PROPOSED GRID CONNECTION INFRASTRUCTURE FOR THE WOODHOUSE SOLAR 1 AND 2 PV PROJECTS, NALEDI LOCAL MUNICIPALITY, NORTH WEST PROVINCE

VISUAL IMPACT ASSESSMENT

Produced for:

Genesis Eco Energy Developments (Pty) Ltd

On behalf of:

savannah environmental

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1. STUDY APPROACH

1.1. Qualification and experience of the practitioner

Lourens du Plessis, a specialist in visual impact assessment and Geographical Information Systems (GIS), undertook the Visual Impact Assessment (VIA).

He has been involved in the application of Geographical Information Systems (GIS) in Environmental Planning and Management since 1990. He has extensive practical knowledge in spatial analysis, environmental modeling and digital mapping, and applies this knowledge in various scientific fields and disciplines. His expertise are often utilised in Environmental Impact Assessments, State of the Environment Reports and Environmental Management Plans.

He is familiar with the "Guidelines for Involving Visual and Aesthetic Specialists in EIA Processes" (Provincial Government of the Western Cape: Department of Environmental Affairs and Development Planning) and utilises the principles and recommendations stated therein to successfully undertake visual impact assessments.

Savannah Environmental appointed Lourens du Plessis as an independent specialist consultant to undertake the visual impact assessment for the proposed grid connection infrastructure for the Woodhouse Solar 1 and 2 PV Projects. He will not benefit from the outcome of the project decision-making.

1.2. Assumptions and limitations

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

1.3. Level of confidence

Level of confidence[1] is determined as a function of:

- The information available, and understanding of the study area by the practitioner:
  - 3: A high level of information is available of the study area and a thorough knowledge base could be established during site visits, surveys etc. The study area was readily accessible.
  - 2: A moderate level of information is available of the study area and a moderate knowledge base could be established during site visits, surveys etc. Accessibility to the study area was acceptable for the level of assessment.
  - 1: Limited information is available of the study area and a poor knowledge base could be established during site visits and/or surveys, or no site visit and/or surveys were carried out.

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[1] Adapted from Oberholzer (2005).

- The information available, understanding of the study area and experience of this type of project by the practitioner:
    - 3: A high level of information and knowledge is available of the project and the visual impact assessor is well experienced in this type of project and level of assessment.
    - 2: A moderate level of information and knowledge is available of the project and/or the visual impact assessor is moderately experienced in this type of project and level of assessment.
    - 1: Limited information and knowledge is available of the project and/or the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

Table 1: Level of confidence.

		Information on the project & experience of the practitioner		
Information on the study area		**3**	**2**	**1**
	3	9	6	3
	2	6	4	2
	1	3	2	1

*The level of confidence for this assessment is determined to be **9** and indicates that the author's confidence in the accuracy of the findings is high:*

- The information available, and understanding of the study area by the practitioner is rated as **3** and
- The information available, understanding and experience of this type of project by the practitioner is rated as **3**.

1.4. Methodology

The study was undertaken using Geographical Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed infrastructure. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by the Japan Aerospace Exploration Agency (JAXA), Earth Observation Research Centre, in the form of the ALOS Global Digital Surface Model "ALOS World 3D - 30m" (AW3D30) elevation model.

Visual Impact Assessment (VIA)

The VIA is determined according to the nature, extent, duration, intensity or magnitude, probability and significance of the potential visual impacts, and will propose management actions and/or monitoring programs, and may include recommendations related to the proposed grid connection infrastructure for the Woodhouse Solar 1 and 2 PV Projects.

The visual impact is determined for the highest impact-operating scenario (worst-case scenario) and varying climatic conditions (i.e. different seasons, weather conditions, etc.) are not considered.

The VIA considers potential cumulative visual impacts, or alternatively the potential to concentrate visual exposure/impact within the region.

The following VIA-specific tasks were undertaken:

- **Determine potential visual exposure**

  The visibility or visual exposure of any structure or activity is the point of departure for the visual impact assessment. It stands to reason that if the proposed grid infrastructure was not visible, no impact would occur.

  Viewshed analyses from the proposed infrastructure indicate the potential visibility.

- **Determine visual distance/observer proximity to the grid connection infrastructure**

  In order to refine the visual exposure of the grid connection infrastructure on surrounding areas/receptors, the principle of reduced impact over distance is applied in order to determine the core area of visual influence for the structures.

  Proximity radii for the proposed infrastructure are created in order to indicate the scale and viewing distance of the structures and to determine the prominence of the structures in relation to their environment.

  The visual distance theory and the observer's proximity to the grid infrastructure are closely related, and especially relevant, when considered from areas with a high viewer incidence and a predominantly negative visual perception of the proposed infrastructure.

- **Determine viewer incidence/viewer perception (sensitive visual receptors)**

  The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of the structure is favourable to all the observers, then the visual impact would be positive.

  It is therefore necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed infrastructure.

  It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer; regularity of sighting, cultural background, state of mind, and purpose of sighting which would create a myriad of options.

- **Determine the visual absorption capacity of the landscape**

  This is the capacity of the receiving environment to absorb the potential visual impact of the proposed structures. The visual absorption capacity (VAC) is primarily a function of the vegetation, and will be high if the vegetation is tall, dense and continuous. Conversely, low growing sparse and patchy vegetation will have a low VAC.

  The VAC would also be high where the environment can readily absorb the structure in terms of texture, colour, form and light / shade characteristics of the structure. On the other hand, the VAC for a structure contrasting markedly with one or more of the characteristics of the environment would be low.

The VAC also generally increases with distance, where discernible detail in visual characteristics of both environment and structure decreases.

The digital terrain model utilised in the calculation of the visual exposure of the grid connection infrastructure does not incorporate the potential VAC of the natural vegetation of the region. It is therefore necessary to determine the VAC by means of the interpretation of the vegetation cover, supplemented with field observations.

- **Calculate the visual impact index**

  The results of the above analyses are merged in order to determine where the areas of likely visual impact would occur. These areas are further analysed in terms of the previously mentioned issues (related to the visual impact) and in order to determine the magnitude of each impact.

- **Determine impact significance**

  The potential visual impacts are quantified in their respective geographical locations in order to determine the significance of the anticipated impact on identified receptors. Significance is determined as a function of extent, duration, magnitude (derived from the visual impact index) and probability. Potential cumulative and residual visual impacts are also addressed. The results of this section are displayed in impact tables and summarised in an impact statement.

- **Propose mitigation measures**

  Mitigation measures will be proposed in terms of the planning, construction, operation and decommissioning phases of the project.

- **Reporting and map display**

  All the data categories, used to calculate the visual impact index, and the results of the analyses will be displayed as maps in the accompanying report. The methodology of the analyses, the results of the visual impact assessment and the conclusion of the assessment will be addressed in the VIA report.

- **Site visit**

  Undertake a site visit (July 2021) in order to verify the results of the spatial analyses and to identify any additional site specific issues that may need to be addressed in the VIA report.

2. BACKGROUND

Genesis Eco-Energy Developments (Pty) Ltd is proposing grid connection infrastructure to connect the authorised Woodhouse 1 and 2 Solar Photovoltaic (PV) Facilities to the national grid. The project includes the following:

- A switching station at Woodhouse 2.
- Two alternative Collector Substations and power line corridors
- 132kV power lines between switching station, collector substation, and Bophirima Substation

The proposed infrastructure is located approximately 6km south-east of the town of Vryburg, within the Naledi Local Municipality of the Dr. Ruth Segomotsi Mompati District Municipality, North West Province.

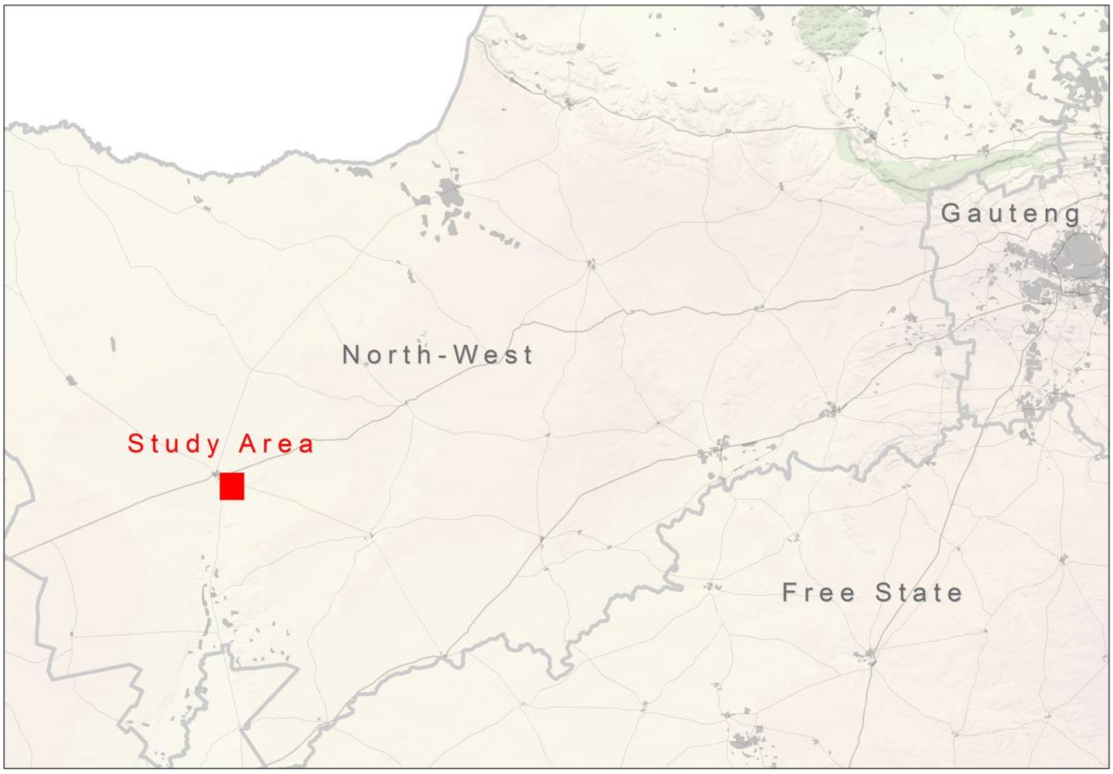


Figure 1: Regional locality of the study area.

The proposed Collector Substation alternatives are:

- **Alternative B1** – located north of the Eskom Bophirima Substation.

- **Alternative B2** – located 570m south-west of the Bophirima Substation.

The Woodhouse 2 PV switching station position is located approximately 2km north-east of the existing Waterloo Solar PV Facility, immediately north of the future Woodhouse 2 PV Facility.

The power line towers will either be steel lattice or monopole structures with a maximum height up to 36m above ground level. The servitude will be up to 40m wide and it is expected that the construction phase will be up to 12 months long. The power line infrastructure in between the two Woodhouse 1 PV Substation alternatives to the Bophirima Substation will be 132kV underground cables.

The proposed grid connection infrastructure are indicated on **Figure 5** and on the maps displayed within this report. Sample images of lattice and monopole tower structures, and a typical substation are displayed below.

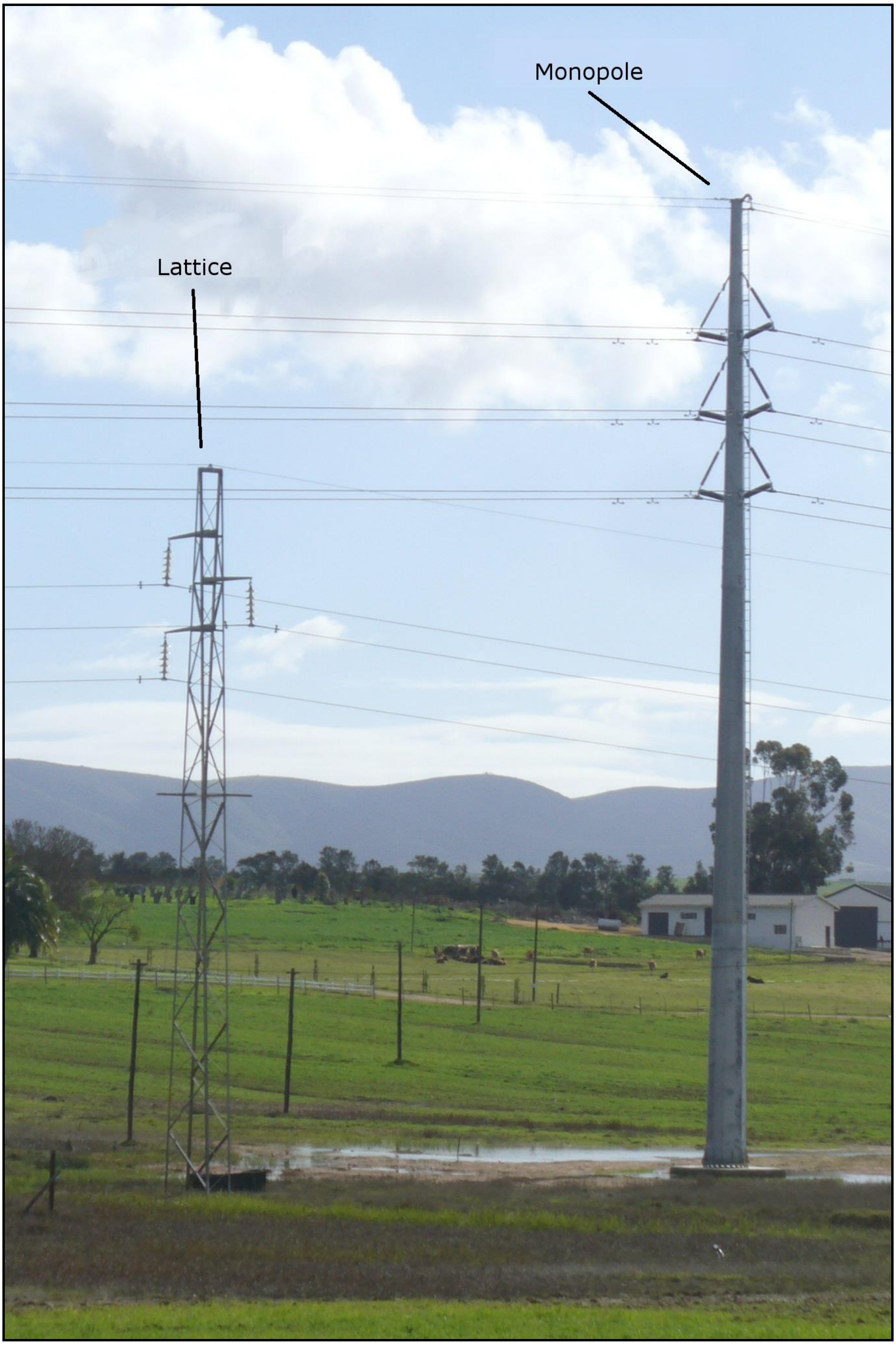


Figure 2: Conventional lattice power line tower compared to a steel monopole structure.

Figure 3: Longer distance view of power line towers.

Figure 4: Typical substation.

3. SCOPE OF WORK

This report is the undertaking of a Visual Impact Assessment (VIA) of the proposed grid connection infrastructure as mentioned above.

The determination of the potential visual impacts is undertaken in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed infrastructure.

The study area for the visual impact assessment encompasses a geographical area of 103km² (the extent of the full page maps displayed in this report) and includes a minimum 3km buffer zone (area of potential visual influence) from the power line alignment.

The broader study area includes a number of homesteads or farm residences, agricultural holdings, part of the Vryburg industrial area, and the existing Waterloo Solar PV Plant.

Anticipated issues related to the potential visual impact of the proposed grid connection infrastructure include the following:

- The visibility of the infrastructure to, and potential visual impact on, observers travelling along the national, arterial or secondary roads within the study area.
- The visibility of the infrastructure to, and potential visual impact on residents of homesteads within the study area.
- The potential visual impact of the infrastructure on the visual character or sense of place of the region.
- The potential visual impact of the infrastructure on tourist routes or tourist destinations (if present).
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the location of the proposed infrastructure within the Vryburg Renewable Energy Development Zone (REDZ) and Northern Power Corridor (an area with existing and authorised solar energy generation infrastructure).
- Potential visual impacts associated with the construction phase.
- The potential to mitigate visual impacts and inform the design process.

It is envisaged that the issues listed above may constitute a visual impact at a local and/or potentially at a regional scale.

4. RELEVANT LEGISLATION AND GUIDELINES

The following legislation and guidelines have been considered in the preparation of this report:

- The Environmental Impact Assessment Regulations, 2014 (as amended);
- Guideline on Generic Terms of Reference for EAPS and Project Schedules (DEADP, Provincial Government of the Western Cape, 2011).

5. THE AFFECTED ENVIRONMENT

The proposed project infrastructure is located within the rural outskirts of the town of Vryburg in the North West Province, approximately 6km south-east of the central business district (at the closest). The study area has a rural and natural character dominated by agricultural holdings and farming activities to the north, and large tracts of natural farm land to the south. The majority of land within the region is utilised as grazing land for cattle farming with limited dryland agriculture in places. See **Figure 5** below.

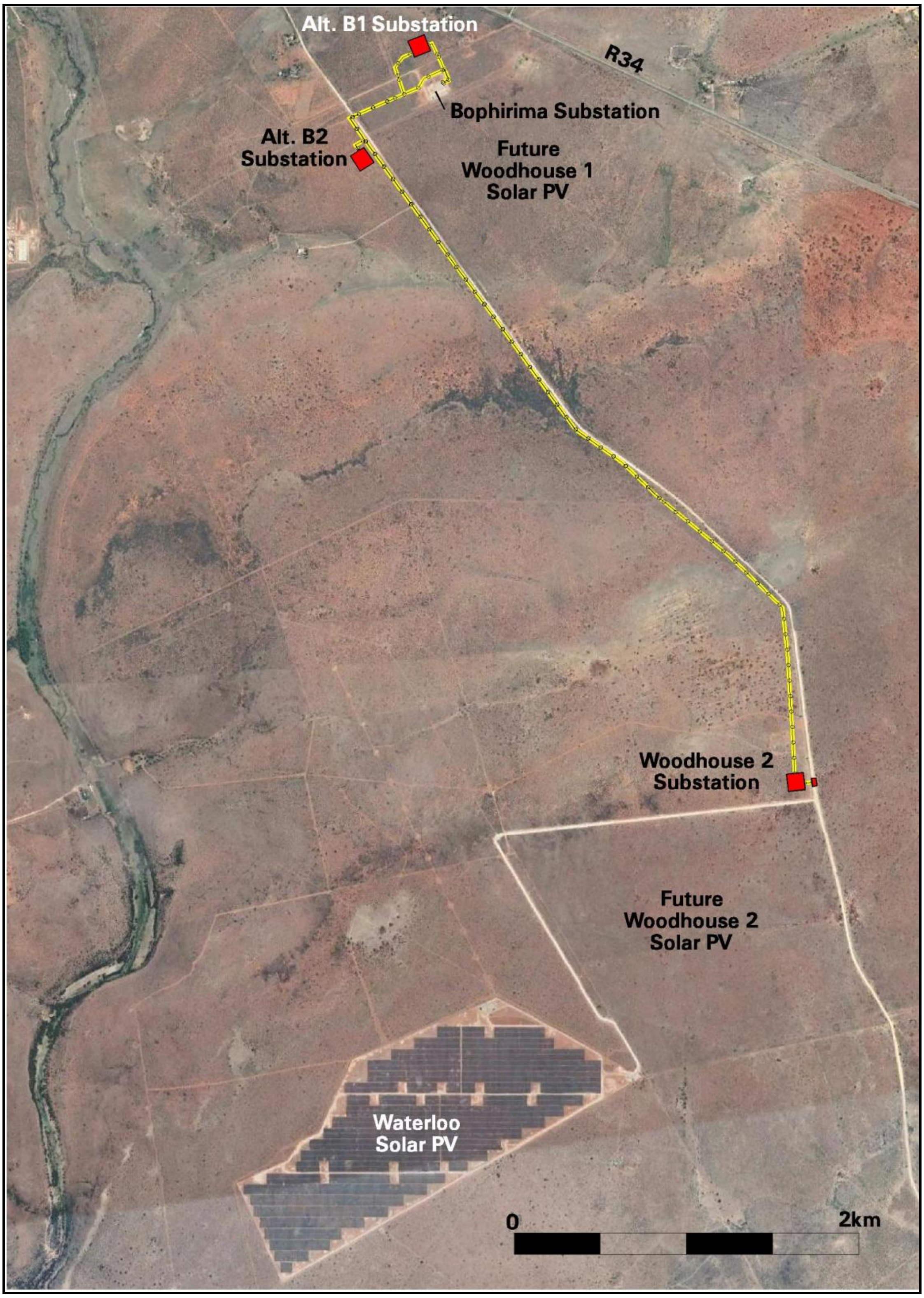


Figure 5: Aerial overview of the power line alignment and substation alternatives.

The proposed project infrastructure will span across four farm portions. These include:

- Portion 56 of the Farm Bernauw 674 (T0IN00000000067400056)
- Portion 2 of the Farm Bernauw 674 (T0IN00000000067400002)
- Portion 2 of the Farm Woodhouse 729 (T0IN00000000072900002)
- The Farm Waterloo 992 (T0IN00000000099200000)

The latter farm is the location of the Waterloo Solar PV Plant. All the properties are currently zoned as agricultural.

Topography, hydrology and vegetation

The study area occurs on land that ranges in elevation from approximately 1,141m (in the south) to 1,257m (to the north-west). The region has a relatively even slope, with only two weak ridges to the centre of the study area. The power line will traverse the northern ridge at an elevation of approximately 1,225m above sea level.

The terrain morphology is described as *plains* with no prominent topographical features (hills or mountains) or major (perennial) rivers. The only water course is the non-perennial Leeuspruit traversing in a southerly direction from the town of Vryburg, to the south-west of the study area. Besides this river there are very few other drainage lines and a limited amount of farm dams within the study area. The region is relatively arid and is referred to as the *Eastern Kalahari Bushveld Bioregion*. The average rainfall is indicated at between 300 – 500mm per annum.

The vegetation cover in the region is primarily *grassland* and *low shrubland*, with some *forest* and *woodland* occurring along the Leeuspruit floodplain. The vegetation type for the entire study area is indicated as *Ghaap Plateau Vaalbosveld* with the vegetation and landscape features described as "*flat plateau with well-developed shrub and open tree layers*".

Refer to **Maps 1** and **2** for the topography and land cover maps of the study area.

Land use and settlement patterns

The majority of the study area is sparsely populated (less than 10 people per km^2) and consists of a landscape of wide-open spaces and very little development, especially to the south. The highest population concentration is at the town of Vryburg and the Huhudi settlement south of the town. The relatively low rainfall has as a consequence that the region has not been transformed by dryland or irrigated agriculture.

Besides the limited cultivation of crops, the study area is largely in a natural state, with cattle and game farming as primary economic activities. The Vryburg region is considered to be the largest beef producing district in South Africa.

Farm residences, or homesteads, dot the landscape at an irregular interval. These homesteads are generally located at great distances from each other (i.e. more than 3km apart). Agricultural holdings are found closer to Vryburg, just north of the R34 arterial road and the Woodhouse 1 Substation site (Alternative B1).

The N14 national road provides motorised access to the region from Johannesburg, the largest metropolitan area closest to the site (approximately 388km by road). A short section of the R34 arterial road and another 1.5km gravel road provides the quickest access to the proposed development site from the N14.

There are neither designated protected areas within the region nor any identified tourist attractions or destinations within the study area.[2]

In spite of the rural and natural character of the study area, there are a number of overhead power lines in close proximity to the development site. These include:

- Mercury - Mookodi 1 400kV
- DeLareyville Municicipal - Vryburg 1 88kV
- Mookodi - Vryburg 1 132kV

These power lines all traverse near the Bophirima Substation and the proposed Woodhouse 1 Substation sites.

Further to this, the proposed project infrastructure is located within the Vryburg Renewable Energy Development Zone (REDZ) and Northern Strategic Transmission Corridor. Refer to **Figure 6** for the regional locality of the site in relation to the Vryburg REDZ. REDZ are described as:

"areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country."

Source: https://redzs.csir.co.za

Figure 6 further indicates the status of Renewable Energy Environmental Applications (REEA) within the Vryburg REDZ (dated 2021 1st quarter).

Applications that have been approved/constructed in the study area include:

- Waterloo Solar PV Facility (operational)
- Woodhouse 1 and 2 Solar PV Facilities
- Gamma Solar PV Facility
- Khubu Solar PV Facility
- Tiger Kloof Solar PV Facility
- Sediba Solar PV Facility

[2] Sources: DEAT (ENPAT North West), NBI (Vegetation Map of South Africa, Lesotho and Swaziland), NLC2018 (ARC/CSIR), REEA_OR_2021_Q1 and SAPAD2021 (DEA).

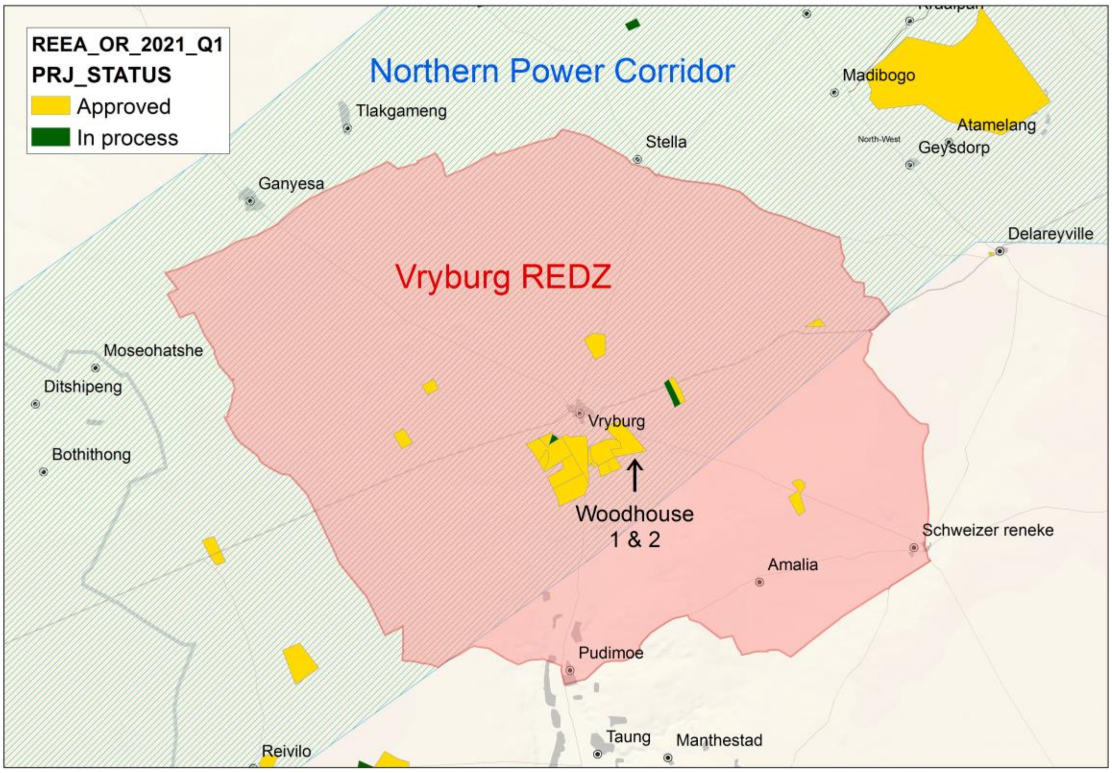


Figure 6: Regional locality of the Woodhouse 1 and 2 Solar PV Facilities in relation to the Vryburg Renewable Energy Development Zone (REDZ) and Northern Power Corridor.

*Note: The data above (**Figure 6**) is provided by the Department of Environmental Affairs. The author accepts no responsibility for the accuracy thereof.*

The photographs below aid in describing the general environment within the study area and surrounding the proposed project infrastructure.

Figure 7: The gravel access road to proposed project site.

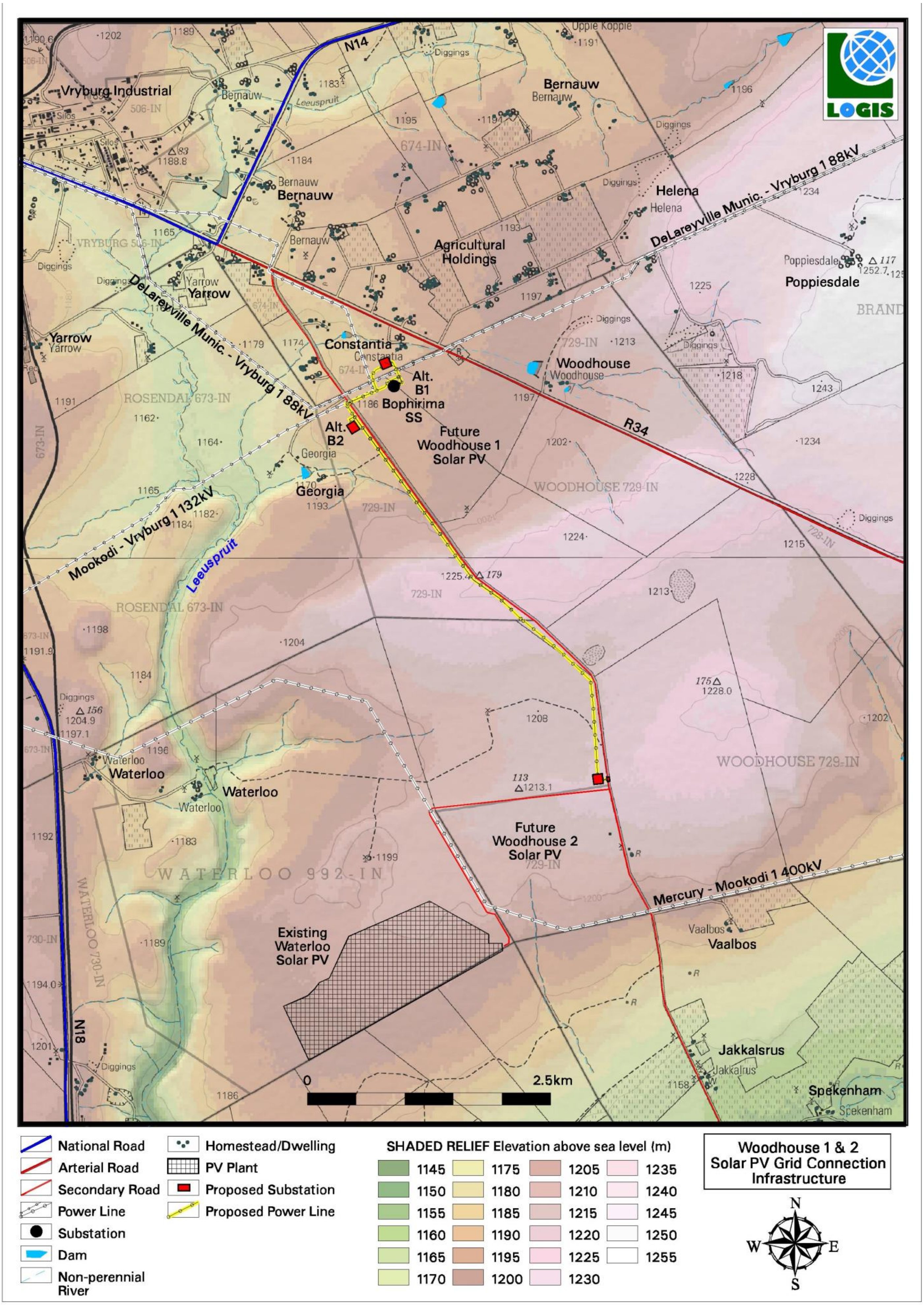
Figure 8: The Bophirima Substation and existing power line infrastructure at the proposed Woodhouse 1 Substation (Alternative B1) site.

Figure 9: The general environment at the Woodhouse 1 Substation site (Alternative B2) (Note: Farm house in the background).

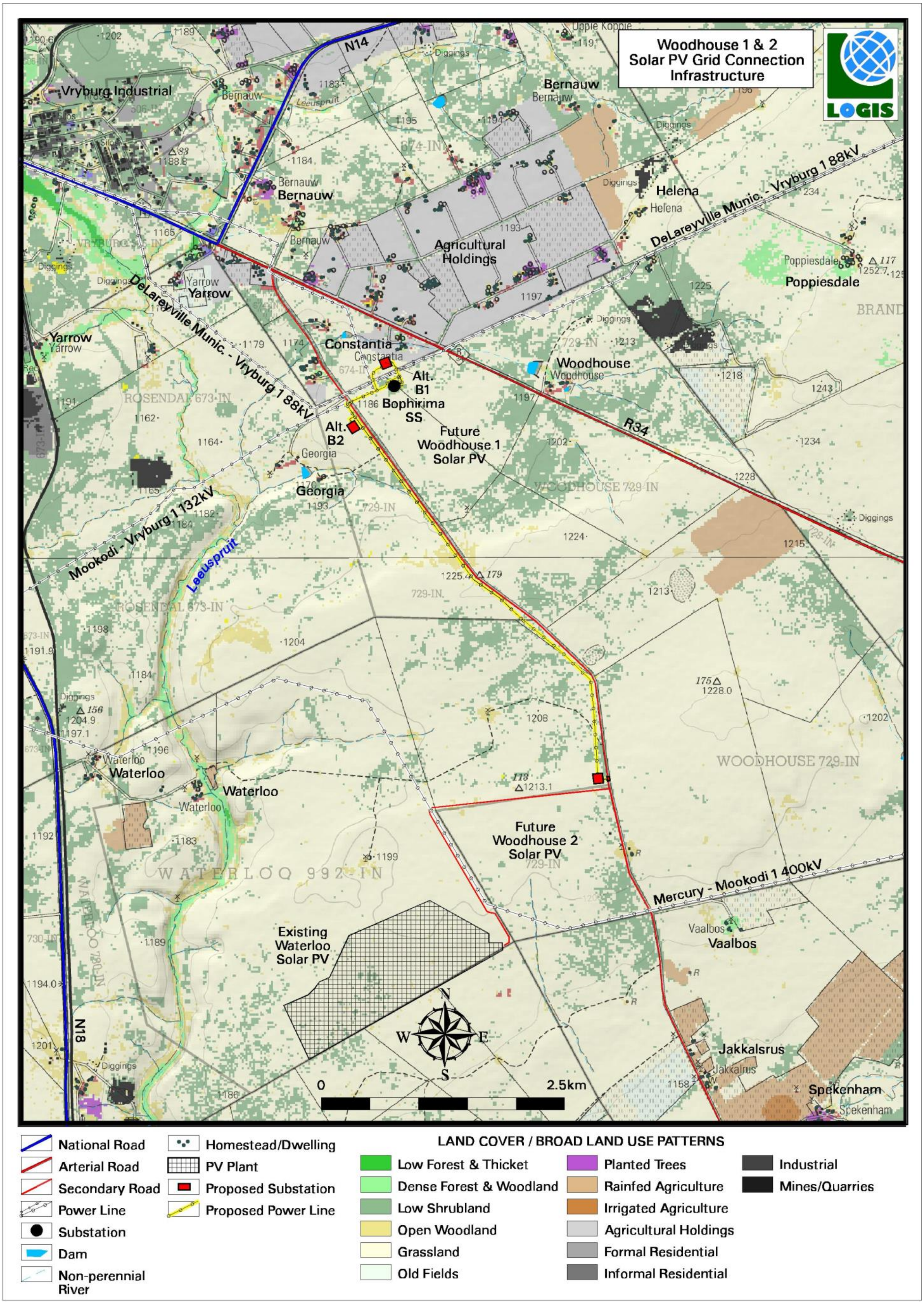
Figure 10: View from the northern ridge looking back towards Vryburg. (Note: The power line will traverse west (left) of this road).

Figure 11: View of the proposed Woodhouse 2 Substation site immediately north of the Waterloo Solar PV Facility access road.

Figure 12: The Mercury to Mookodi 1 400kV power lines near the Waterloo Solar PV facility.



Map 1: Shaded relief map of the study area.



Map 2: Land cover and broad land use patterns. *Source*: *National Land-cover Database 2018.*

6. RESULTS

6.1. Potential visual exposure

The potential visual exposure (visibility) of the grid connection infrastructure is shown on **Map 3**. The visibility analysis was undertaken from the Woodhouse 1 Substation sites, along the power line alignment (up to the Woodhouse 2 Substation site) at an offset of 36m above average ground level (i.e. the approximate height of the grid connection infrastructure), for a distance of 3km from the infrastructure. The viewshed analysis was restricted to a 3km radius due to the fact that visibility beyond this distance is expected to be negligible/highly unlikely for the relatively constrained vertical dimensions of this type of power line (i.e. a 132kV power line) and substations.

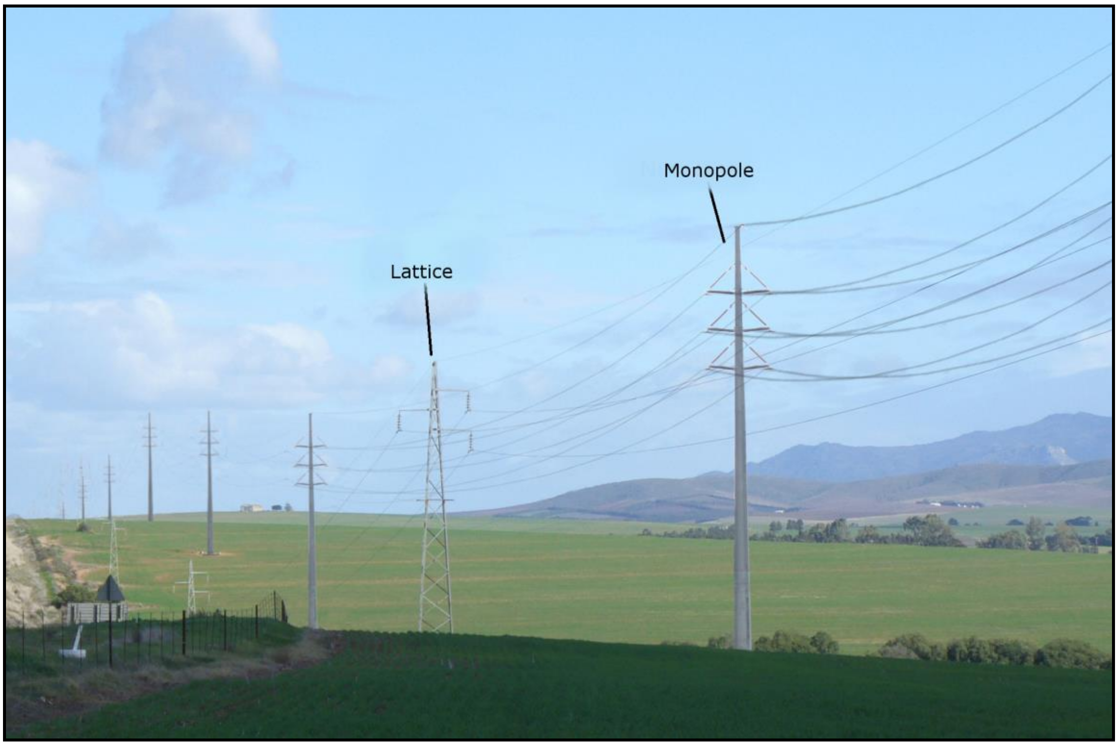


Figure 13: Examples of 132kV overhead power lines.

It is expected that the grid connection infrastructure (all alternatives) may theoretically be visible within the 3km visual corridor and potentially highly visible within a 500 – 1,500m radius of the structures due to the generally flat terrain it traverses. Beyond 1,500m the visibility becomes more scattered due to the undulating nature of the topography. The grid connection structures are unlikely to be visible beyond a 3km radius of the structures.

Although the majority of the exposed areas fall within vacant open space, generally devoid of observers or potential sensitive visual receptors, specific receptors sites are discussed per alternative below.

Collector Substation site Alternative B1 and powerline

This alternative may be visible (within a 500m radius) from the Constantia homestead, The R34 arterial road, the secondary road, as well as from dwellings at the southern section of the agricultural holdings. It may also be visible from two unnamed homesteads located west of the substation site alongside the secondary road.

The visual exposure will not be in isolation, but will occur in conjunction with the existing Bophirima Substation and a significant amount of existing power line infrastructure at this locality. See **Figure 8**. It should also be noted that the Constantia homestead is located on the property identified for the substation site.

The power line infrastructure at this substation site will be underground and will not be visible.

Collector Substation site Alternative B2 and power line

This alternative substation site and overhead power line will be visible from the secondary road, the unnamed homesteads mentioned above, as well as from the Georgia homestead (see **Figure 9**) at a distance of just over 500m. It is expected that the substation and power line will be clearly visible, especially from the secondary road.

Woodhouse 2 Switching Station site

There are very limited potential sensitive visual receptors further south along the proposed switching station alignment. There are no exposed homesteads within a 3km radius of the switching station site. A higher level of visual exposure is however expected along the secondary road, as the switching station will be located immediately adjacent to this road.

Conclusion

In general terms it is envisaged that the grid connection infrastructure, where visible from shorter distances (e.g. less than 1.5km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a visual impact. The incidence rate of sensitive visual receptors is however expected to be quite low, due to the generally remote location of the proposed infrastructure and the low number of potential observers.

The Woodhouse 1 Substation site Alternative B1, has the highest opportunity to consolidate the substation infrastructure within the region and is therefore preferred above the Woodhouse 1 Substation site Alternative B2. The latter alternative will spread the potential visual exposure and ultimately aggravate the visual impact over a larger area.

6.2. Potential cumulative visual exposure

Cumulative visual impacts can be defined as the additional changes caused by a proposed development in conjunction with other similar developments or as the combined effect of a set of developments. In this case the 'development' would be a new 132kV power line and two substations as seen in conjunction with the existing grid connection infrastructure in close proximity.

Cumulative visual impacts may be:

- Combined, where several power lines are within the observer's arc of vision at the same time;
- Successive, where the observer has to turn his or her head to see the various structures of a power line; and

- Sequential, when the observer has to move to another viewpoint to see different power line structures, or different views of the same power line (such as when travelling along a route).

The visual impact assessor is required (by the competent authority) to identify and quantify the cumulative visual impacts and to propose potential mitigating measures. This is often problematic as most regulatory bodies do not have specific rules, regulations or standards for completing a cumulative visual assessment, nor do they offer meaningful guidance regarding appropriate assessment methods. There are also not any authoritative thresholds or restrictions related to the capacity of certain landscapes to absorb the cumulative visual impacts of the power line infrastructure.

To complicate matters even further, cumulative visual impact is not just the sum of the impacts of two developments. The combined effect of both may be much greater than the sum of the two individual effects, or even less.

The cumulative impact of the proposed grid connection infrastructure on the landscape and visual amenity is a product of:

- The distance between the power lines and substation structures;
- The distance over which the structures are visible;
- The overall character of the landscape and its sensitivity to the structures;
- The siting and design of the power line, switching station or substation; and
- The way in which the landscape is experienced.

The specialist is required to conclude if the proposed 'development' will result in any unacceptable loss of visual resource considering the industrial infrastructure proposed in the area.

Results

The proposed Collector Substation and grid corridor Alternative B1 is located adjacent to the Bophirima Substation and associated power lines. It is expected that the existing visual disturbance at this site will largely absorb the potential visual exposure of the proposed substation i.e. the visual amenity of this site has already been compromised.

The Collector Substation and grid corridor Alternative B2 will remove the substation further away from these existing visual disturbances, thereby spreading the visual exposure further apart and potentially aggravating the cumulative visual impact.

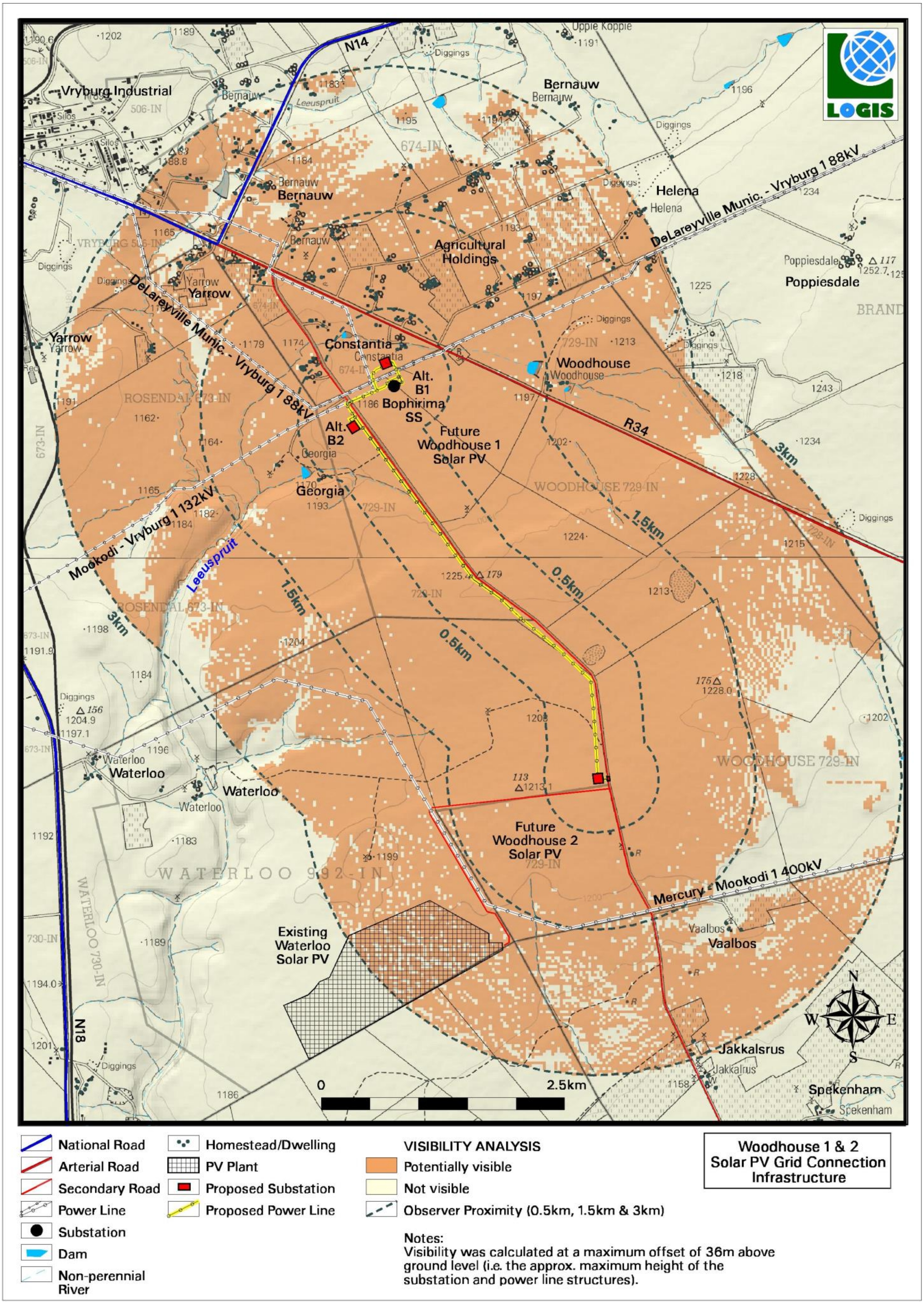
It should also be noted that the area has been subjected to a number of renewable energy applications. These are (according to the South African Renewable Energy EIA Application Database) (REEA_OR_2021_Q1):

- Waterloo Solar PV Facility (operational)
- Woodhouse 1 and 2 Solar PV Facilities
- Gamma Solar PV Facility
- Khubu Solar PV Facility
- Tiger Kloof Solar PV Facility
- Sediba Solar PV Facility

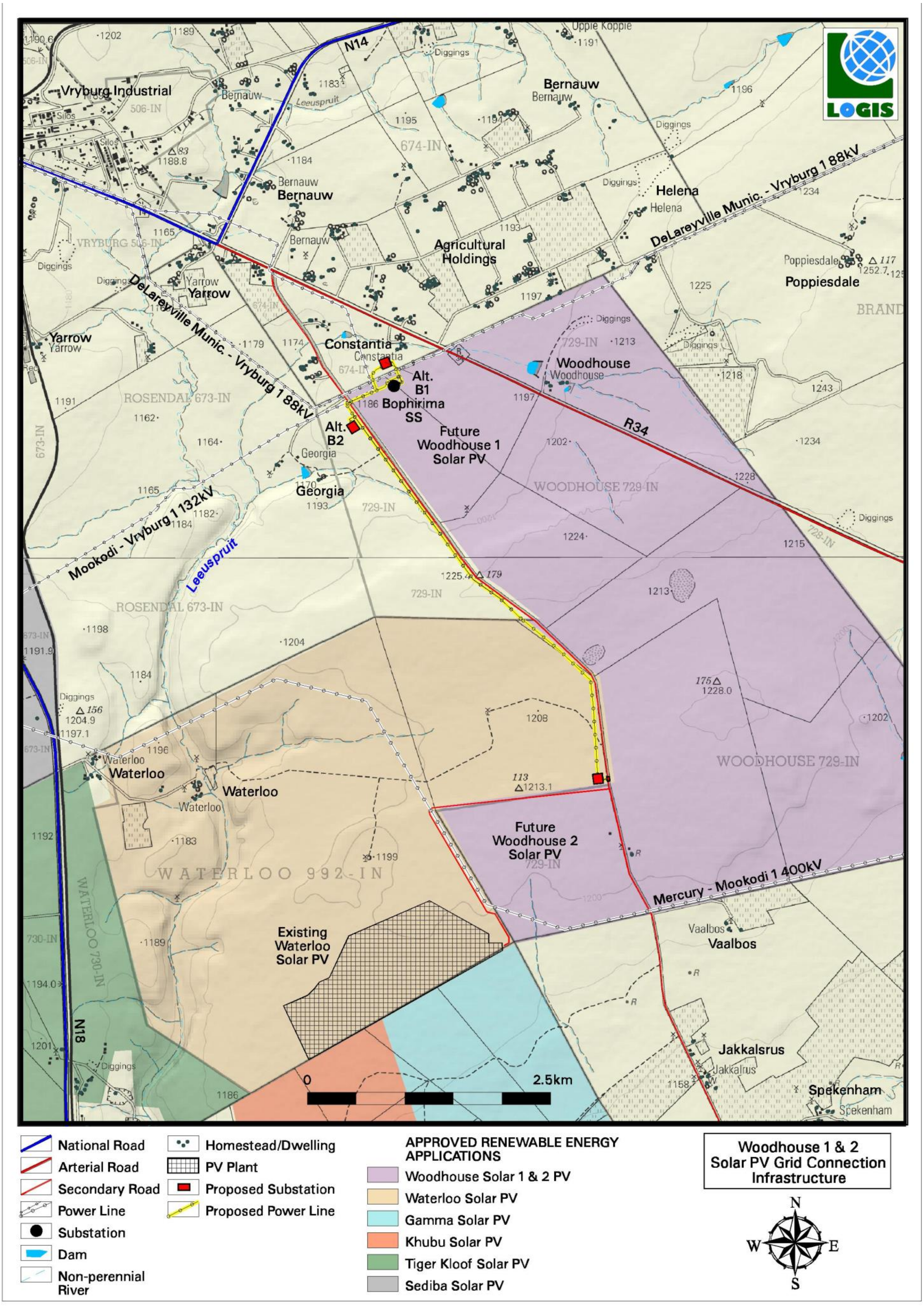
Refer to **Map 4** for the REEA_OR_2021_Q1 applications listed above. It must be noted that the database is not always updated regularly and therefore some projects shown on Map 4 may no longer be considered for development, or no longer have valid Environmental Authorisations (EAs). The data is displayed as provided and the author does not accept responsibility for the accuracy thereof.

Conclusion

The large number of approved renewable energy generation applications within the Vryburg REDZ and this area in particular, is expected to increase the cumulative visual impact should all of these projects be constructed. However, considering the purpose of the establishment of the Vryburg REDZ (i.e. to concentrate renewable energy applications within this area) the cumulative visual impact is considered to be within acceptable limits. It is further recommended that proposed future developments should be contained within this zone, rather than be located further afield and ultimately spreading the visual impacts over larger areas.



Map 3: Viewshed analysis of the proposed Woodhouse 1 and 2 grid connection infrastructure.



Map 4: Renewable Energy Environmental Applications within the study area.

6.3. Visual distance / observer proximity to the grid connection infrastructure

The proximity radii are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger grid connection infrastructure (e.g. 400kV) and downwards for smaller structures (e.g. 132kV) due to variations in height. This methodology was developed in the absence of any known and/or accepted standards for South African power line infrastructure.

The proximity radii (calculated from the grid connection infrastructure) are indicated on **Map 5**, and include the following:

- 0 – 0.5km - Short distance view where the structures would dominate the frame of vision and constitute a very high visual prominence.
- 0.5 – 1.5km - Medium distance views where the structures would be easily and comfortably visible and constitute a high visual prominence.
- 1.5 - 3km - Medium to longer distance view where the structures would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 3km - Long distance view where the structures may still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the power lines.

The visual distance theory and the observer's proximity to the 132kV power line and substations are closely related, and especially relevant, when considered from areas with a higher viewer incidence and a potentially negative visual perception of the proposed infrastructure.

6.4. Viewer incidence / viewer perception

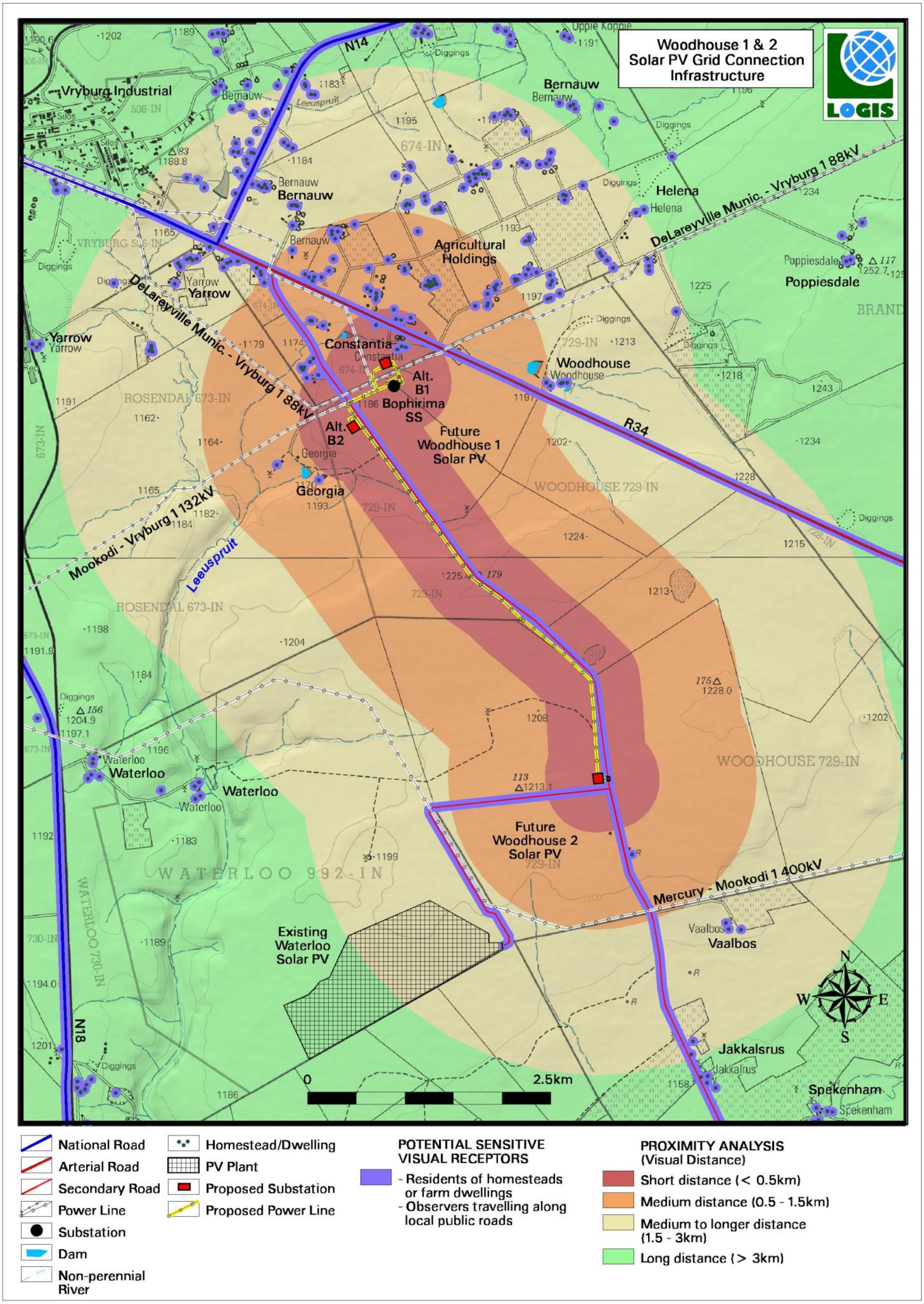
The number of observers and their perception of a structure determine the concept of visual impact. If there are no observers or if the visual perception of the structure is favourable to all the observers, there would be no visual impact.

It is necessary to identify areas of high viewer incidence and to classify certain areas according to the observer's visual sensitivity towards the proposed grid connection infrastructure. It would be impossible not to generalise the viewer incidence and sensitivity to some degree, as there are many variables when trying to determine the perception of the observer: regularity of sighting, cultural background, state of mind, purpose of sighting, etc. which would create a myriad of options.

Viewer incidence is calculated to be the highest along the R34 arterial road and less so for the secondary road traversing between the Woodhouse 1 and 2 Solar PV sites. Travellers using these roads may be negatively impacted upon by visual exposure to the grid connection infrastructure.

Additional sensitive visual receptors are located at the farm residences (homesteads) throughout the study area and at the agricultural holdings north of the R34 arterial road. It is expected that the viewer’s perception, unless the observer is associated with (or supportive of) the grid connection infrastructure, would generally be negative.

Due to the generally remote location of the proposed power line and substations, and the ill populated nature of the receiving environment, there are only three potential sensitive visual receptor sites located within a 500m radius of the proposed infrastructure. These are the residents of, or visitors, to the unnamed homesteads west and north-west of the Woodhouse 1 Substation Alternatives, the Georgia homestead and residences to the south of the agricultural holdings north of the R34. The Constantia homestead is located on the property earmarked for the Alternative B1 Substation, and it is assumed that the land owner is supportive of the proposed infrastructure. Refer to **Map 5**.



Map 5: Proximity analysis and potential sensitive visual receptors.

6.5. Visual absorption capacity

The vegetation cover in the region is primarily *grassland* and *low shrubland*, with some *forest* and *woodland* occurring along the Leeuspruit floodplain. The vegetation type for the entire study area is indicated as *Ghaap Plateau Vaalbosveld* with the vegetation and landscape features described as "*flat plateau with well-developed shrub and open tree layers*".

Overall, the Visual Absorption Capacity (VAC) of the receiving environment is low by virtue of the limited height of the vegetation, the relatively homogenous landform and the overall low occurrence of buildings, structures and infrastructure outside of the urban and industrial areas. In addition, the scale and form of the proposed structures mean that it is unlikely that the environment will visually absorb them in terms of texture, colour, form and light/shade characteristics. Within this area the VAC of vegetation will not be taken into account, thus assuming a worst case scenario in the impact assessment.

Where homesteads and settlements occur, some more significant vegetation and trees may have been planted, which would contribute to the visual absorption capacity (i.e. shielding the observers from the infrastructure). As this is not a consistent occurrence, however, VAC will not be taken into account for any of the homesteads or settlements, thus assuming a worst case scenario in the impact assessment.

Figure 14: Grassland and low shrubland within the study area – low VAC.

6.6. Visual impact index

The combined results of the visual exposure, viewer incidence/perception and visual distance of the proposed grid connection infrastructure culminate in a visual impact index. Here the weighted impact and the likely areas of impact have been indicated as a visual impact index. Values have been assigned for each potential visual impact per data category and merged in order to calculate the visual impact index.

The criteria (previously discussed in this report) which inform the visual impact index are:

- Visibility or visual exposure of the structures
- Observer proximity or visual distance from the structures
- The presence of sensitive visual receptors
- The perceived negative perception or objections to the structures (if applicable)
- The visual absorption capacity of the vegetation cover or built structures (if applicable)

An area with short distance visual exposure to the proposed grid connection infrastructure, a high viewer incidence and a potentially negative perception would therefore have a higher value (greater impact) on the index. This helps in focussing the attention to the critical areas of potential impact and determining the potential **magnitude** of the visual impact.

The index indicates that **potentially sensitive visual receptors** within a 500m radius of the project infrastructure may experience a **high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **moderate** within a 0.5 – 1.5km radius (where/if sensitive receptors are present) and **low** within a 1.5 – 3km radius (where/if sensitive receptors are present). Receptors beyond 3km are expected to have a **very low** or **insignificant** potential visual impact.

Magnitude of the potential visual impact

The visual impact index and potentially affected sensitive visual receptors are indicated on **Maps 6**. In general, there are only a limited number of receptor sites within close proximity (0.5 – 1.5km) to the proposed project infrastructure. These are:

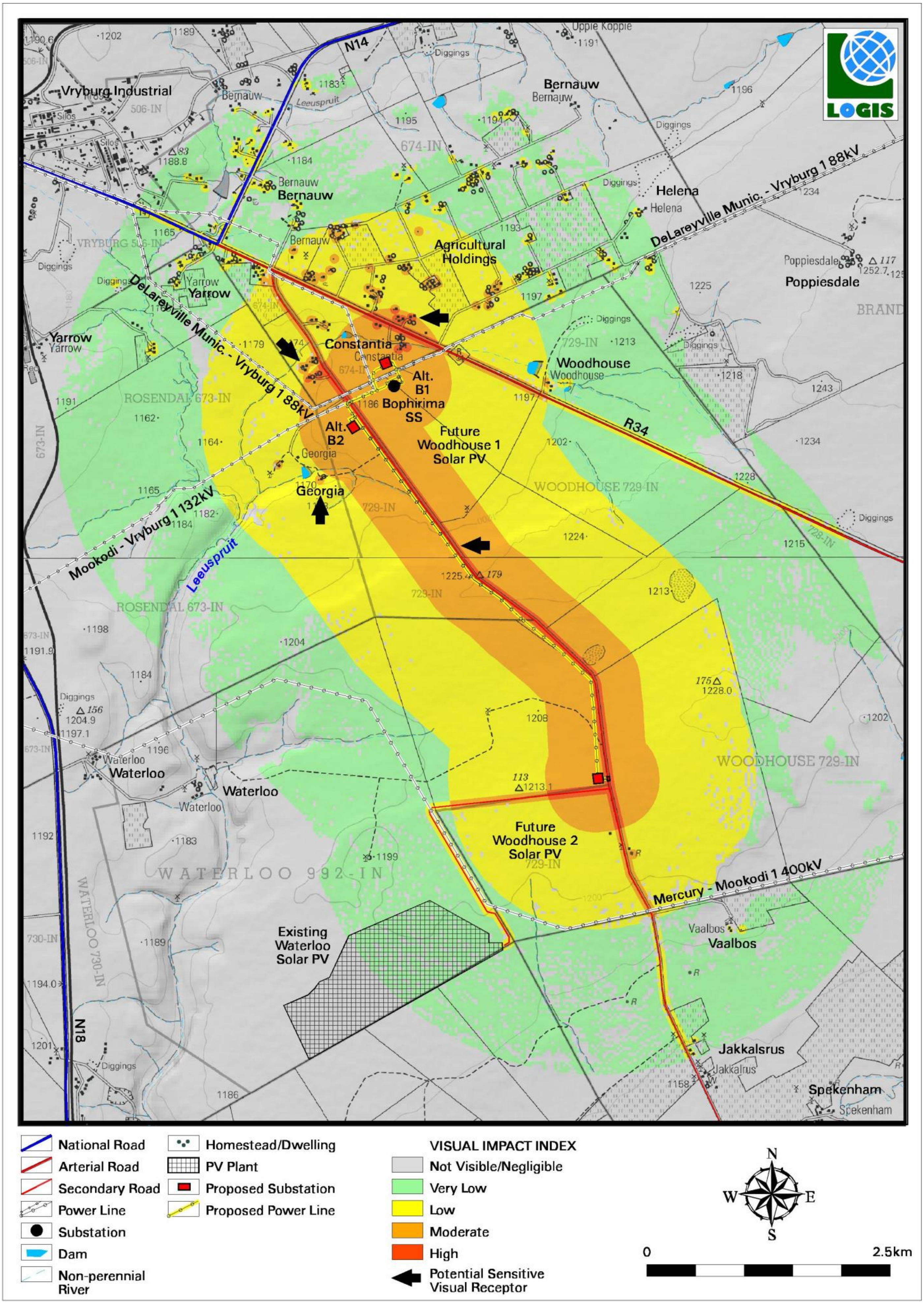
- A short section of the R34 arterial road
- The secondary road traversing adjacent to the proposed power line
- Residents of the southern section of the Bernauw Agricultural Holdings
- The two unnamed residences north and north-west of the Woodhouse 1 Substation sites
- The Georgia homestead

The magnitude of the potential visual impact is expected to range from **moderate** to **high**.

Preferred Collector Substation and grid corridor Alternative

The proposed Collector Substation Alternative B1 is located adjacent to the Bophirima Substation and associated power lines. It is expected that the existing visual disturbance at this site will largely absorb the potential visual exposure of the proposed substation i.e. the visual amenity of this site has already been compromised. The Collector Substation Alternative B2 will effectively be a "green fields" site, with no existing structures or visual disturbances (see **Figure 9**). It will further encroach on the secondary road and the Georgia homestead.

To this end, the B1 Collector Substation Alternative is preferred from a visual impact perspective.



Map 6: Visual impact index and potentially affected sensitive visual receptors.

6.7. Visual impact assessment: impact rating methodology

The previous section of the report identified specific areas where likely visual impacts would occur. This section will attempt to quantify these potential visual impacts in their respective geographical locations and in terms of the identified issues (see **Section 3:** SCOPE OF WORK) related to the visual impact.

The methodology for the assessment of potential visual impacts states the **nature** of the potential visual impact (e.g. the visual impact on users of major roads in the vicinity of the proposed power line alignment) and includes a table quantifying the potential visual impact according to the following criteria:

- **Extent** - site only (very low = 1), local (low = 2), regional (medium = 3), national (high = 4) or international (very high = 5)[3].
- **Duration** - very short (0-1 yrs. = 1), short (2-5 yrs. = 2), medium (5-15 yrs. = 3), long (>15 yrs. = 4), and permanent (= 5).
- **Magnitude** - None (= 0), minor (= 2), low (= 4), medium/moderate (= 6), high (= 8) and very high (= 10)[4].
- **Probability** – very improbable (= 1), improbable (= 2), probable (= 3), highly probable (= 4) and definite (= 5).
- **Status** (positive, negative or neutral).
- **Reversibility** - reversible (= 1), recoverable (= 3) and irreversible (= 5).
- **Significance** - low, medium or high.

The **significance** of the potential visual impact is equal to the **consequence** multiplied by the **probability** of the impact occurring, where the consequence is determined by the sum of the individual scores for magnitude, duration and extent (i.e. **significance = consequence (magnitude + duration + extent) x probability**).

The significance weighting for each potential visual impact (as calculated above) is as follows:

- <30 points: Low (where the impact would not have a direct influence on the decision to develop in the area)
- 31-60 points: Medium/moderate (where the impact could influence the decision to develop in the area)
- >60: High (where the impact must have an influence on the decision to develop in the area)

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[3] Local = within 0.5 – 1.5km of the grid connection infrastructure. Regional = between 1.5 - 3km from the infrastructure.

[4] This value is read from the visual impact index. Where more than one value is applicable, the higher of these will be used as a worst case scenario.

6.8. Visual impact assessment

The primary visual impacts of the proposed grid connection infrastructure for the Woodhouse Solar 1 and 2 PV projects are assessed below. For the purposes of the assessment the proposed project alternatives are grouped and abbreviated accordingly:

Woodhouse Solar PV 2 Switching Station: **WH 2**
Collector Substation and power line Alternative B1: **Alt. B1**
Collector Substation and power line Alternative B2: **Alt. B2**

6.8.1. Construction impacts

Potential visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.

During construction, there may be an increase in heavy vehicles utilising the roads to the power line and substation sites that may cause, at the very least, a visual nuisance to other road users and landowners in the area.

Construction activities may potentially result in a **low** (significance ratings = 16 and 20) temporary visual impact both before and after mitigation.

Table 2: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity to the proposed grid connection infrastructure.			
	Alt. B1	***Alt. B2***	***WH 2***
Extent	Local **(2)**	Local **(2)**	Local **(2)**
Duration	Short term **(2)**	Short term **(2)**	Short term **(2)**
Magnitude	Low **(4)**	Moderate **(6)**	Moderate **(6)**
Probability	Improbable **(2)**	Improbable **(2)**	Improbable **(2)**
Significance	Low **(16)**	Low **(20)**	Low **(20)**
Status (positive or negative)	Negative	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated?	Yes		

Mitigation: Planning: ➢ Retain and maintain natural vegetation immediately adjacent to the development footprint/servitude. Construction: ➢ Ensure that vegetation is not unnecessarily removed during the construction phase. ➢ Plan the placement of lay-down areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible. ➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads. ➢ Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed of regularly at licensed waste facilities. ➢ Reduce and control construction dust using appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent). ➢ Restrict construction activities to daylight hours whenever possible in order to reduce lighting impacts. ➢ Rehabilitate all disturbed areas immediately after the completion of construction works.
Residual impacts: None, provided rehabilitation works are carried out as specified.

6.8.2. Potential visual impact on sensitive visual receptors located within a 1.5km radius of the grid connection infrastructure during the operation phase

The Collector Substation Alternative B1 and power line is expected to have a **low** visual impact (significance rating = 28) on observers within a 1.5km radius of the grid connection infrastructure. The visual impact of the substation will largely be absorbed by the presence of the existing Bophirima Substation and power lines.

The Collector Substation Alternative B2 and power line may have visual impacts of **moderate** significance (rating = 42) as this alternative will introduce an additional visual intrusion (i.e. the substation west of the road) on observers travelling along the secondary road or residing at the Georgia homestead.

The Woodhouse Solar PV 2 Switching Station will similarly place the substation west of the road, thereby introducing additional visual clutter at this location, potentially resulting in an impact of **moderate** significance.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 3: Visual impact on observers in close proximity to the proposed grid connection infrastructure.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads in close proximity to the power line structures			
	Alt. B1	***Alt. B2***	***WH 2***
Extent	Local **(2)**	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**	High **(8)**
Probability	Improbable **(2)**	Probable **(3)**	Probable **(3)**

Significance	Low **(28)**	Moderate **(42)**	Moderate **(42)**
Status (positive, neutral or negative)	Negative	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated?	No		
Mitigation / Management: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint. Operations: ➢ Maintain the general appearance of the infrastructure. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.			
Residual impacts: The visual impact will be removed after decommissioning, provided the power line infrastructure is removed. Failing this, the visual impact will remain.			

6.8.3. Potential visual impact on sensitive visual receptors within the region (1.5 – 3km radius) during the operation of the grid connection infrastructure

The grid connection infrastructure (all alternatives) will have a **low** visual impact (significance rating = 22) on observers traveling along the roads and residents of homesteads within a 1.5 - 3km radius of the infrastructure.

No mitigation of this impact is possible (i.e. the structures will be visible regardless), but general mitigation and management measures are recommended as best practice. The table below illustrates this impact assessment.

Table 4: Visual impact of the proposed grid connection infrastructure within the region.

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 1.5 – 3km radius of the grid connection infrastructure.			
	Alt. B1	***Alt. B2***	***WH 2***
Extent	Regional **(3)**	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**	Improbable **(2)**
Significance	Low **(22)**	Low **(22)**	Low **(22)**
Status (positive, neutral or negative)	Negative	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No	No
Can impacts be mitigated?	No		

Mitigation / Management: Planning: ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. Operations: ➢ Maintain the general appearance of the servitude as a whole. Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided that the grid connection infrastructure is removed. Failing this, the visual impact will remain.

6.9. Visual impact assessment: secondary impacts

The potential visual impact of the proposed grid connection infrastructure on the sense of place of the region.

Sense of place refers to a unique experience of an environment by a user, based on his or her cognitive experience of the place. Visual criteria, specifically the visual character of an area (informed by a combination of aspects such as topography, level of development, vegetation, noteworthy features, cultural / historical features, etc.), plays a significant role.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light.

The greater environment has a predominantly rural, undeveloped character and a natural appearance. These generally undeveloped landscapes are considered to have a high visual quality, except where urban development and power generation/distribution infrastructure represents existing visual disturbances.

The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

Table 5: The potential impact on the sense of place of the region.

Nature of Impact: The potential impact of the development of the proposed grid connection infrastructure on the sense of place of the region.			
	Alt. B1	***Alt. B2***	***WH 2***
Extent	Regional **(3)**	Regional **(3)**	Regional **(3)**
Duration	Long term **(4)**	Long term **(4)**	Long term **(4)**
Magnitude	Minor **(2)**	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**	Improbable **(2)**
Significance	Low **(18)**	Low **(22)**	Low **(22)**
Status (positive, neutral or negative)	Negative	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No	No
Can impacts be	No, only best practise measures can be implemented		

mitigated?	

Generic best practise mitigation/management measures:

Planning:

- Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude.

Operations:

- Maintain the general appearance of the servitude as a whole.

Decommissioning:

- Remove infrastructure not required for the post-decommissioning use.
- Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.

Residual impacts:

The visual impact will be removed after decommissioning, provided the grid connection infrastructure is removed. Failing this, the visual impact will remain.

The potential cumulative visual impact of the proposed grid connection infrastructure on the visual quality of the landscape.

The construction of the grid connection infrastructure for the Woodhouse Solar PV 1 and 2 Projects may increase the cumulative visual impact of industrial type infrastructure within the region.

The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of **moderate** significance (Woodhouse Solar PV 1 Substation Alternative B1 = 42 and Woodhouse Solar PV 1 (Alternative B2) and PV 2 Substations and power line = 56). This is considered to be acceptable from a visual impact perspective.

Table 6: The potential cumulative visual impact on the visual quality of the landscape – Woodhouse Solar PV 1 Substation Alternative B1.

Nature of Impact:
The potential cumulative visual impact of the grid connection infrastructure on the visual quality of the landscape.

	Overall impact of the Preferred Alternative considered in isolation (with mitigation)	***Cumulative impact of the project and other projects within the area (with mitigation)***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Improbable **(2)**	Probable **(3)**
Significance	Low **(28)**	Moderate **(42)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	

Generic best practise mitigation/management measures: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. <u>Operations:</u> ➢ Maintain the general appearance of the servitude as a whole. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.
Residual impacts: The visual impact will be removed after decommissioning, provided the grid infrastructure is removed. Failing this, the visual impact will remain.

Table 7: The potential cumulative visual impact on the visual quality of the landscape – Woodhouse Solar PV 1 (Alternative B2) and PV 2 Substations and power line.

Nature of Impact: The potential cumulative visual impact of the grid connection infrastructure on the visual quality of the landscape.		
	Overall impact of the Alternatives 1 and 1B considered in isolation (with mitigation)	***Cumulative impact of the project and other projects within the area (with mitigation)***
Extent	Local **(2)**	Local **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Probable **(3)**	Highly Probable **(4)**
Significance	Moderate **(42)**	Moderate **(56)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No, only best practise measures can be implemented	
Generic best practise mitigation/management measures: <u>Planning:</u> ➢ Retain/re-establish and maintain natural vegetation immediately adjacent to the development footprint/servitude. <u>Operations:</u> ➢ Maintain the general appearance of the servitude as a whole. <u>Decommissioning:</u> ➢ Remove infrastructure not required for the post-decommissioning use. ➢ Rehabilitate all affected areas. Consult an ecologist regarding rehabilitation specifications.		
Residual impacts: The visual impact will be removed after decommissioning, provided the grid infrastructure is removed. Failing this, the visual impact will remain.		

6.10. The potential to mitigate visual impacts

The primary visual impact, namely the appearance of the proposed grid connection infrastructure is not possible to mitigate. The functional design of the structures cannot be changed in order to reduce visual impacts.

Secondary impacts anticipated as a result of the proposed grid connection infrastructure (i.e. visual character and sense of place) are also not possible to mitigate.

The following mitigation is, however possible:

- Retain/re-establish and maintain natural vegetation in all areas immediately adjacent to the development footprint/servitude. This measure will help to soften the appearance of the grid connection infrastructure within its context.

- Mitigation of visual impacts associated with the construction phase, albeit temporary, would entail proper planning, management and rehabilitation of the construction site. Recommended mitigation measures include the following:

  - Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
  - Plan the placement of laydown areas and any potential temporary construction camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.
  - Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.
  - Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.
  - Reduce and control construction dust through the use of appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent).
  - Restrict construction activities to daylight hours as far as possible, in order to negate or reduce the visual impacts associated with lighting.
  - Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist must be consulted to assist or give input into rehabilitation specifications.

- During operation, the maintenance of the grid connection infrastructure will ensure that the infrastructure does not degrade, therefore aggravating visual impact.

- Roads must be maintained to forego erosion and to suppress dust, and rehabilitated areas must be monitored for rehabilitation failure. Remedial actions must be implemented as a when required.

- Once the grid connection infrastructure has exhausted its life span, all associated infrastructure not required for the post rehabilitation use of the site/servitude should be removed and all disturbed areas appropriately rehabilitated. An ecologist should be consulted to give input into rehabilitation specifications.

- All rehabilitated areas should be monitored for at least a year following decommissioning, and remedial actions implemented as and when required.

Good practice requires that the mitigation of both primary and secondary visual impacts, as listed above, be implemented and maintained on an ongoing basis.

7. CONCLUSION AND RECOMMENDATIONS

The construction and operation of the proposed grid connection infrastructure for the Woodhouse Solar PV 1 and 2 Projects may have a visual impact on the study area, especially within (but not restricted to) a 1.5km radius of the power line and substations. The visual impact will differ amongst places, depending on the distance from the infrastructure.

Overall, the significance of the visual impacts is expected to range from **moderate** to **low** as a result of the generally undeveloped character of the landscape and the remote location of the project infrastructure. There are a very limited number of potentially sensitive visual receptors within a 1.5km radius of the proposed structures, although the possibility does exist for visitors to the region to venture in to closer proximity to the substation and power line structures. These observers may consider visual exposure to this type of infrastructure to be intrusive.

Both of the Collector Substation and grid corridor Alternatives are considered acceptable from a visual impact perspective. However, the Collector Substation Alternative B1 consistently scored lower impact significance ratings than the Substation Alternative B2 and is therefore the preferred alternative from a visual impact perspective.

A number of mitigation measures have been proposed (**Section 6.10.**). Regardless of whether or not mitigation measures will reduce the significance of the anticipated visual impacts, they are considered to be good practice and should all be implemented and maintained throughout the construction, operation and decommissioning phases of the proposed grid connection infrastructure.

If mitigation is implemented as recommended, it is concluded that the significance of most of the anticipated visual impacts will remain at or be managed to acceptable levels. As such, the grid connection infrastructure for the Woodhouse Solar PV 1 and 2 Projects is considered to be acceptable from a visual impact perspective.

8. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed grid connection infrastructure for the Woodhouse Solar PV 1 and 2 Projects indicate that the visual environment surrounding the power line and substation, especially within a 1.5km radius, may be visually impacted upon for the anticipated operational lifespan of the grid connection infrastructure.

This impact is applicable to the proposed grid connection infrastructure and to the potential cumulative visual impact of the infrastructure in association with existing power line infrastructure (and future power generation infrastructure) within the region.

The following is a summary of impacts remaining, assuming mitigation as recommended is exercised:

- During the construction, there may be an increase in heavy vehicles utilising the roads to the power line/substation infrastructure that may cause, at the very least, a visual nuisance to other road users and landowners in the area. Construction activities may potentially result in a **low** temporary visual impact after mitigation (all alternatives).

- The Woodhouse Solar PV 1 Substation Alternative B1 is expected to have a **low** visual impact on observers within a 1.5km radius of the substation structures. The visual impact will largely be absorbed by the presence of the existing Bophirima Substation and power lines.

- The Woodhouse Solar PV 1 (Alternative B2) and PV 2 Substations and power line may have visual impacts of **moderate** significance as this alternative will introduce a new visual intrusion to observers travelling along the secondary road or residing at the Georgia homestead.

- The grid connection infrastructure (all alternatives) will have a **low** visual impact on observers traveling along the roads and residents of homesteads within a 1.5 - 3km radius of the infrastructure.

- The anticipated visual impact of the proposed grid connection infrastructure on the regional visual quality (i.e. beyond 3km of the proposed infrastructure), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance.

- The anticipated cumulative visual impact of the proposed grid connection infrastructure is expected to be of **moderate** significance, which is considered to be acceptable from a visual perspective.

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from **moderate** to **low** significance. No visual impacts of a high significance are expected to occur. Anticipated visual impacts on sensitive visual receptors in close proximity to the power line are not considered to be fatal flaws for the proposed project.

Considering all factors, it is recommended that the development of the grid connection infrastructure as proposed be supported; subject to the implementation of the recommended mitigation measures (**Section 6.10.**) and management programme (**Section 9.**).

Both of the Woodhouse Solar PV 1 Substation Alternatives are considered acceptable from a visual impact perspective. However, the Substation Alternative B1 consistently scored lower impact significance ratings than the Substation Alternative B2 and is therefore the preferred alternative from a visual impact perspective.

9. MANAGEMENT PROGRAMME

The following management plan tables aim to summarise the key findings of the visual impact report and suggest possible management actions in order to mitigate the potential visual impacts. Refer to the tables below.

Table 8: Management Programme: Planning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the planning of the proposed grid connection infrastructure.		
Project component/s	The Woodhouse Solar PV 1 and 2 132kV power line and substations.	
Potential Impact	Primary visual impact due to the presence of the grid connection infrastructure in the landscape.	
Activity/risk source	The viewing of the grid connection infrastructure by observers near the infrastructure as well as within the region.	
Mitigation: Target/Objective	Optimal planning of infrastructure so as to minimise visual impact.	
Mitigation: Action/control	Responsibility	Timeframe
Implement an environmentally responsive planning approach for the development of roads and infrastructure to limit cut and fill requirements. Plan with due cognisance of the topography.	Project proponent / design consultant	Planning phase.
Consolidate infrastructure and make use of already disturbed sites rather than natural areas, as far as practically feasible.	Project proponent / design consultant	Planning phase.
Performance Indicator	No visible degradation of access roads and other associated infrastructure from surrounding areas.	
Monitoring	Not applicable.	

Table 9: Management Programme: Construction.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the construction of the proposed grid connection infrastructure.		
Project component/s	Construction activities associated with the development of the 132kV power line and substations.	
Potential Impact	Visual impact of general construction activities, and the potential scarring of the landscape due to vegetation clearing.	
Activity/risk source	The viewing of general construction activities by observers near the development areas.	
Mitigation: Target/Objective	Minimal visual intrusion by construction activities and intact vegetation cover outside of immediate works areas.	
Mitigation: Action/control	Responsibility	Timeframe
Ensure that vegetation is not unnecessarily cleared or removed during the construction period.	Project proponent / contractor	Early in the construction phase.
Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) wherever possible.	Project proponent / contractor	Early in and throughout the construction phase.
Restrict the activities and movement of construction workers and vehicles to the immediate construction area and existing access roads.	Project proponent / contractor	Throughout the construction phase.
Ensure that rubble, litter, and disused construction materials are appropriately stored (if not removed daily) and then disposed regularly at licensed waste facilities.	Project proponent / contractor	Throughout the construction phase.
Reduce and control construction dust	Project proponent /	Throughout the

through the use of appropriate and effective dust suppression techniques as and when required (i.e. whenever dust becomes apparent).	contractor	construction phase.
Restrict construction activities to daylight hours, as far as possible, in order to negate or reduce the visual impacts associated with lighting.	Project proponent / contractor	Throughout the construction phase.
Rehabilitate all disturbed areas, construction areas, servitudes etc. immediately after the completion of construction works. If necessary, consult an ecologist to give input into rehabilitation specifications.	Project proponent / contractor	Throughout and at the end of the construction phase.
Performance Indicator	Vegetation cover within the servitudes and in the vicinity of the grid connection infrastructure has been maintained as far as possible and disturbed areas have been rehabilitated with no evidence of erosion.	
Monitoring	Monitoring of vegetation clearing during construction. Monitoring of rehabilitated areas post construction.	

Table 10: Management Programme: Operation.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the operation of the proposed grid connection infrastructure.		
Project component/s	The Woodhouse Solar PV 1 and 2 132kV power line and substations.	
Potential Impact	Visual impact of vegetation rehabilitation failure.	
Activity/risk source	The viewing of the above mentioned by observers near the infrastructure.	
Mitigation: Target/Objective	Well-rehabilitated and maintained servitudes.	
Mitigation: Action/control	Responsibility	Timeframe
Maintain roads to forego erosion and to suppress dust.	Project proponent / operator	Throughout the operation phase.
Monitor rehabilitated areas, and implement remedial action as and when required.	Project proponent / operator	Throughout the operation phase.
Performance Indicator	Intact vegetation within servitudes and in the vicinity of the infrastructure.	
Monitoring	Monitoring of rehabilitated areas.	

Table 11: Management Programme: Decommissioning.

OBJECTIVE: The mitigation and possible negation of visual impacts associated with the decommissioning of the proposed grid connection infrastructure.		
Project component/s	The Woodhouse Solar PV 1 and 2 132kV power line and substations.	
Potential Impact	Visual impact of residual visual scarring and vegetation rehabilitation failure.	
Activity/risk source	The viewing of the residual scarring and vegetation rehabilitation failure by observers along or near the areas where the grid connection infrastructure was constructed.	
Mitigation: Target/Objective	Rehabilitated vegetation in all disturbed areas.	
Mitigation: Action/control	Responsibility	Timeframe
Remove infrastructure not required for the post-decommissioning use of the site/servitude.	Project proponent / operator	During the decommissioning phase.

Rehabilitate access roads and servitudes not required for the post-decommissioning use of the sites. If necessary, consult an ecologist to give input into rehabilitation specifications.	Project proponent / operator	During the decommissioning phase.
Monitor rehabilitated areas quarterly for at least a year following decommissioning, and implement remedial action as and when required.	Project proponent / operator	Post decommissioning.
Performance Indicator	Intact vegetation along and in the vicinity of the servitude.	
Monitoring	If rehabilitation is successful then no further monitoring is required.	

10. REFERENCES/DATA SOURCES

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