, they aim to ensure that specialist inputs support the development of effective, practical Environmental Management Plans where projects are authorised to proceed (refer to *Guideline for Environmental Management Plans*).

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist assessment" and "studies" to indicate that the scope of specialists' contribution (if required) depends on the nature of the project, the environmental context and the amount of available information and does not always entail detailed studies or assessment of impacts.

The guidelines draw on best practice in EIA in general, and within specialist fields of expertise in particular, to address the following issues related to the timing, scope and quality of specialist input. The terms "specialist involvement" and "input" have been used in preference to "specialist

assessment" and "studies" to indicate that the scope of specialists' contribution depends on the nature of the project, the environmental context and the amount of available information.

	ISSUES
TIMING	▪ When should specialists be involved in the EIA process; i.e. at what stage in the EIA process should specialists be involved (if at all) and what triggers the need for their input?
SCOPE	▪ Which aspects must be addressed through specialist involvement; i.e. what is the purpose and scope of specialist involvement? ▪ What are appropriate approaches that specialists can employ? ▪ What qualifications, skills and experience are required?
QUALITY	▪ What triggers the review of specialist studies by different roleplayers? ▪ What are the review criteria against which specialist inputs can be evaluated to ensure that they meet minimum requirements, are reasonable, objective and professionally sound?

The following guidelines form part of this first series of guidelines for involving specialists in EIA processes:

- Guideline for determining the scope of specialist involvement in EIA processes
- Guideline for the review of specialist input in EIA processes
- Guideline for involving biodiversity specialists in EIA processes
- Guideline for involving hydrogeologists in EIA processes
- Guideline for involving visual and aesthetic specialists in EIA processes
- Guideline for involving heritage specialists in EIA processes
- Guideline for involving economists in EIA processes

The *Guideline for determining the scope of specialist involvement in EIA processes* and the *Guideline for the review of specialist input in EIA processes* provide generic guidance applicable to any specialist input to the EIA process and clarify the roles and responsibilities of the different roleplayers involved in the scoping and review of specialist input. It is recommended that these two guidelines are read first to introduce the generic concepts underpinning the guidelines which are focused on specific specialist disciplines.

Who is the target audience for these guidelines?

The guidelines are directed at authorities, EIA practitioners, specialists, proponents, financial institutions and other interested and affected parties involved in EIA processes. Although the guidelines have been developed with specific reference to the Western Cape province of South Africa, their core elements are more widely applicable.

What type of environmental assessment processes and developments are these guidelines applicable to?

The guidelines have been developed to support project-level EIA processes regardless of whether they are used during the early project planning phase to inform planning and design decisions (i.e. during pre-application planning) or as part of a legally defined EIA process to obtain statutory approval for a proposed project (i.e. during screening, scoping and/or impact assessment). Where specialist input may be required the guidelines promote early, focused and appropriate involvement of specialists in EIA processes in order to encourage proactive consideration of potentially significant impacts, so that negative impacts may be avoided or

effectively managed and benefits enhanced through due consideration of alternatives and changes to the project.

The guidelines aim to be applicable to a range of types and scales of development, as well as different biophysical, social, economic and governance contexts.

What will these guidelines not do?

In order to retain their relevance in the context of changing legislation, the guidelines promote the principles of EIA best practice without being tied to specific legislated national or provincial EIA terms and requirements. They therefore do not clarify the specific administrative, procedural or reporting requirements and timeframes for applications to obtain statutory approval. They should, therefore, be read in conjunction with the applicable legislation, regulations and procedural guidelines to ensure that mandatory requirements are met.

It is widely recognized that no amount of theoretical information on how best to plan and coordinate specialist inputs, or to provide or review specialist input, can replace the value of practical experience of coordinating, being responsible for and/or reviewing specialist inputs. Only such experience can develop sound judgment on such issues as the level of detail needed or expected from specialists to inform decision-makers adequately. For this reason, the guidelines should not be viewed as prescriptive and inflexible documents. Their intention is to provide best practice guidance to improve the quality of specialist input.

Furthermore, the guidelines do not intend to create experts out of non-specialists. Although the guidelines outline broad approaches that are available to the specialist discipline (e.g. field survey, desktop review, consultation, modeling), specific methods (e.g. the type of model or sampling technique to be used) cannot be prescribed. The guidelines should therefore not be used indiscriminately without due consideration of the particular context and circumstances within which an EIA is undertaken, as this influences both the approach and the methods available and used by specialists.

How are these guidelines structured?

The specialist guidelines have been structured to make them user-friendly. They are divided into six parts, as follows:

- **Part A**: Background;
- **Part B**: Triggers and key issues potentially requiring specialist input;
- **Part C**: Planning and coordination of specialist inputs (drawing up terms of reference);
- **Part D**: Providing specialist input;
- **Part E**: Review of specialist input; and
- **Part F**: References.

Part A provides grounding in the specialist subject matter for all users. It is expected that authorities and peer reviewers will make most use of Parts B and E; EIA practitioners and project proponents Parts B, C and E; specialists Part C and D; and other stakeholders Parts B, D and E. Part F gives useful sources of information for those who wish to explore the specialist topic.

SUMMARY

This guideline document, which deals with specialist visual input into the EIA process, is organised into a sequence of interleading sections. These follow a logical order covering the following:

- the background and context for specialist visual input;
- the triggers and issues that determine the need for visual input;
- the type of skills and scope of visual inputs required in the EIA process;
- the methodology, along with information and steps required for visual input;
- finally, the review or evaluation of the visual assessment process.

Part A is concerned with defining the visual and aesthetic component of the environment, and with principles and concepts relating to the visual assessment process. The importance of the process being logical, holistic, transparent and consistent is stressed in order for the input to be useful and credible.

The legal and planning context within which visual assessments take place indicate that there are already a number of laws and bylaws that protect visual and scenic resources. These resources within the Western Cape context have importance for the economy of the region, along with the proclaimed World Heritage Sites in the Province.

The role and timing of specialist visual inputs into the EIA process are outlined, with the emphasis being on timely, and on appropriate level of input, from the early planning stage of a project, through to detailed mitigation measures and management controls at the implementation stage.

Part B deals with typical factors that trigger the need for specialist visual input to a particular project. These factors typically relate to:

(a) the nature of the receiving environment, in particular its visual sensitivity or protection status;
(b) the nature of the project, in particular the scale or intensity of the project, which would result in change to the landscape or townscape.

The correlation between these two aspects are shown in a table, in order to determine the varying levels of visual impact that can be expected, i.e. from little or no impact, to very high visual impact potential.

Part C deals with the choice of an appropriate visual specialist, and the preparation of the terms of reference (TOR) for the visual input. Three types of visual assessment are put forward, each requiring different expertise, namely:
Type A: assessments involving large areas of natural or rural landscape;
Type B: assessments involving local areas of mainly built environment;
Type C: assessments involving smaller scale sites with buildings, or groups of buildings.

The scope of the visual input would in summary relate to the following:

- the issues raised during the scoping process;
- the time and space boundaries, i.e. the extent or zone of visual influence;

- the types of development alternatives that are to be considered;
- the variables and scenarios that could affect the visual assessment;
- the inclusion of direct, indirect and cumulative effects.

Approaches to the visual input relate to the level of potential impact and range from minimal specialist input, to a full visual impact assessment (VIA). A list of the typical components of a visual assessment is given, and the integration with other studies forming part of the EIA process is discussed.

Part D provides guidance for specialist visual input, and on the information required by specialists. Notes on predicting potential visual impacts are given, along with suggested criteria for describing and rating visual impacts. The assessment of the overall significance of impacts, as well as thresholds of significance are discussed.

Further aspects that need to be considered by visual specialists in EIA processes include:

- affected parties who stand to benefit or lose,
- risks and uncertainties related to the project,
- assumptions that have been made, and their justification,
- levels of confidence in providing the visual input or assessment,
- management actions that can be employed to avoid or mitigate adverse effects and enhance benefits, and
- the best practicable environental option from the perspective of the visual issues and impacts.

Finally, pointers for the effective communication of the findings are given.

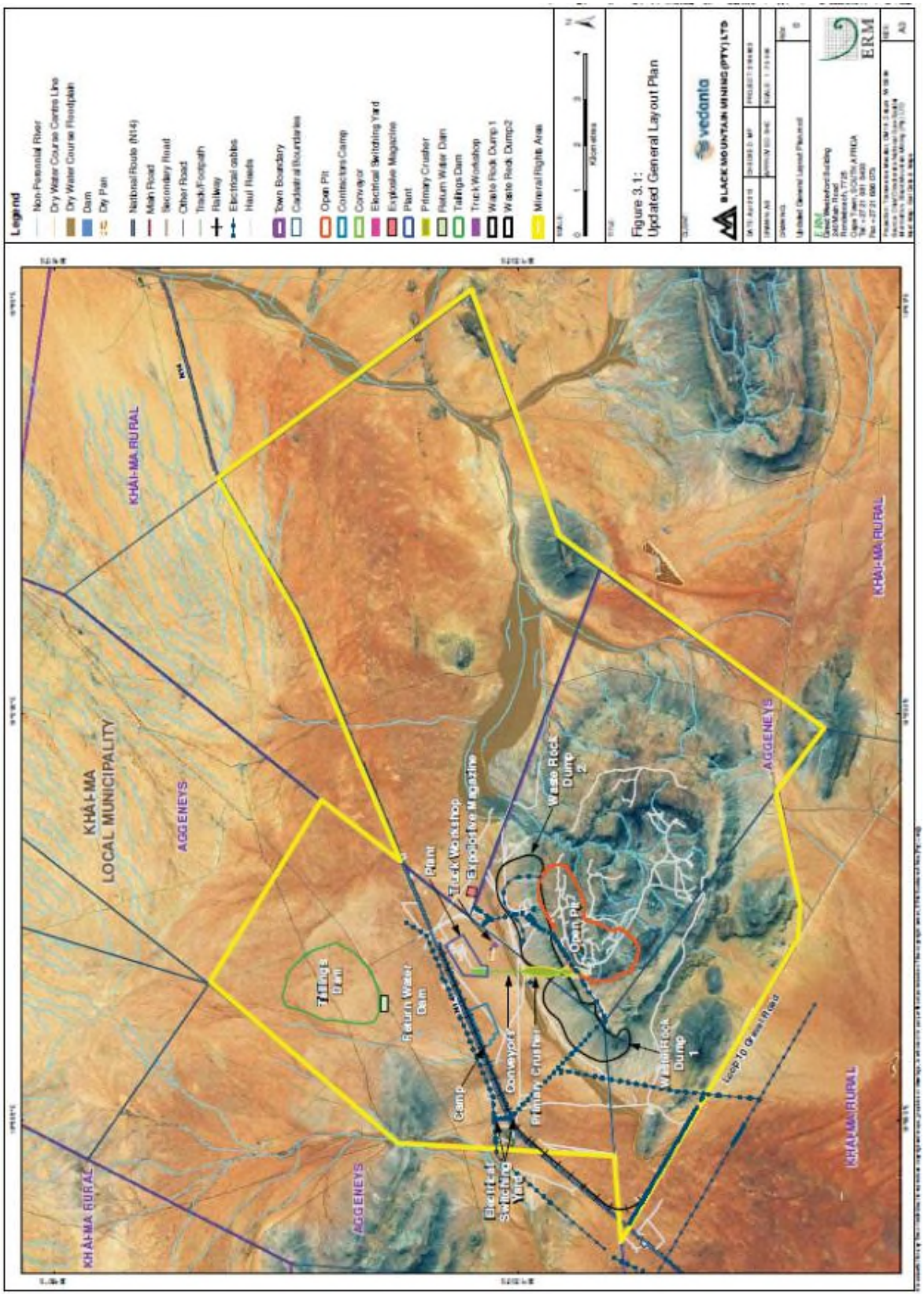
Part E lists specific evaluation criteria for reviewing visual input by a specialist, where this becomes necessary. Further guidance on this is given in the document on *Guideline for the review of specialist input in EIA processes.*

CONTENTS

APPENDIX III

BLACK MOUNTAIN MINING GAMSBERG GENERAL LAYOUT PLAN

(extracted from ERM Environmental Management Programme 2013)

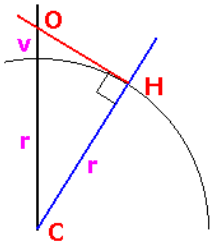

Legend
Non-Perennial River
Dry Water Course Centre Line
Dry Water Course Floodplain
Dam
Dry Pan
National Route (N14)
Main Road
Secondary Road
Other Road
Track/Footpath
Railway
Electrical cables
Haul Roads
Town Boundary
Cadastral Boundaries
Open Pit
Contractors Camp
Conveyor
Electrical Switching Yard
Explosive Magazine
Plant
Primary Crusher
Return Water Dam
Tailings Dam
Truck Workshop
Waste Rock Dump 1
Waste Rock Dump 2
Mineral Rights Area
Figure 3.1:
Updated General Layout Plan
vedanta
BLACK MOUNTAIN MINING (PTY) LTD
ERM
KHÁI-MA LOCAL MUNICIPALITY
KHÁI-MA RURAL
AGGENEYS
Tailings Dam
Return Water Dam
Plant
Truck Workshop
Explosive Magazine
Waste Rock Dump 2
Open Pit
Waste Rock Dump 1
Camp
Conveyor
Primary Crusher
Electrical Switching Yard
Loop 16 Gravel Road

APPENDIX IV

FORMULA FOR DERIVING THE APPROXIMATE VISUAL HORIZON

The Mathematics behind this Calculation

This calculation should be taken as a guide only as it assumes the earth is a perfect ball 6378137 metres radius. It also assumes the horizon you are looking at is at sea level. A triangle is formed with the centre of the earth (C) as one point, the horizon point (H) is a right angle and the observer (O) the third corner. Using Pythagoras's theorem we can calculate the distance from the observer to the horizon (OH) knowing CH is the earth's radius (r) and CO is the earth's radius (r) plus observer's height (v) above sea level.



Sitting in a hotel room 10m above sea level a boat on the horizon will be 11.3km away. The reverse is also true, whilst rowing across the Atlantic, the very top of a mountain range 400m high could be seen on your horizon at a distance of 71.4 km assuming the air was clear enough.

APPENDIX V

CUMULATIVE IMPACT ASSESSMENT

1 Landscape Change

Nature:
The proposed project will extend the general influence of development and specifically solar projects into a relatively natural rural area to the south and east of the proposed site.

The project is one of four proposed projects on the same property.

In addition there are solar projects proposed on fourteen properties within 30km of the proposed site eight of which are located within the relatively natural Rural Landscape Character Area.

Whilst a detailed visual analysis of other solar projects in the area has not been undertaken, the combined effect of all proposed solar projects could be significant. Because the proposed project will largely affect the Developed Landscape Character Area, it is only likely to have a relatively small contribution to landscape change which largely relates to introducing development into the more natural Rural Landscape Character Area.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and surroundings **(2)**	Region**(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small to Minor **(1)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	**Low (21)**	**Medium (39)**
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:

- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible;
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development; and
- Retain natural buffer areas adjacent to the adjacent un-surfaced road.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions;
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area; and
- Maintain natural buffer area adjacent to the northern boundary.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning.

2 Character of the landscape as seen from the N14.

Nature:
The proposed project is very unlikely to have any significant impact on the N14.

A detailed visual analysis of other solar projects in the area has not been undertaken, however given the location of other projects in closer proximity to the road, it seems likely that other solar projects in the area could have a significant impact.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Region, **(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Small **(0)**	Moderate to low,**(5)**
Probability	Very improbable **(1)**	Probable, **(3)**
Significance	**Low(6)**	**Medium, (36)**
Status (positive or negative)	Neutral	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:
- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:
- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning.

3 Change in the character of the landscape as seen from the un-surfaced local roads that run to the north and east of the proposed site.

Nature:
Both the proposed array and substation will be highly obvious to these roads. However they will be seen in the context of the two authorised projects (Aggeneys PV 1and 2) within the same site and possibly the other project that is currently under application (Geelstert PV 1). Views of the project will therefore be in keeping with future development in the area.

Other authorised projects will also be closer to the northern road and will part screen the development.

It is possible that other solar projects will be developed within 30km and to the east of project all of which fall within and are likely to affect the relatively natural Rural Landscape Character Area. The project areas within the Rural Landscape Character Area are likely to result in greater landscape change than those within the Developed Landscape Character Area.

The overall cumulative impact could therefore have a medium significance. The proposed project is likely to result in a relatively low contribution to this overall impact.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional**(3)**
Duration	Long term **(4)**	Long term, **(4)**
Magnitude	Low **(4)**	Moderate to Low, **(5)**
Probability	Probable **(3)**	Probable, **(3)**
Significance	Low **(30)**	**Medium (36)**
Status (positive or negative)	Neutral / Negative	Neutral / Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:

- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development.

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;

- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible.

Decommissioning:
- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning,

4 Cumulative impact on local homesteads

Nature:
The proposed project was assessed as likely to have an improbable, neutral impact with a low significance on views from local homesteads. This was due to the fact that only one homestead will be affected that is some distance from the project. The homestead also appears to be uninhabited.

Whilst a detailed assessment of the impact of other projects has not been undertaken, from review of online mapping, there appear to be a limited number homesteads that are likely to be affected by potential projects.

The cumulative impact is therefore also likely to be probable with a medium significance.

Because the majority are likely to be used for agricultural purposes only, the impact status is likely to be neutral.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional, **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Low **(30)**	Medium **(33)**
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:
Planning:
- Plan levels to minimise earthworks to ensure that levels are not elevated;
- Plan to maintain the height of structures as low as possible; and
- Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development;

Operations:

- Reinstate any areas of vegetation that have been disturbed during construction;
- Remove all temporary works;
- Monitor rehabilitated areas post-construction and implement remedial actions; and
- Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use of the site; and
- Rehabilitate and monitor areas post-decommissioning and implement remedial actions.

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning.

5 Cumulative impact on Settlement

Nature:
The only settlement area that might be affected is the small town of Aggeneys.

The proposed project was assessed as likely to have a very improbable impact of low significance on this settlement.

Whilst a detailed assessment of other projects has not been undertaken, it is possible that they may impact on this settlement. However, views of the surrounding landscape from within Aggeneys are difficult to see due to the density of development and roadside / garden vegetation. Where external views are possible they are also highly influenced by development, particularly mining operations.

Cumulative impacts are therefore anticipated to be low.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional**(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small**(0)**	Small**(0)**
Probability	Very improbable**(1)**	Improbable**(2)**
Significance	Low **(6)**	Low **(14)**
Status	**Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	No mitigation is necessary	Unknown

Mitigation:
No mitigation is necessary.

Residual Impacts:
Residual impacts relate to the loss of indigenous vegetation as well as the failure to remove development and infrastructure on decommissioning,

6 Cumulative impact of glare on the un-surfaced roads to the north and east of the proposed site

Nature of impact:
It is possible that glare from the proposed project could affect travellers on the roads to the north and south during early morning and early evening respectively
Whilst a detailed assessment of other projects has not been undertaken, it is possible that the proposed project within the same property and other projects on different properties to the east cause additional impact. The probability of glare being an issue will increase to "probable" and due to the spread of the possible projects the extent increases to "regional".

The impact of glare should however be reasonably easily mitigated by screening.

With mitigation, cumulative impacts should therefore have a low significance.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional**(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Minor **(2)**
Probability	Probable**(3)**	Probable **(3)**
Significance	Low **(24)**	Low **(27)**
Status	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated	Yes	

Mitigation / Management:
Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the edge of an array.

Residual Impacts:
None

7 Cumulative impact of glare affecting Aggeneys Aerodrome.

Nature:

Whilst a detailed glare analysis of other solar projects in the area has not been undertaken, due to the number of projects in the area, the probability of glare being an issue will increase to probable and due to the spread of the possible projects the extent increases to "regional".

The proposed project is unlikely to add significantly to glare issues associated with solar PV development in the area.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional **(3)**

Duration	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Minor **(2)**
Probability	Improbable **(2)**	Probable**(3)**
Significance	Low **(16)**	Low **(27)**
Status (positive or negative)	**Negative**	**Negative**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: Should glare prove problematic, mitigation might include a slight adjustment to the angle of repose of solar panels, however, the applicant has indicated that this is not a feasible mitigation method and they will investigating alternative methods with the owner of the air strip if glare proves problematic.		
Residual Impacts: None		

8 Night Time Lighting Impacts

Nature:
Currently lighting in the area is focused within the Developed Landscape Character Area. It is comprised of lighting within the settlement of Aggeneys, lighting around mining operations as well as traffic on the N14.

There is a risk that the proposed project will extend the influence of lighting into the more natural Rural Landscape Character Area although it will largely affect areas that are currently influenced by development.

If additional solar development does occur on the sites to the east, it is highly possible that these developments will extend lighting into the Rural Landscape Character Area. If appropriate mitigation measures are applied as recommended for the subject project then cumulative impacts are anticipated to be low.

	Overall impact of the proposed project considered in isolation	**Cumulative impact of the project and other projects in the area**
Extent	Site and immediate surroundings **(2)**	Regional**(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Small **(0)**	Small to minor **(1)**
Probability	Improbable **(2)**	Probable**(3)**
Significance	Low **(12)**	Low **(24)**
Status (positive or negative)	If the lights are generally not visible then the occasional light is unlikely to be seen as negative. **Neutral**	**Neutral**
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
Can impacts be mitigated?	Yes	
Mitigation:		

1) Use low key lighting around buildings and operational areas that is triggered only when people are present; 2) Plan to utilise infra-red security systems or motion sensor triggered security lighting; 3) Ensure that lighting is focused on the development with no light spillage outside the site; and 4) Keep lighting low, no tall mast lighting should be used.
Residual Impacts: No residual risk has been identified.

APPENDIX V
ENVIRONMENTAL MANAGEMENT PLAN

Project component/s	Geelstert 2 Solar Facility, Construction, Operation and Decommissioning		
Potential Impact	Change in Landscape Character: • Extending the influence of development into relatively natural areas; • Changing the nature of views from the N14, local roads, homesteads and the urban area of Aggeneys; • Extending lighting impacts into natural areas that are currently dark during the hours of darkness; • Glint and glare affecting the adjacent local roads and the northern flight path into Aggeneys Aerodrome.		
Activity/risk source	• Engineered change in landform being obvious against natural contours. • Vegetation clearance and lack of rehabilitation during construction and decommissioning making the development more obvious particularly from a distance. • The development dominating the view from the adjacent local road. • Lighting extending into natural areas that are currently dark during the hours of darkness. • Glare affecting drivers on local roads and pilots approaching and leaving the Aggeneys Aerodrome.		
Mitigation: Target/Objective	• Plan platforms and earthworks to blend into surrounding natural contours. • Develop as far from the local road as possible and maintain an undeveloped buffer between the road and the development; • Minimise and reinstate vegetation loss. • Maintain and plant the buffer area along the northern boundary in order to soften views of the development and maintain continuity with the surrounding natural landscape. • Remove structures and rehabilitate site to its natural condition on decommissioning. • Ensuring that the development does not create more night time lighting than necessary. • Ensure PV panels use non reflective surfaces in order to minimise the potential for glint and glare. • Monitor glint and glare impacts on the adjacent local road as well as the Aggeneys Aerodrome and undertake additional mitigation as necessary such as the creation of a screen.		
Mitigation: Action/control		**Responsibility** Contractor (C) Environmental Officer (EO) Environmental Liaison Officer (ELO)	**Timeframe** Construction Phase (C) Operational Phase (O) Decommissioning Phase (D)

Ensure that lighting and security system are designed, installed and maintained in a manner that minimises lighting impacts.	C, EO	C, O
Ensure that the face of panels have the most effective non reflective surface possible at the time of ordering.	C, EO	C
Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development area.	C, EO	C
Reinstate any areas of vegetation that have been disturbed during construction.	C, EO	C
Rehabilitate disturbed areas to their natural state on decommissioning.	EO	D
Monitor rehabilitated areas post-construction and post-decommissioning and implement remedial actions.	C, EO	C, D
Monitor for impacts of glint and glare affecting the local road to the north of the site and Aggeneys Aerodrome. It will be necessary to liaise with the operator of the aerodrome in order to that he / she can report glare issues that may be experienced by pilots.	EO	O
Undertake mitigation measures for glare impacts as necessary possibly including a screen fence and / or adjusting the angle of PV panels. The applicant has indicated that the adjustment of the angle of panels is not the preferred mitigation method.	EO	O
Remove all temporary works.	C, EO	D
Remove infrastructure not required for the post-decommissioning use of the site.	C, ECO	D
Performance Indicators	Natural contours rather than rigid engineered land form. Vegetation presence and density. Minimal night time lighting. Visibility of the development from the N14. Presence of unnecessary infrastructure. Observing glare on the un-surfaced road to the north of the project/ complaints from drivers and pilots.	

Monitoring	Evaluate vegetation before, during and after construction. Evaluate vegetation growth and reinstatement during decommissioning and for a year thereafter. Monitor glare on the adjacent road through visual observations during early evenings particularly during summer months. Monitor glare affecting the aerodrome through liaison with the operator. Visually monitor the effect of night time lighting on the surrounding landscape. Take regular time-line photographic evidence. Responsibility: EO and ELO. Prepare regular reports.