VISUAL IMPACT ASSESSMENT FOR THE PROPOSED THE PROPOSED PAARDEVELEI SOLAR PV AND BATTERY ENERGY STORAGE SYSTEM (BESS), SOMERSET WEST, CAPE TOWN MUNICIPALITY

PREPARED BY:

Nuleaf Planning and Environmental (Pty) Ltd

PREPARED FOR:

JG Afrika

DATE:

November 2023 – Final Report

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Report date:	29 November 2023
Report number:	03 – Final Report

DECLARATION

I, **Tosca de Villiers**, as an independent consultant, compiled this Visual Impact Assessment and declare that it correctly reflects the findings made at the time of the report's compilation. I further declare that I, act as an independent consultant in terms of the following:

- Do not have any financial interest in the undertaking of the activity, other than remuneration for the work performed in terms of the National Environmental Management Act, 1998 (Act107 of 1998);
- Undertake to disclose, to the competent authority, any material information that has or may have the potential to influence the decision of the competent authority or the objectivity of any report, plan or document required in terms of the National Environmental Management Act,1998 (Act 107 of 1998);
- Based on the information provided to me by the project proponent, and in addition to information obtained during the course of this study, will present the results and conclusion within the associated document to the best of my professional judgement.

Tosca de Villiers
Landscape Architect & Environmental Assessment Practitioner
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ACRONYMS AND ABBREVIATIONS

AECI:	African Explosives and Chemical Industries Limited
BESS:	Battery Energy Storage System
DEADP:	Department of Environmental Affairs and Development Planning
DFFE:	Department of Forestry, Fisheries, and Environment
DTM:	Digital Terrain Model
EIA:	Environmental Impact Assessment
GIS:	Geographic Information Systems
MPA:	Marine Protected Area
NEMA:	National Environmental Management Act, Act No. 107 of 1998
PV:	Photovoltaic
REDZ:	Renewable Energy Development Zone
UNESCO:	United Nations Educational, Scientific and Cultural Organization
VIA:	Visual Impact Assessment

1. INTRODUCTION

1.1. QUALIFICATION AND EXPERIENCE OF THE PROFESSIONAL TEAM

Nuleaf Planning and Environmental (Pty) Ltd, specialising in Visual Impact Assessments, undertook the visual assessment for the proposed development.

The team undertaking the visual assessment has extensive practical knowledge in spatial analysis, environmental modelling, and digital mapping, and applies this knowledge in various scientific fields and disciplines. The expertise of these practitioners is often utilised in Environmental Impact Assessments, State of the Environment Reports, Biodiversity Plans and Environmental Management Plans.

The visual assessment team 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. Although the guidelines have been developed with specific reference to the Western Cape Province of South Africa, the core elements are more widely applicable.

Nuleaf Planning and Environmental have been appointed as an independent specialist consultant to undertake the visual impact assessment. Neither the author nor Nuleaf Planning and Environmental will benefit from the outcome of the project decision-making.

1.2. LEGAL FRAMEWORK

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

- **The National Environmental Management Act, 1998 (Act No. 107 of 1998) (NEMA):** This report is in line with Appendix 6 of NEMA: Environmental Impact Assessment (EIA) Regulations (2014, as amended) which details the minimum requirements a specialist report must contain for an Environmental Impact Assessment.
- **Guideline for Involving Visual and Aesthetic Specialists in EIA Processes (DEADP, Provincial Government of the Western Cape, 2005):** This guideline was developed for use in the Western Cape, however in the absence of the development of any other guideline, this provides input for the preparation of visual specialist input into EIA processes. The guideline documents the requirements for visual impact assessment, typical issues that trigger the need for specialist visual input, the scope and extent of a visual assessment, information required, as well as the assessment ad reporting of visual impacts and management actions.
- **Screening Tool as per Regulation 16 (1)(v) of the Environmental Impact Assessment Regulations, 2014 as amended:** a Screening report was generated for this proposed project, whereby a visual impact assessment was identified as one of the specialist studies that would be required.

1.3. INFORMATION BASE

This assessment was based on information from the following sources:

- Topographical maps and GIS generated data were sourced from the Surveyor General, Surveys and Mapping in Mowbray, Cape Town;
- Chief Directorate National (CDN) Geo-Spatial Information, varying dates. *1:50 000 Topographical Maps and Data.*
- DFFE, 2018/2020. *National Land-cover Database 2018/2020 (NLC2018/2020).*
- DFFE, 2022. *South African Protected Areas Database (SAPAD_OR_2022_Q2).*
- JAXA, 2021. Earth Observation Research Centre. *ALOS Global Digital Surface Model (AW3D30).*
- Google Earth Pro. *Up to date and recent satellite images.*
- Professional judgement based on experience gained from similar projects;
- Literature research on similar projects;
- Procedures for the Assessment and Minimum Criteria for Reporting on identified Environmental Themes in terms of Sections 24(5)(a) and (h) and 44 of NEMA

Quality of the above information bases are rated as Good.

1.4. ASSUMPTIONS AND LIMITATIONS

This Report has been prepared by Nuleaf on behalf, and at the request, of JG Afrika to provide them with an independent specialist assessment. Unless otherwise agreed by Nuleaf in writing, Nuleaf does not accept responsibility or legal liability to any person other than the JG Afrika for the contents of, or any omissions from, this Report.

To prepare this Report, Nuleaf utilised only the documents and information provided by JG Afrika, or any third parties directed to provide information and documents by JG Afrika. Nuleaf has not consulted any other documents or information in relation to this report, except where otherwise indicated. The findings, recommendations and conclusions given in this report are based on the author's best scientific and professional knowledge, as well as the available information. This report is based on survey and assessment techniques which are limited by time and budgetary constraints relevant to the type and level of investigation undertaken. Nuleaf and its staff reserve the right to modify aspects of the report including the recommendations if and when new information may become available from on-going research or further work in this field, or pertaining to this investigation.

Although Nuleaf exercises due care and diligence in rendering services and preparing documents, Nuleaf accepts no liability, and JG Afrika, by receiving this document, indemnifies Nuleaf and its directors, managers, agents and employees against all actions, claims, demands, losses, liabilities, costs, damages, and expenses arising from or in connection with the services rendered, directly or indirectly using the information contained in this document.

This report must not be altered or added to without the prior written consent of the author. This also refers to electronic copies of this report which are supplied for the purposes of inclusion as part of other reports. Similarly, any recommendations, statements or conclusions drawn from or based on this report must make reference to this report. If this report is used as part of a main report, the report in its entirety must be included as an appendix or separate section to the main report.

This assessment was undertaken during the planning stage of the project and is based on information available at that time. It is assumed that all information regarding the project details provided by JG Afrika and the Applicant is correct and relevant to the proposed project. No public participation had been undertaken at the time of this scoping VIA Report.

1.5. 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 visits and/or surveys were carried out.

- The information available, understanding of the project 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 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 the visual impact assessor has a low experience level in this type of project and level of assessment.

These values are applied as follows:

[1] Adapted from Oberholzer (2005).

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 Moderate to High:

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

2. METHODOLOGY

The study was undertaken using Geographic Information Systems (GIS) software as a tool to generate viewshed analyses and to apply relevant spatial criteria to the proposed development. A detailed Digital Terrain Model (DTM) for the study area was created from topographical data provided by NASA in the form of a 30m SRTM (Shuttle Radar Topography Mission) elevation model.

The approach utilised to identify potential issues related to the visual impact included the following activities:

- Undertaking a site visit;
- The creation of a detailed digital terrain model (DTM) of the potentially affected environment;
- The sourcing of relevant spatial data. This includes cadastral features, vegetation types, land use activities, topographical features, site placement, etc.;
- The identification of sensitive environments upon which the proposed Facility could have a potential visual impact;
- The creation of viewshed analyses from the proposed affected area in order to determine the visual exposure and the topography's potential to absorb the potential visual impact. The viewshed analyses take into account the dimensions of the proposed structures.

This report (visual impact assessment) sets out to identify and quantify the possible visual impacts related to the proposed Paardevlei Solar PV & Battery Energy Storage System (BESS) and associated infrastructure, as well as, offer potential mitigation measures, where required. The methodology as described below has been followed for the assessment of visual impact.

UNDERTAKE A SITE VISIT

A site visit was undertaken 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. The season was not a consideration, nor had any effect on the carrying out of the visual assessment. A photographic survey was made of the site and the surrounding potentially affected area from several selected viewpoints. The site visit was undertaken on the 08 October 2023.

DETERMINE THE POTENTIAL VISUAL EXPOSURE

The visibility or visual exposure of any development is the point of departure for the visual impact assessment. It stands to reason that if the proposed development were not visible, no impact would occur. Viewshed analyses of the proposed development indicates the potential visibility.

The viewshed analyses of the proposed facility and the related infrastructure are based on a 30m SRTM digital terrain model of the study area.

The first step in determining the visual impact of the proposed facility is to identify the areas from which the structures would be visible. The type of structures, the dimensions, the extent of operations and their support infrastructure are taken into account.

DETERMINE THE VISUAL DISTANCE AND OBSERVER PROXIMITY

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

Proximity radii for the proposed PV Facility are created in order to indicate the scale and viewing distance of the development and to determine the prominence thereof in relation to their environment.

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

DETERMINE VIEWER INCIDENCE, PERCEPTION AND SENSITIVITY

The number of observers and their perception of a development determine the concept of visual impact. If there are no observers, then there would be no visual impact. If the visual perception of a structure is favourable to all 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 development and its related 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 (VAC)

This is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. The digital terrain model utilised in the calculation of the visual exposure of the development does not incorporate the potential visual absorption capacity (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 and other landscape characteristics.

CALCULATE THE VISUAL IMPACT INDEX OF THE PROPOSED DEVELOPMENT

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) in order to judge the magnitude of each impact.

DETERMINE THE IMPACT SIGNIFICANCE

The potential visual impacts identified and described are quantified in their respective geographical locations in order to determine the significance of the anticipated impact. Significance is determined as a function of extent, duration, magnitude, and probability.

FORMULATION OF MITIGATION MEASURES

Recommendation of mitigation measures (if possible) to avoid or minimise potential negative visual impacts of the proposed development, for inclusion in the EMPr and authorisation conditions.

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 this VIA report.

3. PROJECT DESCRIPTION

The City of Cape Town is currently proposing the development of a Solar Photovoltaic (PV) Facility & Battery Energy Storage System (BESS) on City owned vacant land within Somerset West, known as Paardevlei.

The preparation of the Paardevlei Solar PV Facility & BESS project falls under the framework of support where, C40 Cities Finance Facility (CFF) 1, engages primary and secondary cities worldwide to mobilise financial resources for transformative actions, which significantly reduce their r Green House Gas emissions and build climate resilience.

The proposed Paardevlei Solar PV Facility & BESS project will be a 30 to 60 MW facility on City owned land portions (with a total extent of 152 ha) connected directly to an existing 132 kV switching station located near to the site (refer to **Figure 1**) and owned to the City of Cape Town. Construction is planned to start in the 1st quarter of 2026.

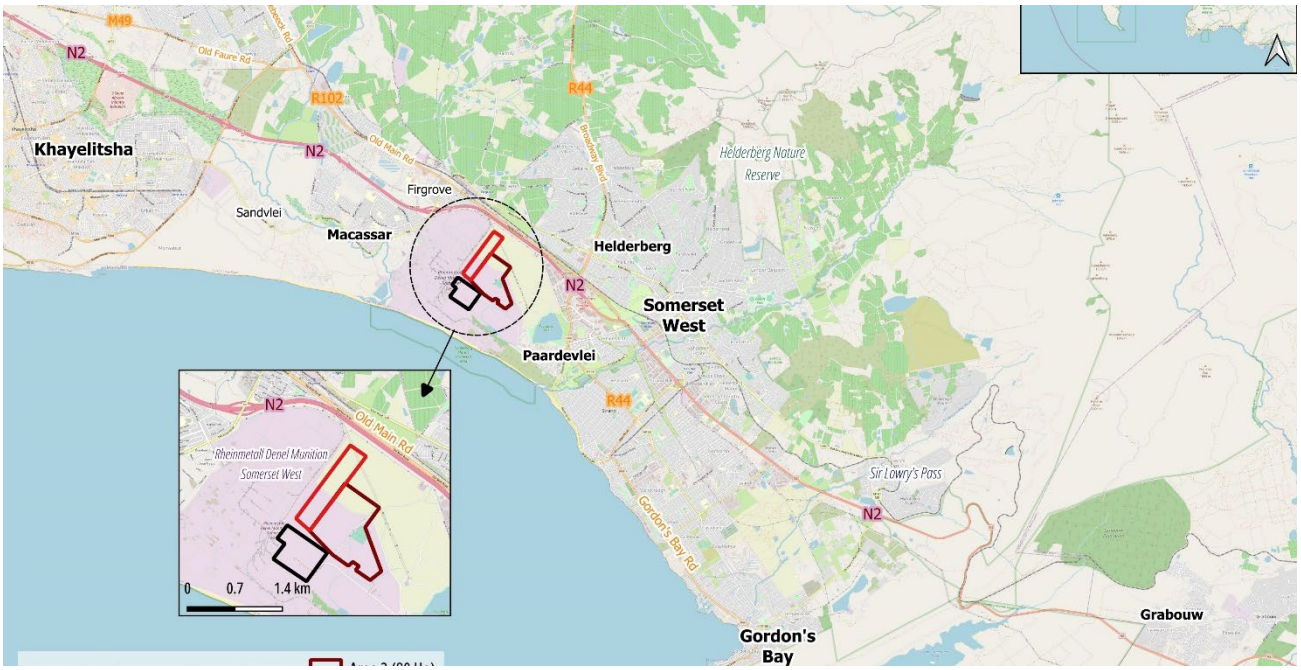


Figure 1: Paardevlei Solar PV Facility & BESS project - Site location

Figure 2 and **Table 2** presents the affected properties information and confirmation of City of Cape Town ownership.

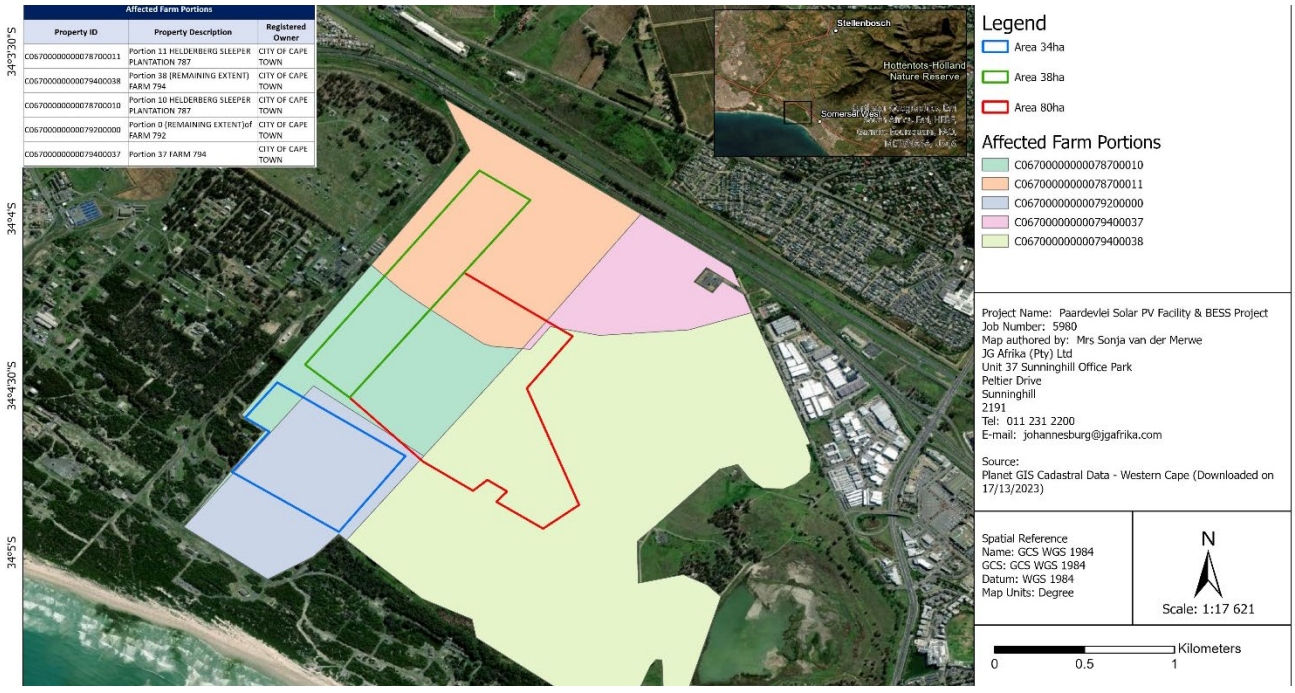


Figure 2: Paardevlei Solar PV Facility & BESS project - Affected properties information

Table 2: Affected properties description

Surveyor General 21G code	Property Description	Registered Owner
C06700000000078700011	Portion 11 HELDERBERG SLEEPER PLANTATION 787	City of Cape Town
C06700000000079400038	Portion 38 (REMAINING EXTENT) FARM 794	City of Cape Town
C06700000000078700010	Portion 10 HELDERBERG SLEEPER PLANTATION 787	City of Cape Town
C06700000000079200000	Portion 0 (REMAINING EXTENT) of FARM 792	City of Cape Town
C06700000000079400037	Portion 37 FARM 794	City of Cape Town

Various solar modules technologies and configurations are currently being assessed. The PV panels will be mounted on metallic structures, most likely rammed into the ground or with some cement-based foundations (fixed tilt or horizontal tracker-type) –refer to **Figure 3**.

Figure 3: Ground mounted Solar PV facility

The following PV configurations are currently being studied:

- **Configuration 1:** The layout consists of 1800 modules arranged in a 18x1 pattern, and the modules are tilted at a 20° angle. This setup covers approximately 57.5% of the available ground area. The pitch is 4.29m and the shading limit angle is 23.1°. The guiding parameter for the design is the shading limit angle, which should be equal to the declination of the earth. Three further configurations were considered with shading angles of 27º, 30º and 33º (configuration 2-4) to compact further the field and increasing the number of modules in the same area of land.

- **Configuration 5:** The layout consists of 1800 modules arranged in an 8x2 pattern, and the modules are tilted at a 34° angle. This setup covers approximately 46.6% of the available ground area. The pitch is 4.91m and the shading limit angle is 23.0°. The guiding parameter for the design is the shading limit angle, which should be equal to the declination of the earth. Two further configurations were considered with shading angles of 27º, 30º (configuration 6 and 7) to compact further the field and increasing the number of modules in the same area of land.

- **Configuration 8:** The layout involves 1600 modules arranged in a 18x1 pattern, tilted at an angle of 20° and half of the field facing east and the other half facing west in an inverted V shape. The ground coverage ratio for this arrangement is about 76.3%. The pitch is 5.30 m and the shading limit angle is 22.9°. The guiding parameter for the design is the loss level versus the previous configurations and to maximize compactness. Another similar configuration (no 9) was done, but with 25º tilt.

- **Configuration 10:** This tracking system follows the sun's movement from east to west, optimizing energy generation throughout the day. The layout involves 1190 modules arranged in a 18x1 pattern. The ground coverage ratio for this arrangement is about 41.1%. The pitch is 6m with +/-60º in the done for a pitch of 6 m to compact further the field and increasing the number of modules.

- **Configuration 13:** This tracking system follows the sun's movement from east to west, optimizing energy generation throughout the day. The layout involves 1190 modules arranged in a 18x1 pattern. The ground coverage ratio for this arrangement is about 38.1%. The pitch is 6m with +/-60º in the tracking angle. The simulation used back tracking enabled. This configuration used bi-facial modules. It uses bifacial PV modules. This was done for a pitch of 5,25m to compact further the field and increasing the number of modules.

The development may also include a 27-43 MWh Battery Energy Storage System (BESS), which usually consists of containerized solutions with battery racks inside, in a temperature-controlled environment and also fire protected - refer to **Figure 4.**

Figure 4: Aerial view of a BESS facility (Photo: Power Engineering International)

The following additional infrastructure is proposed in support of the proposed Paardevlei Solar PV Facility & BESS project.

- Access roads: proposed to use existing roads to access the PV plant and to add internal roads to access the PV Arrays.
- Underground cabling (between and from the PV modules) to tie into inverters and then to switchgears and transformers as well as connection with the proposed BESS and ultimately all will be connected to the new PV plant substation.
- Overhead or underground powerline to connect the PV plant substation to the existing network 132 kV switching station.
- New PV plant substation (to connect to the existing network132 kV switching station).

4. SCOPE OF WORK

The scope of work for this assessment includes the determination of the potential visual impacts in terms of nature, extent, duration, magnitude, probability and significance of the construction and operation of the proposed Paardevlei Solar PV & BESS. Mitigation measures are recommended where appropriate. Anticipated issues related to the potential visual impact of the proposed PV Facility include the following:

- Potential visual impacts associated with the construction phase on observers in close proximity to the proposed PV facility.
- The potential visual impact on sensitive visual receptors in close proximity to the proposed PV facility.
- The potential visual impact on sensitive visual receptors in the region.
- The visibility of the facility to, and potential visual impact on residents of suburbs within the study area.
- The visual absorption capacity of the natural vegetation (if applicable).
- Potential cumulative visual impacts (or consolidation of visual impacts), with specific reference to the placement of the PV facility in relation to other solar energy generation facilities being considered in the study area.

- The potential visual impact of operational, safety and security lighting of the facility at night on observers residing in close proximity of the facility.
- Potential visual impact of solar glint and glare as a visual distraction and possible air/road travel hazard.
- Potential visual impact of solar glint and glare on static ground-based receptors (residents of homesteads) in close proximity to the PV facility.
- The potential visual impact of the proposed infrastructure on the visual quality of the landscape and sense of place of the region.
- Potential residual visual impacts after the decommissioning of the proposed PV facility.
- 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 regional scale.

5. THE AFFECTED ENVIRONMENT

Regionally, the proposed site for the Paardevlei Solar PV & BESS is located within Somerset West, on a vacant section of land (approximately 152 ha in extent) known as Paardevlei, within the Cape Town Municipality in the Western Cape province. Of note is that the site is notably a 'brown fields' site formally an African Explosives and Chemical Industries Limited (AECI) dynamite factory. Dynamite was last produced in 1986 after which the plant was decommissioned leaving behind various infrastructure and buildings some of which were designed by the famous architect, Sir Herbert Baker.

The study area occurs on land that ranges in elevation from 40m above sea level (a.s.l.) along the coastline to 800m a.s.l. on the Helderberg mountain located to the north-east of the proposed site. The site itself occurs on land that is generally flat to slightly undulating with an elevation of about 80m above sea level (a.s.l.). Refer to Error! Reference source not found..

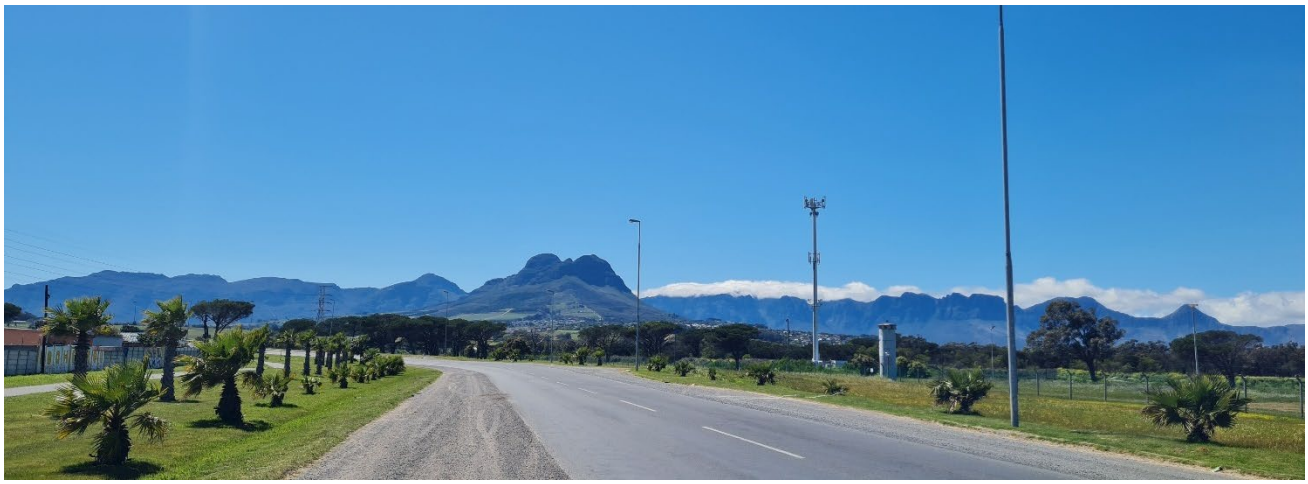


Figure 5: View from the M9 road of the Helderberg Mountain located to the north-east of the proposed site

Figure 6: General topography of the site

The proposed site is situated within the Cape Flats, an expansive low-lying flat area, and on the outskirts of the Cape Winelands, both highly valued cultural landscapes. The Hottentots Holland range, which is comprised of the Stellenbosch, Jonkershoek, Helderberg and Simonsberg Mountains, form the backdrop to the north-east of the proposed site. The most prominent of these within the study area is the Helderberg Mountain.

Figure 7: Cape Wineland located north of the proposed site where the practice viticulture (vineyards) is a typical land use

Numerous farm dams and vleis are scattered throughout the study area, with one prominent vlei, namely the Paardevlei, located adjacent to the south-east of the site, from which the area derives its name. Paardevlei was initially a shallow, seasonal pan, however, over the decades it was changed to be managed as a deepwater permanent reservoir, filled with nutrient rich water, and used to supply water to the former industrial plant on the site. Following its rehabilitation, it now plays a role in providing much needed habitat for various faunal species, as well as playing a role in the management of stormwater from nearby developments upstream.

Other prominent dams and vleis located within the study area include the Meerlust and Klawer Dams, as well as the Zeekoeivlei, all of which are located to the north-west of the proposed site. Additionally, two (2) perennial rivers, flow through the study area, these are the Eersterivier, located west of the site and the Lourensrivier, located east of the site, both of which flow into the Atlantic Ocean.

Land cover on the site itself and its immediate surrounds consists primarily of small areas of low shrubland (fynbos) to the north, as well as low forest and thicket scattered with dense forest and woodland to the south along the coastline. The study area is surrounded by urban development on three of its four sides, with the predominant land use to the north consisting mainly of viticulture (vineyards), irrigated agriculture, associated guest farms and residential, while the east and west are more developed with residential, commercial, and industrial infrastructure. The southern portion of the study area is the least developed overlooking the Atlantic Ocean. Refer to **Map 2**.

Figure 8: General land cover surrounding the site with the Hottentots Holland Mountain range in the background

The study area is densely populated (900 people per km^2) with majority of the people residing in the suburbs of Somerset West, Strand, Macassar and Eersterivier, located to the east, south-east, west and north-west of the proposed site,

respectively. Homesteads/ farm dwellings are scattered in the farmlands located to the north, as well as numerous guesthouses/ wine farms.

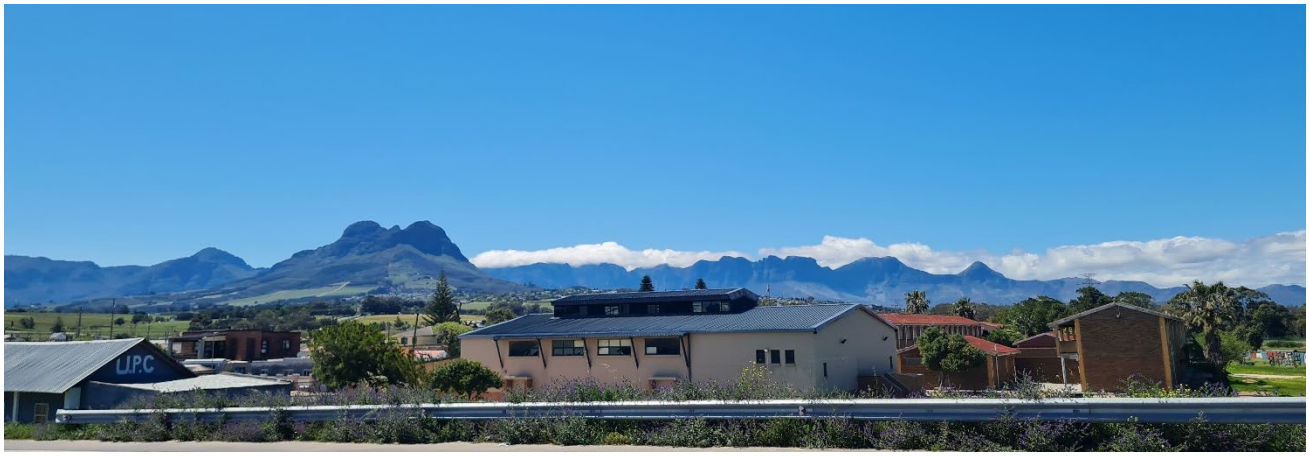


Figure 9: Typical land use associated with the study area

The N2, a national road, and R102, R310 and R44 are the main arterial/provincial roads within the study area. The N2 is located directly adjacent to the north of the site and is the main highway along the Atlantic Ocean, running from Cape Town, through George, Gqeberha, East London all the way to Ermelo. The R102 is a connector that links Cape Town to Bellville to Somerset West before joining with the N2. The R310 connects Muizenberg with Paarl and Franshoek via Stellenbosch, while the R44 is a provincial route that connects Piketberg with Kleinmond via Wellington, Stellenbosch, and Somerset West. Of note is that the coastal section of the R44 between Kleinmond and Gordon's Bay (not located within the study area) is a very scenic ocean drive, while the section between Gordon's Bay and Stellenbosch via Somerset West is a dual carriageway located further inland.

Figure 10: View of the site from the N2 including existing powerlines located on the northern portion of the site

There are three (3) protected areas within the study area, namely the Lourens River Protected Natural Environment, the Helderberg Marine Protected Area (MPA), as well as the outskirts of the Hottentots Holland Nature Reserve. The closest of these to the proposed site are the Lourens River Protected Natural Environment and the Helderberg MPA, located approximately 2km east and less than 1km south from the proposed site, respectively.

The Lourens River Protected Environment is a section of proclaimed protected land along the Lourens River, it is about 23km long extending from the Hottentot Holland Mountains into False Bay at Strand. Its upper reaches are relatively undisturbed and are privately owned. However, the lower part of the river, closest to the site, flow through developed areas of Somerset West and Strand.

While as the Helderberg MPA is a relatively small area comprised of 4km of sandy beaches, as well as some low-lying sandstone reefs extending 500m out to sea. It was proclaimed in 2000 and protects the sandy and rocky shore ecosystems located within this area. Access to this area is limited but can be accessed from the Macassar dunes. The sandy beaches along this coast are noted as important spiritual sites for many.

Additionally, a sizeable portion of the northern portion of study area falls within the Cape Winelands Biosphere Reserve as recognized by UNESCO (United Nations Educational, Scientific and Cultural Organization) in accordance with the global Man and the Biosphere (MAB) Programme. The proposed site itself is not located within the Biosphere Reserve but is located along the southern boundary thereof.

Industrial infrastructure within the southern portion of the study area surrounding the proposed site and consists of numerous high voltage powerlines, substations, railway lines and mining / quarrying.

Despite the very urbanised and developed nature of majority of the study area, the greater environment with its backdrop of the scenic Hottentots Holland Mountain range and ocean views is considered to have a high visual quality.

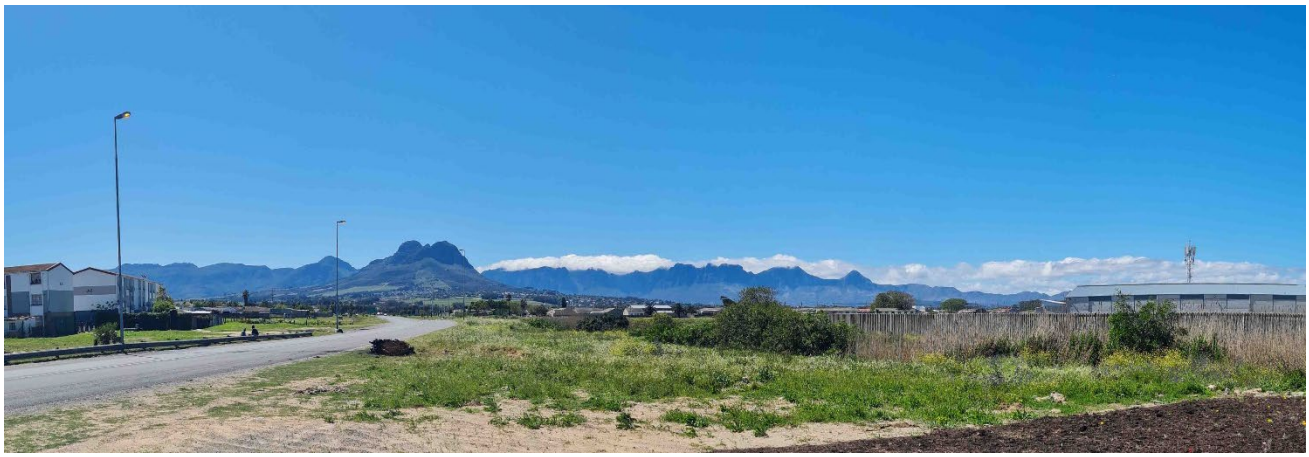
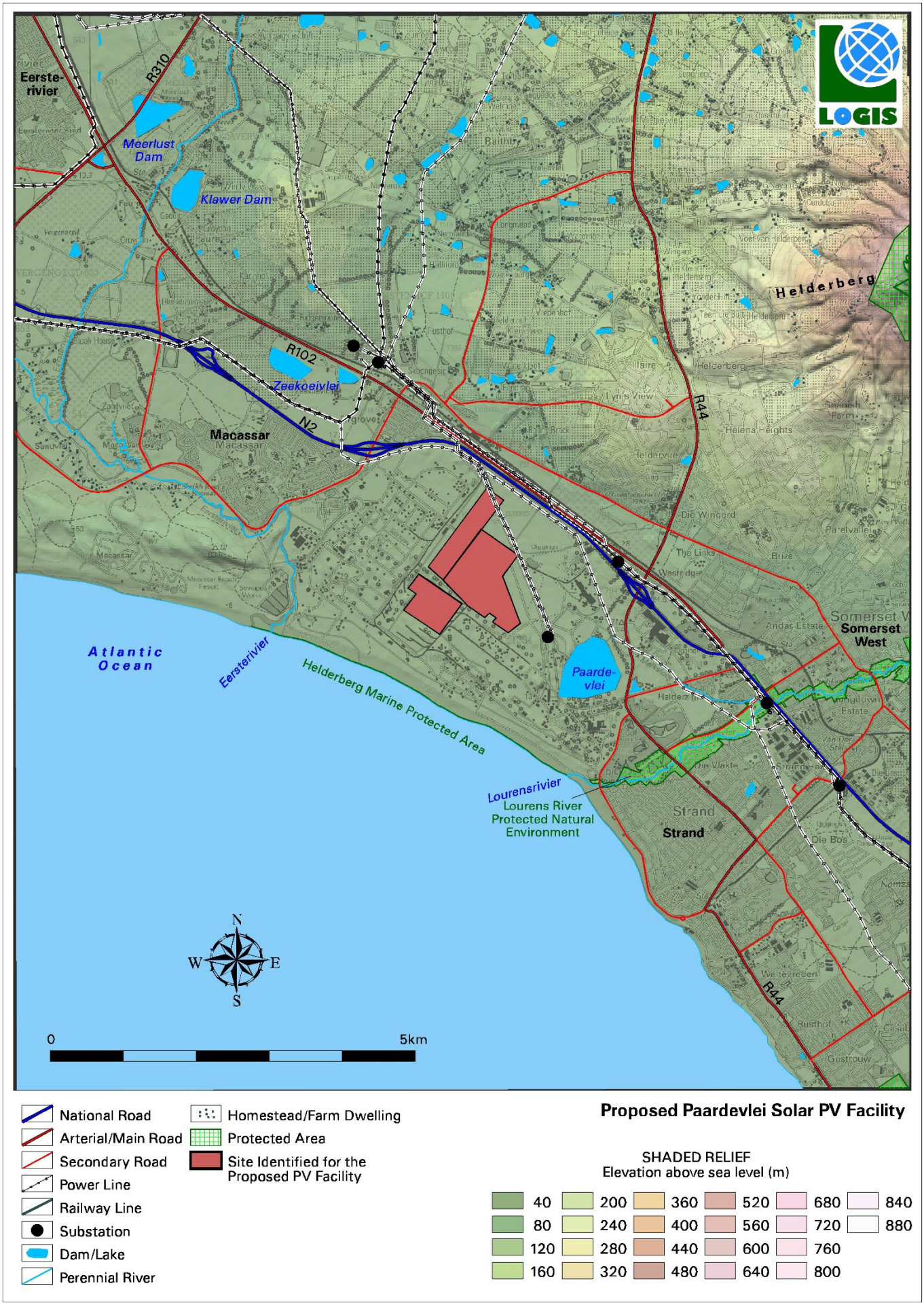
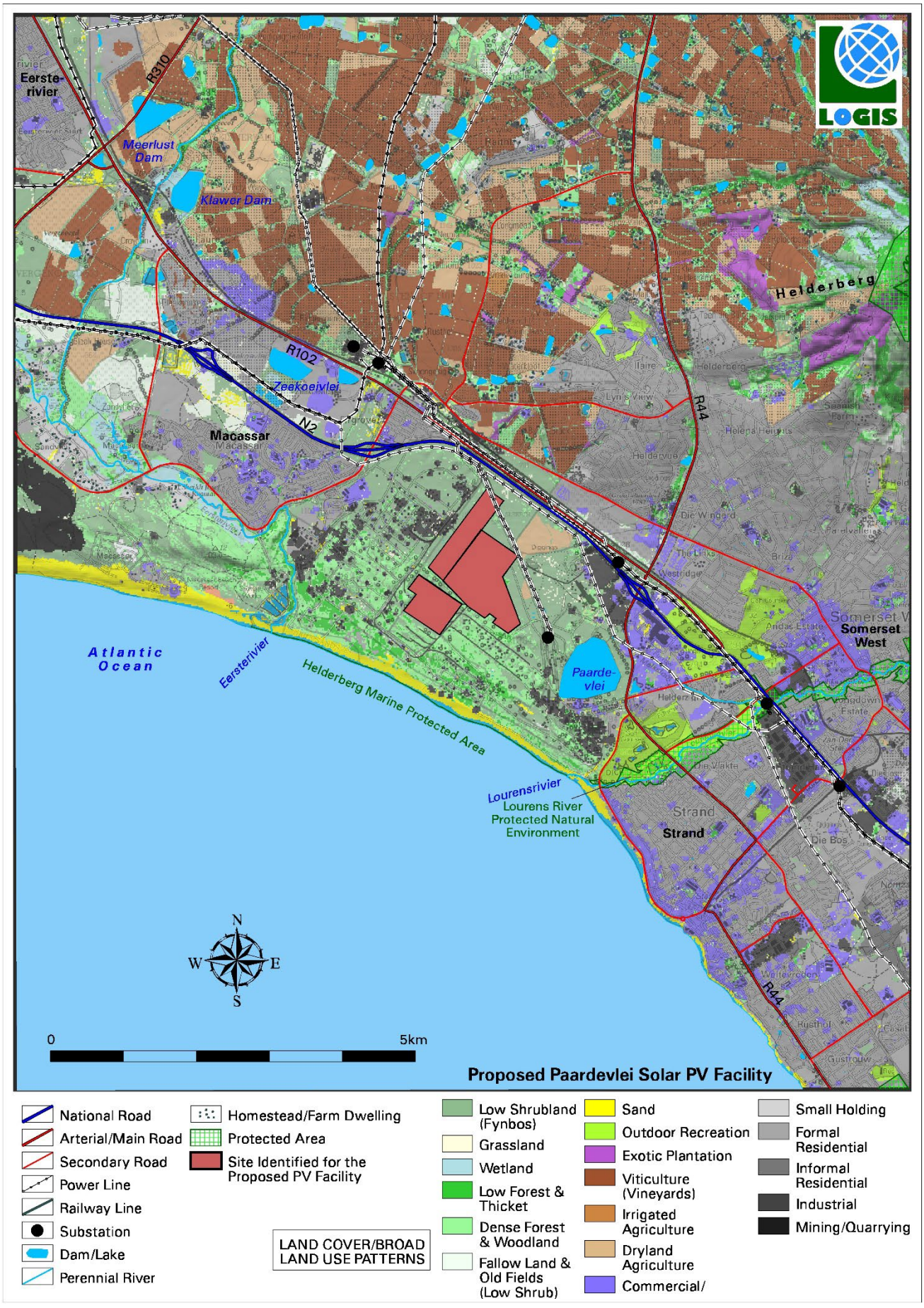


Figure 11: High visual quality of the greater environment despite the developed nature of the study area



Map 1: Shaded relief map of the study area



Map 2: Land cover / broad land use map of the study area

6. VIEWSHED ANALYSIS

6.1. VISUAL DISTANCE AND OBSERVER PROXIMITY

Nuleaf Planning and Environmental determined proximity offsets based on the anticipated visual experience of the observer over varying distances. In general, the severity of the visual impact on visual receptors decreases with increased distance from the proposed infrastructure. Therefore, in order to refine the visual exposure of the proposed Solar PV Facility on the surrounding areas/receptors, the principle of reduced impact over distance is applied. This allows for a core area of visual influence for the proposed Paardevlei Solar PV & BESS to be determined. Proximity offsets for the proposed Solar PV Facility are thus established in order to indicate the scale and viewing distance of the facility and to determine the prominence of the structures in relation to their environment.

These proximity offsets are based on the anticipated visual experience of the observer over varying distances. The distances are adjusted upwards for larger facilities and downwards for smaller facilities (i.e. depending on the size and nature of the proposed infrastructure). Refer to **Map 3**.

The proximity offsets are as follows:

- 0 – 1km. Short distance view where the infrastructure would dominate the frame of vision and constitute a very high to high visual prominence.
- 1 – 3km. Medium distance view where the infrastructure would be easily and comfortably visible and constitute a high to moderate visual prominence.
- 3 – 6km. Medium to longer distance view where the infrastructure would become part of the visual environment, but would still be visible and recognisable. This zone constitutes a medium visual prominence.
- Greater than 6km. Long-distance view where the structures may still be visible though not as easily recognisable. This zone constitutes a low visual prominence for the proposed infrastructure.

6.2. VIEWER INCIDENCE, PERCEPTION AND SENSITIVITY

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 PV Facility. Refer to **Map 3** for potential sensitive visual receptors within a 1km, 3km and 6km radius of the proposed Paardevlei Solar PV & BESS.

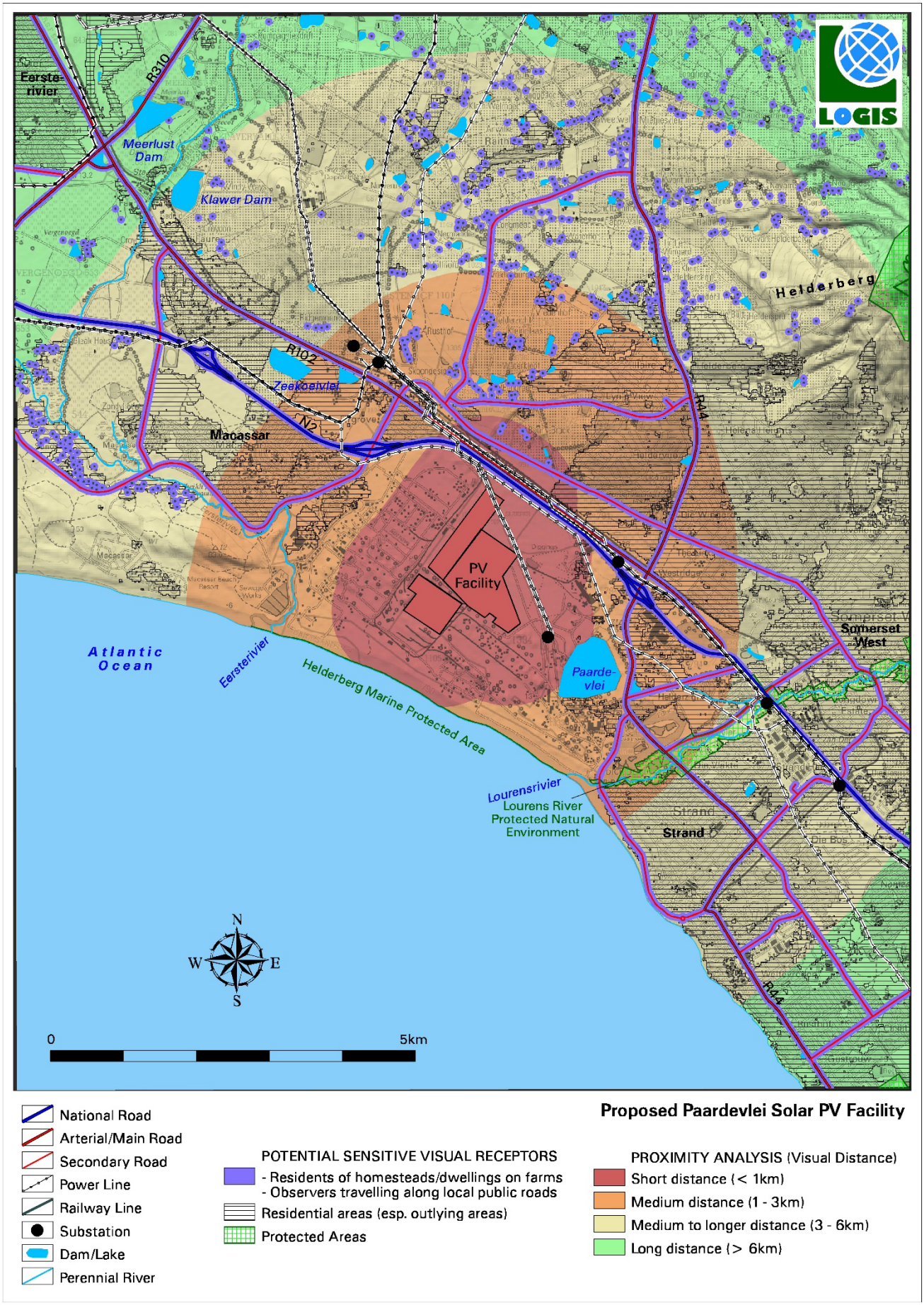
Homesteads / farmsteads, by virtue of their visually exposed nature, are considered to be sensitive visual receptors. Viewer incidence is calculated to be the highest for the homesteads and residents on the outskirts of towns within the areas closest to the proposed development. Second to these are the users along the various secondary roads within the study area. Commuters and possible tourists using these roads may be negatively impacted upon by visual exposure to the proposed infrastructure. Residential receptors in natural contexts are more sensitive than those in more built-up contexts, due to the absence of visual clutter in these undeveloped and undisturbed areas. Receptors within built-up areas are less sensitive to potential visual impact due to the presence of structures, infrastructure, and general visual clutter. Those dwelling on the periphery may be more aware of visual intrusion and may thus be considered somewhat more sensitive.

No specific report can be made on viewer perception regarding the proposed Paardevlei Solar PV & BESS, as no reported stakeholder feedback has been received by the specialist from the EAP.

6.3. VISUAL ABSORPTION CAPACITY

Visual Absorption Capacity (VAC) is the capacity of the receiving environment to absorb the potential visual impact of the proposed development. 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 also generally increases with distance, where discernible detail in visual characteristics of both environment and development decreases.

The broader study areas land cover is totally transformed and includes a highly urbanised single and multi-storey built environment including residential land use (formal and informal), as well as commercial and industrial land use. A few scattered patches of open space remain along drainage lines and as urban parks and public open space. However, ooverall, the Visual Absorption Capacity (VAC) of the receiving environment is very high as a result of the visual clutter associated with the built-up receiving environment. In addition, the scale and form of the proposed PV structures (less than 3m high) mean that it is highly likely that the built environment would visually absorb them in terms of texture, colour, form, and light/shade characteristics. Therefore, within this area the VAC will be taken into account.



Map 3: Visual proximity analysis, observer sensitivity and proximity of the proposed Paardevlei Solar PV & BESS

6.4. POTENTIAL VISUAL EXPOSURE

The result of the viewshed analyses for the proposed Paardevlei Solar PV & BESS are shown on **Map 4**. The visibility analyses (or viewsheds) for the proposed development was calculated from each structure area as outlined in the layout. A height of 3m was used to illustrate the anticipated worst-case visual exposure of the structures (i.e. the maximum height). Receptor height was set at eye level.

Map 4 indicates areas from which the proposed PV Facility could potentially be visible, as well as, proximity offsets (1km, 3km and 6km) from the proposed development area. Typically, structures of this height (i.e. 3m) may be visible from up to 6km away. In this respect, the anticipated Zone of Visual Influence for this facility as calculated from the development footprint (i.e. determined from the edge of the proposed development areas) has been indicated at 6km. The extent of visual exposure within this zone is expected to be very high. The viewshed analysis includes the effect of vegetation cover and existing structures on the exposure of the proposed infrastructure.

The Paardevlei Solar PV & BESS facility is expected to have a relatively constrained area of visual exposure owing to the shielding effect of lower lying elevation and the slightly undulating topography surrounding the site. Visually exposed areas are predominately located in and around the proposed site itself, on the Cape Flats to the west and extending slightly northwards into the Cape Winelands.

The identification of these homesteads or farm dwellings are based on their locations as per the SA 1: 50 000 topographical maps[2]. Should a homestead / residence / institution not be listed in terms of the SA 1: 50 000 topographical maps, then it is assumed that the impacts will be similar to the other identified residences within the same proximity radii. It should also be noted that this section of the report focusses only on the potential visual exposure at varying distances and it does not yet refer to visual impact significance or any correlation thereto.

The following is an overview of the findings of the viewshed of Paardevlei Solar PV & BESS, based on the layout illustrated on the Map provided:

0 - 1km - Short distance

It is expected that the facility would be highly visible within this zone with small pockets of visually screened areas lying to the southern portion of this zone. No residential suburbs and very limited farm dwellings are expected to be located within this zone, as such the sensitive receptors likely to be visually exposed to the PV facility infrastructure are limited to a small portion of observers travelling along the N2 and R102, visitors to the outskirts of the western portions of Paardevlei, as well as a portion of the Helderberg MPA.

1 - 3km - Medium distance

Visual exposure within this zone becomes slightly more scattered with visually screened areas lying to the far portions of the north, east and west of this zone. Visual exposure is concentrated to the inner portions of this zone, on the Somerset West suburbs of Lynn's View, Heldervue, Die Wingerd and The Links of Blue Downs to the north, scattered along the suburb of Macassar to the west, as well as the commercial and housing estates located to the east of the Paardevlei. Numerous residences/ farm dwellings are scattered throughout this zone including Eendrag, Waterkloof, Skoongesig and Rusthof to name a few. Portions of the N2, R102, R44 and other secondary roads fall within the visual exposure. Observers travelling along these roads are expected to be exposed to the PV facility infrastructure. Additionally, scattered areas of exposure are expected in and around Paardevlei and within the Lourens River Protected Natural Environment.

3 - 6km- Medium to long distance

Within a 3 – 6km radius, the visual exposure is greatly reduced and interrupted due to the undulating nature of the topography. Large visually screened areas are found to the north, east, and west. Visual exposure is predominately concentrated to the north-west and the higher lying areas towards the Helderberg in the north-east, with scattered areas of exposure to the south-east. Numerous residential suburbs and farm dwellings are scattered throughout this zone inclusive of Stand, portions of Somerset West, and Ridgemoore. Portions of the N2, the R102 and R44 may be exposed to the PV Facility. It should also be noted that the southernmost portion of the Hottentots Holland Nature Reserve falls inside the visually exposed areas to the north-east.

[2] The names listed here are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name.

> 6km – Long distance

At distances exceeding 6km the intensity of visual exposure is expected to be very low and highly unlikely due to the distance between the object (development) and the observer.

In general terms it is envisaged that the structures, where visible from shorter distances (e.g. less than 1km and potentially up to 3km), and where sensitive visual receptors may find themselves within this zone, may constitute a high visual prominence, potentially resulting in a visual impact. This may include residents of residential suburbs and farm dwellings mentioned above, as well as observers travelling along roads.

6.5. 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 Paardevlei Solar PV & BESS as seen in conjunction with the existing built infrastructure in close proximity.

Cumulative visual impacts may be:

- Combined, where several structures 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; and
- Sequential, when the observer has to move to another viewpoint to see different structures, or different views of the same structure (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 proposed 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.

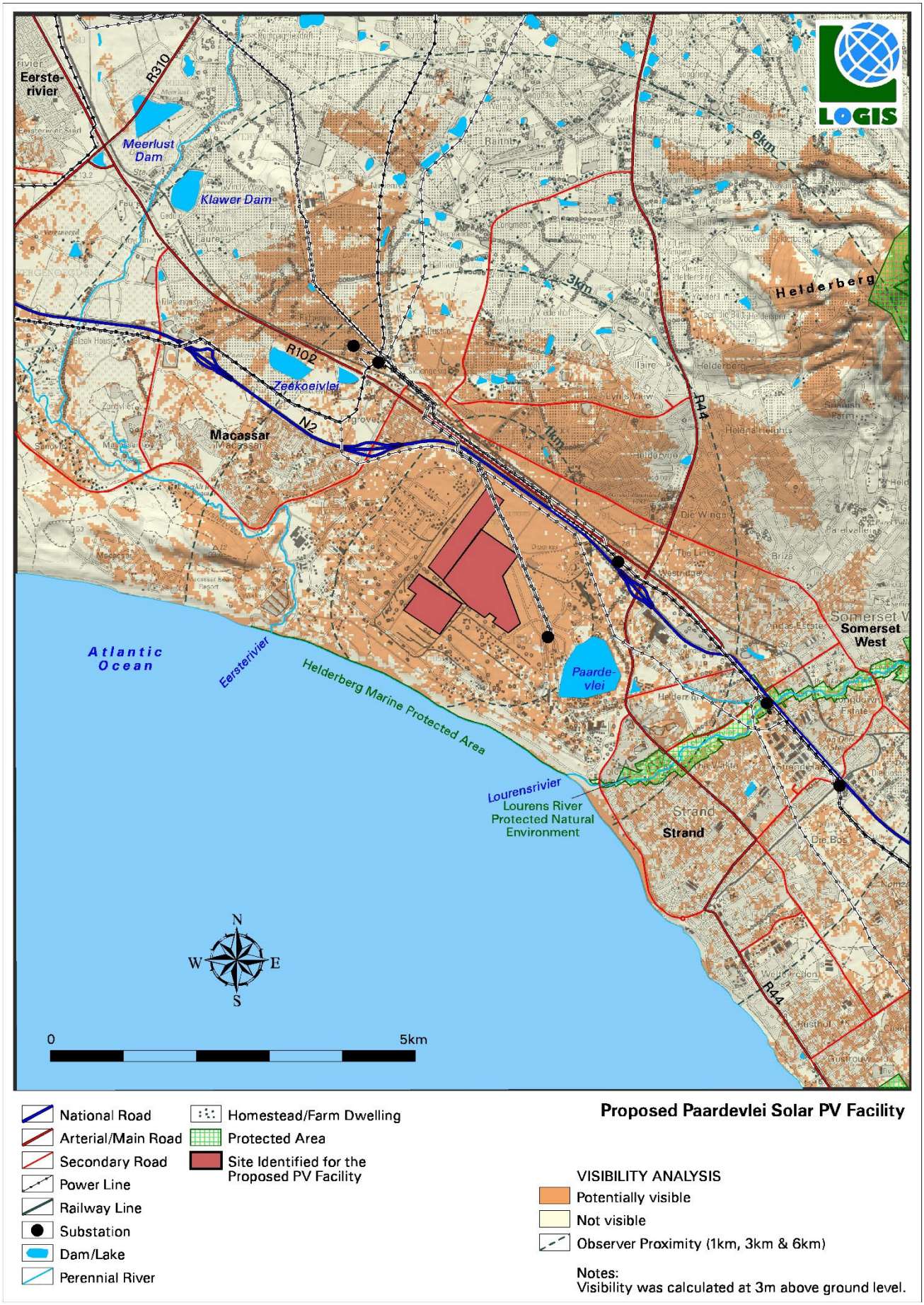
The specialist is required to conclude if the proposed 'development' will result in any unacceptable loss of visual resources considering the industrial infrastructure proposed in the area.

The approach for this assessment includes all renewable energy projects within 30 km that have received an EA, as well as the proposed project. The information was collected from the National DFFE Renewable Energy EIA Application (REEA) database, 2023 Quarter 2.

This is the most accurate and up-to-date data available to the project team. There may be some projects with "in-process" applications for which data is not yet publicly available. This is the data found to be available and efforts were made to determine recent amendments. The REEA database contains land parcels, and not the footprints. In most cases the actual development footprint of the nearby Renewable Energy developments could not be easily quantified or accessed spatially. Hence the land parcels considered, are larger than the land the PV will occupy. It is important to note that the existence of an approved EA does not directly equate to actual development of the project. For these reasons this data tends towards a worst-case scenario.

The author is not aware of any additional PV plants (existing or planned) within the study area. The REEA database also does not indicate that there are any proposed PV Facilities within 30km of the proposed facility. Additionally, the highly urbanised and industrialised nature of the study area makes it impractical to realistically assess the cumulative impacts of PV facilities located within a sea of other infrastructure of equal or higher visual prominence.

Considering the above the potential cumulative visual impact is considered to be low and within acceptable limits.



Map 4: Potential visual exposure (viewshed analysis) of the proposed Paardevlei Solar PV & BESS

6.6. VISUAL IMPACT INDEX

The combined results of visual exposure, viewer incidence / perception and visual distance of the proposed infrastructure are displayed on **Map 5**. Here the weighted impact and the likely areas of impact and potential sensitive visual receptors have been indicated as a 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 infrastructure, a high viewer incidence and a potentially negative perception (i.e. a sensitive visual receptor) 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**[3] within a 1km radius of the proposed facility may experience a **very high** visual impact. The magnitude of visual impact on sensitive visual receptors subsequently subsides with distance to; **high** within a 1–3km radius (where/if sensitive receptors are present) and **moderate** within a 3–6km radius (where/if sensitive receptors are present). Receptors beyond 6km are expected to have a **low** potential visual impact.

Likely areas of potential visual impact and potential sensitive visual receptors located within a 6km radius of the proposed Paardevlei Solar PV and BESS are displayed on **Map 6**.

Magnitude of the potential visual impact

The visual impact index and magnitude of the potential visual impact for the proposed Paardevlei Solar PV & BESS is further described as follows.

The PV facility may have a visual impact of **very high** magnitude on the following identified observers within a 0 – 1km radius:

Residents of/visitors to the following homestead, suburbs, and areas, as well as observers travelling along the following roads:

- Unknown residences including Heartlands Baby Sanctuary located on the affected property (Site 1)
- N2 National, R102 Arterial and Main Road (Site 2)
- Bonny Brack – Bonny Brack Farm (Site 3)
- Unknown residence (Site 4)
- Portions of the Helderberg MPA along the coastline

The PV Facility may have a visual impact of **high** magnitude on the following identified observers 1 – 3km radius:

Residents of/visitors to the following homestead, suburbs, and areas:

- Macassar eastern outlying areas (Site 5)
- Acorn Creek (Siet 6)
- Firgrove (Site 7)
- Skoongesig (Site 8)
- Rusthof - Rustenhof Farm (Site 9)
- Eendrag (Site 10)
- Kleinplaas (Site 11)
- Helderzight - Heron Ridge Wines (Site 12)
- La Montagne (Site 13)
- Lynn's View (Site 14)

[3] The names indicated on the map and listed below here are of the homestead or farm dwelling as indicated on the SA 1: 50 000 topographical maps and do not refer to the registered farm name. Should a homestead / residence / institution not be listed in terms of the SA 1: 50 000 topographical maps, then it is assumed that the impacts will be similar to the other identified residences within the same proximity radii.

- Heldervue (Site 15)
- Schoneberg (Site 16)
- Die Wingerd (Site 17)
- The Links (Site 18)
- Paardevlei (Site 19)
- Portions of the Lourens River Protected Natural Environment

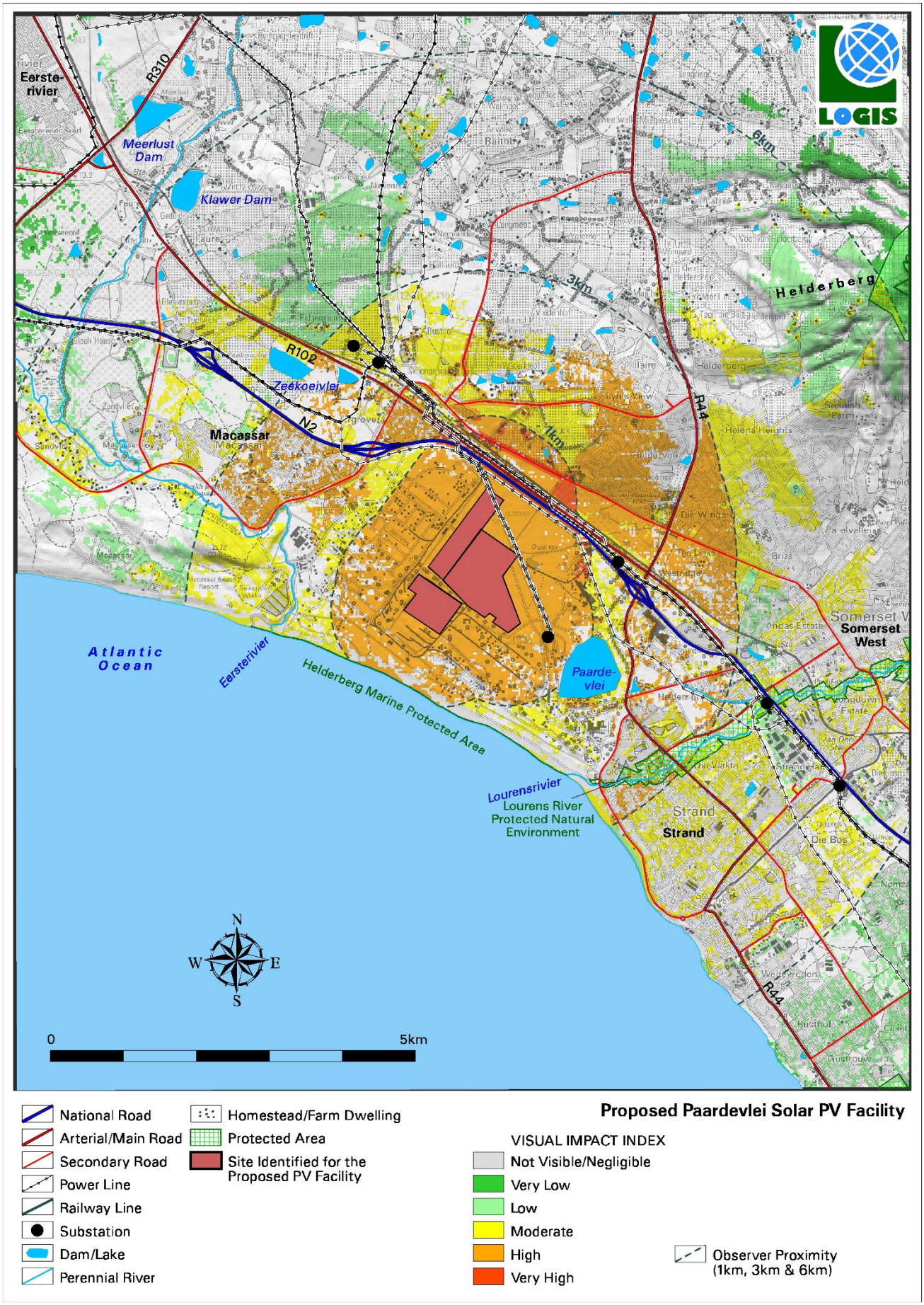
The PV facility may have a visual impact of **moderate** magnitude impact on the following identified observers located between a 3 – 6km radius of the PV facility:

Residents of/visitors to the following homestead, suburbs, and areas:

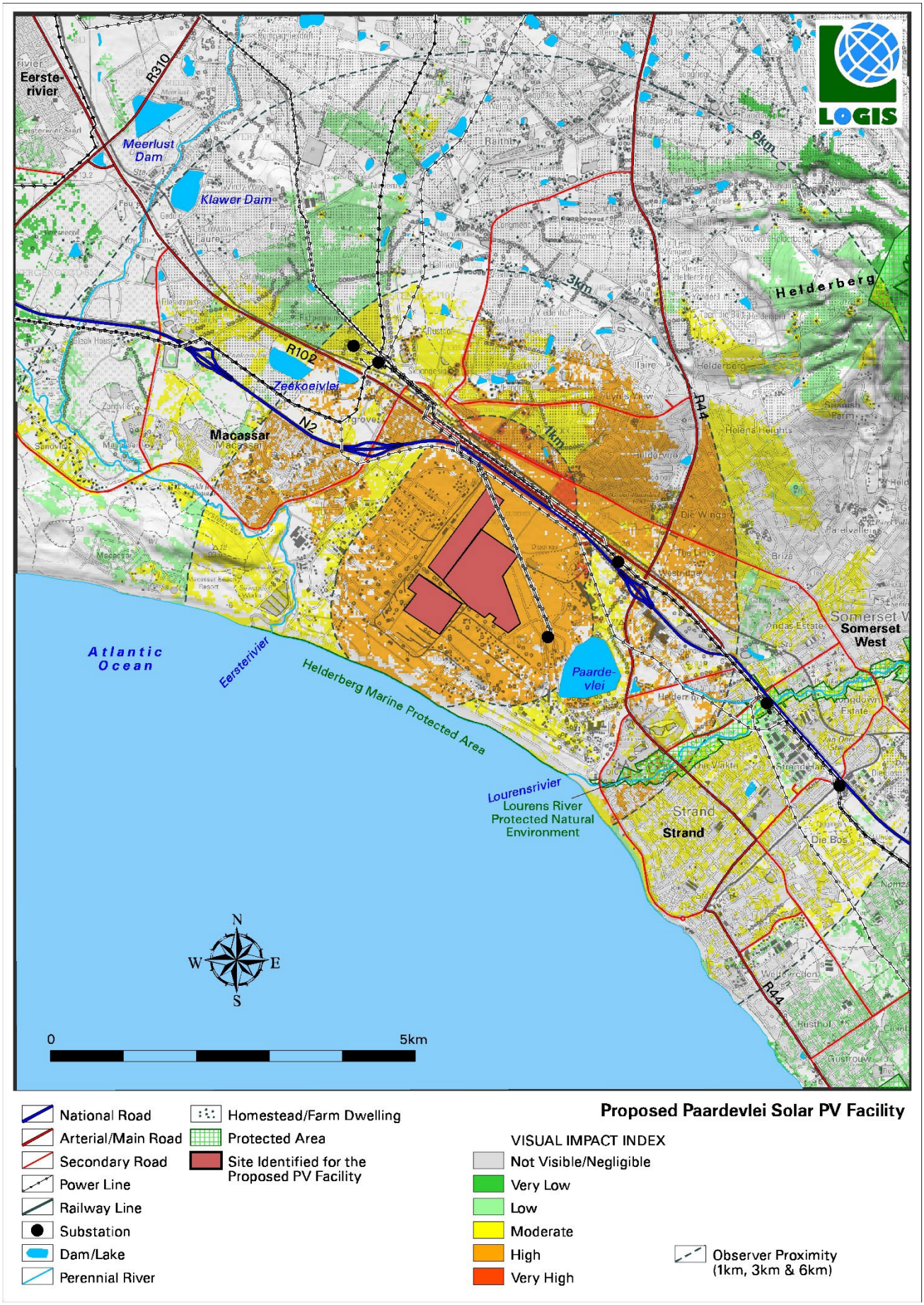
- Macassar beach / resort (Site 20)
- Sheik Josef's Kramat (Site 21)
- Sandvlei (Site 22)
- Croydon Vineyard Estate (Site 23)
- Kelderhof Country Village (Site 24)
- Ridgemore – Ridgemor Villa (Site 25)
- Helderberg (Site 26)
- Spanish Farm (Site 27)
- Helena Heights (Site 28)
- Briza (Site 29)
- Andas Estate (Site 30)
- Die Vlakte & Strand (Site 31)
- Southernmost portion of the Hottentots Holland Nature Reserve

The PV facility may have a visual impact of **low** magnitude impact on observers located beyond the 6km radius of the PV facility.

Note: *Based on detailed observations during the site visit, and given the vertical scale of the PV plant versus the built-up nature of the receiving environment, it can be reliably submitted that visual impact, if any, will be limited to observers in close proximity to the site*.



Map 5: Visual impact index for the proposed Paardevlei Solar PV & BESS



Map 6: Visibility Index illustrating the frequency of exposure of the proposed Paardevlei Solar PV & BESS

7. VISUAL IMPACT ASSESSMENT

7.1. 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 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 infrastructure) and includes a table quantifying the potential visual impact according to the following criteria:

Extent - How far the visual impact is going to extend and to what extent it will have the highest impact. In the case of this type of development the extent of the visual impact is most likely to have a higher impact on receptors closer to the development and decrease as the distance increases.

- (1) Very low: Long distance > 6km
- (2) Low: Medium to long distance between 3 – 6km
- (3) Medium: Short distance between 1 – 3km
- (4) High: Very short distance < 1km
- (5) Very high: *Site* specific, within the development site only

Duration - The timeframe in both the construction and operational phase over which the effects of the impact will be felt.

- (1) Very short: 0-1 years
- (2) Short: 2-5 years
- (3) Medium: 5-15 years
- (4) Long: >15 years
- (5) Permanent

Magnitude - The severity or size of the impact. This value is read off the Visual Impact Index maps. Where more than one value is applicable, the higher of these will be used as a worst-case scenario.

- (0) None
- (2) Minor
- (4) Low
- (6) Moderate
- (8) High
- (10) Very High

Probability - The likelihood of the impact occurring.

- (1) Very improbable: Less than 20% sure of the likelihood of an impact occurring
- (2) Improbable: 20-40% sure of the likelihood of an impact occurring
- (3) Probable: 40-60% sure of the likelihood of an impact occurring
- (4) Highly probable: 60-80% sure of the likelihood of that impact occurring
- (5) Definite: More than 80% sure of the likelihood of that impact occurring

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

- ***(0-11) Negligible:***
  Where the impact would have no direct influence on the decision to develop in the area. The impact would be of a very low order.
- ***(12-29) Low:***
  Where the impact would have a very limited direct influence on the decision to develop in the area. The impact would be of a low order and with little real effect.
- ***(30-59) Moderate:***
  Where the impact could influence the decision to develop in the area. The impact would be real but not substantial.
- ***(60-79) High:***
  Where the impact must have an influence on the decision to develop in the area. The impacts are of a substantial order.
- ***(80-100) Very High:***
  Where the impact will definitely have an influence on the decision to develop in the area. The impacts are of the highest order possible.

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**).

Status – The perception of Interested and Affected Parties towards the proposed development.

- Positive
- Negative
- Neutral

Reversibility – The possibility of visual recovery of the impact following the decommissioning of the proposed development

- (1) Reversible
- (3) Recoverable
- (5) Irreversible

7.2. DIRECT IMPACTS

The direct visual impacts of the proposed Paardevlei Solar PV & BESS are assessed as follows:

7.2.1. CONSTRUCTION PHASE IMPACTS

During the construction period it is expected that any visual impact of concern on sensitive visual receptors within the study area will be temporary and limited to a short-term period (2-5 year). The below direct construction visual impacts of the proposed Paardevlei Solar PV & BESS are assessed as follows:

7.2.1.1. POTENTIAL VISUAL IMPACT OF CONSTRUCTION ON SENSITIVE VISUAL RECEPTORS WITHIN 1KM TO THE PROPOSED DEVELOPMENT

During the construction period, there will be an increase in heavy vehicles utilising the roads to the construction sites that may cause, at the very least, a visual nuisance to other road users and landowners (as identified in Section 6.6) in the area within 1km. Additionally, stripping of the vegetation and the resultant dust of the construction activities, as well as construction equipment (i.e. cranes), temporary laydown areas, construction camps, etc. may also be visible at the site, resulting in a visual impact occurring during construction.

< 1km on residents of towns and homesteads

Construction activities may potentially result in a **high** (significance rating = 64) temporary visual impact, that may be mitigated to **moderate** (significance rating = 36) on residents of towns and homesteads located within 1km of the proposed PV Facility. Refer to Table 3.

Table 3: Visual impact of construction on residents of towns and homesteads within 1km of the proposed PV facility.

Nature of Impact: Visual impact of construction activities on residents of towns and homesteads within 1km of the proposed PV facility.		
	Without mitigation	***With mitigation***
Extent	Very Short distance **(4)**	Very Short **distance (4)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Very high **(10)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	High **(64)**	Moderate **(36)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation: Planning: ➢ Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site. ➢ Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. Construction: ➢ Ensure that vegetation is not unnecessarily removed during the construction period. ➢ Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible. ➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site 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 approved 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 that rehabilitation works are carried out as required.

< 1km on observers travelling along various roads

Additionally, it is expected that construction activities may potentially result in a **moderate** (significance rating = 48) temporary visual impact, that may be mitigated to a slightly lower **moderate** (significance rating = 36) on observers travelling along the various roads within 1km to the proposed PV Facility. Refer to Table 4.

A mitigating factor in the above scenario is that observers travelling along the various roads (i.e. N2, R102 and various main roads) will only experience a visual impact for a brief period of time and it is expected the visual exposure of the PV facility structures will be in conjunction with the existing visual clutter as a result of the urban development within the region. This reduces the probability of this impact occurring.

Table 4: Visual impact of construction on observers travelling along the various roads within 1km to the proposed PV facility.

Nature of Impact: Visual impact of construction activities on observers travelling along the various roads within 1km to the proposed PV facility.		
	Without mitigation	***With mitigation***
Extent	Very Short distance **(4)**	Very Short **distance (4)**
Duration	Short term **(2)**	Short term **(2)**
Magnitude	Very high **(10)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(48)**	Moderate **(36)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning: ➢ Retain and maintain natural vegetation in all areas outside of the development footprint, but within the project site. Construction: ➢ Ensure that vegetation is not unnecessarily removed during the construction period. ➢ Plan the placement of laydown areas and temporary construction equipment camps in order to minimise vegetation clearing (i.e. in already disturbed areas) where possible. ➢ Restrict the activities and movement of construction workers and vehicles to the immediate construction site 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 approved 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 that rehabilitation works are carried out as required.		

7.2.2. OPERATIONAL PHASE IMPACTS

During the operational phase of the proposed Paardevlei Solar PV & BESS, it is generally accepted that the Solar PV Panels associated with the proposed facility will constitute the largest visual impact of concern on sensitive visual receptors within the study area, as a result of their nature and scale in relation to other proposed infrastructure that may be located on the site. The below direct operational visual impacts of the proposed Paardevlei Solar PV & BESS are assessed as follows:

7.2.2.1. POTENTIAL OPERATIONAL VISUAL IMPACTS ON SENSITIVE VISUAL RECEPTORS WITHIN 1KM TO THE PROPOSED DEVELOPMENT

< 1km on residents of towns and homesteads

The operation of the proposed PV facility is expected to have a **high** visual impact (significance rating = 72) pre-mitigation and a **moderate** visual impact (significance rating = 42) post mitigation on residents at homesteads, suburbs, developed areas, and visitors/tourists (as per Section 6.6) within a 1km radius of the PV and BESS Facility. Refer to Table 5.

Table 5: Visual impact on residents at homesteads, towns, and visitors/tourists within 1km to the PV facility.

Nature of Impact: Visual impact on residents at homesteads, towns, and visitors/tourists within 1km to the PV facility.		
	Without mitigation	***With mitigation***
Extent	Very Short distance **(4)**	Very Short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	High **(72)**	Moderate **(42)**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. ➢ Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

< 1km on observers travelling along various roads

Additionally, the operation of the proposed PV facility is expected to have a **moderate** visual impact (significance rating = 54) pre-mitigation and a slightly lower **moderate** visual impact (significance rating = 42) post mitigation on observers travelling along the various roads (as per Section 6.6) within a 1km radius of the PV and BESS Facility.

A mitigating factor in the above scenario is that observers travelling along the various roads (i.e. N2, R102 and various main roads) will only experience a visual impact for a brief period of time and it is expected the visual exposure of the PV facility structures will be in conjunction with the existing visual clutter as a result of the urban development within the region. This reduces the probability of this impact occurring.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The tables below illustrates this impact assessment.

Table 6: Visual impact on observers travelling along the various roads within 1km to the proposed PV facility.

Nature of Impact: Visual impact on observers travelling along the various roads within 1km to the proposed PV facility.		
	Without mitigation	***With mitigation***
Extent	Very Short distance **(4)**	Very Short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Moderate **(6)**
Probability	Probable **(3)**	Probable **(3)**
Significance	Moderate **(54)**	Moderate **(42)**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. ➢ Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.2.2. POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN 1 – 3KM OF THE PROPOSED DEVELOPMENT

The operational facility could have a **moderate** visual impact (significance rating = 45) which may be mitigated to **low** (significance rating = 26) on sensitive receptors, as identified in Section 6.6, within 1 – 3km radius of the facility.

A mitigating factor in this scenario is that the visual exposure of the PV facility structures will be experienced in conjunction with the existing visual clutter as a result of the urban development within the region. This reduces the probability of this impact occurring.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 7: Impact table summarising the significance of visual impacts of the proposed infrastructure on sensitive visual receptors within 1 - 3km of the proposed development

Nature of Impact: Visual impact on sensitive receptors within a 1 – 3km radius of the facility		
	Without mitigation	***With mitigation***
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(45)**	Low **(26)**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

7.2.2.3. POTENTIAL VISUAL IMPACT ON SENSITIVE VISUAL RECEPTORS WITHIN 3 – 6KM OF THE PROPOSED DEVELOPMENT

The operational facility could have a **low** visual impact both before (significance rating = 24) and after mitigation (significance rating = 20) on possible visual sensitive receptors (as outlined in Section 6.6) within 3 – 6km radius of the facility.
A mitigating factor in this scenario is that the visual exposure of the PV facility structures will be experienced in conjunction with the existing visual clutter as a result of the urban development within the region. This reduces the probability of this impact occurring.

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 8: Impact table summarising the significance of visual impacts of the proposed infrastructure on sensitive visual receptors within 3 - 6km of the proposed development

Nature of Impact: Visual impact on observers travelling along the roads and residents at homesteads within a 3 – 6km radius of the facility		
	Without mitigation	***With mitigation***
Extent	Medium distance **(2)**	Medium distance **(2)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Improbable **(2)**	Improbable **(2)**
Significance	Low **(24)**	Low **(20)**
Status (positive, neutral or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.2.4. POTENTIAL VISUAL IMPACT OF OPERATIONAL, SAFETY AND SECURITY LIGHTING OF THE FACILITY AT NIGHT

The area immediately surrounding the proposed facility has a relatively high incidence of receptors and light sources (i.e exiting power station, towns and mines), so light trespass and glare from the security and after-hours operational lighting for the facility will likely not have a significant impact on visual receptors in the study area, especially those located in closer proximity to the PV Facility especially within 0-1km and potentially up to 3km.

Lighting impacts relate to the effects of glare and sky glow. The source of glare light is unshielded luminaries which emit light in all directions and which are visible over long distances.

Sky glow is the condition where the night sky is illuminated when light reflects off particles in the atmosphere such as moisture, dust or smog. The sky glow intensifies with the increase in the number of light sources. Each new light source, especially upwardly directed lighting, contribute to the increase in sky glow. It is possible that the PV facility may contribute to the already existing sky glow within the environment which is highly developed.

A mitigating factor in this scenario is that the expected lighting impacts of the PV and BESS Facility will be in conjunction with the existing sky-glow as a result of existing development within the region. This reduces the probability of this impact occurring.

Mitigation of direct lighting impacts and sky glow entails the pro-active design, planning and specification of lighting for the facility. The correct specification and placement of lighting and light fixtures for the facility and the ancillary infrastructure will go far to contain rather than spread the light.

This anticipated lighting impact is likely to be of **moderate** significance (rating = 39), and may be mitigated to **low** (rating = 22) especially within 0-1km and potentially up to 3km radius of the PV and BESS Facility.

Table 9: Impact table summarising the significance of visual impact of lighting at night on visual receptors in close to medium proximity (within 0-1km and potentially up to 3km) to the proposed PV facility

Nature of Impact: Visual impact of lighting at night on sensitive visual receptors.		
	No mitigation	***Mitigation considered***
Extent	Short/Medium **(3)**	Short/Medium **(3)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(39)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: <u>Planning & operation</u>: ➢ Shield the sources of light by physical barriers (walls, vegetation, or the structure itself). ➢ Limit mounting heights of lighting fixtures, or alternatively use foot-lights or bollard level lights. ➢ Make use of minimum lumen or wattage in fixtures. ➢ Make use of down-lighters, or shielded fixtures. ➢ Make use of Low-Pressure Sodium lighting or other types of low impact lighting. ➢ Make use of motion detectors on security lighting. This will allow the site to remain in relative darkness, until lighting is required for security or maintenance purposes.		
Cumulative impacts: The expected lighting impacts of the PV and BESS Facility will be in conjunction with the existing sky-glow as a result of existing development within the region. There it is not expected that the additional lightning at night will contribute to a local and regional increase in lighting impact.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.2.5. SOLAR GLINT AND GLARE POTENTIAL VISUAL IMPACT OF SOLAR GLINT AND GLARE ON STATIC GROUND-BASED RECEPTORS (RESIDENTS OF HOMESTEADS), AS WELL AS A VISUAL DISTRACTION AND POSSIBLE AIR/ROAD TRAVEL HAZARD

Glint and glare occurs when the sun reflects off surfaces with specular (mirror-like) properties. Examples of these include glass windows, water bodies and potentially some solar energy generation technologies (e.g. parabolic troughs and CSP heliostats). Glint is generally of shorter duration and is described as “a momentary flash of bright light”, whilst glare is the reflection of bright light for a longer duration.

The visual impact of glint and glare relates to the potential it has to negatively affect sensitive visual receptors in relatively close proximity to the source (e.g. residents of homesteads and users of the roads), or aviation safety risk for pilots

(especially where the source interferes with the approach angle to the runway). The Federal Aviation Administration (FAA) of the United States of America have researched glare as a hazard for aviation pilots on final approach and prescribes specific glint and glare studies for solar energy facilities in close proximity to aerodromes (airports, airfields, military airbases, etc.).

It is generally possible to mitigate the potential glint and glare impacts through the design and careful placement of the infrastructure on static ground-based receptors and users of the roads. The following is recommended to be undertaken to aid in mitigating potential glint and glare:

- Use anti-reflective panels and dull polishing on structures. PV panels are designed to generate electricity by absorbing the rays of the sun and are therefore constructed of dark-coloured materials, and are covered by anti-reflective coatings. Indications are that as little as 2% of the incoming sunlight is reflected from the surface of modern PV panels especially where the incidence angle (angle of incoming light) is smaller i.e. the panel is facing the sun directly. This is particularly true for tracker arrays that are designed to track the sun and keep the incidence angle as low as possible.[4]
- It is recommended to avoid using deeply textured glass, as research has indicated that employing smooth or lightly textured glass, effectively mitigates any glint and glare impacts.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- Provide significant screening around the development site. Significant screening' with respect to visibility of reflecting solar panels implies that the observer's view is impeded to the extent that the presence of the solar panels cannot be easily discerned at first glance. [5] Refer to Figure 13 below for an illustration as to what is meant by 'sufficient screening'. This can be achieved through the application of one or a combination of the following methods:
    - Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the boundary of the entire development footprint.
    - Construct and plant a vegetated berm
    - Should no existing vegetation be present in certain areas or should it be insufficient in height to provide sufficient screening in certain areas, then it is recommended that vegetated berms be constructed and planted. This vegetated berm is required to consist of the following:
        - Plant species that are preferably locally endemic but at a minimum at least indigenous.
        - A combination of plant species of various height variations (i.e low shrubs to tall trees) to ensure sufficient coverage exceeding the expected panel heights.
        - Evergreen species to ensure coverage through all seasons of the year, especially winter.
- Should the construction and planting of a vegetated screen not be possible then it is recommended that a wall be constructed exceeding the height of the panels.
- Reduce the mounting height of the panels to as low as possible to ensure that the screening measures recommended above are possible to implement.

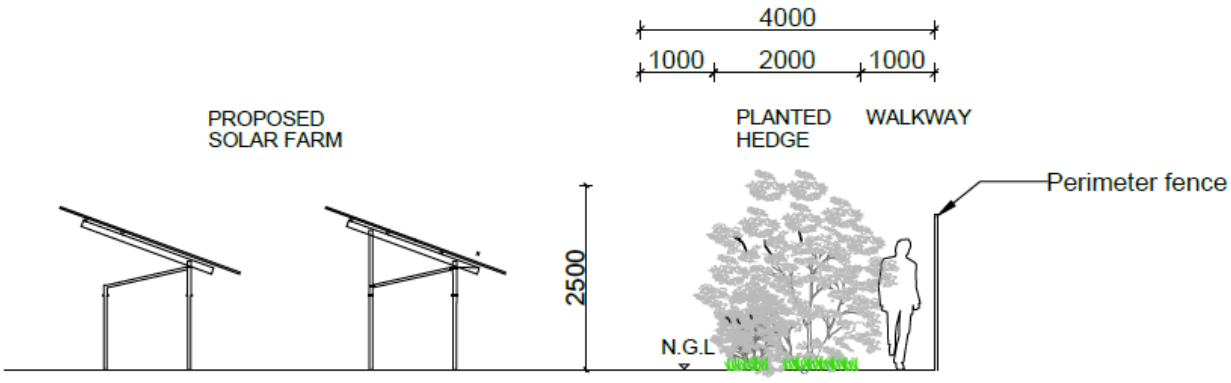


Figure 12: Example of how vegetation screening may be implemented

[4] Sources: Blue Oak Energy, FAA and Meister Consultants Group.

[5] Sources: PagerPower 2023.

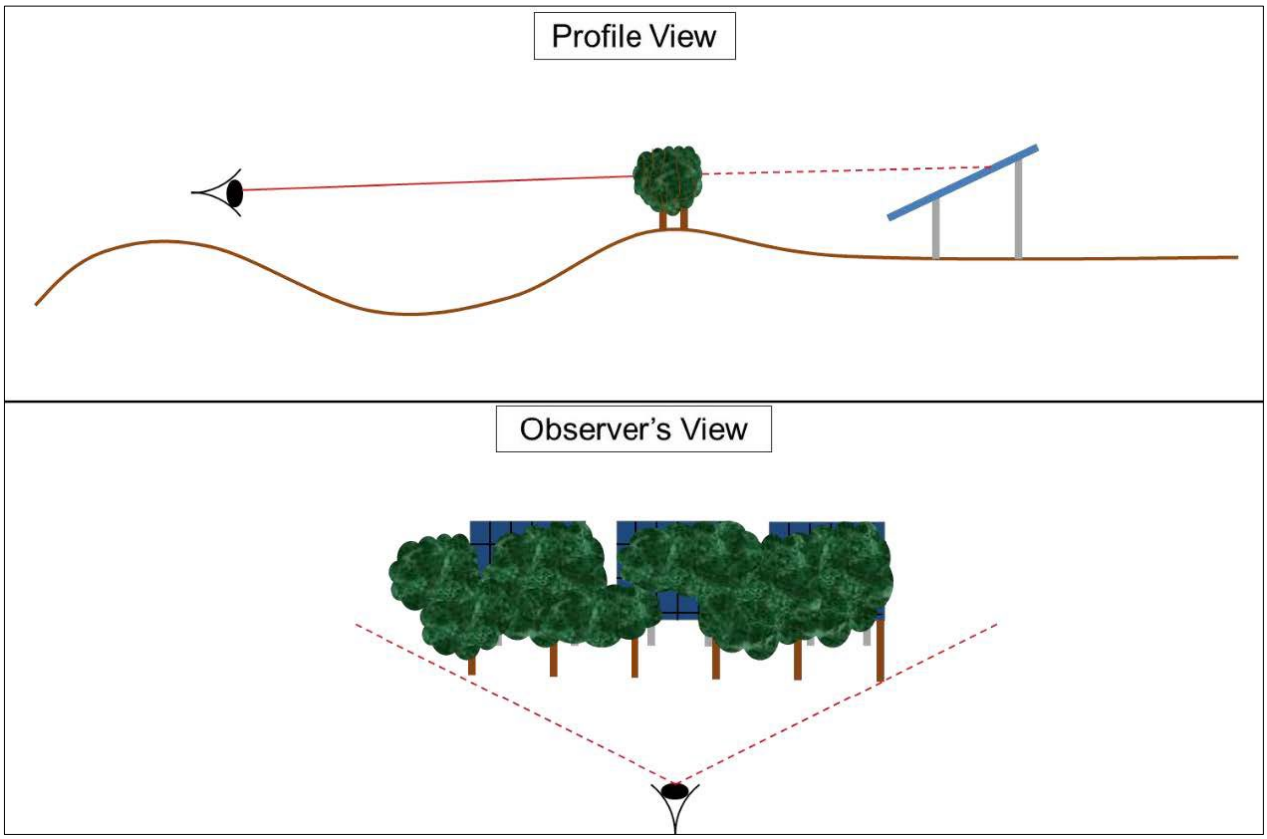


Figure 13: Illustration of 'significant screening'[6]

Glint and Glare on road users

There are two (2) major roads within a 1km radius of the proposed PV facility, namely the N2 and R102. This approximate distance is recommended as a threshold within which the visual impact of glint and glare (if there is visual line of sight from the road) may influence road users.[7]

The potential visual impact related to solar glint and glare as a road travel hazard is therefore expected to be of **moderate** significance (rating = 54), and may be mitigated to **low** (rating = 14) for users of the N2 and R102.

Of note is that should all the recommended mitigation measure as outlined above not be implemented and sufficient screening not be achieved, then a significance rating of low will not be attained and it is expected that a the visual impact will remain moderate potentially even high.

Table 10: Impact table summarising the significance of the visual impact of solar glint and glare as a visual distraction to users of the roads

Nature of Impact: The visual impact of solar glint and glare as a visual distraction and possible road travel hazard		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very High **(10)**	Moderate **(6)**
Probability	Probable **(3)**	Very improbable **(1)**
Significance	Moderate **(54)**	Low **(14)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning & operation:		

[6] Sources: PagerPower 2023.
[7] December 2020, Solar Photovoltaic Glint and Glare Guidance Third Edition.

- Use anti-reflective panels and dull polishing on structures, where possible and industry standard.
- It is recommended to avoid using deeply textured glass, as research has indicated that employing smooth or lightly textured glass, effectively mitigates any glint and glare impacts.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- Provide significant screening around the development site. This can be achieved through the application of one or a combination of the following methods:
  - Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the boundary of the entire development footprint.
  - Construct and plant a vegetated berm
  - Should no existing vegetation be present in certain areas or should it be insufficient in height to provide sufficient screening in certain areas, then it is recommended that vegetated berms be constructed and planted. This vegetated berm is required to consist of the following:
    - Plant species that are preferably locally endemic but at a minimum at least indigenous.
    - A combination of plant species of various height variations (i.e low shrubs to tall trees) to ensure sufficient coverage exceeding the expected panel heights.
    - Evergreen species to ensure coverage through all seasons of the year, especially winter.
- Should the construction and planting of a vegetated screen not be possible then it is recommended that a wall be constructed exceeding the height of the panels.
- Reduce the mounting height of the panels to as low as possible to ensure that the screening measures recommended above are possible to implement
- Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.
- Recommended that a Glint and Glare Assessment be undertaken if the airstrip noted on PV Site B will be retained and used during the operational phase of the development.

Residual impacts:
The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.

Glint and Glare as an air hazard

The South African Civil Aviation Authority (CAA) mandates that a glint and glare assessment be conducted for any solar project within three kilometres of an aerodrome and located on the extended centreline of a runway, as outlined in Obstacle Notice 3/2020.

No aerodromes are located within 3km of the proposed site.

Glint and Glare on Static Ground-Based Receptors

A few residences and buildings are located within a 1km radius of the proposed PV facility, as identified in Section 6.6,. The potential visual impact related to solar glint and glare on static ground-based receptors is therefore expected to be of a **high** visual impact (significance rating = 64) which may be mitigated to **low** (significance rating = 28).

Mitigation of this impact is possible and both specific measures as well as general "best practice" measures are recommended in order to reduce/mitigate the potential visual impact. The table below illustrates this impact assessment.

Table 11: Impact table summarising the significance of the visual impact of solar glint and glare on static ground receptors

Nature of Impact: The visual impact of solar glint and glare on residents of homesteads within 1km of the PV facility		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Improbable **(2)**
Significance	High **(64)**	Low **(28)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Planning & operation: ➢ Use anti-reflective panels and dull polishing on structures, where possible and industry standard.		

- It is recommended to avoid using deeply textured glass, as research has indicated that employing smooth or lightly textured glass, effectively mitigates any glint and glare impacts.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- Provide significant screening around the development site. This can be achieved through the application of one or a combination of the following methods:
  - Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the boundary of the entire development footprint.
  - Construct and plant a vegetated berm
  - Should no existing vegetation be present in certain areas or should it be insufficient in height to provide sufficient screening in certain areas, then it is recommended that vegetated berms be constructed and planted. This vegetated berm is required to consist of the following:
    - Plant species that are preferably locally endemic but at a minimum at least indigenous.
    - A combination of plant species of various height variations (i.e low shrubs to tall trees) to ensure sufficient coverage exceeding the expected panel heights.
    - Evergreen species to ensure coverage through all seasons of the year, especially winter.
- Should the construction and planting of a vegetated screen not be possible then it is recommended that a wall be constructed exceeding the height of the panels.
- Reduce the mounting height of the panels to as low as possible to ensure that the screening measures recommended above are possible to implement
- Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- If specific sensitive visual receptors are identified during operation, investigate screening at the receptor site, where possible.
- Recommended that a Glint and Glare Assessment be undertaken if the airstrip noted on PV Site B will be retained and used during the operational phase of the development.

Residual impacts:
The visual impact will be removed after decommissioning, provided the PV facility infrastructure is removed. Failing this, the visual impact will remain.

7.2.2.6. ANCILLARY INFRASTRUCTURE

On-site ancillary infrastructure associated with the PV Facility includes a BESS, access roads, onsite substation, etc. No dedicated viewshed analyses have been generated for the ancillary infrastructure, as the range of visual exposure will fall within that of the Solar PV Facility.

The anticipated visual impact resulting from this infrastructure is likely to be of **low** significance both before (significance rating = 24) and after mitigation (significance rating = 12).

Table 12: Visual impact of the ancillary infrastructure

Nature of Impact: Visual impact of the ancillary infrastructure on observers in close proximity to the structures.		
	Without mitigation	***With mitigation***
Extent	Very Short distance **(4)**	Very Short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Low **(4)**	Low **(4)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(24)**	Low **(12)**
Status (positive, neutral, or negative)	Negative	Negative
Reversibility	Reversible (1)	Reversible (1)
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Generic best practise mitigation/management measures: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the development footprint, where possible. ➢ Investigate the potential to screen affected receptor sites (if applicable and located within 1km of the facility) with planted vegetation cover.		
Residual impacts: The visual impact will be removed after decommissioning, provided the ancillary infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

7.2.3. DECOMMISSIONING IMPACTS

During decommissioning there may be a noticeable increase in heavy vehicles utilising the roads to the site that may cause, at the very least, a visual nuisance to other road users and landowners in closer proximity (< 1 km) to the decommissioning activities.

Decommissioning activities may potentially result in a **moderate** (significance rating = 52), temporary visual impact, that may be mitigated to a slightly lower **moderate** (significance rating = 33).

A mitigating factor in this scenario is that the visual exposure of the PV facility structures will be experienced in conjunction with the existing visual clutter as a result of the urban development within the region. This reduces the probability of this impact occurring.

Table 13: Visual impact of decommissioning activities on sensitive visual receptors in close proximity (within 1km) to the proposed facility

Nature of Impact: Visual impact of construction activities on sensitive visual receptors in close proximity (within 1km) to the proposed facility.		
	Without mitigation	***With mitigation***
Extent	Very short distance **(4)**	Very short distance **(4)**
Duration	Very Short term **(1)**	Very Short term **(1)**
Magnitude	High **(8)**	Moderate **(6)**
Probability	Highly probable **(4)**	Probable **(3)**
Significance	Moderate **(52)**	Moderate **(33)**
Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation: Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas as per the rehabilitation plan undertaken. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions as required.		
Residual impacts: None, provided rehabilitation works are carried out as specified.		

7.3. INDIRECT IMPACTS

The indirect visual impacts of the proposed Paardevlei Solar PV & BESS are assessed as follows:

7.3.1. OPERATIONAL PHASE

7.3.1.1. POTENTIAL VISUAL IMPACT OF FACILITY OPERATIONS ON THE VISUAL CHARACTER OF THE LANDSCAPE AND 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.), play 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.

In general, the landscape character of the greater study area presents as very urbanised and developed in nature of majority of the study area, however, the greater environment with its backdrop of the scenic Hottentots Holland Mountain range and ocean views is considered to have a high visual quality. As such, the entire study area is considered sensitive to visual impacts.

The anticipated visual impact of the proposed PV facility on the regional visual quality (i.e. beyond 6km of the proposed infrastructure and within the greater region), and by implication, on the sense of place, is difficult to quantify, but is generally expected to be of **low** significance (rating = 26) and may be mitigated to a slightly lower **low** significance (rating = 13).

Table 14: Impact table summarising the significance of visual impacts of facility operations on landscape character and sense of place within the region

Nature of Impact: The potential impact on the sense of place of the region.		
	No Mitigation	***Mitigation considered***
Extent	Long distance **(1)**	Long distance **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	High **(8)**	High **(8)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(26)**	Low **(13)**
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: Planning: ➢ Retain/re-establish and maintain natural vegetation in all areas outside of the development footprint/servitude, but within the project site. Operations: ➢ Maintain the general appearance of the facility as a whole.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility infrastructure is removed and the area rehabilitated. Failing this, the visual impact will remain.		

6..1.1.1. POTENTIAL VISUAL IMPACT ON TOURIST DESTINATIONS AND PROTECTED AREAS WITHIN THE REGION

Despite the very urbanised and developed nature of majority of the study area, the greater region is generally seen as having a high scenic value and tourism value potential, especially since a sizeable portion of the northern portion of study area falls within the Cape Winelands Biosphere Reserve as recognized by UNESCO, a highly valued cultural landscape. There are also three (3) protected areas within the study area, namely the Lourens River Protected Natural Environment, the Helderberg Marine Protected Area (MPA), as well as the outskirts of the Hottentots Holland Nature Reserve.

The anticipated visual impact of the final 25 turbine layout for the proposed Paardevelei Solar PV & BESS on tourist destinations, designated protected areas and other accommodation and attractions within the region, is therefore expected to be as follows:

< 1km

Visitors to the Helderberg Marine Protected area and other similar sensitive receptors within this zone are likely to experience a visual impact of **high** (significance rating = 72), that may be mitigated to **moderate** (significance rating = 42) located within 1km of the proposed PV Facility.

Table 15: Impact table summarising the significance of visual impacts on tourist destinations within 1km of the proposed infrastructure

Nature of Impact: Visual impact of the proposed development on tourist destinations / protected areas within 1km of the proposed infrastructure		
	No mitigation	***Mitigation considered***
Extent	Very Short distance **(4)**	Very Short distance **(4)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Very high **(10)**	Moderate **(6)**
Probability	Highly Probable **(4)**	Probable **(3)**
Significance	High **(72)**	Moderate **(42)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation / Management: Planning: ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint.		

➢ Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. ➢ Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. <u>Construction:</u> ➢ Rehabilitate all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for infrastructure. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. ➢ Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.

<u>1 – 3km</u>

Visitors to portions of the Lourens River Protected Natural Environment and other similar sensitive receptors (i.e visitors to tourist desitination such as wine farms) within this zone are likely to experience a visual impact of **moderate** (significance rating = 45), that may be mitigated to **low** (significance rating = 22) located within 1-3km of the proposed PV Facility.

Table 16: Impact table summarising the significance of visual impacts on tourist destinations within 1 – 3km of the proposed infrastructure

Nature of Impact: Visual impact of the proposed development on tourist destinations / protected areas within 1-3km of the proposed infrastructure		
	No mitigation	***Mitigation considered***
Extent	Short distance **(3)**	Short distance **(3)**
Duration	Long **(4)**	Long **(4)**
Magnitude	High **(8)**	Low **(4)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(45)**	Low **(22)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation / Management: <u>Planning:</u> ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. ➢ Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. <u>Construction:</u> ➢ Rehabilitate all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for infrastructure. <u>Operations:</u> ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. ➢ Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

3 – 6km

Visitors to the southernmost portion of the Hottentots Holland Nature Reserve and other similar sensitive receptors (i.e visitors to tourist desitination such as wine farms) within this zone are likely to experience a visual impact of **low** (significance rating = 24), that may be mitigated to **negligible** (significance rating = 8) located within 3-6km of the proposed PV Facility.

Table 17: Impact table summarising the significance of visual impacts on tourist destinations within 3-6km of the proposed infrastructure

Nature of Impact: Visual impact of the proposed development on tourist destinations / protected areas within 3-6km of the proposed infrastructure		
	No mitigation	***Mitigation considered***
Extent	Medium distance **(2)**	Medium distance **(2)**
Duration	Long **(4)**	Long **(4)**
Magnitude	Moderate **(6)**	Minor **(2)**
Probability	Improbable **(2)**	Very improbable **(1)**
Significance	Low **(24)**	Negligible **(8)**
Status (positive or negative)	Negative	Negative
Reversibility	Recoverable **(3)**	Recoverable **(3)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation / Management: Planning: ➢ Retain / re-establish and maintain natural vegetation in all areas outside of the development footprint. ➢ Plan ancillary infrastructure in such a way and in such a location that clearing of vegetation is minimised. ➢ Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible, and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems. Construction: ➢ Rehabilitate all construction areas. ➢ Ensure that vegetation is not cleared unnecessarily to make way for infrastructure. Operations: ➢ Maintain the general appearance of the facility as a whole. ➢ Monitor rehabilitated areas, and implement remedial action as and when required. ➢ Decommissioning: ➢ Remove infrastructure not required for the post-decommissioning use of the site. ➢ Rehabilitate all areas. Consult an ecologist regarding rehabilitation specifications. ➢ Monitor rehabilitated areas post-decommissioning and implement remedial actions.		
Residual impacts: The visual impact will be removed after decommissioning, provided the facility and ancillary infrastructure is removed. Failing this, the visual impact will remain.		

7.3.1.2. POTENTIAL CUMULATIVE VISUAL IMPACT WITHIN THE REGION

The proposed Paardevlei Solar PV & BESS is located within an area where no other PV facilities have been authorized within 30km of the site.

The anticipated cumulative visual impact of the proposed Paardevlei Solar PV & BESS is expected to be of **low** significance.

Table 18: Impact table summarising the significance of the cumulative visual impact on sensitive visual receptors within the region

Nature of Impact: The potential cumulative visual impact of the proposed facility together with the other existing built structures on sensitive visual receptors within the region		
	Overall impact of the proposed project considered in isolation	***Cumulative impact of the project and other projects in the area***
Extent	Region **(1)**	Region **(1)**
Duration	Long term **(4)**	Long term **(4)**
Magnitude	Moderate **(6)**	High **(8)**
Probability	Probable **(3)**	Improbable **(2)**
Significance	Moderate **(33)**	Low **(26)**

Status (positive or negative)	Negative	Negative
Reversibility	Reversible **(1)**	Reversible **(1)**
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation potential	Very Difficult	
Mitigation / Management: Not Applicable		
Residual impacts: The visual impact will be removed after decommissioning, provided the buildings and ancillary infrastructure are removed. Failing this, the visual impact will remain.		

7.4. THE POTENTIAL TO MITIGATE VISUAL IMPACTS

The primary visual impact, namely the layout and appearance of the pproposed Paardevlei Solar PV & BESS is not possible to mitigate. The functional design of the facility cannot be changed in order to reduce visual impacts. The following mitigation is however possible:

- Consult adjacent landowners (if present) in order to inform them of the development and to identify any (valid) visual impact concerns.
- It is recommended that vegetation cover (i.e. either natural or cultivated) immediately adjacent to the development footprint be maintained, both during construction and operation of the proposed facility. This will minimise visual impact as a result of cleared areas and areas denuded of vegetation.
- Plan buildings in such a way and in such a location that clearing of vegetation is minimised. Consolidate buildings as much as possible and make use of already disturbed areas rather than pristine sites wherever possible.
- Use existing roads wherever possible. Where new roads are required to be constructed, these should be planned carefully, taking due cognisance of the local topography. Roads should be laid out along the contour wherever possible and should never traverse slopes at 90 degrees. Construction of roads should be undertaken properly, with adequate drainage structures in place to forego potential erosion problems.

Glint and glare impact mitigation measures include the following:

- Use anti-reflective panels and dull polishing on structures.
- It is recommended to avoid using deeply textured glass, as research has indicated that employing smooth or lightly textured glass, effectively mitigates any glint and glare impacts.
- Adjust tilt angles of the panels if glint and glare issues become evident, where possible.
- Provide significant screening around the development site. Significant screening' with respect to visibility of reflecting solar panels implies that the observer's view is impeded to the extent that the presence of the solar panels cannot be easily discerned at first glance. This can be achieved through the application of one or a combination of the following methods:
    - Retain/re-establish and maintain natural vegetation (if present) immediately adjacent to the boundary of the entire development footprint.
    - Construct and plant a vegetated berm
    - Should no existing vegetation be present in certain areas or should it be insufficient in height to provide sufficient screening in certain areas, then it is recommended that vegetated berms be constructed and planted. This vegetated berm is required to consist of the following:
        - Plant species that are preferably locally endemic but at a minimum at least indigenous.
        - A combination of plant species of various height variations (i.e low shrubs to tall trees) to ensure sufficient coverage exceeding the expected panel heights.
        - Evergreen species to ensure coverage through all seasons of the year, especially winter.
- Should the construction and planting of a vegetated screen not be possible then it is recommended that a wall be constructed exceeding the height of the panels.
- Reduce the mounting height of the panels to as low as possible to ensure that the screening measures recommended above are possible to implement.

Mitigation of visual impacts associated with the construction phase, albeit temporary, entails proper planning, management, and rehabilitation of all construction sites. Construction should be managed according to the following principles:

- Ensure that vegetation is not unnecessarily cleared or removed during the construction period.
- Reduce the construction period through careful logistical planning and productive implementation of resources.

- Plan the placement of lay-down areas and any potential temporary construction camps in order to minimise vegetation clearing.
- Restrict the activities and movement of construction workers and vehicles to the immediate construction site 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 through the use of approved dust suppression techniques as and when required (i.e., whenever dust becomes apparent).
- Restrict construction activities to daylight hours in order to negate or reduce the visual impacts associated with lighting.
- Ensure that all infrastructure and the site and general surrounds are maintained and kept neat.
- Access roads, which are not required post-construction, should be ripped and rehabilitated.
- Rehabilitate all disturbed areas, construction areas, roads, slopes etc. immediately after the completion of construction works. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.
- Monitor all rehabilitated areas for at least a year for rehabilitation failure and implement remedial action as required. If necessary, an ecologist should be consulted to assist or give input into rehabilitation specifications.

- During Operations, monitor the general appearance of the facility as a whole as well as all rehabilitated areas. Implement remedial action where required.
- Retain natural pockets (wetland, river, and other sensitive vegetation zones) as buffers within the property and along the perimeter.
- Keeping infrastructure at minimum heights.
- Avoid the use of highly reflective material.
- Metal surfaces, where they occur, should be painted in natural soft colours that would blend in with the environment.
- Indirect impacts anticipated as a result of the proposed infrastructure (i.e., impacts on landscape character and sense of place) are not possible to mitigate.

- After decommissioning, all infrastructure should be removed and all disturbed areas appropriately rehabilitated. Monitor rehabilitated areas post-decommissioning and implement remedial actions and consult an ecologist regarding rehabilitation specifications if necessary.

The possible mitigation of both direct and indirect visual impacts as listed above should be implemented and maintained on an ongoing basis.

8. IMPACT STATEMENT

The findings of the Visual Impact Assessment undertaken for the proposed Paardevlei Solar PV & BESS is that the visual environment surrounding the site, especially within a 1km radius (and potentially up to a radius of 3km) of the proposed facility, may be visually impacted during the anticipated operational lifespan of the facility (i.e. >15 years). The table below is a summary of the visual impacts as assessed above:

Table 19: Impact table summarising the significance ratings as determined

Significance Ratings Summary		
	Pre-mitigation impact rating	**Post mitigation impact rating**
Direct Impacts		
Construction Phase		
Potential temporary visual impact of construction on residents of towns and homesteads located within 1km of the proposed PV Facility	High (64)	Moderate (36)
Potential temporary visual impact of construction on observers travelling along the various roads within 1km to the proposed PV Facility	Moderate (48)	Moderate (36)
Operational Phase		
Potential visual impact on residents at homesteads, suburbs, developed areas, and visitors/tourists within1km of the proposed PV Facility	High (72)	Moderate (42)
Potential visual impact on observers travelling along roads located within a 1km radius of the proposed PV Facility	Moderate (54)	Moderate (42)

Potential visual impact on sensitive visual receptors within 1 - 3km radius of the proposed PV Facility	Moderate (45)	Low (26)
Potential visual impact on sensitive visual receptors within 3 - 6km radius of the proposed PV Facility	Low (24)	Low (20)
Potential visual impact of operational, safety and security lighting of the facility on sensitive visual receptors at night	Moderate (39)	Low (22)
Potential visual impact of solar glint and glare on roads users within 1km of the proposed PV Facility	Moderate (54)	Low (14)
Potential visual impact of solar glint and glare as a air hazard within 3km of the proposed PV Facility	N/A No aerodomes	N/A No aerodomes
Potential visual impact of solar glint and glare on static ground-based receptors within 1km of the proposed PV Facility	High (64)	Low (28)
Potential visual impact of ancillary infrastructure	Low (24)	Low (12)
Decommissioning		
Potential temporary visual impact of decommisioning on sensitive receptors located within 1km of the proposed PV Facility	Moderate (52)	Moderate (33)
Indirect Impacts		
Operational Phase		
Potential visual impact of the proposed infrastructure on the sense of place of the region	Low (26)	Low (13)
Potential visual impact on tourist destinations and protected areas within 1km	High (72)	Moderate (42)
Potential visual impact on tourist destinations and protected areas within 1-3km	Moderate (45)	Low (22)
Potential visual impact on tourist destinations and protected areas within 3-6km	Low (24)	Negligible (8)
Cumulative Impacts		
The potential cumulative visual impact of the proposed PV Facility on the visual quality of the landscape	*In isolation* Moderate (33)	*Cumulative* Low (26)

The anticipated visual impacts listed above (i.e. post mitigation impacts) range from prominently **moderate** to **low** significance. No post-mitigation visual impacts of **high** is anticipated in terms of the proposed Paardevlei Solar PV &BESS.

9. CONCLUSION AND RECOMMENDATIONS

The visual impact assessment (VIA) practitioner takes great care to ensure that all the spatial analyses and mapping is as accurate as possible. The intention is to quantify, using visibility analyses, proximity analyses and the identification of sensitive receptors and the potential visual impacts associated with the proposed **Paardevlei Solar PV & Battery Energy Storage System (BESS)**. These processes are deemed to be transparent and scientifically defensible when interrogated.

The construction and operation of the proposed Paardevlei Solar PV & BESS may have a visual impact on the study area, especially within a 1km radius (and potentially up to a radius of 3km) of the proposed facility. The visual impact will differ amongst places, depending on the distance from the facility. Overall, the post mitigation significance of the visual impacts are expected to range from **moderate** to **low.**

The REEA database indicates that there are no proposed PV Facilities within 30km of the proposed facility. Additionally, the highly urbanised and industrialised nature of the study area makes it impractical to realistically assess the cumulative impacts of PV facilities located within a sea of other infrastructure of equal or higher visual prominence. Considering the above the potential **cumulative visual impact is considered to be low and within acceptable limits**.

According to the Provincial Government of the Western Cape, Department of Environmental Affairs and Development Planning (DEA&DP) Guideline for Involving Visual and Aesthetic Specialists in the EIA Process (Oberholzer, 2005), the criteria that determine whether or not a visual impact constitutes a potential fatal flaw are categorised as follows:

1. Non-compliance with Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites.
2. Non-compliance with conditions of existing Records of Decision.
3. Impacts that may be evaluated to be of high significance and that are considered by the majority of the stakeholders and decision-makers to be unacceptable.

In terms of the above and to the knowledge of the author the proposed development is compliant with all Acts, Ordinances, By-laws and adopted policies relating to visual pollution, scenic routes, special areas or proclaimed heritage sites, as well as, conditions of existing Records of Decisions (if any in place).

Since no objections have been reported from stakeholders or decision-makers within the region to the knowledge of the author, this assessment has adopted a risk averse approach by assuming that the perception of most (if not all) of the sensitive visual receptors, would be predominantly negative towards the development.

Therefore, with the information available to the specialist at the time of writing this report, it cannot be empirically determined that the statistical majority of objecting stakeholders were exceeded. If evidence to the contrary surfaces during the progression of the development application, the specialist reserves the right to revise the statement below.

A number of mitigation measures have been proposed (**Section 7.4**). 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 facility.

If mitigation is undertaken 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 Paardevlei Solar PV & BESS would be considered to be **acceptable from a visual impact perspective**.

It should be noted that the results/deductions in this report are based solely from a visual perspective in relation to potential visual impacts and sensitive visual receptors and exclude any potential issues/comments/fatal flaws identified by other specialist studies.

10. REFERENCES

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