

Geelstert 1

Northern Cape Province

Basic Assessment Report

August 2020

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PROJECT DETAILS

Title	:	Basic Assessment Process: Basic Assessment Report for Geelstert 1, a solar PV facility and associated infrastructure proposed on a site near Aggeneys and within the Springbok Renewable Energy Development Zone (REDZ), in the Northern Cape Province.
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Client	:	Geelstert Solar Facility 1 (Pty) Ltd
Report Revision	:	Revision 0
Date	:	August 2020

When used as a reference this report should be cited as: Savannah Environmental (2020) Basic Assessment for Geelstert 1, Northern Cape Province.

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PURPOSE OF THE BA REPORT AND INVITATION TO COMMENT

Geelstert Solar Facility 1 (Pty) Ltd, the proponent, proposes the development of a 125MW_{AC} solar photovoltaic (PV) facility, as well as, associated infrastructure on a study area and development area located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Geelstert 1. The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality, as well as the Springbok Renewable Energy Development Zone (REDZ).

The project development footprint is within the development area that will house the proposed development, and which has been considered fully within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective within this Basic Assessment (BA) Report.

In terms of NEMA, the EIA Regulations, 2014 (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Geelstert 1 requires Environmental Authorisation (EA) from the National Department of Environmental Affairs (DEA) subject to the completion of a Basic Assessment process, as prescribed in Regulations 21 to 24 of the EIA Regulations, 2014 (GNR 326) and as per GNR 114. The need for EA subject to the completion of Basic Assessment process is triggered by the inclusion of, amongst others, Activity 1 of Listing Notice 2 (GNR 325) as well as the location of the development area within the Springbok REDZ.

The BA Report is available for review from **Thursday, 20 August 2020 to Monday, 21 August 2020**. The BA Report is available for download, review, and comment on the Savannah Environmental website at: www.savannahsa.com/public-documents/energy-generation/geelstert-1-and-geelstert-2-solar-pv-facilities-and-associated-grid-connection/.

Please submit your comments by **Monday, 21 September 2020** to:

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Comments can be made as written submission via fax, post or email.

EXECUTIVE SUMMARY

Geelstert Solar Facility 1 (Pty) Ltd, proposes the development of Geelstert 1, a photovoltaic (PV) solar energy facility of up to 125MW_{AC} and associated infrastructure, on a site located 11km south-east of the town of Aggeneys in the Northern Cape Province and is located on the Remaining Extent of the Farm Bloemhoek 61. The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A development area of approximately 578ha has been identified within the study area by the proponent for the development of Geelstert 1. Within this identified development area, a development footprint or facility layout has been defined. This development footprint/facility layout of approximately 245ha has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is larger than the area needed for the construction of a 125MW_{AC} solar PV facility, and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint.

The development footprint is regarded as being of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities. Geelstert 1 will have a contracted capacity of up to 125MW_{AC} and will include specific infrastructure, namely:

- » Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- » Centralised inverter stations or string inverters;
- » A temporary laydown area;
- » Cabling between the panels, to be laid underground where practical;
- » An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- » An access road with a maximum width of 8m;
- » Internal access roads within the PV panel array area with a maximum width of 5m;
- » Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

Geelstert Solar Facility 1 (Pty) Ltd has confirmed that the development footprint is suitable for the development of a solar energy facility from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability, site-specific characteristics such as topography and accessibility, the location within the Springbok REDZ, as well as the proximity of the area to authorised and constructed solar energy facilities, i.e. the operational BioTherm Aggeneys Solar PV Facility and the proposed Aggeneys 1 and Aggeneys 2 solar PV facilities.

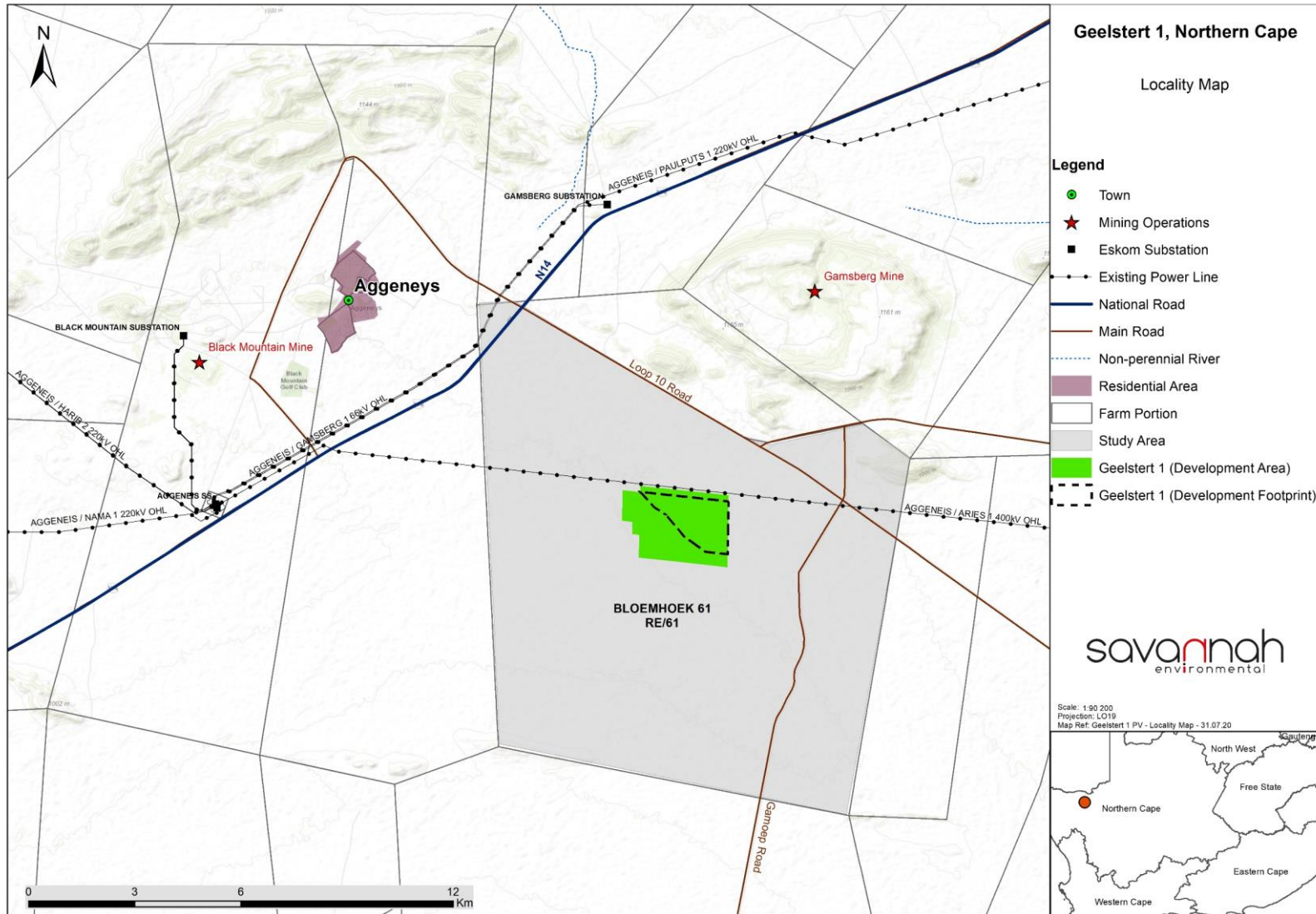


Figure 0.1: Locality map illustrating the location of the study area and development area under investigation for the development of Geelster 1

No environmental fatal flaws were identified in the independent specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. Some mitigation measures have already been considered through the micro-siting of the solar PV facility.

The potential environmental impacts associated with Geelster 1 identified and assessed through the BA process include:

- » Impacts on ecology, flora and fauna.
- » Impacts on avifauna.
- » Impacts on freshwater features.
- » Impacts to soils and agricultural potential.
- » Impacts on heritage resources
- » Visual impacts on the area as a result of the facility.
- » Positive and negative social impacts.
- » Traffic impacts.

Impacts on Ecology

The Ecological Impact Assessment (Appendix D) is based on the findings of three full field assessments undertaken in June 2018, March 2019, and June 2020. The ecological impacts identified to be associated with Geelster 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction phase of the solar PV facility, and long-term for the operation phase of the solar PV facility.

The Ecological Impact Assessment assessed the impact of Geelster 1 on the sensitive ecological features present within the development area for the life-cycle of the project. The Geelster 1 development area is located within the Bushmanland Arid Grassland Vegetation type, the second most extensive vegetation type in South Africa, occupying an area of 45 478km². This vegetation type is associated with open grasslands, which are considered to be of a low sensitivity. In addition, the development area and development footprint of the solar PV facility falls within an Ecological Support Area (ESA). The dune habitat associated with the Red Lark in the area, to the south of the development footprint is considered to be a Critical Biodiversity Area (CBA). A small portion of the dune habitat is located within the development area, however the development footprint of the solar PV facility falls outside of this area.

The ecological assessment identified impacts for the construction, operation, and decommissioning phases of the project. During the construction phase (and the decommissioning phase), the impacts include impacts on vegetation and listed or protected plant species and direct faunal impacts. The significance of the construction phase impacts ranges from medium to low, following the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified following the implementation of the recommended mitigation measures.

During the operation phase, the anticipated impacts include faunal impacts and habitat degradation due to erosion and alien plant invasion. The significance of the impacts for the operation phase will be low, following the implementation of the mitigation measures recommended by the specialist. No impacts of a high or medium significance were identified.

From the findings of the Ecological Impact Assessment (**Appendix D**) it can be concluded that no impacts of high ecological significance were identified which would hinder the development of Geelstert 1 and its associated infrastructure within the defined development footprint. The proposed development is considered to be appropriate and acceptable from an ecological perspective and will not result in detrimental impacts to ecosystems and habitat features present within the development footprint and within the surrounding properties. The specialist has, therefore, indicated that the development may be authorised, constructed, and operated, subject to the implementation of the recommended mitigation measures.

Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of three full field assessments undertaken in June 2018, March 2019, and June 2020. The avifauna impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction phase of the solar PV facility, and long-term of the lifetime of the solar PV facility.

During the construction phase (and decommissioning phase) of Geelstert 1, direct avifauna impacts include habitat loss and disturbance related to vegetation clearance, the operation of heavy machinery (noise) and increased human presence. The significance of the construction phase impacts will be medium, with the implementation of the mitigation measures recommended by the specialist. No impacts of high significance are expected to occur during the construction phase of Geelstert 1.

Impacts on avifauna during the operation phase of Geelstert 1 include collisions with PV panels, entrapment along perimeter fencing, and disturbance due to traffic and night lighting. The significance of the impacts will be low, with the implementation of the recommended mitigation measures. No impacts of high or medium significance are expected to occur during the operation of the solar PV facility.

From the results of the avifauna assessment, it can be concluded that the development footprint for Geelstert 1 is a suitable environment for the location of a solar PV facility.

Considering that the study area falls within the Nama-Karoo bioregion and supports the typical avifaunal assemblage for the area, there are no impacts associated with the development that are considered to be of a high residual significance and which cannot be mitigated to a low acceptable level.

Although there are Threatened and Near-Threatened avifauna species within the surrounding area, most of these species are not common in the area and therefore probably occur in low numbers. Species such as the Martial Eagle, Verreaux's Eagle and the Ludwig Bustard's were recorded within the study area and the surrounding environment due to the availability of suitable foraging habitat.

The development area supports a few species and/or features of concern, such as communal nesting or roosting sites of Red-listed species. The Red Lark occurs within the development area, within the dune habitat which is located approximately 500m to the south from the boundary of the development footprint. Therefore, the sensitive habitat for the Red Lark is considered to be adequately buffered from the development footprint of the solar PV facility.

From the results of the avifauna impact assessment, it can be concluded that no fatal flaws will be associated with the development of Geelstert 1 within the defined development footprint.

Impacts on Freshwater Features

The Freshwater Resource Study and Assessment (**Appendix F**) is based on the findings of a field assessment undertaken from 21 July – 22 July 2020. The freshwater resource impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be long-term for the construction (including decommissioning) and operation phase of the solar PV facility.

Five (5) depression wetlands and three (3) ephemeral streams/washes were identified within the development area and its vicinity. The results of the screening assessment undertaken by the specialist indicated that only the depression wetlands would potentially be impacted by the development of Geelstert 1 either directly or indirectly. The ephemeral washes are within the 500m radius of the development area of Geelstert 1 and are located in separate micro-catchments or some distance downslope and downstream of the development footprint. Therefore, it is highly unlikely that the proposed development will impact these washes. All five (5) depression wetlands are located outside of the defined development footprint, at a distance of between 30 and 75m west of the development footprint. However, the development footprint of the solar PV facility extends slightly into the catchments of these depression wetlands, therefore the development may potentially impact these wetlands.

During the construction phase, potential impacts include an impact on the depression wetlands through the possible increase in surface water run-off; an increase in sedimentation and erosion and impacts on the localised surface water quality. The significance of the construction phase impacts will be low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of the mitigation measures.

During the operation phase, the impact relates to altered run-off patterns due to rainfall interception by PV panel infrastructure and compacted areas resulting in high levels of erosion, sedimentation, and turbidity within the lower lying depression wetland areas. The significance of the impact will be low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

Considering that the depression wetlands identified are located outside the development footprint, there are no fatal flaws associated with the development of the solar PV facility from a freshwater feature's perspective. From the results of the assessment undertaken, it can be concluded that the development of Geelstert 1 will have an overall negative impact of low significance with the implementation of the recommended mitigation measures on the depression wetlands. The construction of Geelstert 1 and the associated infrastructure is therefore supported from a freshwater feature's perspective and considered acceptable subject to obtaining of the necessary water use authorisation from the Department of Human Settlements, Water and Sanitation.

Impacts on Soil and Agricultural Potential

The Soils Impact Assessment (**Appendix G**) is based on the findings of a field assessment undertaken in November 2018. Impacts include the loss of agricultural land through the undertaking of construction activities and panel installation; and increased wind erosion due to a disturbance of the soil. The soil

impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction (including decommissioning) and operation phase of the solar PV facility.

No fatal flaws have been identified in terms of soils and agricultural potential, and all impacts can be mitigated to be within low and acceptable levels of impact. Therefore, the development footprint of Geelstert 1 is considered to be acceptable.

Impacts on Heritage Resources (including archaeology and palaeontology)

The Heritage Screening Assessment (**Appendix H**) indicated that the impacts anticipated as a result of the proposed development of Geelstert 1 will be neutral and local in extent. The duration of the impacts will be short-term for the construction (including decommissioning) phase. No operation phase impacts were assessed for Geelstert 1 from a heritage perspective.

Heritage impacts during the construction phase of the Geelstert 1 include an impact on the significant archaeological, built environment resources, however this impact is unlikely to occur owing to the lack of significant heritage sites located within the development footprint. Heritage sites are, however, present within the surrounding landscape of the development footprint. In addition, the bedrock associated with the Aggeneys area and the development footprint is mainly unfossiliferous and is of no palaeontological interest. As a result, the impact of the Geelstert 1 on heritage and palaeontological resources is of low significance. Therefore, there are no fatal flaws associated with the development of the solar PV facility from a heritage perspective. In conclusion, the specialist has indicated that the development of Geelstert 1 is supported from a heritage perspective, subject to the implementation of the recommended mitigation measures.

Visual Impacts

The Visual Impact Assessment (**Appendix I**) is based on the findings of a field assessment undertaken in January 2019. The duration of the construction and operation phase impacts will be long-term and local in extent for the solar PV facility.

The Visual Impact Assessment identified negative impacts on visual receptors for the construction and the operation phase of Geelstert 1. The impacts include a change in the character of a relatively natural area to the south and east of Geelstert 1; a change in the character of the landscape as seen from the N14, the Loop 10 gravel road, the Gamoep gravel roads and local homesteads; a change in the landscape as seen from local settlement areas (specifically Aggeneys); glare impacts which could affect travellers on the Loop 10 and Gamoep roads and the northern flight path of the Aggeneys Aerodrome; and visual impacts related to the operational, safety and security lighting of the solar PV facility. The significance of the impacts is low with the implementation of the recommended mitigation measures. No impacts of a high or medium significance are anticipated.

The Visual Impact Assessment concluded that the development of Geelstert 1 will impact visually on an area where there is currently a strong influence of industrial development including mining infrastructure, therefore changes to the landscape quality are unlikely to be visually intrusive. As a result, no fatal flaws as a result of the development are anticipated from a visual perspective. In conclusion, the development of Geelstert 1 is considered to be acceptable.

Social Impacts

The Social Impact Assessment (**Appendix J**) identified that most social impacts associated with the development of Geelstert 1 will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. Both positive and negative impacts have been identified for both the construction and operation phases of the development.

During the construction phase, negative impacts include an influx of jobseekers and a change in the population of the area; safety and security impacts; impacts on daily living and movement patterns; and nuisance impacts, which include noise and dust. The significance of the negative construction phase impacts will be low, within the implementation of the recommended mitigation measures by the specialist. The positive social impact of the construction phase includes the creation of direct and indirect employment opportunities during the construction phase. The significance of the positive impacts will be medium following the implementation of the recommended enhancement measures.

Social impacts associated with the operation of Geelstert 1 will be both positive and negative. The negative impacts are related to an influx of jobseekers and a change in the population within the study area; and to the transformation in the sense of place. Both impacts will be of a low significance with the implementation of the recommended mitigation measures. The positive impacts for the operational phase of the solar PV facility include the creation of employment opportunities and skills development opportunities for the local economy and the country; the development of non-polluting renewable energy infrastructure; and a contribution to Local Economic Development (LED) and social upliftment. The significance of the positive social impacts during the operation phase will be medium to high, with the implementation of the recommended enhancement measures.

From a social perspective, it is concluded that the development of Geelstert 1 is acceptable subject to the implementation of the recommended mitigation measures. There are no fatal flaws associated with the development of the solar PV facility.

Impacts on Traffic

The Traffic Impact Assessment (**Appendix K**) identified that the construction and operation phase traffic impacts associated with the development of Geelstert 1 will be short- and long-term and will have a regional extent.

During the construction phase, traffic will be generated through the transportation of project components and employees to the site. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

During the operation phase, traffic will be generated and will relate to the presence of the operation and maintenance staff at the solar PV facility. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

No fatal flaws and no impacts of high significance are expected. The development of Geelstert 1 is therefore considered to be acceptable from a traffic perspective.

Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional, and national level have the potential to be significant.

Geelstert 1 is located within the Springbok REDZ, or REDZ 8. The REDZ areas are zones identified by the Department of Environmental Affairs as a geographical area of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy projects and it is expected that several solar PV facilities will be developed within these focus areas. Currently, one solar PV energy facility is operational and located within the vicinity of the development area for Geelstert 1. The BioTherm Aggeneys Solar PV facility is located 9km north-west of the development area for Geelstert 1.

Considering all aspects, cumulative impacts associated with Geelstert 1 have been assessed to be acceptable, with no unacceptable loss or risk expected.

Figure 0.2 provides an environmental sensitivity map of the preferred layout for Geelstert 1.

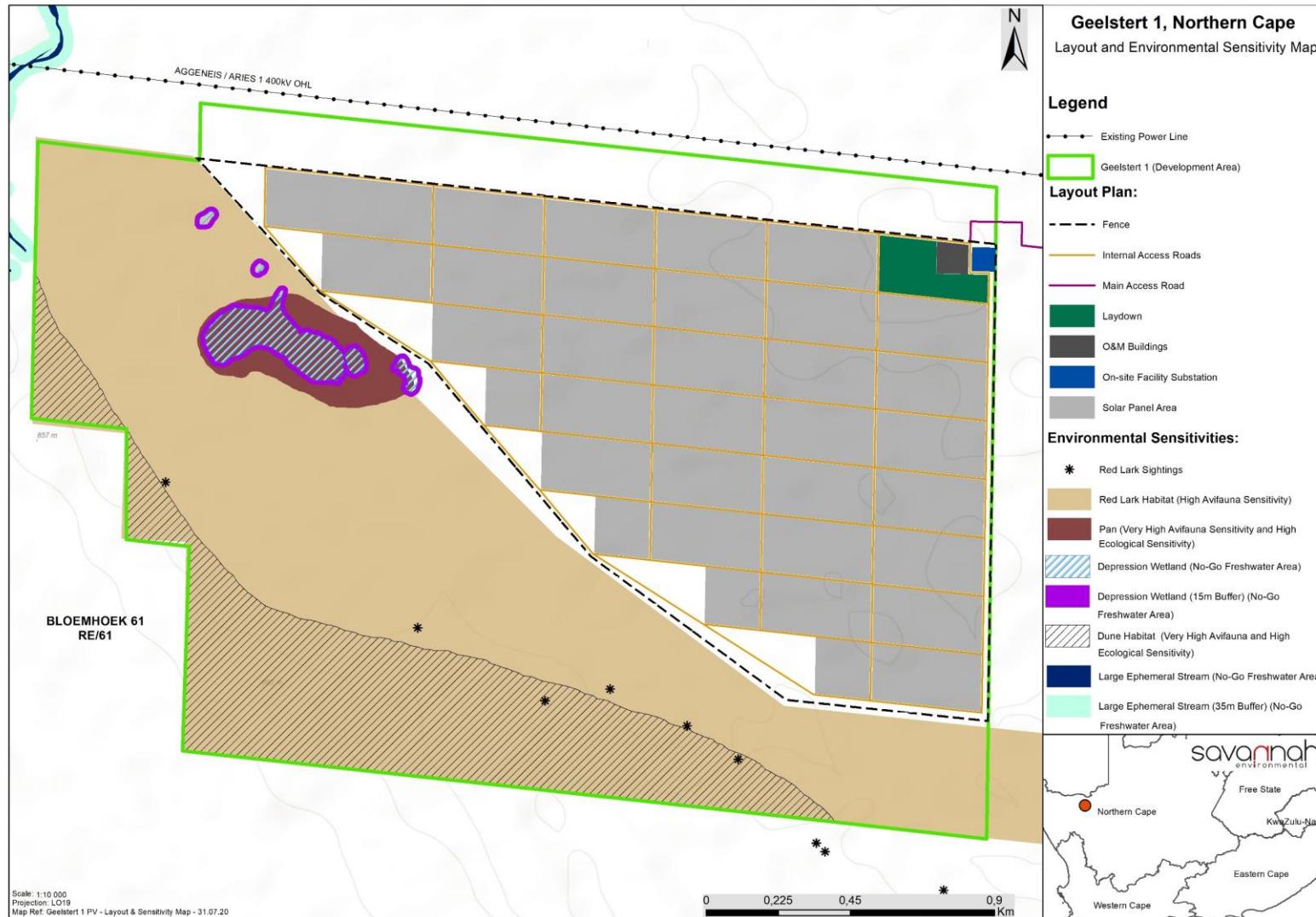


Figure 0.2: Final preferred layout map of the preferred development footprint for Geelstert 1, as was assessed as part of the BA process, overlain with the environmental sensitivities (refer to **Appendix O** for A3 maps)

DEFINITIONS AND TERMINOLOGY

Alternatives: Alternatives are different means of meeting the general purpose and need of a proposed activity. Alternatives may include location or site alternatives, activity alternatives, process or technology alternatives, temporal alternatives or the 'do nothing' alternative.

Archaeological material: Remains resulting from human activities which are in a state of disuse and are in or on land and which are older than 100 years, including artefacts, human and hominid remains and artificial features and structures.

Commence: The start of any physical activity, including site preparation and any other activity on site furtherance of a listed activity or specified activity, but does not include any activity required for the purposes of an investigation or feasibility study as long as such investigation or feasibility study does not constitute a listed activity or specified activity.

Construction: Construction means the building, erection or establishment of a facility, structure or infrastructure that is necessary for the undertaking of a listed or specified activity. Construction begins with any activity which requires Environmental Authorisation.

Cumulative impacts: Impacts that result from the incremental impact of the proposed activity on a common resource when added to the impacts of other past, present or reasonably foreseeable future activities (e.g. discharges of nutrients and heated water to a river that combine to cause algal bloom and subsequent loss of dissolved oxygen that is greater than the additive impacts of each pollutant). Cumulative impacts can occur from the collective impacts of individual minor actions over a period and can include both direct and indirect impacts.

Decommissioning: To take out of active service permanently or dismantle partly or wholly, or closure of a facility to the extent that it cannot be readily re-commissioned. This usually occurs at the end of the life of a facility.

Development area: the identified area (located within the study area) where the Geelstert 1 facility is planned to be located. The development area is ~578ha in extent.

Development footprint: the defined area (located within the development area) where the PV panel array and other associated infrastructure for Geelstert 1 is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed. The Geelstert 1 development footprint is ~245ha in extent.

Direct impacts: Impacts that are caused directly by the activity and generally occur at the same time and at the place of the activity (e.g. noise generated by blasting operations on the site of the activity). These impacts are usually associated with the construction, operation, or maintenance of an activity and are generally obvious and quantifiable.

Disturbing noise: A noise level that exceeds the ambient sound level measured continuously at the same measuring point by 7 dB or more.

'Do nothing' alternative: The 'do nothing' alternative is the option of not undertaking the proposed activity or any of its alternatives. The 'do nothing' alternative also provides the baseline against which the impacts of other alternatives should be compared.

Endangered species: Taxa in danger of extinction and whose survival is unlikely if the causal factors continue operating. Included here are taxa whose numbers of individuals have been reduced to a critical level or whose habitats have been so drastically reduced that they are deemed to be in immediate danger of extinction.

Emergency: An undesired/ unplanned event that results in a significant environmental impact and requires the notification of the relevant statutory body, such as a local authority.

Endemic: An "endemic" is a species that grows in a particular area (is endemic to that region) and has a restricted distribution. It is only found in a particular place. Whether something is endemic or not depends on the geographical boundaries of the area in question and the area can be defined at different scales.

Environment: the surroundings within which humans exist and that are made up of:

- i. The land, water and atmosphere of the earth;
- ii. Micro-organisms, plant and animal life;
- iii. Any part or combination of (i) and (ii) and the interrelationships among and between them; and
- iv. The physical, chemical, aesthetic and cultural properties and conditions of the foregoing that influence human health and well-being.

Environmental Authorisation (EA): means the authorisation issued by a competent authority (Department of Environmental Affairs) of a listed activity or specified activity in terms of the National Environmental Management Act (No 107 of 1998) and the EIA Regulations promulgated under the Act.

Environmental assessment practitioner (EAP): An individual responsible for the planning, management and coordinating of environmental management plan or any other appropriate environmental instruments introduced by legislation.

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Environmental impact: An action or series of actions that have an effect on the environment.

Environmental impact assessment: Environmental Impact Assessment, as defined in the NEMA EIA Regulations and in relation to an application to which scoping must be applied, means the process of collecting, organising, analysing, interpreting and communicating information that is relevant to the consideration of that application.

Environmental management: Ensuring that environmental concerns are included in all stages of development, so that development is sustainable and does not exceed the carrying capacity of the environment.

Environmental Management Programme (EMPr): A plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a project or facility and its ongoing maintenance after implementation.

Environmental Officer (EO): The Environmental Officer (EO), employed by the Contractor, is responsible for managing the day-to-day on-site implementation of this EMPr, and for the compilation of regular (usually weekly) Monitoring Reports. The EO must act as liaison and advisor on all environmental and related issues and ensure that any complaints received from the public are duly recorded and forwarded to the Site Manager and Contractor.

Habitat: The place in which a species or ecological community occurs naturally.

Hazardous waste: Any waste that contains organic or inorganic elements or compounds that may, owing to the inherent physical, chemical or toxicological characteristics of that waste, have a detrimental impact on health and the environment.

Indigenous: All biological organisms that occurred naturally within the study area prior to 1800.

Incident: An unplanned occurrence that has caused, or has the potential to cause, environmental damage.

Indirect impacts: Indirect or induced changes that may occur because of the activity (e.g. the reduction of water in a stream that supply water to a reservoir that supply water to the activity). These types of impacts include all the potential impacts that do not manifest immediately when the activity is undertaken, or which occur at a different place because of the activity.

Interested and affected party: Individuals or groups concerned with or affected by an activity and its consequences. These include the authorities, local communities, investors, work force, consumers, environmental interest groups, and the public.

Method Statement: a written submission by the Contractor in response to the environmental specification or a request by the Site Manager, setting out the plant, materials, labour and method the Contractor proposes using to conduct an activity, in such detail that the Site Manager is able to assess whether the Contractor's proposal is in accordance

Mitigation hierarchy: The mitigation hierarchy is a framework for managing risks and potential impacts related to biodiversity and ecosystem services. The mitigation hierarchy is used when planning and implementing development projects, to provide a logical and effective approach to protecting and conserving biodiversity and maintaining important ecosystem services. It is a tool to aid in the sustainable management of living, natural resources, which provides a mechanism for making explicit decisions that balance conservation needs with development priorities.

No-go areas: Areas of environmental sensitivity that should not be impacted on or utilised during the development of a project as identified in any environmental reports.

Photovoltaic effect: Electricity can be generated using photovoltaic solar panels which are comprised of individual photovoltaic cells that absorb solar energy to directly produce electricity. The absorbed solar radiation excites the electrons inside the cells and produces what is referred to as the Photovoltaic Effect.

Pollution: A change in the environment caused by substances (radio-active or other waves, noise, odours, dust or heat emitted from any activity, including the storage or treatment or waste or substances.

Pre-construction: The period prior to the commencement of construction, this may include activities which do not require Environmental Authorisation (e.g. geotechnical surveys).

Rare species: Taxa with small world populations that are not at present Endangered or Vulnerable, but are at risk as some unexpected threat could easily cause a critical decline. These taxa are usually localised within restricted geographical areas or habitats or are thinly scattered over a more extensive range. This category was termed Critically Rare by Hall and Veldhuis (1985) to distinguish it from the more generally used word "rare."

Red data species: Species listed in terms of the International Union for Conservation of Nature and Natural Resources (IUCN) Red List of Threatened Species, and/or in terms of the South African Red Data list. In terms of the South African Red Data list, species are classified as being extinct, endangered, vulnerable, rare, indeterminate, insufficiently known or not threatened (see other definitions within this glossary).

Riparian: the area of land adjacent to a stream or river that is influenced by stream-induced or related processes. Riparian areas which are saturated or flooded for prolonged periods would be considered wetlands and could be described as riparian wetlands. However, some riparian areas are not wetlands (e.g. an area where alluvium is periodically deposited by a stream during floods, but which is well drained).

Significant impact: An impact that by its magnitude, duration, intensity, or probability of occurrence may have a notable effect on one or more aspects of the environment.

Waste: as per the NEM: Waste Amendment Act, 2014 (Act No. 26 of 2014)

- (a) any substance, material or object, that is unwanted, rejected, abandoned, discarded or disposed of, or that is intended or required to be discarded or disposed of, by the holder of that substance, material or object, whether or not such substance, material or object can be re-used, recycled or recovered and includes all wastes as defined in Schedule 3.
- (b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister by notice in the *Gazette*,

but any waste or portion of waste, referred to in paragraph (a) and (b), ceases to be a waste –

- (i) once an application for its re-use, recycling or recovery has been approved or, after such approval, once it is, or has been re-used, recycled or recovered;
- (ii) where approval is not required, once a waste is, or has been re-used, recycled or recovered;
- (iii) where the Minister has, in terms of section 74, exempted any waste or a portion of waste generated by a particular process from the definition of waste; or
- (iv) where the Minister has, in the prescribed manner, excluded any waste stream or a portion of a waste stream from the definition of waste.

ACRONYMS

BA	Basic Assessment
BAR	Basic Assessment Report
DAFF	Department of Agriculture, Forestry and Fisheries
dB	Decibels
DAEARD&LR	Northern Cape Department of Agriculture, Environmental Affairs, Rural Development & Land Reform
DEA	Department of Environmental Affairs
DEFF	Department of Environment, Forestry and Fisheries
DENC	Northern Cape Department of Environment and Nature Conservation
DoE	Department of Energy
DMRE	Department of Mineral Resources and Energy
EAP	Environmental Impact Practitioner
EHS	Environmental, Health and Safety
EIA	Environmental Impact Assessment
EIR	Environmental Impact Report
EMPr	Environmental Management Programme
GPS	Global Positioning System
GWh	Giga Watt hour
HIA	Heritage Impact Assessment
I&APs	Interested and Affected Parties
IDP	Integrated Development Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
kV	Kilo Volt
MW	Mega Watt
NEMA	National Environmental Management Act
NEMAA	National Environmental Management Amendment Act
NEMBA	National Environmental Management: Biodiversity Act
NERSA	National Energy Regulator of South Africa
NHRA	National Heritage Resources Act
NWA	National Water Act
PM	Post Meridiem; "Afternoon"
SAHRA	South African National Heritage Resources Agency
SWMP	Stormwater Management Plan

TABLE OF CONTENTS

PROJECT DETAILS	i
PURPOSE OF THE BA REPORT AND INVITATION TO COMMENT	ii
EXECUTIVE SUMMARY	iii
<i>Impacts on Ecology</i>	v
<i>Impacts on Avifauna</i>	vi
<i>Impacts on Freshwater Features</i>	vii
<i>Impacts on Soil and Agricultural Potential</i>	vii
<i>Impacts on Heritage Resources (including archaeology and palaeontology)</i>	viii
<i>Visual Impacts</i>	viii
<i>Social Impacts</i>	ix
<i>Impacts on Traffic</i>	ix
<i>Assessment of Cumulative Impacts</i>	x
DEFINITIONS AND TERMINOLOGY	xii
ACRONYMS	xvi
TABLE OF CONTENTS	xvii
APPENDICES LIST	xxii
CHAPTER 1: INTRODUCTION	23
1.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	25
1.2..... Project Overview	26
1.3..... Requirement for a Basic Assessment Process	26
1.4..... Details and Expertise of the Environmental Assessment Practitioner (EAP)	27
1.5..... Details of the Independent Specialist Team	28
CHAPTER 2: PROJECT DESCRIPTION	30
2.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	30
2.2..... Project, Study Area and Development Area descriptions	30
2.3..... Summary of the Site Selection Process and Pre-Feasibility Analysis	35
2.4..... PV Technology considered for Geelster 1 and the Generation of Electricity	37
2.5..... Activities during the Project Development Stages	39
2.5.1 Design and Pre-Construction Phase	39
2.5.2 Construction Phase	40
2.5.3 Operation Phase	42
2.5.4 Decommissioning Phase	43
CHAPTER 3: CONSIDERATION OF ALTERNATIVES	44
3.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	44
3.2..... Alternatives Considered during the BA Process	44
3.2.1 Consideration of Fundamentally Different Alternatives	44
3.2.2 Consideration of Incrementally Different Alternatives	45
3.2.3 Technology Alternatives	48
3.2.4 The 'Do-Nothing' Alternative	51
CHAPTER 4: POLICY AND LEGISLATIVE CONTEXT	52

4.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	52
4.2..... Strategic Electricity Planning in South Africa	52
4.3..... National Policy	54
4.4..... Provincial Planning and Context	58
4.5..... Local Policy and Planning Context	60
4.6..... International Policy and Planning Context	61
CHAPTER 5: NEED AND DESIRABILITY	63
5.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	63
5.2..... Need and Desirability from an International Perspective	63
5.3..... Need and Desirability from a National Perspective	64
5.3.1 Policy and Planning	64
5.3.2 Renewable Energy Development Zones (REDZ)	67
5.4..... Need and Desirability of the project from a Regional Perspective	70
5.5..... Receptiveness of the proposed development area for the establishment of Geelster 1	72
5.6..... Benefits of Renewable Energy and the Need and Desirability	76
CHAPTER 6: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS	79
6.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	79
3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.	80
6.2..... Relevant legislative permitting requirements	80
6.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)	80
6.2.2 National Water Act (No. 36 of 1998) (NWA)	82
6.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA).....	84
6.3..... Overview of the Basic Assessment Process for Geelster 1	84
6.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)	85
6.3.2. Public Participation Process.....	86
6.4..... Assessment of Issues Identified through the BA Process	96
6.5..... Outcomes of the DEA Web-Based Screening Tool	98
6.6..... Assumptions and Limitations of the BA Process	100
6.7..... Legislation and Guidelines that have informed the preparation of this Basic Assessment Report	100
6.7.2 Best Practice Guidelines Birds & Solar Energy (2017)	113
6.7.3 The IFC EHS Guidelines	114
6.7.4 IFC's Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015)	115
CHAPTER 7: DESCRIPTION OF THE RECEIVING ENVIRONMENT.....	121
7.1..... Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	121
7.2..... Regional Setting	122
7.3..... Climatic Conditions	124
7.4..... Biophysical Characteristics of the Study Area and Development Area	124
7.4.1. Topography, Terrain and Land Use	124
7.4.2. Geology, Soils and Agricultural Potential	125
7.4.3. Ecological Profile of the Study Area and the Development Area	127
7.5. ... Integrated Heritage including Archaeology, Palaeontology and the Cultural Landscape	137

7.5.1. <i>Heritage and the cultural landscape</i>	137
7.5.2. <i>Archaeology</i>	137
7.5.3. <i>Palaeontology</i>	138
7.6..... Visual Quality	138
7.7 Traffic Conditions	140
7.8 Social Context	141
CHAPTER 8: ASSESSMENT OF IMPACTS	143
8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	145
8.2. ... Quantification of Areas of Disturbance on the Site	146
8.3. ... Potential Impacts on Ecology (Ecology, Flora and Fauna)	147
8.3.1 <i>Results of the Ecological Impact Assessment</i>	147
8.3.2 <i>Description of Ecological Impacts</i>	148
8.3.3 <i>Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning (with and without mitigation)</i>	149
8.3.4 <i>Implications for Project Implementation</i>	153
8.4. ... Potential Impacts on Avifauna	154
8.4.1 <i>Results of the Avifauna Impact Assessment</i>	154
8.4.2 <i>Description of Avifaunal Impacts</i>	156
8.4.3 <i>Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation)</i>	158
8.4.4 <i>Implications for Project Implementation</i>	161
8.5. ... Potential Impacts on Freshwater Features	161
8.5.1 <i>Results of the Freshwater Impact Assessment</i>	162
8.5.2 <i>Description of Freshwater Impacts</i>	164
8.5.3 <i>Impact tables summarising the significance of impacts on freshwater features during construction, operation and decommissioning (with and without mitigation)</i>	164
8.5.4 <i>Implications for Project Implementation</i>	168
8.6. ... Assessment of Impacts on Soil and Agricultural Potential	168
8.6.1 <i>Results of the Soil Impact Assessment</i>	169
8.6.2 <i>Description of Soil and Agricultural Potential Impacts</i>	169
8.6.3 <i>Impact tables summarising the significance of impacts on Soil and Agricultural Potential during construction, operation and decommissioning (with and without mitigation)</i>	169
8.7. ... Assessment of Impacts on Heritage Resources	171
8.7.1 <i>Impact tables summarising the significance of impacts on Heritage Resources during construction, operation and decommissioning (with and without mitigation)</i>	171
8.7.2 <i>Implications for Project Implementation</i>	173
8.8. ... Assessment of Visual Impacts	174
8.8.1 <i>Results of the Visual Impact Assessment</i>	174
8.8.2 <i>Visual Assessment</i>	175
8.8.3 <i>Impact table summarising the significance of visual impacts during construction, operation and decommissioning (with and without mitigation)</i>	177
8.8.4 <i>Implications for Project Implementation</i>	184
8.9. ... Assessment of Social Impacts	184
8.9.1 <i>Results of the Social Impact Assessment</i>	184
8.9.2 <i>Description of Social Impacts</i>	184

8.9.3	Impact tables summarising the significance of social impacts during construction, operation and decommissioning (with and without mitigation measures)	185
8.9.4	Implications for Project Implementation	196
8.10.	Assessment of Impacts on Traffic	196
8.10.1	Description of Traffic Impacts	198
8.10.2	Impact tables summarising the significance of impacts on traffic during the construction, operation and decommissioning phases (with and without mitigation)	198
8.10.3	Implications for Project Implementation	199
8.11.	Contribution of the Project to Climate Change Mitigation	199
8.12.	Assessment of the 'Do Nothing' Alternative	200
8.12.1	Results of the Assessment of the Do Nothing Alternative	200
8.12.2	Conclusion	203
CHAPTER 9: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS		204
9.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	205
9.2 Approach taken to Assess Cumulative Impacts	205
9.3 Cumulative Impacts on Ecological Processes	209
9.4 Cumulative Impacts on Avifauna	210
9.5 Cumulative Impacts on Freshwater Features	211
9.6 Cumulative Impacts Soil and Agricultural Potential	212
9.7 Cumulative Impacts on Heritage (including archaeology and palaeontology)	213
9.8 Cumulative Visual Impacts	213
9.9 Cumulative Social Impacts	219
9.10	.. Cumulative Traffic Impacts	221
9.11	.. Conclusion regarding Cumulative Impacts	222
CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS		225
10.1.	Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report	226
10.2.	Evaluation of Geelstert 1	226
10.2.1	Impacts on Ecology	227
10.2.2	Impacts on Avifauna	228
10.2.3	Impacts on Freshwater Features	229
10.2.4	Impacts on Soil and Agricultural Potential	229
10.2.5	Impacts on Heritage Resources	230
10.2.6	Visual Impacts	230
10.2.7	Social Impacts	231
10.2.8	Impacts on Traffic	231
10.2.9	Assessment of Cumulative Impacts	232
10.3.	Environmental Sensitivity Mapping	233
10.4.	Environmental Costs of the solar PV Facility versus Benefits of the solar PV Facility	235
10.5...	Overall Conclusion (Impact Statement)	236
10.6.	Overall Recommendation	236
CHAPTER 11: REFERENCES		239
Ecological Impact Assessment		239
Avifauna Impact Assessment		239
Aquatic Impact Assessment		241
Soils and Agricultural Potential Impact Assessment		242

Heritage Impact Assessment	242
Visual Impact Assessment	243
Social Impact Assessment	244
Traffic Impact Assessment	245

APPENDICES LIST

Appendix A:	Curriculum Vitae
Appendix B:	Correspondence with Authorities
Appendix C:	Public Participation Process
<i>Appendix C1</i>	<i>Public Participation Plan</i>
<i>Appendix C2:</i>	<i>I&AP Database</i>
<i>Appendix C3:</i>	<i>Site Notices and Advertisements</i>
<i>Appendix C4:</i>	<i>Background Information Document</i>
<i>Appendix C5:</i>	<i>Organs of State Correspondence</i>
<i>Appendix C6:</i>	<i>Stakeholder Correspondence</i>
<i>Appendix C7:</i>	<i>Comments Received</i>
<i>Appendix C8:</i>	<i>Minutes of Meetings</i>
<i>Appendix C9:</i>	<i>Comments and Responses Report</i>
Appendix D:	Ecology Impact Assessment
Appendix E:	Avifauna Impact Assessment
Appendix F:	Aquatic Impact Assessment
Appendix G:	Soils and Agricultural Potential Impact Assessment
Appendix H:	Heritage Impact Assessment (including Archaeology & Palaeontology)
Appendix I:	Visual Impact Assessment
Appendix J:	Social Impact Assessment
Appendix K:	Traffic Impact Assessment
Appendix L:	Screening Report
Appendix M:	Environmental Management Programme (EMPr)
<i>Appendix A:</i>	<i>Curriculum Vitae</i>
<i>Appendix B:</i>	<i>Grievance Mechanism for Public Complaints and Issues</i>
<i>Appendix C:</i>	<i>Alien Plant and Open Space Management Plan</i>
<i>Appendix D:</i>	<i>Plant Rescue and Protection Plan</i>
<i>Appendix E:</i>	<i>Re-vegetation and Rehabilitation Plan</i>
<i>Appendix F:</i>	<i>Erosion Management Plan</i>
<i>Appendix G:</i>	<i>Stormwater Management Plan</i>
<i>Appendix H:</i>	<i>Waste Management Plan</i>
<i>Appendix I:</i>	<i>Traffic Management Plan</i>
<i>Appendix J:</i>	<i>Emergency Preparedness, Response and Fire Management Plan</i>
<i>Appendix K:</i>	<i>Key Legislation</i>
<i>Appendix L:</i>	<i>Chance Find Protocol</i>
<i>Appendix M:</i>	<i>A3 Maps</i>
Appendix N:	EAP Affirmation and Specialist Declarations
Appendix O:	A3 Maps
Appendix P:	Additional Information

CHAPTER 1: INTRODUCTION

Geelster Solar Facility 1 (Pty) Ltd, proposes the development of Geelster 1, a photovoltaic (PV) solar energy facility of up to 125MW_{AC} and associated infrastructure, on a site located 11km south-east of the town of Aggeneys in the Northern Cape Province (refer to **Figure 1.1**) and is located on the Remaining Extent of the Farm Bloemhoek 61. The study area¹ falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A development area² of approximately 578ha has been identified within the study area by the proponent for the development of Geelster 1. Within this identified development area, a development footprint³ or facility layout has been defined. This development footprint/facility layout of approximately 245ha has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is larger than the area needed for the construction of a 125MW PV facility, and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of major identified environmental sensitivities by the development footprint.

From a regional perspective, the Aggeneys area is considered favourable for the development of a commercial solar energy facility by virtue of prevailing climatic conditions, relief, aspect, the extent of the affected property, the availability of a direct grid connection (i.e. a point of connection to the national grid) and the availability of land on which the development can take place. The complete extent of the study area, inclusive of the development area is located within Focus Area 8 of the Renewable Energy Development Zones (REDZs), also known as the Springbok REDZ. Furthermore, two (2) authorised solar PV facilities, Aggeneys 1 and 2 are located within the study area for Geelster 1 to the north of the development area.

Geelster 1 is planned to be bid into the Department of Mineral Resource and Energy's (DMRE) Renewable Energy Independent Power Producer Procurement (REIPPP) Programme with the aim of evacuating the generated power into the national grid. This will aid in the diversification and stabilisation of the country's electricity supply with Geelster 1 set to inject up to 125MW_{AC} into the national grid.

In order to connect Geelster 1 to the national grid, a grid connection (known as Geelster Grid Connection) will need to be developed and implemented. The grid connection will include the development of a collector substation and a double-circuit power line with a capacity of up to 220kV. The power line will connect Geelster 1 to the existing Aggeneys Main Transmission Substation (MTS) in order to complete the connection and enable the evacuation of the generated electricity to the national grid. This infrastructure will be assessed within a separate BA process.

¹ The study area is defined as the Remaining Extent of the Farm Bloemhoek 61, which has the extent of ~ 12 378,97ha.

² The development area is that identified area (located within the study area) where the Geelster 1 facility is planned to be located. The development area is ~578ha in extent.

³ The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for Geelster 1 is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed. The Geelster 1 development footprint is ~245ha in extent.

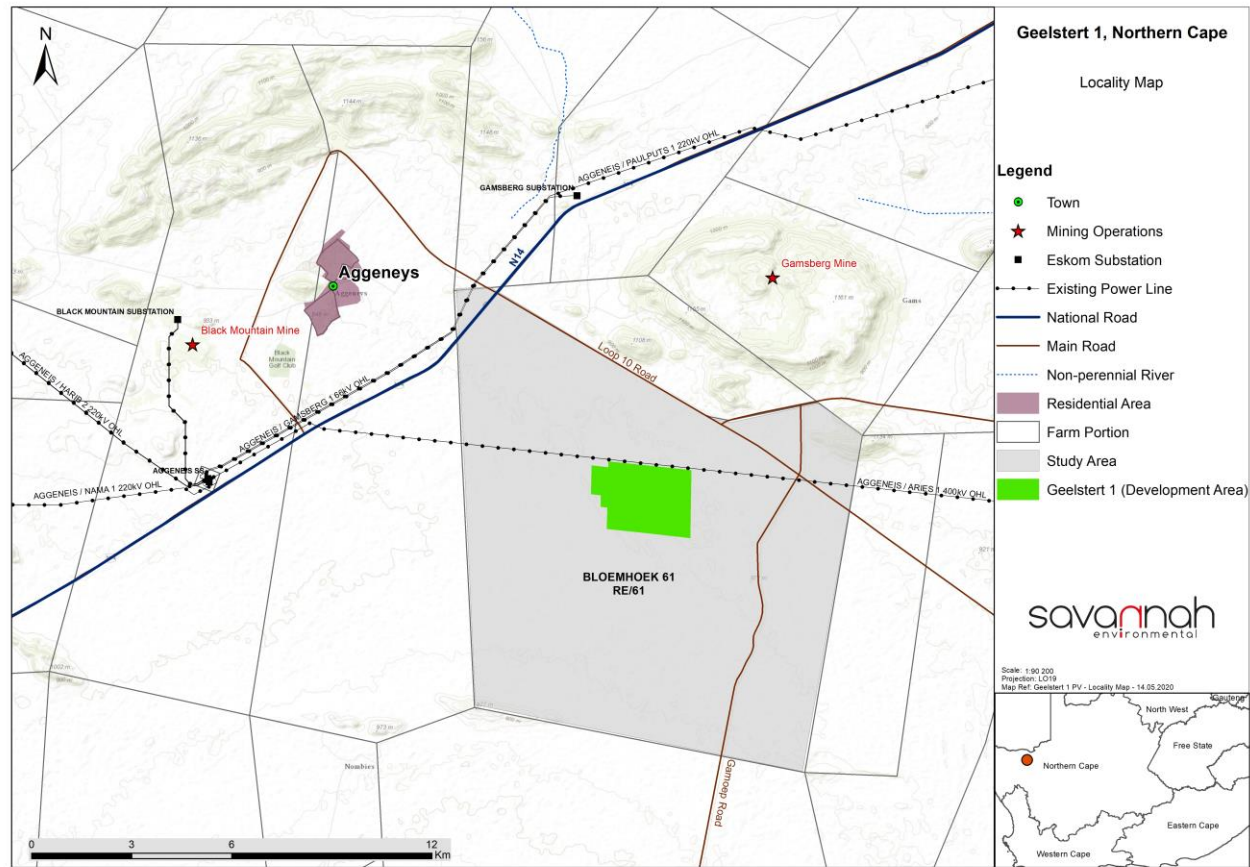


Figure 1.1: Locality map illustrating the location of the study area and development area for Geelstert 1 being considered within this Basic Assessment process.

1.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This BA Report has been prepared in accordance with the requirements of the EIA Regulations published on 08 December 2014 (as amended) promulgated in terms of Chapter 5 of the National Environmental Management Act (No. 107 of 1998). This Chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
1 (a) the details of the EAP who prepared the report and (ii) the expertise of the EAP, including a curriculum vitae.	The details and expertise of the EAP who prepared the report is included in section 1.4 and CVs of the project team are included in Appendix A .
(b) the location of the activity including (i) the 21 digit Surveyor General code of each cadastral land parcel, (ii) where available the physical address and farm name and (iii) where the required information in items (i) and (ii) is not available, the co-ordinates of the boundary of the property or properties.	A description of the location of Geelster 1 is included in Table 1.1 and Figure 1.1 . The information provided includes the 21-digit Surveyor General Code of the affected property and the farm name. Information on the relevant province, local and district municipalities, ward and current land zoning is also provided.

The BA Report is structured according to the following chapters:

- » **Chapter 1** provides background to Geelster 1 and the BA process.
- » **Chapter 2** provides a project description of Geelster 1.
- » **Chapter 3** provides site selection information and identified project alternatives.
- » **Chapter 4** outlines strategic regulatory and legal context for energy planning in South Africa and specifically relating to Geelster 1.
- » **Chapter 5** describes the need and desirability of Geelster 1 within the study area.
- » **Chapter 6** outlines the approach to undertaking the BA process.
- » **Chapter 7** describes the existing biophysical and social environment within and surrounding the study and development area.
- » **Chapter 8** provides an assessment of the potential issues and impacts associated with the solar PV facility and presents recommendations for the mitigation of significant impacts.
- » **Chapter 9** provides an assessment of the potential cumulative impacts.
- » **Chapter 10** presents the conclusions and recommendations based on the findings of the BA Report.
- » **Chapter 11** provides references used in the compilation of the BA Report.

1.2 Project Overview

The details of the location of the development footprint considered for the development of Geelster 1 are included in **Table 1.1** below.

Table 1.1: A detailed description of the Geelster 1 development footprint

Province	Northern Cape Province
District Municipality	Namakwa District Municipality
Local Municipality	Khai-Ma Local Municipality
Ward number(s)	4
Nearest town(s)	Aggeneys, (11km to the north-west); Pofadder (58km to the east) and Springbok (116km to the south-west).
Affected Properties: Farm name(s), number(s) and portion numbers	The Remaining Extent of the Farm Bloemhoek 61
SG 21 Digit Code (s)	C05300000000006100000
Current zoning	Agricultural
Site Co-ordinates (centre of the development footprint)	29°17'59.36"S 18°56'33.99"E Corner points of the development footprint are included in Appendix O .

Geelster 1 will have a contracted capacity of up to 125MW_{AC} and will include specific infrastructure, namely:

- » Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- » Centralised inverter stations or string inverters;
- » A temporary laydown area;
- » Cabling between the panels, to be laid underground where practical;
- » An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- » An access road with a maximum width of 8m;
- » Internal access roads within the PV panel array area with a maximum width of 5m;
- » Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The key infrastructure components associated with the development of Geelster 1 are described in greater detail within Chapter 2.

1.3 Requirement for a Basic Assessment Process

The National Environmental Management Act (NEMA, Act No. 107 of 1998) is the national legislation that provides for the authorisation of certain controlled activities known as 'listed activities'. In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be considered, investigated, assessed, and reported on to the Competent Authority (the decision-maker) charged by the NEMA with the granting of the relevant environmental authorisation being applied for through this BA process. The DEA will be assisted by the DENC as the Commenting Authority on this project.

The development (i.e. construction and operation) of Geelstert 1 is subject to the requirements of the EIA Regulations of 2014 (as amended), published in terms of Section 24(5) of NEMA. Therefore, in terms of the EIA Regulations of 2014, promulgated under Section 24 and 24D of NEMA, various aspects of Geelstert 1 are listed as activities that may have a detrimental impact on the environment. The primary listed activity triggered by Geelstert 1 is Activity 1 of Listing Notice 2 (GN R325) which relates to the development of facilities or infrastructure for the generation of electricity from a renewable resource where the generating capacity is 20MW or more. Geelstert 1 will have a contracted capacity of up to 125MW_{AC}.

Geelstert 1 is located within the Springbok REDZ, one of eight (8) designated REDZ areas⁴. The need to comply with the requirements of the EIA Regulations ensures that the decision-makers are provided with an opportunity to consider the potential environmental impacts of a project early in the development process and assess whether the environmental impacts can be avoided, minimised, or mitigated to acceptable levels. The nature and extent of Geelstert 1, as well as, the potential environmental impacts and mitigation measures associated with the construction, operation and decommissioning have been assessed through detailed specialist assessments. This process provides an opportunity to test the environmental suitability of the development area, to delineate areas of sensitivity, and to define and optimise the facility layout of the components of Geelstert 1.

1.4 Details and Expertise of the Environmental Assessment Practitioner (EAP)

In accordance with Regulation 12 of the EIA Regulations, 2014 (GN R326), Geelstert Solar Facility 1 (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd as the independent environmental consultant to undertake the BA process and prepare the BA Report for Geelstert 1. Neither Savannah Environmental nor any of its specialists are subsidiaries of/or are affiliated to Geelstert Solar Facility 1 (Pty) Ltd. Furthermore, Savannah Environmental does not have any interest in secondary developments that may arise out of the authorisation of the proposed solar PV facility.

Savannah Environmental is a leading provider of integrated environmental and social consulting, advisory and management services with considerable experience in the fields of environmental assessment and management. The company is wholly woman-owned (51% black woman-owned) and is rated as a Level 2 Broad-Based Black Economic Empowerment (B-BBEE) Contributor. The company was established in 2006 with a clear objective to provide services to the infrastructure development sector. Savannah Environmental benefits from the pooled resources, diverse skills and experience in the environmental field held by its team that has been actively involved in undertaking environmental studies for a wide variety of projects (including those associated with electricity generation and transmission) throughout South Africa and neighbouring countries. Strong competencies have been developed in project management of environmental processes, as well as strategic environmental assessment and compliance advice, and the assessment of environmental impacts, the identification of environmental management solutions and mitigation/risk minimising measures.

⁴ Based on the location of the study area within the Springbok REDZ, Geelstert 1 is subject to a BA process and not a full Scoping and Environmental Impact Reporting (SEIR) process. A shortened timeframe of 57 days for the processing of an application for environmental authorisation will also be applicable.

The Savannah Environmental team in this project includes:

- » **Reuben Maroga** - the principle author of this report. He holds a Bachelor degree in Environmental Management and an Honours degree in Geology and has three years of experience in the environmental management field. His key focus is on undertaking environmental impact assessments, public participation, environmental management plans and programmes.
- » **Lisa Opperman** - the co-author of this report. She holds a Bachelor degree with Honours in Environmental Management and has five years of experience in the environmental field. Her key focus is on environmental impact assessments, public participation, environmental management plans and programmes, as well as mapping using ArcGIS for a variety of environmental projects.
- » **Jo-Anne Thomas** – is the registered EAP for this project. Jo-Anne holds a Master of Science Degree in Botany (M.S.c Botany) from the University of the Witwatersrand and is registered as an Environmental Assessment Practitioner (2019/726) with the Environmental Assessment Practitioners Association of South Africa (EAPASA), as well as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 21 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. Her responsibilities for environmental studies include project management, review and integration of specialist studies, identification and assessment of potential negative environmental impacts and benefits, and the identification of mitigation measures, and compilation of reports in accordance with applicable environmental legislation.
- » **Nicolene Venter** – a Board Member of IAPSA (International Association for Public Participation South Africa). She has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and meeting facilitation. She is responsible for project management of public participation processes for a wide range of environmental projects across South Africa and neighbouring countries.

Curricula Vitae (CVs) detailing Savannah Environmental team's expertise and relevant experience are provided in **Appendix A**.

1.5 Details of the Independent Specialist Team

In order to adequately identify and assess potential impacts associated with the project, a number of specialists have been appointed as part of the project team and have provided specialist input into this BA Report (refer to **Table 1.2**).

Table 0.2: Specialists which form part of the EIA project team

Company	Specialist Area of Expertise	Specialist Name
3Foxes Biodiversity Consulting	Ecology	Simon Todd
3Foxes Biodiversity Consulting	Avifauna	Eric Hermann
Nkurenkuru Biodiversity	Freshwater	Gerhard Botha
Agriculture Research Council –Soil, Climate and Water	Soils, Land and Agricultural Potential	Garry Paterson
Environmental Planning and	Visual	Jon Marshall

Company	Specialist Area of Expertise	Specialist Name
Design		
CTS Heritage	Heritage and Palaeontology	Jenna Lavin
Savannah Environmental and Neville Bews and Associates	Social	Lisa Opperman with a peer review by Neville Bews.
Knight Piésold	Traffic	Andrew Cleghorn

CVs detailing the independent specialist's expertise and relevant experience are provided in **Appendix A** of the BA Report.

CHAPTER 2: PROJECT DESCRIPTION

This Chapter provides an overview of the project and details related to the project scope, which include the planning/design, construction, operation and decommissioning activities. This Chapter also explores the use of solar energy as a means of power generation.

2.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the Basic Assessment report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
(c) a plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale.	A plan which locates the proposed activity or activities applied for as well as associated structures and infrastructure at an appropriate scale is included in Figures 2.1 and 2.2.
(h)(ix) the outcome of the site selection matrix;	The outcome of the site selection process undertaken for the identification of the preferred study area is included in section 2.3.

2.2 Project, Study Area and Development Area descriptions

A study area has been identified for the development of Geelstert 1 which consists of one property, known as the Remaining Extent of the Farm Bloemhoek 61. The study area is located within Ward 4 of the Khai-Ma Local Municipality and within the greater Namakwa District Municipality. Within the study area, a development area, of approximately 578ha, has been identified for Geelstert 1. The development area can be accessed via the R358 gravel road, also known as the Gamoep road. The R358 is located to the east of the development area and connects to Loop 10, which runs along the northern boundary of the study area and intersects with the N14 east of Aggeneys (refer to **Figure 2.1**). The development area is located to the south of the authorised Aggeneys 1 and Aggeneys 2 solar PV facilities and to the east of the N14. The development footprint (245ha) of Geelstert 1 will be sited within the development area and will have a much smaller extent (i.e. ~42% of the development area). The development footprint will house the PV Panels and other associated infrastructure, including the site access road. No infrastructure will be constructed outside the development footprint.

Prior to the initiation of the BA process, the study area, within which the development area and footprint have been placed, was subject to a pre-feasibility desktop screening and fatal flaw assessment. The assessment was undertaken to identify potential environmental constraints and sensitivities within the study area. This was then used to inform the location of the development area, while ensuring that potential negative environmental impacts were minimised as far as possible. The development area was then subject to more detailed specialist studies to assess and determine the location of the Geelstert 1 development footprint, which will include the PV panels, an on-site facility substation, inverters, buildings and access roads (**Figure 2.2**).

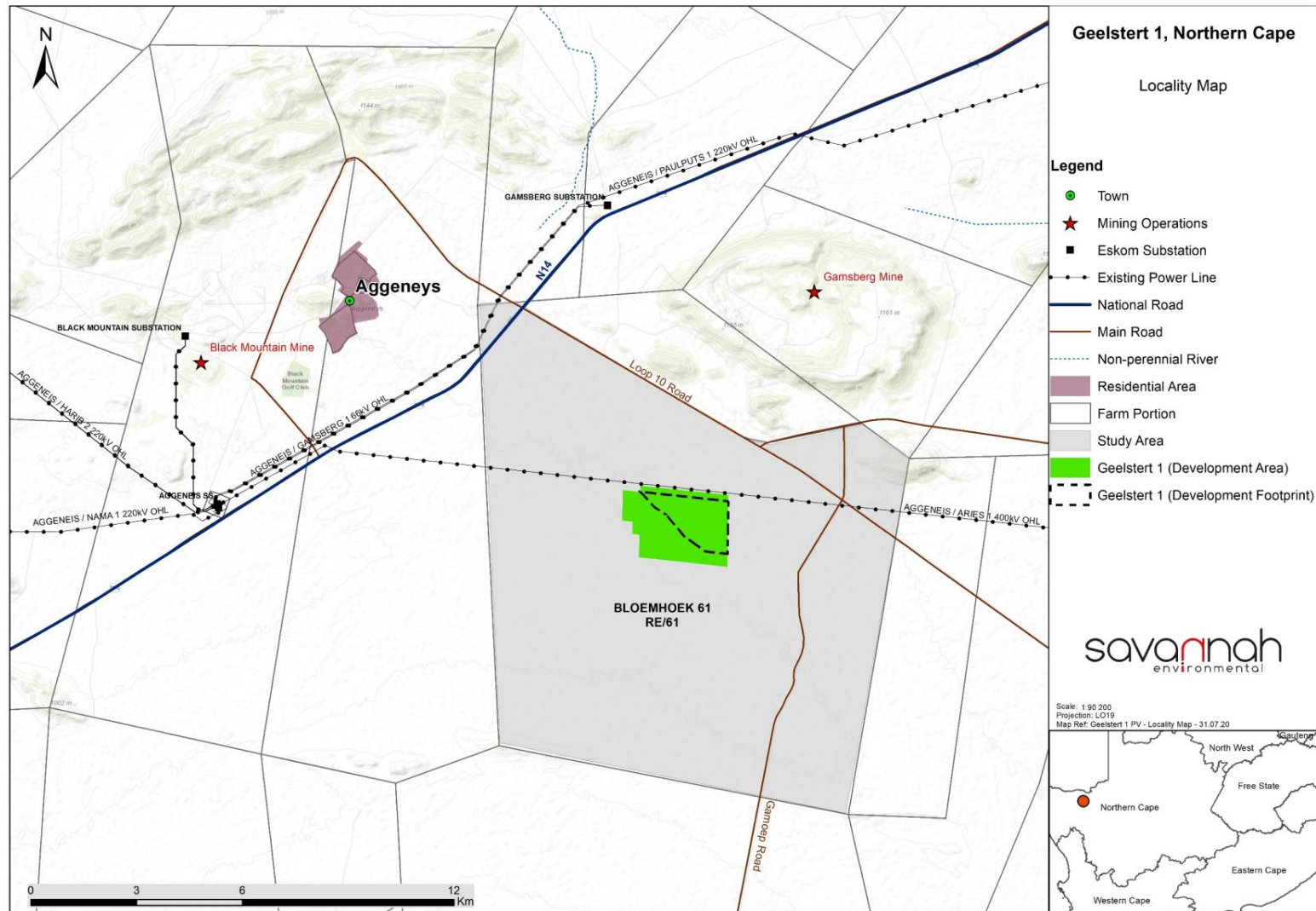


Figure 2.1: Map illustrating the study area, the development area (578ha) and the development footprint (245ha) for Geelster 1.

Previously, fourteen solar PV facilities were authorised on the Remaining Extent of Farm Bloemhoek 61, however these Environmental Authorisations are no longer valid. There are however, two recently authorised 100MW solar energy facilities⁵ (i.e. Aggeneys 1 and Aggeneys 2) located to the north of Geelstert 1, on the Remaining Extent of the Farm Bloemhoek 61.

Geelstert 1 will use either monofacial or bifacial photovoltaic (PV) panels, which will be mounted on fixed tilt, single or double axis tracking systems. **Table 2.1** provides the details of Geelstert 1, including the main infrastructure components that will be required during the project life cycle. The proposed facility layout, which will be assessed in this BA report is illustrated in **Figure 2.2**.

Table 2.1: Details of Geelstert 1 and associated infrastructure

Component	Description / Dimensions
Total Extent of the Affected Property, also referred to as the study area	~12 378,97ha
Total of the Development Area (i.e. total area to be occupied by Geelstert 1)	~578ha
Extent of the development Footprint (i.e. total area occupied by infrastructure within the development area boundary)	~245ha
Contracted capacity of the facility	Up to 125MW _{AC}
Technology	Static or tracking photovoltaic systems.
PV panels	<ul style="list-style-type: none"> » Height: ~3.5m from ground level (installed). » Between 300 000 – 400 000 panels required. » Monofacial or Bifacial PV panels, mounted on either fixed-tilt, single-axis tracking, and/or double-axis tracking systems.
On-site Facility Substation	<ul style="list-style-type: none"> » 22kV/33kV stepping up to 132kV/220kV » Approximately 1ha in extent.
Site and Internal Access Roads	<ul style="list-style-type: none"> » Direct access to the study area and the development area is provided by the existing R358 (Gamoep Road). The R358 can be accessed via the Loop 10 Road which intersects with the N14. » A 8m wide and 3.5km long main gravel/hard surfaced access road will be constructed to provide direct access to the development area. The road will be tarred if necessary. » A network of gravel internal access roads, each with a width of up to 5m, will be constructed to provide access to the various components of the Geelstert 1 development.
Temporary Laydown Area	<ul style="list-style-type: none"> » ~5ha
Other infrastructure	<ul style="list-style-type: none"> » Gate House and Security Office/House » Control Centre » Office Building » Warehouse

⁵ Aggeneys 1 (DEA Ref No.:14/12/16/3/3/1/2019) and Aggeneys 2 (DEA Ref No.: 14/12/16/3/3/1/2020).

- » Canteen and Visitors Centre
- » Perimeter Fence

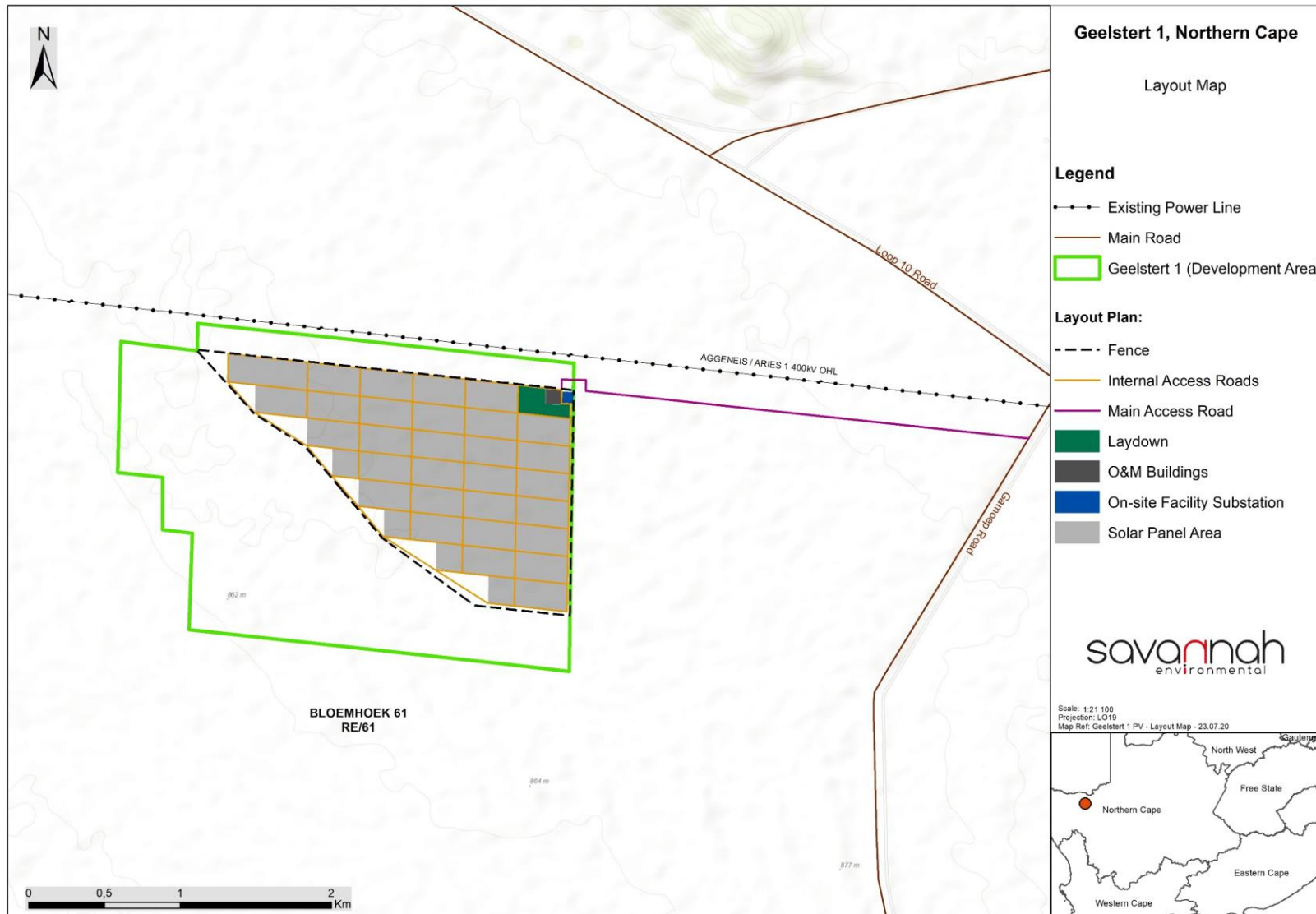


Figure 2.2: Map illustrating the proposed facility layout (development footprint) for Geelster 1 within the development area.

In order to connect Geelstert 1 to the national grid, a grid connection (known as Geelstert Grid Connection) will need to be developed and implemented, which will be assessed within a separate BA process. The grid connection will include the development of specific infrastructure components which include a Collector Substation and a double-circuit power line of up to 220kV in capacity. The power line will connect Geelstert 1 to the existing Aggeneis Main Transmission Substation (MTS)⁶.

2.3 Summary of the Site Selection Process and Pre-Feasibility Analysis

As a precursor to initiating the BA process, Geelstert Solar Facility 1 (Pty) Ltd undertook a solar resource assessment, as well as a site identification and selection process to determine areas suitable for the development of a solar PV facility from an environmental and technical perspective in the Northern Cape Province.

Through this process, the study area (i.e. the Remaining Extent of the Farm Bloemhoek 61) was identified by the proponent as having the potential for the installation of a PV facility on the basis of key technical criteria such as:

- * favourable climatic conditions (solar renewable energy facilities are directly reliant on average solar irradiation values for a particular area);
- * access and capacity of the electricity grid and connection cost;
- * accessibility of the affected property;
- * compatibility of current land use; and
- * local site topography.

In addition, the study area is located within the Springbok Renewable Energy Development Zone (REDZ 8), and the Northern Strategic Transmission Corridor, both of which have been designated by Government for the development of large-scale solar PV facilities and grid infrastructure.

From the initial pre-feasibility analysis, the proponent excluded the following:

- a) Areas where the current land use was not considered compatible with the proposed land use. This relates to current and future land use activities being undertaken within the areas that would be affected by the development of Geelstert 1. These activities include mining activities related to the current mining operations being undertaken by the Black Mountain Mining (Pty) Ltd; areas under cultivation which are not considered to be compatible for the development of a solar PV facility and areas where other solar PV facilities have been proposed or authorised;
- b) Areas that present greater environmental constraints which would have a higher environmental impact and reduce the chances of success for the project (i.e. environmentally constrained); and

⁶ The grid connection solution to connect Geelstert 1 to the Aggeneis MTS includes the development of a double-circuit power line of up to 220kV and a Collector Substation (including switching station components), as well as associated infrastructure which will be assessed within a separate BA process.

c) Areas where there were greater technical constraints (i.e. solar energy availability), as this would influence the cost effectiveness of the facility and therefore the economic feasibility of the development.

At the screening stage, all existing and proposed infrastructure within the selected study area were identified. These include the existing Aggeneis-Aries 400kV power line which traverses the northern portion of the study area and development area, as well as two authorised solar PV facilities (i.e. Aggeneys 1 and 2 solar PV facilities).

The detail regarding site-specific characteristics, and how these provide further motivation for the selection of the specific study area for Geelstert 1 is provided below:

Study Area Extent, Conditions and Land Availability: Availability of level land of sufficient extent can be a restraining factor for the development of a solar PV facility.

Geelstert 1 would require sufficient space for the placement of infrastructure in order to generate the envisaged contracted capacity of up to 125MW_{AC}. The development area proposed for Geelstert 1 (~578ha in extent) provides sufficient space for the solar PV facility, while allowing for the avoidance of any potential environmental sensitivities.

The following are key considerations in terms of land availability:

- » The study area and development area terrain conditions are optimal for a development of this nature, with the site being of a suitable gradient for the development of a solar PV facility.
- » The region within which the study area is located can be described as a flat plateau. The area is consistent with the land type and classifies the landscape with an average slope of between 0% and 1.3% which is suitable for a development of this nature.
- » The development area (inclusive of the Geelstert 1 development footprint) would comprise ~3,2% of the total extent of the study area.

The study area, including the development area is, therefore, considered suitable and appropriate from a technical perspective for the construction and operation of Geelstert 1.

Site access: Access to the development area is considered as an important characteristic as easy access is required for the transportation of project related infrastructure and heavy machinery during construction. The proximity of the study area to viable access routes decreases the impact on secondary roads in terms of traffic during the construction and operation phases. The study area can be readily accessed via the Gamoep Road (R358) and the Loop 10 Road which are aligned its eastern and northern boundaries respectively. The Loop 10 Road comes off an intersection with the N14 Road approximately 7km west of the study area. The N14 Road connects the town of Aggeneys with other towns/cities such as Springbok, Pofadder, Kakamas, Keimoes, Upington and Johannesburg.

Considering the readily available site access to the study area and development area, the location of Geelstert 1 is considered to be suitable and appropriate.

Land use considerations: The current land use of the site is an important consideration in the site selection in terms of limiting disruption to existing land use practices. There is no cultivated agricultural land within

the affected property (as a result of low agricultural potential) which could be impacted upon by the development of Geelstert 1. The affected property is currently used for livestock grazing. Furthermore, the landowner is currently considering options for the alternative use of their land other than for grazing. Other

activities present within the study area and within the surrounding areas include power line servitudes associated with the existing and approved grid infrastructure, mining activities and the future development of other solar PV facilities which have been authorised. It is considered that the development of Geelstert 1 is compatible with the study area and will not present a conflicting land use. The location of the development area proposed for Geelstert 1 is also considered to be acceptable within the study area as it avoids all conflicting land uses and will rather add to the current activities being undertaken in the area, such as the mining operations of the Black Mountain and Gamsberg mines which are located to the west and north of the study area.

Grid connection considerations: Ease of access into the Eskom national electricity grid is vital to the viability of a solar PV facility and addresses Eskom's concerns for lower cost connection alternatives given current funding constraints. Solar PV facilities that are located near a grid connection point and/or demand centre are favourable and reduce the losses associated with power transmission. Various existing grid connection infrastructure is located within the Aggeneys area. These include both power lines and substations, namely:

- » Aggeneis/Aries 400kV power line
- » Aggeneis/Paulputs 220kV power line
- » Aggeneis/Harib 220kV power line
- » Aggeneis/Nama 220kV power line
- » Aggeneis/Gamsberg 66kV power line
- » Gamsberg Substation
- » Black Mountain Substation
- » Aggeneis Main Transmission Substation (MTS)

The grid connection point for Geelstert 1 will be the existing Aggeneis MTS located 13km west of the project development area. The grid connection solution will be assessed within a separate BA process and will include a collector substation and a new double-circuit power line of up to 220kV in capacity.

2.4 PV Technology considered for Geelstert 1 and the Generation of Electricity

Solar PV energy facilities use the energy from the sun to generate electricity through a process known as the **Photovoltaic Effect**. This effect refers to photons of light colliding with electrons and placing them into a higher state of energy to create electricity.

A PV cell is made of silicon acting as a semi-conductor and used to produce the photovoltaic effect. Individual PV cells are linked and placed behind a protective glass sheet to form a PV panel. The PV cell is positively charged on one side and negatively charged on the other side and electrical conductors are

attached to either side to form a circuit. This circuit then captures the released electrons in the form of an electric current (direct current). An inverter must be used to convert direct current (DC⁷) to alternating current (AC⁸). The electricity is then stepped up to a higher voltage via a transformer before being evacuated into the national grid via a power line.

The Photovoltaic Effect is achieved through the use of the following components:

Photovoltaic Cells

A PV cell is made of silicon that acts as a semiconductor used to produce the photovoltaic effect. A single cell is sufficient to power a small device such as an emergency telephone. However, to produce up to 125MW_{AC} of power, the solar PV facility will require numerous cells arranged in multiples/arrays which will be placed behind a protective glass sheet and fixed to a support structure. Each PV cell is positively charged and negatively charged on each side, with electrical conductors attached to either side to form a circuit. This circuit captures the released electrons in the form of an electrical current (DC).

Monofacial and Bifacial Cells

In monofacial solar cells, the front surface is transparent with glass lamination and the back surface is opaque. In contrast, bifacial cells capture the diffuse reflected light from the ground and other reflective surfaces that surround the panel. A bifacial cell has identical metallic grid as a monofacial cell, just on both front and back surfaces.

The Inverter

An inverter is used to convert the electricity which is produced as direct current into alternating current for the purpose of grid connection. In order to connect a large solar PV facility to the national grid, numerous inverters will be arranged in several arrays to collect and convert the produced power.

The Support Structure

PV panels will be fixed to a support structure. PV panels can either utilise fixed / static support structures, or single or double axis tracking support structures (refer to **Figure 2.3**). PV panels which utilise fixed / static support structures are set at an angle (fixed-tilt PV system) so as to optimise the amount of solar irradiation. With fixed / static support structures the angle of the PV panel is dependent on the latitude of the proposed development and may be adjusted to optimise for summer and winter solar radiation characteristics. PV panels which utilise tracking support structures track the movement of the sun throughout the day so as to receive the maximum amount of solar irradiation.

⁷ DC (direct current) is the unidirectional flow or movement of electric charge carriers (which are usually electrons). The intensity of the current can vary with time, but the general direction of movement stays the same at all times. As an adjective, the term DC is used in reference to voltage whose polarity never reverses. In a DC circuit, electrons emerge from the negative, or minus, pole and move towards the positive, or plus, pole. Nevertheless, physicists define DC as traveling from plus to minus. (sourced from <https://whatistechtarget.com/definition/DC-direct-current/>).

⁸ An alternating current (AC) occurs when charge carriers in a conductor or semiconductor and periodically reverse their direction of movement. The voltage of an AC power source can be easily changed by means of a power transformer. This allows the voltage to be stepped up (increased) for transmission and distribution (sourced from <https://whatistechtarget.com/definition/alternating-current-AC/>).

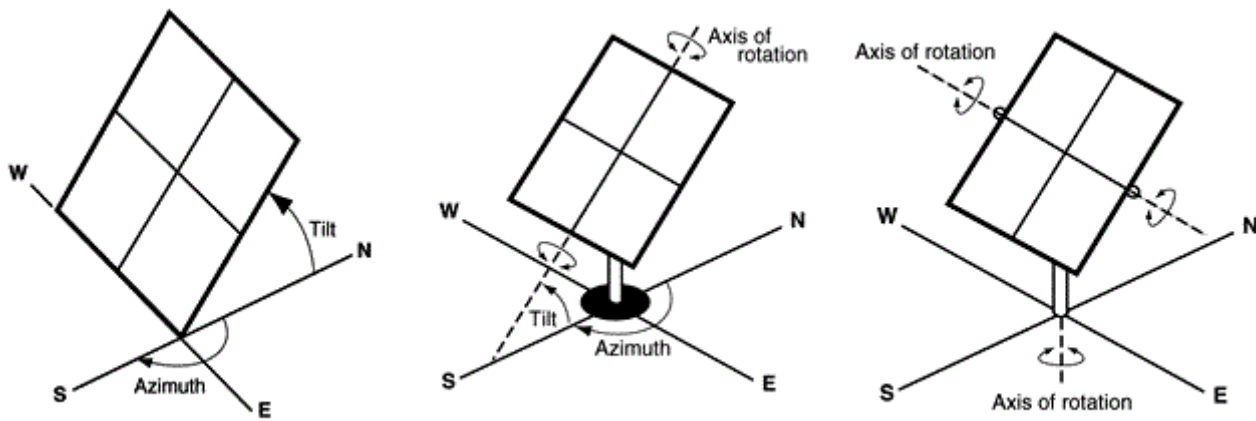


Figure 2.3: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

PV panels are designed to operate continuously for more than 25 years, mostly unattended and with low maintenance.

2.5 Activities during the Project Development Stages

In order to construct Geelstert 1 and its associated infrastructure, a series of activities will need to be undertaken during the design, pre-construction, construction, operation, and decommissioning phases which are discussed in more detail below.

2.5.1 Design and Pre-Construction Phase

Pre-planning: Several post-authorisation factors are expected to influence the final design of the facility and could result in small-scale modifications of the PV array and/or associated infrastructure. While an objective of the Engineering, Procurement and Construction (EPC) contractor, who will be responsible for the overall construction phase of the project, will be to comply with the approved facility design as far as possible, it should be understood that the construction process is dynamic and that unforeseen changes to the project specifications will take place. This BA Report therefore describes the project in terms of the best available knowledge at the time. The final facility design is required to be approved by the DEA. Importantly, should there be any substantive changes or deviations from the original scope or layout of the project, the DEA will need to be notified and where relevant, approval obtained.

Conduct Surveys: Prior to initiating construction, a number of surveys will be required including, but not limited to confirmation of the micro-siting footprint (i.e. the precise location of the PV panels, on-site facility substation and the facility's associated infrastructure) and a geotechnical survey. Geotechnical surveys are executed by geotechnical engineers and geologists to acquire information regarding the physical characteristics of soil and rocks underlying a proposed development area. The purpose is to design earthworks and foundations for structures and to execute earthwork repairs necessitated due to changes in the subsurface environment.

2.5.2 Construction Phase

The construction phase will entail a series of activities including:

Procurement and employment

Geelstert 1 is likely to create approximately ~400 (at its peak) employment opportunities (temporary) for a period of ~12 to 18 months, depending on the final design, during the construction phase. Of this approximately 60% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 15% of employment opportunities will be for skilled individuals (engineers, project managers, site managers etc.). Solar PV facilities make use of high numbers of low skilled and semi-skilled labour so there will be good opportunity to use local labour. Employment opportunities for Geelstert 1 will peak during the construction phase and significantly decline during the operation phase.

Establishment of an Access Road to the Study Area and Internal Access Roads within the Development Area

The study area and development area is accessible via the Gamoep Road (R358) which is located to the east of the development area and forms an intersection with the Loop Road to the north of the development area. The Gamoep Road (R358) runs in a southerly direction from this intersection. The Loop 10 Road forms an intersection with the N14 approximately 7km to the west of the development area and runs in east-west direction. Within the development area itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). An 8m wide access road and a network of 5m wide internal access roads will be developed to provide access to the development area and to the various project components within the development footprint of Geelstert 1.

Undertake Site Preparation

Site preparation activities will include the clearance of vegetation. These activities will require the stripping of topsoil which will need to be stockpiled, backfilled, and/or spread on site.

Water Usage and Waste Requirements

During the construction phase water will be required for the undertaking of the required construction activities as well as for potable use. For the duration of the construction phase (i.e. 12-18 months) ~ 10 000m³ of water will be required. Water for the construction phase will be sourced directly from the Khâi-Ma Local Municipality. Alternatively, water will be trucked in, or otherwise made available for collection at the municipality's Wastewater Treatment Plant via a metered standpipe. Should this not be possible, the proponent will liaise with a third-party water supplier which may include either of the nearby mines or a water services company in the area. A borehole may be drilled on site; however it will be subject to a complete geohydrological test and a water use authorisation process.

During the construction phase solid and hazardous waste will be generated. Solid waste will mainly be in the form of construction material, excavated substrate, and domestic solid waste; whereas hazardous waste will be in the form of concrete and used hydrocarbon chemicals (i.e. used oils etc). All solid waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by a contractor. Excess waste material will be removed once the construction phase is complete and will be disposed of at registered landfill site/waste facility. The handling, storage, and disposal of the hazardous waste components, i.e. oils and other lubricants, will be done in accordance with the relevant legislation.

Services Required

During the construction phase specific services will be required for the undertaking of the construction activities. The services required includes refuse material disposal and sanitation. Chemical toilets will be the primary source of effluent collection. Any other effluent discharge during the construction phase will be collected in sealed containers/tanks and collected via a honey-sucker truck and treated by a service provider (either the Khâi-Ma Local Municipality or a contractor) at a licensed disposal site.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For Geelstert 1, transport of components would be via the N14, Loop 10 Road and the Gamoep Road (R358). Some of the components (i.e. on-site facility substation transformers) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)⁹ by virtue of the dimensional limitations. Typical civil engineering construction equipment (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) will need to be brought to the site as well as components required for the mounting of the PV support structures, construction of the on-site facility substation and site preparation.

Establishment of Laydown Areas on Site

A temporary laydown and storage area will be required for the typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment laydown area (of approximately 5ha in extent) will be established. The laydown area serves to confine activities and storage of equipment to one designated area to limit the potential ecological impacts associated with this phase of the project. The laydown area will be used for the storage of the PV panels and the general placement/storage of construction equipment and other components required for the operations of the facility.

Erect PV Cells and Construct On-Site Facility Substation and Invertors

The construction phase involves installation of the solar PV panels, including the entire necessary structural and electrical infrastructure to make the plant operational. In addition, preparation of the soil and improvement of the access roads would continue for most of the construction phase. For array installation, typically vertical support posts are driven into the ground. Depending on the results of the Geotechnical Report, a different foundation method, such as screw pile, helical pile, micro-pile or drilled post/pile could be used. The posts will hold the support structures (tables) on which PV arrays would be mounted. Brackets attach the PV modules to the tables. Trenches are dug for the underground AC and DC cabling and the foundations of the inverter enclosures and transformers are prepared. While cables are being laid and combiner boxes are being installed, the PV tables are erected. Wire harnesses connect the PV modules to the electrical collection systems. Underground cables and overhead circuits connect the Power Conversion Stations (PCS) to the on-site AC electrical infrastructure and ultimately the project's on-site facility substation.

⁹ A permit will be required for the transportation of these abnormal loads on public roads.



Figure 2.4: Frame structural details.

The construction of an on-site facility substation would require a survey of the site, site clearing and levelling, construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, rehabilitation of any disturbed areas and protection of erosion sensitive areas.

Establishment of Ancillary Infrastructure

Ancillary infrastructure will include cabling for the connection to the Eskom national grid, workshops and maintenance buildings, storage and laydown areas, gatehouse, security offices, and other storage areas under roof. The establishment of these facilities/buildings will require the localised clearing of vegetation and levelling of the development footprint and the excavation of foundations prior to construction.

Undertake Site Remediation

Once construction is completed and all construction equipment is removed, the site must be rehabilitated where practical and reasonable. On full commissioning of the solar PV facility, any access points to the site which are not required during the operation phase must be closed and rehabilitated.

2.5.3 Operation Phase

Geelster 1 is expected to be operational for a minimum of 20 years. The facility will, under normal operating conditions, operate continuously, 7 days a week.

Key elements of the Operation and Maintenance plan include monitoring and reporting the performance of the project, conducting preventative and corrective maintenance, receiving visitors, and maintaining security of the project. The operation phase of the solar PV facility will create 60 full-time employment opportunities. The number of skilled and semi-skilled personnel will comprise 30% and unskilled will comprise 70% of the workforce during the operation phase. Employees that can be sourced from the local municipal pool include the less skilled and semi-skilled such as safety and security staff and certain maintenance crew. Highly skilled personnel may need to be recruited from outside the local area.

Water will be required for the operation phase of Geelster 1. Approximately 5 000m³ of water per annum will be required for the operation of the solar PV facility. The water required will be sourced directly from

the Khâi-Ma Local Municipality following a Service Level Agreement (SLA) between the municipality and the proponent. Alternatively, water will be transported to site by trucks, or water will be made available at the Municipality's nearest water treatment plant via a metered standpipe.

Other services required for the operation of Geelstert 1 include refuse material disposal and sanitation. No effluent is anticipated to be produced during the operation phase, except for normal sewage due to the presence of the operations and maintenance staff. The sewage generated over this period will be collected and treated as per normal standards using a septic or conservancy tank. Should the Khâi-Ma Local Municipality not permit the use of the septic tank, sewage will be stored in the conservancy tank and collected either by a honey-sucker truck or by a service provider (Contractor) for treatment at a licensed disposal site.

Limited electricity will be required for the operation of Geelstert 1. A Service Level Agreement will be entered into with the local municipality or Eskom for the provision of electricity via an 11kV or 22kV feeder line.

2.5.4 Decommissioning Phase

Depending on the continued economic viability of Geelstert 1 following the initial 20-year operation period, the solar PV facility will either be decommissioned, or the operation phase will be extended. If it is deemed financially viable to extend the operation phase, existing components would either continue to operate or be disassembled and replaced with new, more efficient technology/infrastructure available at that time. However, if the decision is made to decommission the solar PV facility, the following activities will form part of the project scope.

Site Preparation

Site preparation activities will include confirming the integrity of the access to the site to accommodate the required decommissioning equipment.

Disassemble and Remove Existing Components

When the solar PV facility is ultimately decommissioned, the equipment to be removed will depend on the proposed land use for the site at that time. At this time, all above ground facilities that are not intended for future use at the site will be removed. Underground equipment (e.g. foundation, wiring) will be removed, and the surface restored. Much of the above ground wire, steel, and PV panels, of which the system is comprised, are recyclable materials and would be recycled to the extent feasible. The components of the plant would be deconstructed and recycled or disposed of in accordance with regulatory requirements. The site will be rehabilitated and returned to a beneficial land use.

Future plans for the site and infrastructure after decommissioning

The capacity of Geelstert 1 would have degraded by ~15% over 20 years. The expectation is that the development area will be used for future renewable energy procurement as the operation phase approaches the termination date of the 20-year Power Purchase Agreement (PPA). If decommissioning were to occur, it would be 20 years (or the stated years) after the commencement of the PPA. Another option for the site after decommissioning is for grazing to resume.

CHAPTER 3: CONSIDERATION OF ALTERNATIVES

This Chapter provides an overview of the various alternatives considered for Geelstert 1 as part of the BA Process.

3.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

Requirement	Relevant Section
(g) a motivation for the preferred site, activity and technology alternative;	A motivation for the preferred site, activity and technology alternative is included in section 3.1.
(h)(i) details of all the alternatives considered;	The details of all alternatives considered is included in section 3.1.2.
(h)(x) if no alternatives, including alternative locations for the activity were investigated, the motivation for not considering such.	A motivation for not considering any alternative development locations is included in section 3.1.2.

3.2 Alternatives Considered during the BA Process

Appendix 1 of the EIA Regulations, 2014 (as amended), states that a BA Report must contain a motivation for the preferred site (i.e. study and development area), activity and technology alternatives. The identified study and development area for Geelstert 1 is located within a REDZ area (also known as the Springbok REDZ) which is a strategic area identified by the DEA for the development of large-scale renewable energy projects. At least one solar renewable energy facility, the operational 40MW Biotherm Aggeney's PV Solar Energy Facility, is approximately 9km north-east of the study area. This supports the suitability of the area for solar PV projects.

The DEA Guideline for determining alternatives states that the key criteria for consideration when identifying alternatives are that they should be "practicable", "feasible", "relevant", "reasonable" and "viable". Essentially there are two types of alternatives:

- » Incrementally different (modifications) alternatives to the project.
- » Fundamentally (totally) different alternatives to the project.

In this instance, 'the project' refers to Geelstert 1, a solar PV facility with capacity of up to 125MW_{AC} and associated infrastructure proposed to be developed by an Independent Power Producer (IPP) and intended to form part of the DMRE's REIPPP Programme.

3.2.1 Consideration of Fundamentally Different Alternatives

Fundamentally different alternatives are usually assessed at a strategic level and, as a result, project-specific EIAs are therefore limited in scope and ability to address fundamentally different alternatives. At a

strategic level, electricity generating alternatives have been addressed as part of the DMRE's current Integrated Resource Plan for Electricity 2010 – 2030 (IRP)¹⁰, and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation from solar PV facilities has been identified as part of the technology mix for power generation in the country for the next 20 years. Therefore, fundamentally different alternatives to the proposed project are not considered within this BA process.

3.2.2 Consideration of Incrementally Different Alternatives

Incrementally different alternatives relate specifically to the project under investigation. "Alternatives", in relation to a proposed activity, means different ways of meeting the general purposes and requirements of the activity, which may include alternatives for:

- » The property on which, or location where the activity is proposed to be undertaken.
- » The type of activity to be undertaken.
- » The design or layout of the activity.
- » The technology to be used in the activity.
- » The operational aspects of the activity.

In addition, the option of not implementing the activity (i.e. the "do-nothing" alternative) must also be considered.

These alternatives are discussed under the respective sub-headings below and where no alternatives are applicable, a motivation has been included.

i. Property or Location Alternatives

Previously, fourteen solar PV facilities were authorised on the Remaining Extent of Farm Bloemhoek 61, however these Environmental Authorisations are no longer valid. In addition, two recently authorised 100MW solar energy facilities¹¹ (i.e. Aggeneys 1 and Aggeneys 2) are located to the north of the Geelster 1 development area on the Remaining Extent of the Farm Bloemhoek 61. As a result of the affected property being previously authorised for developments of a similar nature, the suitability of the land for the development of solar PV facilities has therefore been confirmed.

The placement of a solar PV facility is also dependent on several other factors including land suitability, climatic conditions (solar irradiation levels), topography, the location and extent of the study area, availability of grid connection infrastructure and the need and desirability of the project (discussed in detail in **Chapter 5** of the BA Report). Geelster Solar Facility 1 (Pty) Ltd as the proponent, considers the preferred development area placed within the study area as being highly favourable and suitable for the establishment of a solar PV facility due to the following site-specific favourable characteristics:

¹⁰ The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

¹¹ Aggeneys 1 (DEA Ref No.:14/12/16/3/3/1/2019) and Aggeneys 2 (DEA Ref No.: 14/12/16/3/3/1/2020).

- » **Land suitability:** The development area is currently used for grazing; however, this farming practice can continue in tandem with the operations of the solar PV facility once the construction and commissioning phases of the facility are complete. Sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major outcrops etc.) are also favoured due to the reduced construction activities. Based on the suitability of the development area, no alternative locations are considered.
- » **Solar resource:** The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values of the area within which it will operate. The Global Horizontal Irradiation (GHI) for the study area is in the region of approximately 2310kWh/m²/annum. The Northern Cape Province is considered to have the highest solar irradiation values of the country and therefore enables the development of solar energy projects and the successful operation thereof. Based on the solar resource available, no alternative locations are considered.
- » **Topography:** The study area consists of gently undulating topography, with slopes of less than 2% over most of the area, and with an altitude range of 850 -1000m above mean sea level (amsl). The flat topography of the study area under investigation is considered as beneficial in terms of the construction activities that will be required. Based on the suitable and preferable topography present, no location alternatives are considered for the development.
- » **Site extent:** The affected property (i.e. Remaining Extent of the Farm Bloemhoek 61), known as the study area, is approximately 12 378,97ha in extent, which is sufficient for the installation of a solar PV facility with a contracted capacity of up to 125MW_{AC}, while allowing for the avoidance of environmental site sensitivities. A development area of ~578ha has been identified within the study area within which the solar PV facility will be located. The development footprint/layout of Geelstert 1 will occupy an area of ~245ha, which is equivalent to 42% of the extent of the development area. The site extent is sufficient for the proposed development and therefore eliminates the need to consider alternative locations for the development.
- » **Site access:** Access to the study area and development area is provided via the existing Loop 10 (TR84/1) Road and the Gamoep Road (R358) that run along the northern and eastern boundaries of the study area. The Loop 10 gravel road intersects with the N14 national road which is located to the west of the study area and development area. The N14 links the town of Aggeneys with major towns in the Province such as, Springbok, Kakamas, Keimoes and Upington. Based on the sufficient access available for the development no alternative locations are considered.
- » **Grid access:** A key factor in the siting of any energy generation project, is a viable grid connection. The Aggeneis Main Transmission Substation (MTS) is located approximately 13km south-west of the development area and is proposed as the preferred grid connection point for Geelstert 1. In terms of Eskom's 2020 – 2029 Transmission Development Plan (TDP), the document currently stipulates the following grid rollouts for increasing transmission capacity at this substation:

Project Name	Capacity (kV)	Project Status
Gromis-Nama-Aggeneis	400	To be constructed

Existing grid infrastructure (i.e. power lines and substations) within close proximity to Geelstert 1 provide an opportunity for the project to connect to the national grid with minimal new linear infrastructure (i.e. of less than 20km) required. The necessary grid infrastructure required to connect the project to the national grid, via the Aggeneis MTS, has been assessed within a separate BA process¹².

- » **Geographic location:** The study area and development area are located within the Springbok REDZ 8 which is a node identified by the DEA for the development of renewable energy projects. The development of renewable energy projects within the area has been on-going with one solar PV facility in close proximity to the development area already operational (i.e. the Biotherm Aggeneys PV Solar Energy Facility (refer to **Figure 3.1**)). The study area is also adjacent to several other proposed solar renewable energy developments which compliments existing and future land use activities in the area. Based on the location of the development area within a REDZ, no location alternatives are relevant for consideration.
- » **Landowner support:** The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner does not view the development as a conflict with their current land use practices. The support from the landowner for the development to be undertaken on the affected property has been solidified by the provision of consent for the project to proceed on the property through the signing of a land lease agreement with the proponent as well as a landowners consent as per the requirements of the EIA Regulations, 2014. Furthermore, the landowner had previously consented to the development of fourteen solar PV facilities on the property, which no longer hold valid Environmental Authorisations. Therefore, with the affected landowner in support of the development, no location alternatives are considered.

Based on above site-specific attributes, the proponent considers the development area located within the study area as highly preferred in terms of the development of a solar PV facility, and expects that Geelstert 1 will be able to draw on synergies with the projects proposed and / or currently authorised within the vicinity of the study area. As a result, no property/location alternatives are proposed as part of this BA process.

ii. Design and Layout Alternatives

Geelstert 1 will have a development footprint of approximately 245ha, to be located within the development area (approximately 578ha). Specialist field surveys and assessments were undertaken as part of the BA process in order to provide the proponent with site specific information regarding the study area and the development area considered for the Geelstert 1 (refer to **Appendices D-K**). Prior to the

¹² The grid connection solution to connect Geelstert 1 to the Aggeneis MTS has been assessed within a separate BA process. The grid connection will include a collector substation, with a switching station component and a double-circuit power line of up to 220kV in capacity.

finalisation of the layout assessed in this BA Report, the proponent undertook extensive consultations with ecological, avifauna and freshwater specialists to delineate areas of environmental sensitivity within the development area in order to ensure that the placement of the solar PV facility and the associated infrastructure does not have a significant and negative impact on the environment. The identified sensitivities were utilised as a tool by the proponent to identify and locate the development footprint within the development area. This was undertaken with the aim of avoiding possible highly sensitive areas within the study area so as to limit impacts associated with the development which would result in unacceptable loss.

As a result, the preferred development footprint (245ha) within the affected property (i.e. 12 378,97ha in extent) is considered as the most feasible and appropriate location for Geelstert 1, based on the following considerations:

- i) Through consultation with specialists, outside the BA process, the proponent was made aware of areas within the development area of a high ecological, avifauna and freshwater sensitivity. The proponent acknowledged these sensitivities and has proposed a development footprint that avoids significant environmental sensitivities that were identified during this process;
- ii) Geelstert Solar Facility 1 (Pty) Ltd, the proponent to this application for environmental authorisation has entered into an option to lease agreement with the landowner; and
- iii) The development area is considered suitable for the development of a solar PV facility from a technical perspective to ensure the success of the development.

Based on the ecological, avifauna and freshwater sensitivities identified within the development area, the proponent was able to place the development footprint for the Geelstert 1 solar PV facility in order to ensure avoidance of sensitive environmental features (i.e. the Red Lark habitat and depression wetlands, etc.). In addition, this approach is in accordance with the mitigation hierarchy to ensure that avoidance is the first priority for development.

Considering the process undertaken above, which includes the consideration of sensitive environmental features within the development area, a reduction in the on-ground impacts and the opportunity that the development area presents for the development of Geelstert 1, no layout alternative is proposed for assessment.

3.2.3 Technology Alternatives

The Aggeneys area has been identified for the development of solar and wind energy renewable facilities. Few technology options are available for solar facilities, and the use of those that are considered are usually differentiated by weather and temperature conditions that prevail in the area, so that optimality is obtained by the final site selection. Solar energy is considered to be the most suitable renewable energy technology for this area, based on the site location, ambient conditions and energy resource availability.

Solar PV was determined as the most suitable option for further assessment. The IRP (2019), excludes the procurement of power from CSP facilities until 2030; whereas new additional capacity of approximately 6 000MW will be required from solar PV facilities. Therefore, PV technology was identified as being the preferred option for the study area and consists of a lower visual profile and limited water requirements when compared to the CSP technology alternative. Given the allocations in the IRP (2019), solar PV is considered as the most appropriate technology option. Furthermore, the development of Geelstert 1

provides an opportunity to optimally use a site that is currently earmarked for energy generation through making use of solar PV technology, but with reduced visual intrusion and/or impacts and reduced water use requirements.

Therefore, considering the above, no other technology alternatives are being assessed for the development of Geelster 1. The development of the solar PV facility on the site is considered as the best option for the area considering the current proposed technology on the site, the ample solar resource available and the potential resource saving in terms of water requirements in an area experiencing extreme conditions.

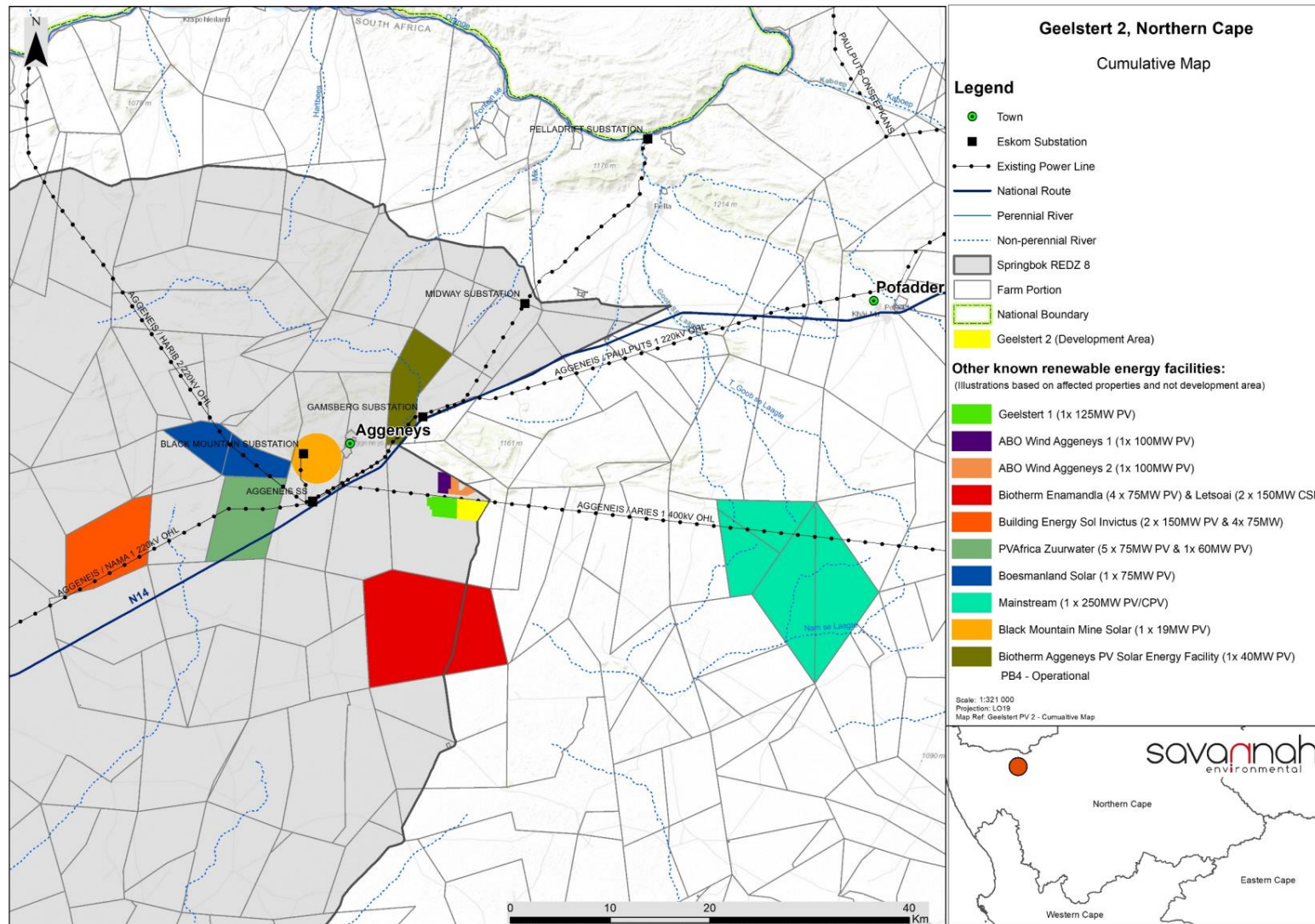


Figure 3.1: A Cumulative Map showing the location of other solar energy facilities in relation to Geelster 1

Several solar PV technology alternatives are available, including *inter alia*:

- » Bifacial PV panels
- » Monofacial PV panels
- » Fixed mounted PV systems (static / fixed-tilt panels).
- » Single-axis tracking or double-axis tracking systems (with solar panels that rotate around a defined axis to follow the sun's movement).

The primary difference between PV technologies available relate to the extent of the facility, as well as the height of the facility (visual impacts), however the potential for environmental impacts remain similar in magnitude. Fixed mounted PV systems are able to occupy a smaller extent and have a lower height when compared to tracking PV systems, which require both a larger extent of land, and are taller in height. However, both options are considered to be acceptable for implementation from an environmental perspective. Bifacial solar PV panels offer many advantages over monofacial PV panels, as power can be produced on both sides of the module, increasing total energy generation. The preference will therefore be determined on the basis of technical considerations and the site conditions.

The PV panels are designed to operate continuously for more than 20 years, mostly unattended and with low maintenance. The impacts associated with the construction, operation, and decommissioning of the facility are anticipated to be the same irrespective of the PV panel selected for implementation.

3.2.4 The 'Do-Nothing' Alternative

The 'Do-Nothing' alternative is the option of not constructing Geelstert 1. Should this alternative be selected, there would be no environmental impacts or benefits as a result of construction and operation activities associated with a solar PV facility. The 'Do-Nothing' alternative has been assessed as part of the BA process (refer to **Chapter 8** and **Chapter 10** of this BA Report).

CHAPTER 4: POLICY AND LEGISLATIVE CONTEXT

This Chapter provides an overview of the policy and legislative context within which the development of a solar PV facility, such as Geelstert 1, is proposed. It identifies environmental legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks and instruments that are applicable to this activity and are to be considered in the assessment process which may be applicable to or have bearing on the proposed project.

4.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
(e) a description of the policy and legislative context within which the development is proposed including-	A description of the policy and legislative context within which Geelstert 1 is proposed is included in sections 4.3, 4.4, 4.5 and 4.6.
(i) an identification of all legislation, policies, plans, guidelines, spatial tools, municipal development planning frameworks, and instruments that are applicable to this activity and have been considered in the preparation of the report.	
(ii) how the proposed activity complies with and responds to the legislation and policy context, plans, guidelines, tools frameworks, and instruments.	

4.2 Strategic Electricity Planning in South Africa

The need to expand electricity generation capacity in South Africa is based on national policy and informed by on-going strategic planning undertaken by the Department of Mineral Resources and Energy (DMRE). The hierarchy of policy and planning documentation that support the development of renewable energy projects such as a solar energy facility is illustrated in **Figure 4.1**. These policies are discussed in more detail in the following sections, along with the provincial and local policies or plans that have relevance to the development of Geelstert 1.

The South African energy industry is evolving rapidly, with regular changes to legislation and industry role-players. The regulatory hierarchy for an energy generation project of this nature consists of three tiers of authority who exercise control through both statutory and non-statutory instruments – that is National, Provincial and Local levels. As solar energy developments are a multi-sectoral issue (encompassing economic, spatial, biophysical, and cultural dimensions) various statutory bodies are likely to be involved in the approval process of a solar energy project and the related statutory environmental assessment process.

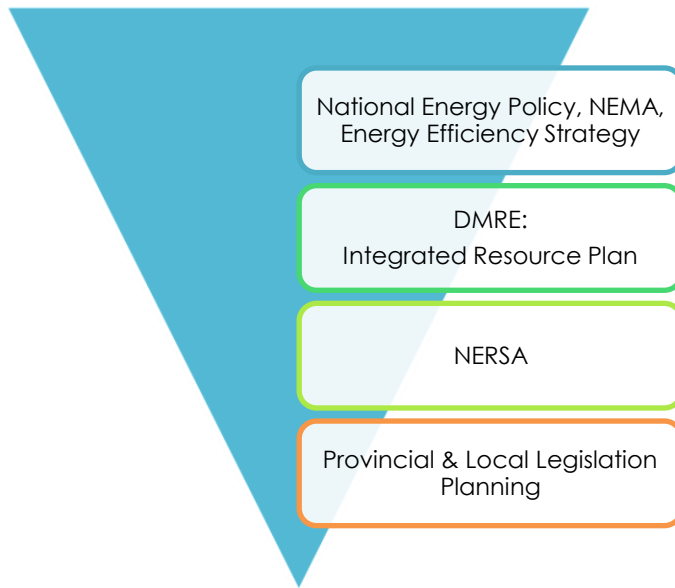


Figure 4.1: Hierarchy of electricity and planning documents

At **National Level**, the main regulatory agencies are:

- » **Department of Mineral Resources and Energy (DMRE):** This Department is responsible for policy relating to all energy forms and for compiling and approving the Integrated Resource Plan (IRP) for electricity. Furthermore, the Department is also responsible for granting approvals for the use of land which is contrary to the objects of the Mineral and Petroleum Resource Development Act (Act No. 28 of 2002) (MPRDA) in terms of Section 53 of the Act. Therefore, in terms of the Act, approval from the Minister is required to ensure that proposed activities do not sterilise mineral resources that may occur within the study area and development area.
- » **National Energy Regulator of South Africa (NERSA):** NERSA is responsible for regulating all aspects of the electricity sector and will ultimately issue licenses for IPP projects to generate electricity.
- » **Department of Environmental Affairs (DEA):** This Department is responsible for environmental policy and is the controlling authority in terms of NEMA and the EIA Regulations, 2014 (GN R326) as amended. DEA is the Competent Authority for this project (as per GN R779 of 01 July 2016), and is charged with granting the EA for the project under consideration.
- » **The South African Heritage Resources Agency (SAHRA):** SAHRA is a statutory organisation established under the National Heritage Resources Act (No. 25 of 1999) (NHRA), as the national administrative body responsible for the protection of South Africa's cultural heritage.
- » **South African National Roads Agency Limited (SANRAL):** This Agency is responsible for the regulation and maintenance of all national road routes.
- » **Department of Water and Sanitation¹³:** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is

¹³ The Department of Water and Sanitation (DWS) is soon to be known as the Department of Human Settlements, Water and Sanitation (DHSWS).

also responsible for evaluating and issuing licenses pertaining to water use (i.e. Water Use Licenses (WUL) and General Authorisation).

- » **The Department of Agriculture, Forestry and Fisheries (DAFF)¹⁴:** This Department is the custodian of South Africa's agricultural resources and is primarily responsible for the formulation and implementation of policies governing the agriculture sector. Furthermore, the Department is also responsible for issuing permits for the disturbance or destruction of protected tree species listed under Section 15 (1) of the National Forest Act (No. 84 of 1998) (NFA).

At **Provincial Level**, the main regulatory agencies are:

- » **Provincial Government of the Northern Cape – Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR):** This Department is the commenting authority for the BA process for the project and is responsible for issuing of biodiversity and conservation-related permits.
- » **Northern Cape Department of Transport, Safety and Liaison:** This Department provides effective co-ordination of crime prevention initiatives, provincial police oversight, traffic management and road safety towards a more secure environment.
- » **Ngwao-Boswa Ya Kapa Bokone (NBKB):** This Department identifies, conserves and manages heritage resources throughout the Northern Cape Province.

At the **Local Level**, the local and district municipal authorities are the principal regulatory authorities responsible for planning, land use and the environment. In the Northern Cape Province, both the local and district municipalities play a role. The local municipality includes the Khâi-Ma Local Municipality which forms part of the Namakwa District Municipality. In terms of the Municipal Systems Act (No. 32 of 2000), it is compulsory for all municipalities to go through an Integrated Development Planning (IDP) process to prepare a five-year strategic development plan for the area under their control.

4.3 National Policy

Further to the South African government's commitment in August 2011 to support the development of renewable energy capacity, the DMRE initiated the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) to procure renewable energy from the private sector in a series of rounds. To date, the Department has procured 6 422MW of renewable energy capacity from 102 independent power producers (IPPs), with 3 876MW operational and made available to the grid¹⁵. National policies have to be considered for the construction and operation of the solar PV facility to ensure that the development is in line with the planning of the country.

¹⁴ The Department of Agriculture, Forestry and Fisheries (DAFF) is soon to be known as the Department of Agriculture, Rural Development and Land Reform.

¹⁵<https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html>

A brief review of the most relevant national policies is provided below in **Table 4.1**. The development of Geelstert 1 is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.1: Relevant national legislation and policies for Geelstert 1

Relevant legislation or policy	Relevance to Geelstert 1
Constitution of the Republic of South Africa, 1996	<p>Section 24 of the Constitution pertains specifically to the environment. It states that everyone has the right to an environment that is not harmful to their health or well-being, and to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that prevent pollution and ecological degradation, promote conservation and secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.</p> <p>The Constitution outlines the need to promote social and economic development. Section 24 of the Constitution therefore requires that development be conducted in such a manner that it does not infringe on an individual's environmental rights, health, or well-being. This is especially significant for previously disadvantaged individuals who are most at risk to environmental impacts.</p>
National Environmental Management Act (No. 107 of 1998) (NEMA)	<p>This piece of legislation is South Africa's key piece of environmental legislation and sets the framework for environmental management in South Africa. NEMA is founded on the principle that everyone has the right to an environment that is not harmful to their health or well-being as contained within the Bill of Rights.</p> <p>The national environmental management principles state that the social, economic and environmental impacts of activities, including disadvantages and benefits, must be considered, assessed and evaluated, and decisions must be appropriate in the light of such consideration and assessment.</p> <p>The need for responsible and informed decision-making by government on the acceptability of environmental impacts is therefore enshrined within NEMA.</p>
White Paper on the Energy Policy of the Republic of South Africa (1998)	<p>The White Paper on Energy Policy places emphasis on the expansion of energy supply options to enhance South Africa's energy security. This can be achieved through increased use of RE and encouraging new entries into the generation market.</p> <p>The policy states that the advantages of RE include, minimal environmental impacts during operation in comparison with traditional supply technologies, generally lower running costs, and high labour intensities. Disadvantages include, higher capital costs in some cases, lower energy densities, and lower levels of availability, depending on specific conditions, especially with sun and wind-based systems. Nonetheless, renewable resources generally operate from an unlimited resource base and, as such, can increasingly contribute towards a long-term sustainable energy future.</p>
White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)	<p>The White Paper on Renewable Energy Policy supplements Government's predominant policy on energy as set out in the White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The policy recognises the potential of RE and aims to create the necessary conditions for the development and commercial implementation of RE technologies.</p> <p>The White Paper on RE sets out Government's vision, policy principles, strategic goals, and objectives for promoting and implementing RE in South Africa. The country relies heavily on coal to meet its energy needs due to its abundant, and fairly accessible</p>

Relevant legislation or policy	Relevance to Geelster 1
	<p>and affordable coal resources. However, massive RE resources that can be sustainable alternatives to fossil fuels, have so far remained largely untapped.</p> <p>The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from RE by 2013 to be produced mainly from biomass, wind, solar and small-scale hydro. The target was subsequently reviewed in 2009 during the RE summit of 2009. The policy supports the investment in RE facilities as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of RE sources.</p>
National Energy Act (No. 34 of 2008)	<p>The purpose of the National Energy Act (No. 34 of 2008) is to ensure that diverse energy resources are available, in sustainable quantities and at affordable prices, to the South African economy in support of economic growth and poverty alleviation, while taking environmental management requirements into account. In addition, the Act also provides for energy planning, and increased generation and consumption of Renewable Energies (REs).</p> <p>The Act provides the legal framework which supports the development of RE facilities for the greater environmental and social good and provides the backdrop against which South Africa's strategic planning regarding future electricity provision and supply takes place.</p>
The Electricity Regulation Act (No. of 2006)	<p>The Electricity Regulation Act of 2006, replaced the Electricity Act (No. 41 of 1987), as amended, with the exception of Section 5B, which provides funds for the energy regulator for the purpose of regulating the electricity industry. The Act establishes a national regulatory framework for the electricity supply industry and introduces the National Energy Regulator (NERSA) as the custodian and enforcer of the National Electricity Regulatory Framework. The Act also provides for licences and registration as the manner in which the generation, transmission, distribution, trading, and import and export of electricity are regulated.</p>
Integrated Energy Plan (IEP), 2015	<p>The Integrated Energy Plan (IEP) (which was developed under the National Energy Act (No. 34 of 2008)), recognises that energy is essential to many human activities, and is critical to the social and economic development of a country. The purpose of the IEP is essentially to ensure the availability of energy resources, and access to energy services in an affordable and sustainable manner, while minimising associated adverse environmental impacts. Energy planning therefore needs to balance the need for continued economic growth with social needs, and the need to protect the natural environment.</p>
Integrated Resource Plan for Electricity (IRP) 2010-2030 (2019)	<p>The Integrated Resource Plan (IRP) for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's National electricity plan. The primary objective of the IRP is to determine the long-term electricity demand and detail how this demand should be met in terms of generating capacity, type, timing and cost. The IRP also serves as input to other planning functions, including amongst others, economic development and funding, and environmental and social policy formulation.</p> <p>On 27 August 2018, the then Minister of Energy published a draft IRP which was issued for public comment. The lengthy public participation and consultation process has culminated in the issue of the overdue IRP 2019 which updates the energy forecast from the current period to the year 2030. Since the promulgated IRP 2010, the following capacity developments have taken place:</p> <p>» A total of 6 422MW has been procured thus far under the REIPPP Programme, with</p>

Relevant legislation or policy	Relevance to Geelster 1
	<p>3 876MW being currently operational and made available to the grid. In addition, IPPs have commissioned 1005MW from two (2) Open Cycle Gas Turbines (OCGT) peaking plants; and</p> <ul style="list-style-type: none"> » Under the Eskom Build Programme, 1 332MW has been procured from the Ingula Pumped Storage Project, 1 588MW and 800MW from the Medupi and Kusile power stations and 100MW from the Sere Wind Farm. <p>Provision has been made for the following new capacity by 2030:</p> <ul style="list-style-type: none"> » 1 500MW of coal; » 2 500MW of hydro; » 6 000MW of solar PV; » 14 400MW of wind; » 1 860MW of nuclear; » 2 088MW of storage; » 3 000MW of gas/diesel; and » 4 000MW from other distributed generation, co-generation, biomass and landfill technologies. <p>Based on the IRP 2019, 1 474MW has been installed for solar PV facilities, whereas, 814MW has already been procured. In addition, 1 000MW has been allocated for solar PV facilities from 2022 to 2030. This will bring the total installed capacity of solar PV facilities by 2030 to 8 288MW. Therefore, the development of the Geelster 1 is supported by the IRP 2019.</p>
National Development Plan 2030 (2012)	<p>The National Development Plan (NDP) 2030 is a plan prepared by the National Planning Commission in consultation with the South African public which is aimed at eliminating poverty and reducing inequality by 2030.</p> <p>In terms of the Energy Sectors role in empowering South Africa, the NDP envisages that, by 2030, South Africa will have an energy sector that promotes:</p> <ul style="list-style-type: none"> » Economic growth and development through adequate investment in energy infrastructure. The sector should provide reliable and efficient energy service at competitive rates, while supporting economic growth through job creation. » Social equity through expanded access to energy at affordable tariffs and through targeted, sustainable subsidies for needy households. » Environmental sustainability through efforts to reduce pollution and mitigate the effects of climate change. <p>The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The development of Geelster 1 supports the NDP through the development of energy-generating infrastructure which will not lead to the generation of GHGs and will result in economic development and growth of the area surrounding the development area.</p>
Strategic Integrated Projects (SIPs)	<p>The Presidential Infrastructure Coordinating Commission (PICC) is integrating and phasing investment plans across 18 Strategic Integrated Projects (SIPs) which have 5 core functions, including to unlock opportunity, transform the economic landscape, create new jobs, strengthen the delivery of basic services and support the integration of African economies.</p> <p>SIP 8 of the energy SIPs supports the development of RE projects as follows:</p>

Relevant legislation or policy	Relevance to Geelster 1
	<p>Green energy in support of the South African economy: Support sustainable green energy initiatives on a national scale through a diverse range of clean energy options as envisaged in the Integrated Resource Plan (IRP 2010) and supports bio-fuel production facilities.</p> <p>The development of Geelster 1 is aligned with SIP 8 as it constitutes a green energy initiative that would contribute clean energy in accordance with the IRP 2010 – 2030.</p>
<p>National Climate Change Response Policy, 2011</p>	<p>The Conference of the Parties (COP) 21 was held in Paris from 30 November to 12 December 2015. From this conference, an agreement to tackle global warming was reached between 195 countries. This Agreement is open for signature and subject to ratification, acceptance or approval by States and regional economic integration organisations that are Parties to the Convention from 22 April 2016 to 21 April 2017. Thereafter, this Agreement shall be open for accession from the day following the date on which it is closed for signature. The agreement can only be sanctioned once it has been ratified by 55 countries, representing at least 55% of emissions.</p> <p>South Africa signed the Agreement in April 2016 and ratified the agreement on 01 November 2016. The Agreement was assented to by the National Council of Provinces on 27 October 2016, and the National Assembly on 1 November 2016. The Agreement was promulgated on 04 November 2016, thirty days after the date on which at least 55 Parties to the Convention, which account for at least 55% of the total global greenhouse gas emissions have deposited their instruments of ratification, acceptance, approval or accession with the Depositary.</p> <p>South Africa's National Climate Change Response Policy (NCCRP) establishes South Africa's approach to addressing climate change, including adaptation and mitigation responses. The NCCRP formalises Government's vision for a transition to a low carbon economy, through the adoption of the 'Peak, Plateau and Decline' (PPD) GHG emissions trajectory whereby South Africa's emissions should peak between 2020 and 2025, plateau for approximately a decade, and then decline in absolute terms thereafter, and based on this the country has pledged to reduce emissions by 34% and 42% below Business As Usual (BAU) emissions in 2020 and 2025, respectively.</p> <p>The policy provides support for Geelster 1, which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.</p>
<p>Climate Change Bill, 2018</p>	<p>On 08 June 2018, the Minister of Environmental Affairs published the Climate Change Bill ("the Bill") for public comment. The Bill provides a framework for climate change regulation in South Africa aimed at governing South Africa's sustainable transition to a climate resilient, low carbon economy and society. The Bill provides a procedural outline that will be developed through the creation of frameworks and plans.</p> <p>Geelster 1 consists of a renewable energy generation facility and would not result in the generation or release of emissions during its operation.</p>

4.4 Provincial Planning and Context

A brief review of the most relevant provincial policies is provided below in **Table 4.2**. The proposed development is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.2: Relevant provincial legislation and policies for Geelster 1

Relevant policy	Relevance to Geelster 1
Northern Cape Provincial Spatial Development Framework (PSDF) 2012	<p>The Northern Cape Provincial Spatial Development Framework (PSDF) 2012 states that the overarching goal for the province is to enable sustainability through sustainable development. The province considers social and economic development as imperative in order to address the most significant challenge facing the Northern Cape, which is poverty.</p> <p>The PSDF identifies key sectoral strategies and plans which are considered to be the key components of the PSDF. Sectoral Strategy 19 refers to a provincial renewable energy strategy. Within the PSDF a policy has been included which states that renewable energy sources (including the utilisation of solar energy) are to comprise 25% of the province's energy generation capacity by 2020.</p> <p>The overall energy objective for the province also includes promoting the development of renewable energy supply schemes which are considered to be strategically important for increasing the diversity of domestic energy supply and avoiding energy imports, while also minimising the detrimental environmental impacts. The implementation of sustainable renewable energy is also to be promoted within the province through appropriate financial and fiscal instruments.</p> <p>The development of Geelster 1 supports the overall energy objective of the province to have 25% of its electricity from renewable energy sources.</p>
Northern Cape Provincial Spatial Development Framework (PSDF) 2018 Review - Executive Summary	<p>The review of the Northern Cape PSDF (2018) refers to infrastructure investment and that a balance must be maintained between investments aimed at meeting the social needs of communities and investment aimed at promoting economic development and job creation.</p> <p>The Spatial Development Strategy identified in the PSDF for basic infrastructure includes the achieving the provision of green infrastructure which includes renewable energy.</p> <p>As part of the Vision 2040 of the PSDF key opportunities are identified for the Province. The strengthening of the development triangle that is formed by the linking of Kimberley, Vryburg, Upington and De Aar. The development triangle sustains a diverse economy with strong mining, agricultural and renewable energy sectors. It is stated in the PSDF that a sustainable and viable economic network must be driven within the development triangle to improve the return of public investment in the Province.</p> <p>The development of Geelster 1 will contribute to the economic network of the province specifically in terms of the renewable sector, albeit it does not fall within the development triangle.</p>
The Northern Cape Climate Change Response Strategy	<p>The key aspects of the Northern Cape Climate Change Response Strategy (NCCCRS) Report are summarised in the MEC's (NCPG: Environment and Nature Conservation) 2011 budget speech: <i>"The Provincial Climate Change Response Strategy will be underpinned by specific critical sector climate change adaptation and mitigation strategies that include the Water, Agriculture and Human Health sectors as the 3 key Adaptation Sectors, the Industry and Transport alongside the Energy sector as the 3 key Mitigation Sectors with the Disaster Management, Natural Resources and Human Society, livelihoods and Services sectors as 3 remaining key. Sectors to ensure proactive long-term responses to the frequency and intensity of extreme weather events such as flooding and wildfire, with</i></p>

Relevant policy	Relevance to Geelster 1
	<p><i>heightened requirements for effective disaster management”.</i></p> <p>Key points from the MEC address include the NCPG's commitment to develop and implement policy in accordance with the National Green Paper for the National Climate Change Response Strategy (2010), and an acknowledgement of the Northern Cape Province's extreme vulnerability to climate-change driven desertification. The development and promotion of a provincial green economy, including green jobs, and environmental learnership is regarded as an important provincial intervention in addressing climate change. The renewable energy sector, including solar and wind energy (but also biofuels and energy from waste), is explicitly indicated as an important element of the Provincial Climate Change Response Strategy.</p> <p>The development of Geelster 1 will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.</p>

4.5 Local Policy and Planning Context

The local tiers of government relevant to the Geelster 1 project are the Khâi-Ma Local Municipality and the Namakwa District Municipality. Instruments and/or policies at both the district and local level contain objectives which align with the development of Geelster 1. These include, economic growth, job creation, community upliftment and poverty alleviation.

Table 4.3: Relevant district and local legislation and policies for Geelster 1

Relevant policy	Relevance to Geelster 1
<p>Namakwa District Municipality (NDM) Integrated Development Plan (2017-2022)</p>	<p>The mission statement for the NDM is summarised by the following aspects:</p> <ul style="list-style-type: none"> » The stimulation of radical economic and social transformation; » The fostering of partnership with relevant role-players; » Supporting and capacitating of local municipalities; » Transparent and accountable processes; and » Providing of local leadership <p>The key priority issues listed in the Namakwa District Municipality's Integrated Development Plan (NDM:IDP) include:</p> <ul style="list-style-type: none"> » Basic service delivery; » Municipal institutional development and transformation; » Local economic development; » Municipal financial viability and management; » Good governance and public participation. <p>The development goals listed in the IDP that are relevant to the development of Geelster 1 include:</p> <ul style="list-style-type: none"> » To deliver a positive contribution to the sustainable growth and development within its boundaries and the rest of the Northern Cape; » The creation of a healthy and environmentally friendly environment within and outside of the Councils' district boundaries, must be attempted; » The promotion of human resources within and outside the organisation through training and the implementation of new technological aids. <p>Linked to the developmental goals are a number of developmental objectives. The following objectives are relevant to the development of Geelster 1:</p>

Relevant policy	Relevance to Geelster 1
	<ul style="list-style-type: none"> » Promotion of SMMEs in order to strengthen the Local Economic Sector; » Promote the infrastructure development, including electricity.
Khâi-Ma Local Municipality (Integrated Development Plan 2017 /18 - 2021/22)	Chapter 6 of the municipality's 2020-2021 IDP indicates that at least 20 000MW is anticipated to be procured from renewable energy by 2030. Within the municipal area, there are four (4) established IPP projects located within the local municipality. The projects include Kaxu Solar One, Xina Solar One, Konkoonsies Solar Plant and the Biotherm Aggeney's PV Solar Energy Facility. The development of Geelster 1 means the Khâi-Ma Local Municipality will add an additional IPP project within its jurisdiction. This will lead to an economic multiplier effect for the municipality and its residents which will fulfil the socio-economic objectives of the IDP such as creation of employment opportunities and economic growth.

4.6 International Policy and Planning Context

A brief review of the most relevant international policies relevant to the establishment of Geelster 1 are provided below in **Table 4.4**. Geelster 1 is considered to align with the aims of these policies, even if contributions to achieving the goals therein are only minor.

Table 4.4: International policies relevant to Geelster 1

Relevant policy	Relevance to Geelster 1
United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)	<p>Following COP24 held in Katowice, Poland, and Chile's announcement that they could not host the next COP, nearly 27 000 delegates met in Madrid, Spain for COP25 with the intention to finalise the 'rulebook' of the Paris Agreement. The Conference also intended to communicate to the global community that the efforts of the United Nations (UN) to curb climate change remained relevant and that the UN recognised the yawning gap between current progress and global goals to limit global warming. The UNFCCC Secretariat announced¹⁶ on 29 May 2020 that COP 26, originally scheduled for 9 – 19 November 2020 was postponed for 1 – 12 November 2021 and will be held in Glasgow, Scotland. In the previous COP, talks between the parties were unable to reach consensus in many areas, with a lot of issues being postponed to COP26 in 2021. Although COP26 has been postponed, the provision in the 2015 Climate Treaty that each Party must take a more ambitious commitment in 2020 to reduce greenhouse emissions has not been postponed.</p> <p>The UN at COP25 expressed their dissatisfaction with the results of the Conference and that the global community lost out on an opportunity to show increased ambition on mitigation, adaptation and finance to tackle the climate crisis¹⁷.</p> <p>The policy provides support for Geelster 1 which will contribute to managing climate change impacts, supporting the emergency response capacity, as well as assist in reducing GHG emissions in a sustainable manner.</p>

¹⁶ <https://cei.org/blog/cop-26-un-climate-conference-delayed%C2%A0until-november-2021>

¹⁷ <https://www.carbonbrief.org/cop25-key-outcomes-agreed-at-the-un-climate-talks-in-madrid>

Relevant policy	Relevance to Geelster 1
<p>The Equator Principles III (June 2013)</p>	<p>The Equator Principles (EPs) III constitute a financial industry benchmark used for determining, assessing, and managing project's environmental and social risks. The EPs are primarily intended to provide a minimum standard for due diligence to support responsible risk decision-making. The EPs are applicable to large infrastructure projects (such as Geelster 1) and apply globally to all industry sectors.</p> <p>Such an assessment should propose measures to minimise, mitigate, and offset adverse impacts in a manner relevant and appropriate to the nature and scale of Geelster 1. In terms of the EPs, South Africa is a non-designated country, and as such the assessment process for projects located in South Africa evaluates compliance with the applicable IFC Performance Standards on Environmental and Social Sustainability, and Environmental Health and Safety (EHS) Guidelines.</p> <p>Geelster 1 is currently being assessed in accordance with the requirements of the EIA Regulations, 2014 as amended (GN R326), published in terms of Section 24(5) of the National Environmental Management Act (No. 107 of 1998) (NEMA), which is South Africa's national legislation providing for the authorisation of certain controlled activities. Through this assessment, all potential social and environmental risks are identified and assessed, and appropriate mitigation measures proposed.</p>
<p>International Finance Corporation (IFC) Performance Standards and Environmental and Social Sustainability (January 2012)</p>	<p>The International Finance Corporation's (IFC) Performance Standards (PSs) on Environmental and Social Sustainability were developed by the IFC and were last updated on 1 January 2012.</p> <p>Performance Standard 1 requires that a process of environmental and social assessment be conducted, and an ESMS appropriate to the nature and scale of the project, and commensurate with the level of its environmental and social risks and impacts, be established and maintained. The above-mentioned standard is the overarching standard to which all the other standards relate. Performance Standard 2 through to 8 establish specific requirements to avoid, reduce, mitigate or compensate for impacts on people and the environment, and to improve conditions where appropriate. While all relevant social and environmental risks and potential impacts should be considered as part of the assessment, the standards 2 and 8 describe potential social and environmental impacts that require particular attention specifically within emerging markets. Where social or environmental impacts are anticipated, the developer is required to manage them through its ESMS consistent with Performance Standard 1.</p> <p>Given the nature of Geelster 1, it is anticipated (at this stage of the process) that Performance Standards 1, 2, 3, 4, 6, and 8 may be applicable to the project.</p>

CHAPTER 5: NEED AND DESIRABILITY

Appendix 1 of the EIA Regulations, 2014 (as amended) requires the inclusion of a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location. This Chapter provides an overview of the anticipated suitability of Geelstert 1 being developed at the preferred location from an international, national, regional, and site-specific perspective. It also provides an overview of the need and desirability and perceived benefits of the project specifically.

5.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the Basic Assessment report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(f) a motivation for the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred location.	The need and desirability for the development of Geelstert 1 is included and discussed as a whole within this chapter. The need and desirability for the development of the solar PV facility has been considered from an international, national, regional and site-specific perspective.

5.2 Need and Desirability from an International Perspective

The need and desirability of Geelstert 1, from an international perspective, can be described through the project's alignment with internationally recognised and adopted agreements, protocols and conventions. South Africa is a signatory to a number of international treaties and initiatives, including the United Nation's Development Programme's (UNDP's) Sustainable Development Goals (SDGs). The SDGs address global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment and social justice. The SDGs consist of 17 global goals set by the United Nations. The 17 SDGs are characterised by 169 targets, and 304 indicators.

Goal 7 of the SDGs relates to "Affordable and Clean Energy", with the aim of the goal being to ensure access to affordable, reliable, sustainable and modern energy for all. The following targets and indicators have been set for Goal 7:

Targets	Indicators
7.1 By 2030, ensure universal access to affordable, reliable and modern energy services.	7.1.1 Proportion of population with access to electricity. 7.1.2 Proportion of population with primary reliance on clean fuels and technology.
7.2 By 2030, increase substantially the share of renewable energy in the global energy mix.	7.2.1 Renewable energy share in the total final energy consumption.
7.3 By 2030, double the global rate of improvement in energy efficiency.	7.3.1 Energy intensity measured in terms of primary energy and GDP.
7.A By 2030, enhance international cooperation to	7.A.1 Mobilised amount of United States dollars per year

Targets	Indicators
facilitate access to clean energy research and technology, including renewable energy, energy efficiency and advanced and cleaner fossil-fuel technology, and promote investment in energy infrastructure and clean energy technology.	starting in 2020 accountable towards the \$100 billion commitment.
7.B By 2030, expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, in particular least developed countries, small island developing States, and land-locked developing countries, in accordance with their respective programmes of support.	7.B.1 Investments in energy efficiency as a percentage of GDP and the amount of foreign direct investment in financial transfer for infrastructure and technology to sustainable development services.

The development of Geelstert 1 would contribute positively towards Goal 7 of the SDGs through the following:

- » By generating up to 125MW_{AC} of affordable and clean energy.
 - * A study published by the CSIR on 14 October 2016 ("Cost of new power generators in South Africa Comparative analysis based on recent Independent Power Producer (IPP) announcements", Dr Tobias Bischof-Niemz and Ruan Fourie) which took into consideration the results of the cost prices bid successfully under the Department of Mineral Resources and Energy's Renewable Energy (RE) IPP and Coal Baseload IPP Procurement Programmes, found that solar PV and wind were 40% cheaper than new baseload coal (i.e. R0.62/kWh for PV and wind vs R1.03 for coal).
 - * PV technology is one of the cleanest electricity generation technologies, as it does not result in the release of emissions during its operation.
- » By contributing towards South Africa's total generation capacity, specifically through the utilisation of renewable energy resources.

5.3 Need and Desirability from a National Perspective

5.3.1 Policy and Planning

Geelstert 1 is proposed in specific response to a National Government initiative, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP). This programme was initiated in order to give effect to the requirements of the IRP with regards to renewable energy targets. As a result, the need and desirability of Geelstert 1 from a national perspective can largely be linked from the project's alignment with national government policies, plans, and programmes which have relevance to energy planning and production (as discussed in detail in **Chapter 4**). The following key plans have been developed by National Government to consider South Africa's current energy production, projected future demands, and provides the necessary framework within which energy generation projects can be developed:

- » Integrated Energy Plan (IEP)
- » Integrated Resource Plan (IRP)

The above-mentioned energy plans have been extensively researched and are updated on an on-going basis to take into consideration changing scenarios, new information, developments in new technologies,

and to reflect updated demands and requirements for energy production within the South African context. These plans form the basis of South Africa's energy generation sector and dictate national priorities for energy production.

The IEP is intended to provide a roadmap of South Africa's future energy landscape and guide future energy infrastructure investments and policy development. The latest iteration of the IEP (25 November 2016) contained the following statement regarding solar power in South Africa:

“South Africa experiences some of the highest levels of solar radiation in the world and this renewable resource holds great potential for the country. The daily solar radiation in South Africa varies between 4.5 and 6.5 kilowatt hours per square meter (kWh/m²) (16 and 23 mega joules per square meter [MJ/m²]) (Stassen, 1996), compared to about 3.6 kWh/m² in parts of the United States and about 2.5 kWh/m² in Europe and the United Kingdom. The total area of high radiation in South Africa amounts to approximately

194 000 km², including the Northern Cape, which is one of the best solar resource areas in the world. With electricity production per square kilometre of mirror surface in a solar thermal power station being 30.2 MW, and just 1% of the high radiation area in the country being made available for solar power generation, the generation potential is approximately 64 GW. Solar energy has the potential to contribute quite substantially to South Africa's future energy needs. This would, however, require large investments in transmission lines from the areas of high radiation to the main electricity consumer centres.”

In terms of electricity generation, the IEP states that South Africa should continue to pursue a diversified energy mix which reduces reliance on a single or a few primary energy sources, and includes the following statement regarding solar energy's contribution to the diversified energy mix:

- » *Solar should play a much more significant role in the electricity generation mix than it has done historically and constitutes the greatest share of primary energy (in terms of total installed capacity) by 2050. The contribution of solar in the energy mix comprises both CSP and solar PV. Solar PV includes large scale installations for power generation which supply to the grid and individual, off-grid solar home systems and rooftop panels.*
- » *Several interventions which could enhance the future solar energy landscape are recommended as follows: – Large scale CSP projects with proven thermal storage technologies and hybridisation / industrial steam application projects should be incentivised in the short to medium term. In the long term, the existing incentives could be extended to promote locally developed CSP technology storage solutions and large-scale solar fuel projects.*
- » *A thorough solar resource assessment for South Africa should continue to be undertaken in the Northern Cape Province and extended to other provinces deemed to have high solar radiation levels.*
- » *Investments should be made to upgrade the grid in order to accommodate increasing solar and other renewable energy contributions.*

The IRP for Electricity 2010 – 2030 is a subset of the IEP and constitutes South Africa's current gazetted energy plan. The purpose of the plan is to ensure sustainable electricity development which takes into consideration technical, economic, and social constraints, and identifies investments in the electricity sector which are required to meet the country's forecasted electricity demands at minimum costs. The IRP 2010 - 2030 includes 9.6GW of nuclear, 6.25GW of coal, **17.8GW of renewables**, and approximately 8.9GW of other generation sources such as hydro and gas in addition to all existing and committed power plants.

Since the promulgated IRP 2010, the following capacity developments have taken place:

- » A total of **6 329MW** under the REIPP Programme has been procured with **3 876MW** being operational and made available to the grid;
- » **1 005MW** has been commissioned by IPPs from two (2) Open Cycle Gas Turbine (OCGT) peaking plants; and
- » Under the Eskom Build Programme, **1 332MW** has been commissioned from the Ingula Pump Storage Project in Kwa-Zulu Natal, **1 588MW** and **800MW** from the Medupi and Kusile power stations, whereas **100MW** has also been commissioned from the Sere Wind Farm.

In line with government policy to reduce greenhouse gas (GHG) emissions, the IRP uses the moderate decline constraint for GHG emissions. Although, this is subject to change following recent correspondence received from the DEA indicating that carbon budget methodology must be used instead of emissions decline constraints, the consideration of GHG emissions in the determination of the energy generation mix indicates government's commitment to international obligations under the Paris Agreement.

In response to the IRP 2010, the then-DoE initiated a number of IPP Procurement Programmes to secure electricity generated by a range of resources from the private sector (i.e. from Independent Power Producers, or IPPs). Under these Programmes, IPPs are invited to submit proposals for the finance, construction, operation, and maintenance of electricity generation facilities for the purpose of entering into an Implementation Agreement with the DMRE and a Power Purchase Agreement (PPA) with Eskom as the buyer. Provision has been made for new additional capacities by the IRP 2019 (refer to **Table 5.1**).

Table 5.1: Overview of the total installed capacity expected by 2030

IPP Procurement Programme	Technology	MW	Total
Renewables	Wind	17 742MW	31 320MW
	Solar CSP	600MW	
	Solar Photovoltaic	8 288MW	
	Hydro	4 600MW	
Coal	Coal	33 364MW	33 364MW
Nuclear	Nuclear	1 860MW	1 860MW
Gas & Diesel	Gas & Diesel	3 000MW	3 000MW
Other (Distributed Generation, CoGen, Biomass, Landfill)	Other (Distributed Generation, CoGen, Biomass, Landfill)	4 000MW	4 000MW

Renewable resources are valuable in contributing towards electricity generation and diversifying South Africa's electricity mix, while contributing towards South Africa's response to Climate Change. Under the REIPPPP, the DMRE intends to secure 14 725MW of electricity from renewable energy generation facilities utilising either onshore wind, concentrated solar thermal, solar photovoltaic (PV), biomass, biogas, landfill gas, or hydro across a number of bidding windows, while simultaneously contributing towards socio-

economic development. A total of 1 474MW¹⁸ of PV generated electricity has been awarded to preferred bidders across four (4) rounds of bidding to date, with 814MW still remaining to be allocated in subsequent bidding rounds. Preferred bidders identified under any IPP Procurement Programme, including the REIPPPP, are required to satisfy a number of economic development requirements, including amongst others, job creation, local content, skills development, enterprise and supplier development, and socio-economic development. In addition to electricity generation and supply, IPP Procurement Programmes also contribute positively towards socio-economic development of a region, over and above job creation.

The need for new power generation from solar PV facilities has been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments under the Paris Agreement; therefore, provision has been made for the inclusion of new PV power generation capacity in South Africa's energy mix. The implementation of Geelstert 1 has the potential to contribute positively towards the identified need, while simultaneously contributing to job creation and socio-economic development, identified as a need for the country within the National Development Plan (NDP).

Geelstert 1 will make use of renewable energy technology and would contribute positively towards reducing South Africa's GHG emissions and ensure compliance with all applicable legislation and permitting requirements. In addition, by making use of PV technology, Geelstert 1 would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the then-Department of Water and Sanitation's (now the Department of Human Settlements, Water and Sanitation) National Water Resource Strategy 2 (2013) (i.e. transitioning to a low carbon economy through stimulating renewable energy and retrofitting buildings).

5.3.2 Renewable Energy Development Zones (REDZ)

The DEA has committed to contribute to the implementation of the NDP, the National Infrastructure Plan (NIP) and the undertaking of Strategic Environmental Assessments (SEAs) to identify adaptive processes that streamline the regulatory environmental requirements for Strategic Integrated Projects (SIPs) while safeguarding the environment.

The solar photovoltaic (PV) and wind SEA was accordingly commissioned by the DEA in support of SIP 8, which aims to facilitate the implementation of sustainable green energy initiatives. This SEA identifies areas where large-scale solar PV and wind energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the environment, while yielding the highest possible socio-economic benefits to the country. These areas are referred to as Renewable Energy Development Zones (REDZ).

The procedure to be followed in applying for environmental authorisation for a large-scale project in a REDZ was formally gazetted on 16 February 2018 (GN R114). The aim of the zones is to streamline the regulatory process, identifying geographical areas where wind and solar PV technologies can be

¹⁸ <https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html>

incentivised. These REDZ will ensure a transition to a low carbon economy, accelerating infrastructure development and contributing to a more coherent and predictable regulatory framework.

As illustrated in **Figure 5.1**, the complete extent of the development area of Geelster 1 falls within the Springbok REDZ, which was selected by the DEA as an area highly suitable for the development of solar energy facilities given a range of factors considered, including environmental sensitivities. This alignment with the REDZ area provides further support for the selection of the specific site chosen for this project.

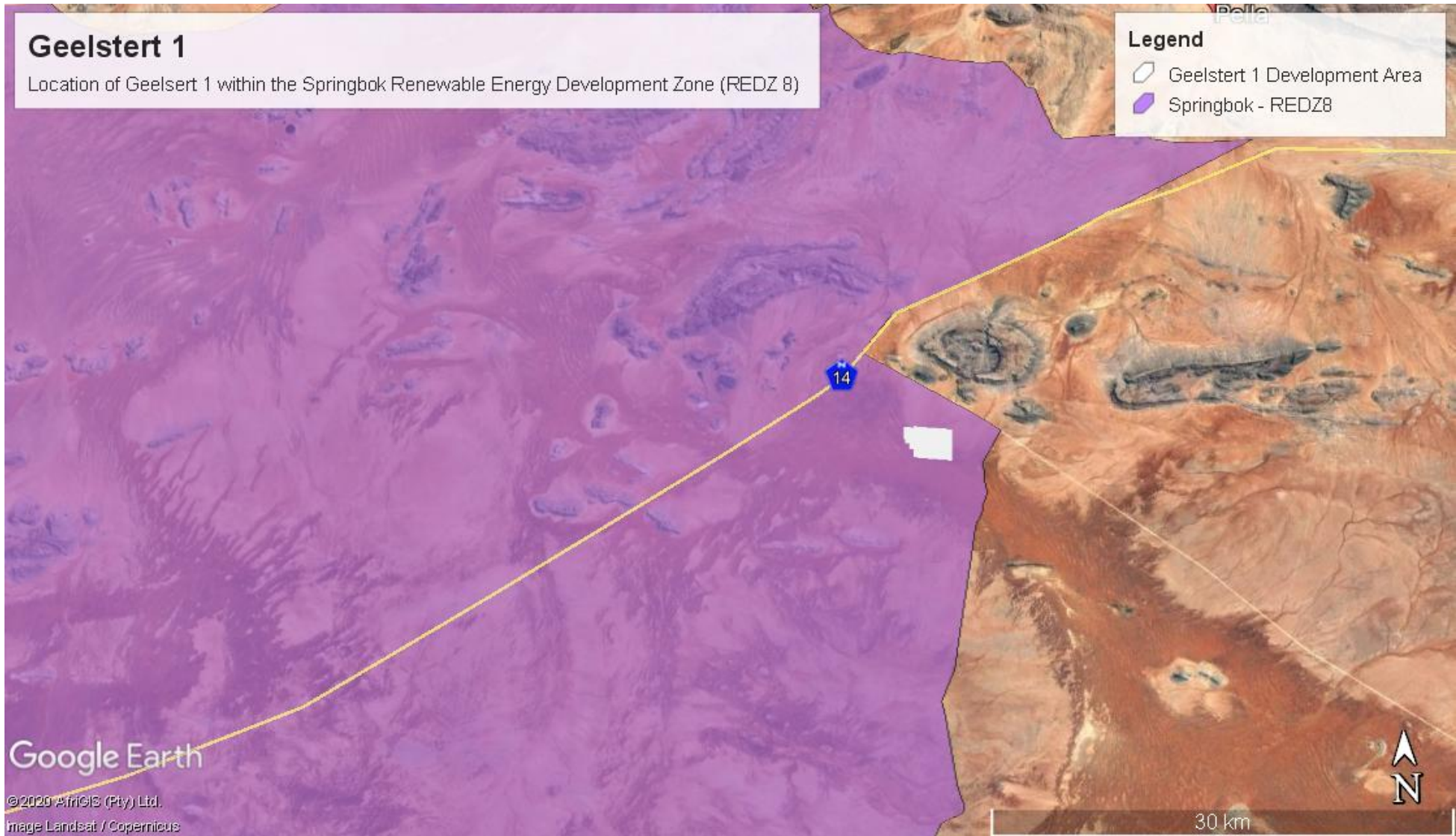


Figure 5.1: Geelster 1 is located within the eastern corner of the Springbok REDZ area (Zone 8).

From a planning perspective, the proposed Geelstert Grid Connection¹⁹ is also considered to be appropriately located within the Northern Corridor of the Strategic Transmission Corridors (as gazetted on 16 February 2018, GN R113) (refer to **Figure 5.2**).

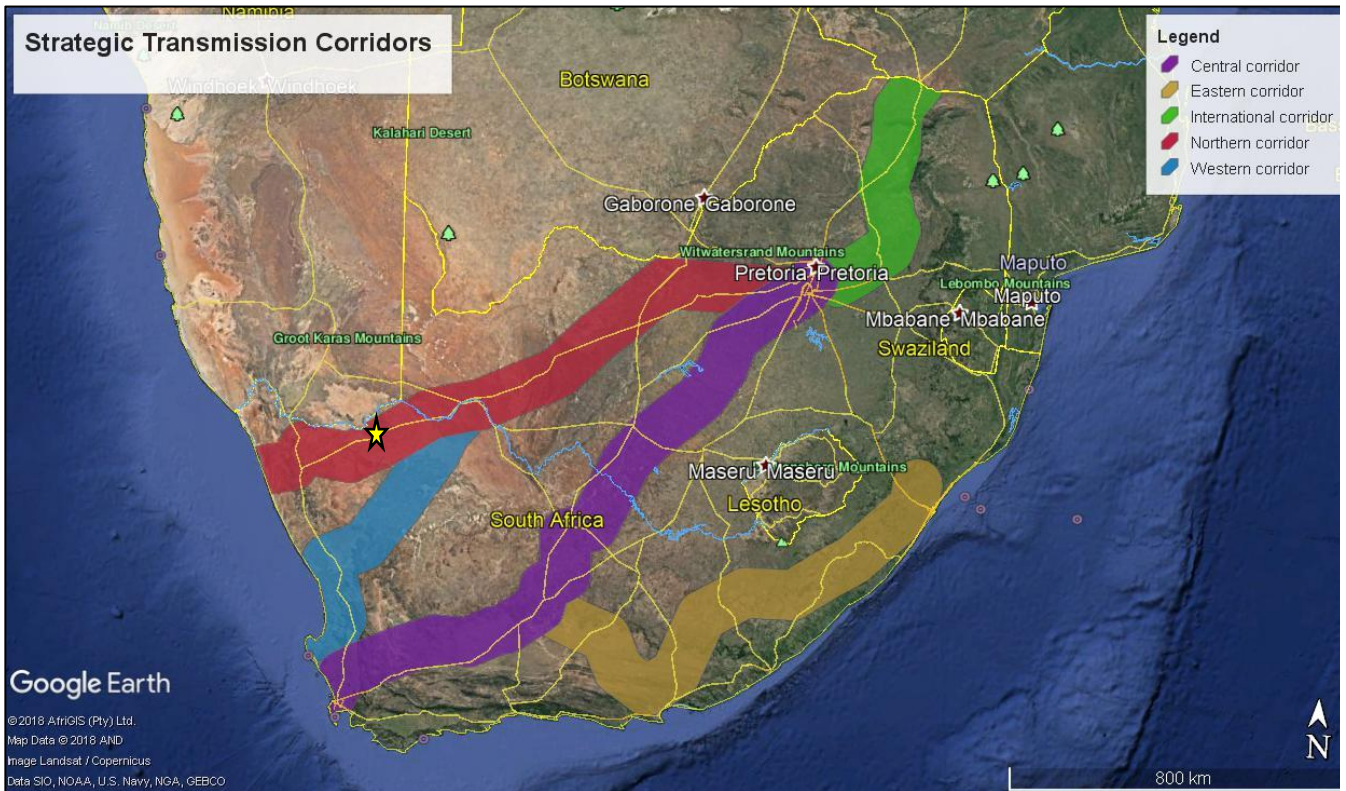


Figure 5.2: Strategic Power Corridors identified as the optimal locations where power infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. The location of the development area and study area for Geelstert 1 is indicated with a star.

5.4 Need and Desirability of the project from a Regional Perspective

South Africa's electricity generation mix has historically been dominated by coal. This can be attributed to the fact that South Africa has abundant coal deposits, which are relatively shallow with thick seams, and are therefore easy and comparatively cost effective to mine. However, up to 2030 a new capacity demand will be driven by the decommissioning of existing coal-fired power stations. A further 24 100MW (**Figure 5.3**) of coal power is expected to be decommissioned in the period 2030 to 2050. Therefore, additional capacity will be required from renewable energy sources, particularly solar with 6 000MW being allocated for the period up to 2030.

¹⁹ The grid connection solution to connect Geelstert 1 to the Aggeneis MTS has been assessed within a separate BA process.



Figure 5.3: A snapshot of the updated Energy Mix as per the IRP 2019²⁰

Although the majority of South Africa's electricity generation infrastructure (coal-fired power stations) is currently located within Mpumalanga due to the location of coal resources within this province, the Northern Cape Province has been identified as an area where electricity generation from solar energy facilities is highly feasible and a viable option. The location of the study area within the Northern Cape is therefore considered to support the Province/Region's generation targets.

The Springbok area has been earmarked as a hub for the development of solar energy projects due to the viability of the solar resource for the area. This is further supported by the Springbok REDZ, which was selected by the DEA as an area highly suitable for the development of large-scale solar energy facilities. This alignment of the Geelstert 1 development area with the REDZ area provides further support for the selection of the specific site chosen for this project.

The overarching objective for the solar energy facility is to maximise electricity production through exposure to the solar resource, while minimising infrastructure, operational and maintenance costs, as well as social and environmental impacts. From a regional site selection perspective, this region is considered to be preferred for solar energy development by virtue of its annual solar irradiation values. The GHI for the

²⁰<https://www.cliffedekkerhofmeyr.com/en/news/publications/2019/Corporate/energy-alert-22-october-The-Integrated-Resource-Plan-2019-A-promising-future-roadmap-for-generation-capacity-in-South-Africa.html>

area derived from the World Bank Group's Global Solar Atlas is approximately 2 303 kWh/m²/annum, equivalent to the highest GHI values in the country (refer to **Figure 5.4**).

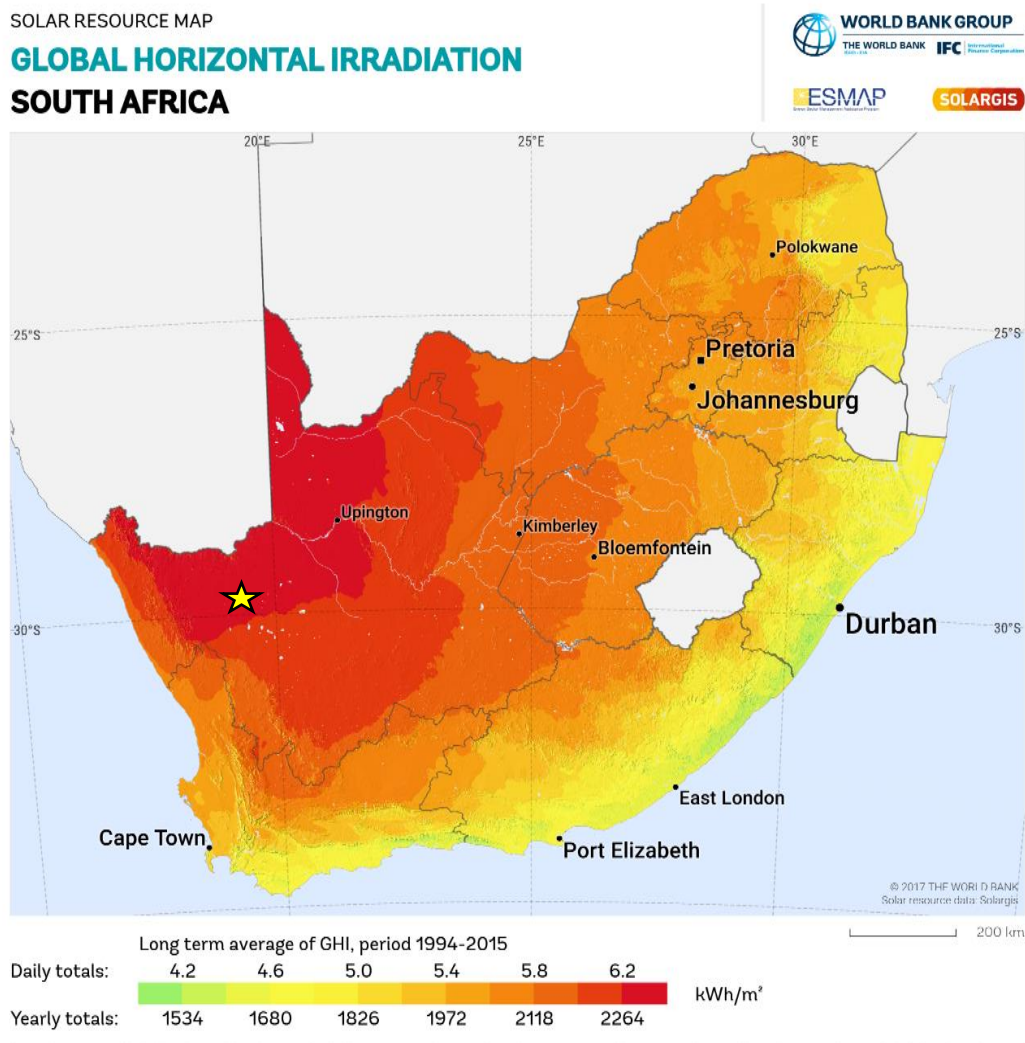


Figure 5.4: Solar irradiation map for South Africa, with the position of Geelstert 1 shown by the yellow star (Source: World Bank Groups Global Solar Atlas)

5.5 Receptiveness of the proposed development area for the establishment of Geelstert 1

The placement of a solar PV facility is strongly dependent on several factors including climatic conditions (solar irradiation levels), topography, the location of the site, and in particular the location in a planned node for renewable projects, availability of grid connection, the extent of the site and the need and desirability for the project. From a local level perspective, the study area and development area have specifically been identified by the proponent as being highly desirable from a technical perspective for the development of a solar PV facility due to the following site characteristics:

- » **Solar resource:** The economic viability of a solar PV facility is directly dependent on the annual direct solar irradiation values. The Global Horizontal Irradiation (GHI) for the study area is in the region of

approximately 2 303kWh/m²/annum, which is considered favourable for the development of a solar PV facility.

- » **Geographic location:** The study and development area are located within the Springbok REDZ, which is a node identified by National Government for the development of renewable energy projects, with the following operational and under construction solar PV and CSP facilities in close proximity to the development area: Biotherm Aggeneys PV Solar Energy Facility, Kaxu Solar One, Xina Solar One and the Konkoonsies Solar Plant. The development area is also adjacent to a cluster or node of proposed solar PV developments, which compliments existing and future land use activities in the Aggeneys area and is in line with the vision of National Government through the promulgation of the REDZ areas. Therefore, the geographical location is considered as preferable and acceptable for the development of Geelstert 1.
- » **Topography:** Sites that facilitate easy construction conditions, (i.e. relatively flat topography, lack of major rock outcrops, limited watercourse crossings, etc.) are favoured by developers during the site selection process. As a result, the development area for Geelstert 1 (**Figure 5.5**) consists of a gently undulating topography, with slopes of less than 5% over the majority of the area, and with an altitude range of between 830 – 870m above sea level. These characteristics are preferred for the construction and operation of a solar PV facility such as Geelstert 1.

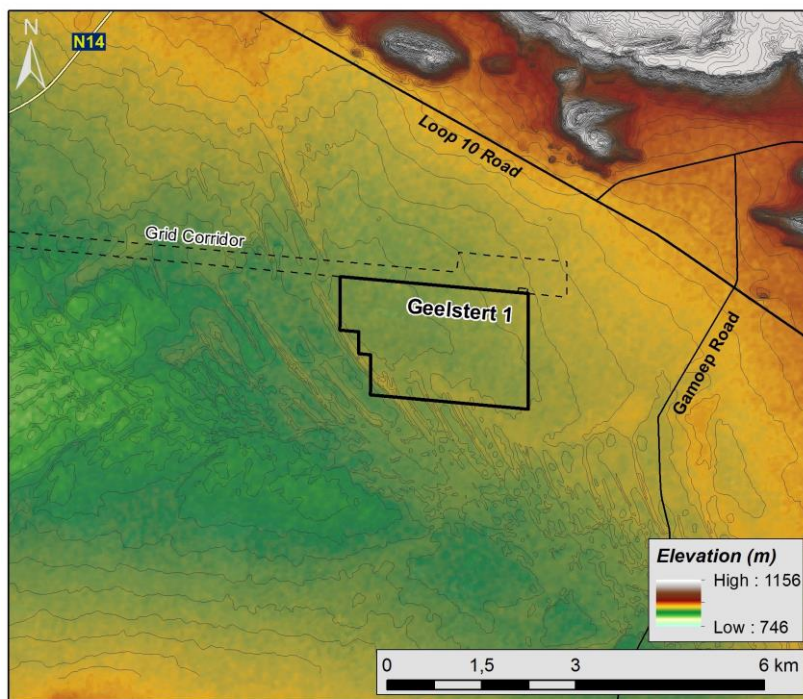


Figure 5.5: The topography of the Geelstert 1 development area.

- » **Site extent and land availability:** The affected property, the Remaining Extent of the Farm Bloemhoek 61, known as the study area, is approximately 12 378,97ha in extent, which is sufficient for the development of a solar PV facility with a contracted capacity of up to 125MW_{AC}, while allowing for the avoidance of environmental sensitivities. A development area of ~ 578ha has been identified within the study area within which the solar PV facility will be sited. The development footprint of the facility, i.e. facility infrastructure, would occupy an area of ~245ha, which is equivalent to approximately 42%

of the extent of the development area. The extent of land available for the construction and operation of Geelstert 1, and the opportunity provided for the avoidance of environmental sensitivities contributes to the need and desirability of the development of Geelstert 1 in the proposed location. Furthermore, taking into consideration that the authorised Aggeneys 1 and 2 solar PV facilities are located within the same study area (i.e. Remaining Extent of the Farm Bloemhoek 61), and directly to the north of the Geelstert 1 development area, also adds to the desirability of the proposed development in the proposed location.

Access to Road Infrastructure and Site access: Access to the study area and development area is provided via the N14 national road which is aligned with the western boundary of the affected property, at a distance of approximately 6km west of the development area. The N14 national road provides access to the town of Aggeneys and the development area from Upington, Pofadder, Springbok and Johannesburg. From the N14, access to the study area and development area can be obtained via the existing and unsurfaced Loop 10 and Gamoeep (R358) roads. The proximity of the study area and development area to the N14 national road (refer to **Figure 5.6**) decreases the impact on secondary roads from traffic during the construction and operation phases. As material and components would need to be transported to the development area during the construction phase, accessibility to the study area was a key factor in determining the viability of Geelstert 1, particularly taking transportation costs (direct and indirect) into consideration and the impact of this has on the project economics and the ability to submit a competitive bid under the DMRE's REIPPP Programme.



Figure 5.6: Existing road infrastructure within the vicinity of the development area for Geelstert 1. This infrastructure will primarily be used to gain access to the study area and development area for Geelstert 1.

- » **Grid access:** A key factor in the siting of any solar PV facility is that the project must have a viable grid connection in order to evacuate the generated electricity to the national grid. The grid connection

point for Geelstert 1 will be the existing Aggeneis MTS. The Aggeneis MTS is located approximately 12km west of the development area with the Aries/Aggeneis 400kV, Aggeneis/Harib 400kV and the Aggeneis/Nama 400kV overhead power lines connecting into the substation. The Aggeneis/Aries 400kV power line runs in an east-west direction to the Aggeneis MTS and is located to the north of the development area for Geelstert 1. Eskom's 2020 – 2029 Transmission Development Plan (TDP) stipulates the following grid rollouts for this substation, which are to be constructed:

- » Gromis/Nama/Aggeneis 440kV Power Line
- » Aggeneis/Paulputs 220kV Power Line

The existing grid infrastructure within close proximity of Geelstert 1 provides an opportunity for the project to connect to the national grid with minimal new linear infrastructure (i.e. less than 20km) required to be developed. In order to connect the project to the national grid at the existing Aggeneis MTS, a grid connection comprising a collector substation (with switching station components) and a new overhead power line of up to 220kV will be required for the operation of the solar PV facility and will be assessed within a separate BA process. The principle of minimising associated infrastructure and the resulting impacts is also supported.

- » **Land suitability and land use activities:** The current land use of the development area is an important consideration in site selection in terms of limiting disruption to existing land use practices. The land suitability and current land use activities also need to be considered in terms of the need and desirability of a development within the area proposed. The study area is currently used for grazing, which is generally preferred for developments of this nature as the grazing activities can continue on the study area in tandem with the operation of the solar PV facility. The surrounding land uses of the area have been assessed and the proposed development is compatible with the surrounding area and does not present a conflicting land use.

The majority of the land in the Aggeneys area is mainly used for agriculture or reserved for mining-related activities. The study area, Remaining Extent of the Farm Bloemhoek 61 is one of the few available and privately-owned land parcels with sufficient extent for the development of a solar PV facility. Within the study area and development area for Geelstert 1, there is no cultivated agricultural land present as a result of the low agricultural potential associated with the area. The land is currently used for livestock grazing and the landowner is currently considering alternative land uses based on the challenges and limitations experienced within the area from a climatic perspective. Other land uses present within the vicinity of the study area and development area include power line servitudes associated with existing and approved grid connection infrastructure, mining-related activities and the future development of other renewable solar energy facilities, which have received environmental authorisations from the Department of Environmental Affairs.

- » **Landowner Support:** The selection of a site where the landowner is supportive of the development of renewable energy is essential for ensuring the success of the project. The landowner does not view the development as a conflict with their current land use practices. The support from the landowner for the development to be undertaken on the affected property has been solidified by the provision of consent for the project to proceed on the property through the signing of a land option to lease agreement with the proponent.

Taking into consideration the solar resource, grid access, land suitability, landowner support, access to road infrastructure, the current land use of the study area and development area, in conjunction with other large-scale solar PV and CSP projects that have been authorised within the vicinity of the study area, the development of Geelstert 1 is therefore considered to be desirable and will ultimately contribute to, and further develop the successful power generation activities already being undertaken within the area.

Therefore, the development of Geelstert 1 within the study area and development area is considered to be desirable considering the characteristics of the area.

5.6 Benefits of Renewable Energy and the Need and Desirability

The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa; these include:

Socio-economic upliftment of local communities: Geelstert 1 has the potential to create much needed employment for unskilled locals during the construction phase. Training opportunities will also be afforded to qualified local people who can be upskilled to undertake certain roles during the construction and operation phases. In terms of the needs of the local community, the Local and District municipality IDPs identified the need to facilitate economic development by creating an environment that is conducive for business development, economic growth, sustainable employment opportunities and growth in personal income levels of communities; unlock opportunities to increase participation amongst all sectors of society in the mainstream economy to create decent job opportunities; promote Local Economic Development; and enhance rural development and agriculture. A study undertaken by the Department of Mineral Resource and Energy (DMRE), National Treasury and the Development Bank of Southern Africa (DBSA) in June 2017 found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more jobs for South African citizens than anticipated. The study also found that significantly more people from local communities were employed during construction than was initially planned, confirming the potential benefits for local communities associated with the implementation of renewable energy projects.

Geelstert 1 also has the potential to make a positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPPP, the project will commit benefits to the local community in the form of job creation, localisation, and community ownership. In accordance with the DMRE's bidding requirements of the REIPPPP, a percentage of the revenue generated per annum during operation will be made available to local communities through a social beneficiation scheme. Therefore, the potential for creation of employment and business opportunities, and the opportunity for skills development for local communities is significant. Secondary social benefits can be expected in terms of additional spend in nearby towns due to the increased demand for goods and services. These socio-economic benefits would include an increase in the standard of living for local residents within the area as well as overall financial and economic upliftment.

Increased energy security: Given that renewables can often be deployed in a short timeframe and in a decentralised manner close to consumers, they offer the opportunity for improving grid strength and supply quality in the short-term, while reducing expensive distribution losses. As a result of the power constraints in the first half of 2015, power generators meant to be the "barely-ever-used" safety net for the system (diesel-fired gas turbines) were running at >30% average load factor in the first half of 2015. Load shedding occurred during 82 days in the first half of 2015 (out of 181 days). Results of a CSIR Energy Centre

study for the period January to June 2015 (CSIR, August 2015), concluded that the already implemented renewable projects (wind and solar) within the country avoided 203 hours of so-called 'unserved energy'. During these hours the supply situation was such that some customers' energy supply would have had to be curtailed ('unserved') had it not been for the renewables. The avoidance of unserved energy cumulated into the effect that for 15 days, from January to June 2015, load shedding was avoided entirely, delayed, or a higher stage of load shedding prevented due to the contribution of renewable wind and PV projects²¹.

Resource saving: It is estimated that the achievement of the targets in the Renewable Energy White Paper will result in water savings of approximately 16.5 million kilolitres per annum. As an already water-stressed nation, it is critical that South Africa engages in a variety of water conservation measures, particularly due to the detrimental effects of climate change on water availability. Renewable energy also translates into revenue savings, as fuel for renewable energy facilities is free, while compared to the continual purchase of fuel for conventional power stations. Results of a CSIR Energy Centre study for January – June 2015 (CSIR, August 2015) have quantified the contribution from renewable energy to the national power system and the economy over the first 6 months of 2015 compared to the 12 months of 2014:

2015 (6 months)	2014 (12 months)
R3.60 billion saving in diesel and coal fuel costs	R3.64 billion saving in diesel and coal fuel costs
200 hours of unserved energy avoided, saving at least an additional R1.20 billion–R4.60 billion for the economy	120 hours of unserved energy avoided, saving at least an additional R1.67 billion for the economy
Generated R4.0 billion more financial benefits than cost	Generated R0.8 billion more financial benefits than cost

Exploitation of significant renewable energy resource: At present, valuable renewable resources including biomass by-products, solar irradiation and wind power remain largely unexploited. The use of these energy flows will strengthen energy security through the development of a diverse energy portfolio in South Africa.

Economics: As a result of the available renewable energy resources and the competitive renewable energy procurement process, both wind power and solar PV power have now been proven as cheaper forms of energy generation in South Africa than fossil fuel (coal) generated power. The IRP 2019 gazetted by the Minister of Mineral Resources and Energy in October 2019, updates the energy forecast for South Africa from the current period until the year 2030 and has made an allocation of 6000MW in addition to the already installed/committed capacity of 2 288MW from solar PV facilities which will be developed from 2022 – 2030.

Pollution reduction: The release of by-products through the burning of fossil fuels for electricity generation have a particularly hazardous impact on human health and contribute to ecosystem degradation. The use of solar irradiation or wind for power generation is a non-consumptive use of a natural resource which produces zero emissions during its operation.

²¹ (http://ntww1.csir.co.za/plsql/ptl0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

Climate friendly development: The uptake of renewable energy offers the opportunity to address energy needs in an environmentally responsible manner and thereby allows South Africa to contribute towards mitigating climate change through the reduction of GHG emissions. South Africa is estimated to currently be responsible for approximately 1% of global GHG emissions (and circa half of those for which Africa is responsible) and is currently ranked 9th worldwide in terms of per capita carbon dioxide emissions. Since its inception, the REIPPPP has achieved carbon emission reductions²² of 25.3 million tonnes of CO₂ (IPP Office, March 2018). The development of Geelstert 1, and the associated electricity generated as a result of the facility, will result in considerable savings on tons of CO₂ emissions.

Support for international agreements: The effective deployment of renewable energy provides a tangible means for South Africa to demonstrate its commitment to its international agreements under and for cementing its status as a leading player within the international community.

Employment creation: The development, procurement, installation, maintenance and management of renewable energy facilities have significant potential for job creation and skills development in South Africa. In the short 8-year period, the REIPPPP has attracted R209.4 billion in committed private sector investment, resulting in 38 701 jobs for the youth and women from surrounding communities²³.

Acceptability to society: Renewable energy offers a number of tangible benefits to society including reduced pollution concerns, improved human and ecosystem health and climate friendly development.

Support to a new industry sector: The development of renewable energy offers the opportunity to establish a new industry within the South African economy, which will create jobs and skill local communities which have potential for further renewable energy projects.

Protecting the natural foundations of life for future generations: Actions to reduce our disproportionate carbon footprint can play an important part in ensuring our role in preventing dangerous anthropogenic climate change, thereby securing the natural foundations of life for generations to come; this is the basis of sustainable development. The development of renewable energy facilities contributes to the protection of the foundations.

²² Carbon emission reduction is calculated based on a displacement of power, from largely coal-based to more environmentally friendly electrical energy generation, using a gross Eskom equivalent emissions factor of 1.015 tons CO₂/MWh.

²³ <https://www.sanews.gov.za/south-africa/renewable-energy-programme-attracts-r2094-billion-sa-economy>

CHAPTER 6: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 (as amended in April 2017) published in terms of the NEMA (Act No. 107 of 1998) as amended, the construction and operation of Geelstert 1 is a listed activity requiring Environmental Authorisation (EA). In terms of GN R114 of February 2018, the application for EA is required to be supported by a BA process based on the location of the Geelstert 1 study area and the development area within the Springbok REDZ.

The BA process aims at identifying and describing potential environmental issues associated with the development of the proposed solar PV facility and the associated infrastructure. In order to ensure that a comprehensive assessment is provided to the competent authority and I&APs regarding the impacts of the facility, detailed independent specialist studies were undertaken as part of the BA process.

Following the initiation of the BA, South Africa was subject to the enforcement of Government Gazette 43096 which placed the country in a national state of disaster limiting the movement of people to curb the spread of the COVID-19 virus. Considering the limitations in place, a comprehensive consultation process was designed and implemented to cater for the undertaking of a full-scale, innovative public participation process which included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders, while remaining within the limits as stipulated by the National Government. This chapter serves to outline the process that was followed during the BA process.

6.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(d)(i) a description of the scope of the proposed activity, including all listed and specified activities triggered and being applied for.	All listed activities triggered by the development of Geelstert 1 have been included in section 6.2, Table 6.1 . The specific project activity relating to the relevant triggered listed activity has also been included in Table 6.1 .
3(h)(ii) details of the public participation process undertaken in terms of Regulation 41 of the Regulations, including copies of the supporting documents and inputs.	A public participation plan was prepared and approved by the DEA (Appendix C1). The details of the public participation process undertaken for Geelstert 1 have been included and described in section 6.3.2.
3(h)(iii) a summary of the issues raised by interested and affected parties, and an indication of the manner in which the issues were incorporated, or the reasons for not including them.	All comments raised during the announcement of the BA process have been included in the C&R Report (Appendix C9) of the BA Report.

3(h)(vi) the methodology used in determining and ranking the nature, significance, consequences, extent, duration and probability of potential environmental impacts and risks associated with the alternatives.

The methodology used to assess the significance of the impacts of Geelstert 1 has been included in section 6.4.

(o) a description of any assumptions, uncertainties, and gaps in knowledge which relate to the assessment and mitigation measures proposed.

The assumptions and limitations of the BA process being undertaken for Geelstert 1 is included in section 6.6.

6.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to Geelstert 1, as identified at this stage in the process, are described in more detail under the respective sub-headings.

6.2.1 National Environmental Management Act (No. 107 of 1998) (NEMA)

NEMA is South Africa's key piece of national environmental legislation that provides for the authorisation of certain controlled activities known as "listed activities". In terms of Section 24(5) of NEMA, the potential impact on the environment associated with listed activities must be considered, investigated, assessed and reported on to the competent authority (the decision-maker) charged by NEMA with granting of the relevant EA. Due to the fact that Geelstert 1 is a power generation project and therefore relates to the IRP 2010 – 2030, the National DEA has been determined as the Competent Authority in terms of GN R779 of 01 July 2016. The Provincial Northern Cape Department of Environment and Nature Conservation (NC DENC) is the Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under the NEMA ensures that proponents are provided the opportunity to consider the potential environmental impacts of their activities early in the project development process, and also allows for an assessment to be made as to whether environmental impacts can be avoided, minimised or mitigated to acceptable levels. Comprehensive, independent environmental studies are required to be undertaken in accordance with the EIA Regulations to provide the competent authority with sufficient information in order for an informed decision to be taken regarding the project and Application for EA.

The BA process being conducted for Geelstert 1 is undertaken in accordance with Section 24(5) of the NEMA, which defines the procedure to be followed in applying for EA, and requires that the potential consequences for, or impacts of, listed or specified activities on the environment be considered, investigated, assessed, and reported on to the competent authority. Listed Activities are activities identified in terms of Section 24 of the NEMA which are likely to have a detrimental effect on the environment, and which may not commence without an EA from the competent authority subject to the completion of an environmental assessment process (either a Basic Assessment (BA) or full Scoping and EIA).

As the proposed development is located within Zone 8 of the Renewable Energy Development Zones (REDZ) (also known as the Springbok REDZ), one of the eight (8) designated REDZ areas, the EIA (Environmental Impact Assessment) process to be followed for Geelstert 1 will be as per GN R114, as formally gazetted on 16

February 2018. Geelstert 1 is subject to a Basic Assessment process and not a full EIA process, as well as a shortened timeframe of 57 days for the processing of an application for EA.

Table 6.1 details the listed activities in terms of the EIA Regulations, 2014 (as amended) that apply to Geelstert 1, and for which an application for EA has been submitted to the DEA. The table also includes a description of the specific project activities that relate to the applicable listed activities.

Table 6.1: Listed activities as per the EIA regulations that are triggered by Geelstert 1

Indicate the number and date of the relevant notice:	Activity No (s) (in terms of the relevant notice):	Describe each listed activity as per project description
GN R327, 08 December 2014 (as amended on 07 April 2017)	11 (i)	<p>The development of facilities or infrastructure for the transmission and distribution of electricity -</p> <p>(i) outside urban areas or industrial complexes with a capacity of more than 33 but less than 275 kilovolts.</p> <p>Geelstert 1 will require the construction and operation of an on-site facility substation with a capacity of up to 220kV and an extent of up to 1ha to facilitate the connection of the facility to the national grid. The development area assessed for the siting of Geelstert 1 is located outside of an urban area.</p>
GN R327, 08 December 2014 (as amended on 07 April 2017)	14	<p>The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 80 cubic meters or more but not exceeding 500 cubic meters.</p> <p>The development and operation of Geelstert 1 will require the storage of 80 cubic metres of dangerous goods, which will include flammable and combustible liquids such as oils associated with the on-site facility substation transformers, lubricants, and solvents.</p>
GN R327, 08 December 2014 (as amended on 07 April 2017)	28(ii)	<p>Residential, mixed, retail, commercial, industrial, or institutional developments where such land was used for agriculture, game farming, equestrian purposes or afforestation on or after 01 April 1998 and where such development</p> <p>(ii) will occur outside an urban area, where the total land to be developed is bigger than 1 hectare.</p> <p>Geelstert 1 will be constructed and operated on land used for agricultural purposes, mainly grazing. The development footprint of Geelstert 1 is 245ha in extent and is located outside of an urban area.</p>
GN R325, 08 December 2014 (as amended on 07 April 2017)	1	<p>The development of facilities or infrastructure for the generation of electricity from a renewable resource where the electricity output is 20 megawatts or more.</p> <p>Geelstert 1 is a solar PV facility and will make use of solar energy as</p>

		a renewable energy resource. The project will have a contracted capacity of up to 125MW_{AC}.
GN R325, 08 December 2014 (as amended on 07 April 2017)	15	The clearance of an area of 20 hectares or more of indigenous vegetation. Geelster 1 will require the clearance of an area of up to 245ha (equivalent to the development footprint) of vegetation. The proposed project would therefore result in the clearance of an area of indigenous vegetation greater than 20ha in extent.
GN R324, 08 December 2014 (as amended on 07 April 2017)	4(g)(ii)(bb)	The development of a road wider than 4 metres with a reserve less than 13.5 metres in the (g) Northern Cape (ii) outside an urban area within (bb) a National Protected Area Expansion Strategy Focus Area. Geelster 1 will require the development of a main access with a width of up to 8m and internal access roads with a width of up to 5m within the Kamiesberg-Bushmanland-Augrabies Focus Area.
GN R324, 08 December 2014 (as amended on 07 April 2017)	10(g)(ii)(iii)(bb)	The development and related operation of facilities or infrastructure, for the storage, or for the storage and handling, of a dangerous good, where such storage occurs in containers with a combined capacity of 30 cubic meters but not exceeding 80 cubic metres in the (g) Northern Cape (ii) within 100 metres from the edge of a watercourse or wetland; (iii) outside an urban area and within a (bb) National Protected Area Expansion Strategy Focus Area. The development and operation of Geelster 1 will require facilities or infrastructure for the storage and handling of dangerous goods in containers with a combined capacity exceeding 80 cubic meters within the development footprint of Geelster 1 which is located 100m from the edge of the depression wetlands that are located within the development area, but outside the development footprint. The development footprint of Geelster 1 is located within the Kamiesberg-Bushmanland-Augrabies Focus Area.

6.2.2 National Water Act (No. 36 of 1998) (NWA)

In accordance with the provisions of the National Water Act (No. 36 of 1998) (NWA), all water uses must be licensed with the Competent Authority (i.e. the Regional Department of Water and Sanitation²⁴). Water use is

²⁴ The Department of Water and Sanitation (DWS) is soon to be called the Department of Human Settlements, Water and Sanitation.

defined broadly, and includes taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which detrimentally impact on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.

Table 0.1 lists the possible water uses associated with the proposed project and identified in terms of the NWA which can be authorised under a General Authorisation (GA), or require a WUL application. The table also includes a description of those project activities which relate to the applicable Water Uses.

Table 0.1: List of Water Uses published under Section 21 of NWA, as amended.

Notice No.	Activity No.	Description of Water Use
NWA (No. 36 of 1998)	Section 21 (c)	<p><i>Impeding or diverting the flow of water in a watercourse.</i></p> <p><i>The Geelstert 1 development footprint falls within the regulated area of the depression wetlands and ephemeral watercourses present within the development area²⁵. Although the development footprint of the solar PV facility is located outside of these areas, activities pertaining to the establishment of the facility may encroach on the catchment areas of these features, which may lead to an impediment and diversion of the flow of water to these features.</i></p>
	Section 21 (i)	<p>Altering the bed, banks, course or characteristics of a watercourse.</p> <p><i>The Geelstert 1 development footprint falls within the regulated area of the depression wetlands and ephemeral watercourses present within the development area. Although the development footprint of the solar PV facility is located outside of these areas, activities pertaining to the establishment of the facility may lead to an alteration of the characteristics of these features in the area.</i></p>

Due to the development area of Geelstert 1 being located within the regulated area of the delineated depression wetlands in the area, an application for a water use authorisation in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GN R267), or a GA registered in accordance with the GN R509 of 2016. The water use authorisation process for Geelstert 1 will only be completed once a positive EA has been received and the

²⁵ 'watercourse' means –

- (a) a river or spring'
- (b) a natural channel in which water flows regularly or intermittently;
- (c) a wetland, lake or dam into which, or from which, water flows and
- (d) any collection of water which the Minister may, by notice in the Gazette, declare to be a watercourse, and a reference to a watercourse includes, where relevant, its bed and banks.

project selected as Preferred Bidder. This is line with the requirements of the Department of Water and Sanitation.

6.2.3 National Heritage Resources Act (No. 25 of 1999) (NHRA)

The National Heritage Resources Act (No. 25 of 1999) (NHRA) provides an integrated system which allows for the management of national heritage resources and to empower civil society to conserve heritage resources for future generations. Section 38 of NHRA provides a list of activities which potentially require the undertaking of a Heritage Impact Assessment.

Section 38: Heritage Resources Management

- 1). *Subject to the provisions of subsections (7), (8) and (9), any person who intends to undertake a development categorised as –*
- a. *the construction of a road, wall, power line, pipeline, canal or other similar form of linear development or barrier exceeding 300m in length;*
 - b. *the construction of a bridge or similar structure exceeding 50m in length;*
 - c. *any development or other activity which will change the character of a site –*
 - i). *exceeding 5 000m² in extent; or*
 - ii). *involving three or more existing erven or subdivisions thereof; or*
 - iii). *involving three or more erven or divisions thereof which have been consolidated within the past five years; or*
 - iv). *the costs of which will exceed a sum set in terms of regulations by SAHRA or a provincial heritage resources authority;*

Must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

In terms of Section 38(8), approval from the heritage authority is not required if an evaluation of the impact of a development on heritage resources is required in terms of any other legislation (such as NEMA), provided that the consenting authority ensures that the evaluation of impacts fulfils the requirements of the relevant heritage resources authority in terms of Section 38(3) and any comments and recommendations of the relevant resources authority with regard to such development have been taken into account prior to the granting of the consent. However, should heritage resources of significance be affected by Geelstert 1, a permit is required to be obtained prior to disturbing or destroying such resources as per the requirements of Section 48 of the NHRA, and the SAHRA Permit Regulations (GN R668).

6.3 Overview of the Basic Assessment Process for Geelstert 1

Key tasks undertaken for the BA included:

- » Consultation with relevant decision-making and regulating authorities (at National, Provincial and Local levels).
- » Submission of the completed Application for Environmental Authorisation to the competent authority (i.e. DEA) in terms of Regulations 5 and 6 of the EIA Regulations, 2014 (GNR 326), as amended.

- » Undertaking a public participation process in accordance with Chapter 6 of GNR326, and the Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations, Department of Environmental Affairs, Pretoria, South Africa (hereinafter referred to as "the Guidelines") in order to identify issues and concerns associated with the proposed project.
- » Undertaking of independent specialist studies in accordance with Appendix 6 of the EIA Regulations, 2014 (GNR326), as amended²⁶.
- » Preparation of a BA Report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GN R326.
- » 30-day public and authority review period of the BA report.
- » Compilation of a C&R report detailing the comments raised by I&APs, addressing these comments in detail and finalisation of the BA report.
- » Submission of a final BA report to the DEA for review and decision-making.

The tasks are discussed in detail in the sub-sections below.

6.3.1. Authority Consultation and Application for Authorisation in terms of the 2014 EIA Regulations (as amended)

In terms of Government Notice 779 of 01 July 2016, the National Department of Environmental Affairs (DEA) is the competent authority for all projects related to the IRP. As the project is located within the Northern Cape Province, the Northern Cape Department of Environment and Nature Conservation (DENC) is the commenting authority. Consultation with the regulating authorities (i.e. DEA and DENC) as well as with all other relevant Organs of State will continue throughout the BA process. To date, this consultation has included the following:

- » Requesting of a Pre-Application Meeting with DEA on 22 June 2020 to discuss the Public Participation Plan and project details. The DEA requested that the Public Participation Plan be submitted to the Department via email for approval. Following submission of the plan, the DEA provided approval of the submitted Plan via email on 25 June 2020 and advised that the Pre-Application Meeting is not required for the project.
- » Submission of the application form for Environmental Authorisation to the DEA via the use of the DEA Novell Filr System.
- » Submission of the BA Report for review and comment by:
 - * The competent and commenting authorities.
 - * State departments that administer laws relating to a matter affecting the environment relevant to an application for Environmental Authorisation.
 - * Organs of State which have jurisdiction in respect of the activity to which the application relates.

²⁶ The independent specialist studies (**Appendix D-K**) were initiated prior to 8 May 2020, and comply with the requirements of Appendix 6 of the EIA Regulations, 2014 (as amended), as per the direction provided by the DEA on 02 July 2020 (refer to **Appendix P**). The date of appointment of specialists is also confirmed in **Appendix P**.

The submissions, as listed above, were undertaken electronically, as required by the DEA (in line with the directions for new Applications for Environmental Authorisations provided for in GNR650 of 05 June 2020).

A record of all authority correspondence undertaken during the BA process is included in **Appendix B** and **Appendix C**.

6.3.2. Public Participation Process

Public participation is an essential and regulatory requirement for an environmental authorisation process and is guided by Regulations 41 to 44 of the EIA Regulations 2014 (GN R326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GN R326) (as amended) and is being followed for this proposed project.

The Public Participation Process for Geelstert 1 has been run in tandem with the public consultation for Geelstert 2 as well as the Geelstert Grid Connection. The benefit to the stakeholder is that all information relevant to all related applications has been made available for review together, and not only for comments to be raised across the three applications at one time, but also provided a complete picture of the potential for impacts and/or benefits related to the suite of projects.

The Public Participation Process undertaken for the proposed development of Geelstert 1 considers the restrictions and limitations imposed by Government through section 27 (2) of the Disaster Management Act (Act No. 57 of 2002) of 2002 and the Directions issued by the Minister of Forestry and Fisheries (DEFF) in terms of consultations with I&APs. A Public Participation Plan was prepared and submitted to the DEA on 22 June 2020. Approval of the Plan was provided by the DEA Case Officer via email on 25 June 2020 (**Appendix B**).

The alternative means of undertaking consultation have been designed and implemented by Savannah Environmental to ensure that I&APs are afforded sufficient opportunity to access project information and raise comments on the project through an interactive web-based platform (i.e. online stakeholder engagement platform) readily available and accessible to any person registering their interest in the project, and ensures that the public participation process is undertaken in line with Regulations 41 to 44 of the EIA Regulations, 2014 as amended. The Public Participation Plan (**Appendix C1**) considers the limitations applied by the Disaster Management Act Regulations prohibiting the gathering of people, as well as limitations which certain I&APs may have in terms of access to computers and internet as well as access to public spaces currently not open for operation that inhibits access to hard copy documentation. The online stakeholder engagement platform implemented by Savannah Environmental for the project allowed the EAP to visually present details regarding the project as well as consultation documentation, including project maps and plans, presentations and posters. The platform also contains the BA report available for review. The use of an online tool enables stakeholders and I&APs to explore the project-specific content in their own time, and still enables them to participate in a meaningful way in the consultation process. The online platform allows for instant feedback and comments to be submitted, in so doing saving time for the stakeholder and also giving the assurance that their comments have been submitted for inclusion in the project reporting.

The sharing of information forms the basis of the public participation process and offers the opportunity for I&APs to become actively involved in the BA process from the outset. The public participation process is

designed to provide sufficient and accessible information to I&APs in an objective manner. The public participation process affords I&APs opportunities to provide input into and receive information regarding the BA process in the following ways:

During the BA process:

- » provide an opportunity to submit comments regarding the project;
- » assist in identifying reasonable and feasible alternatives;
- » contribute relevant local information and knowledge to the environmental assessment;
- » allow registered I&APs to verify that their comments have been recorded, considered and addressed, where applicable, in the environmental investigations;
- » foster trust and co-operation;
- » generate a sense of joint responsibility and ownership of the environment; and
- » comment on the findings of the environmental assessments.

During the decision-making phase:

- » to advise I&APs of the outcome of the competent authority's decision, and how and by when the decision can be appealed.

The public participation process therefore aims to ensure that:

- » Information containing all relevant facts in respect of the application is made available to potential stakeholders and I&APs for their review;
- » The information presented during the public participation process is presented in such a manner, i.e. local language and technical issues, that it avoids the possible alienation of the public and prevents them from participating.
- » Public participation is facilitated in such a manner that I&APs are provided with a reasonable opportunity to comment on the project;
- » A variety of mechanisms are provided to I&APs to correspond and submit their comments i.e. fax, post, email, telephone, text message (SMS and WhatsApp), or online through the project's online platform; and
- » An adequate review period is provided for I&APs to comment on the findings of the BA Report.

In terms of the requirement of Chapter 6 of the EIA Regulations of December 2014, as amended, the following key public participation tasks are required to be undertaken:

- » Fix a notice board at a place conspicuous to the public at the boundary or on the fence of—
 - (i) the site where the activity to which the application relates is or is to be undertaken; and
 - (ii) any alternative site mentioned in the application.
- » Give written notice to:
 - (i) the owner or person in control of that land if the applicant is not the owner or person in control of the land;
 - (ii) the occupiers of the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;
 - (iii) owners and occupiers of land adjacent to the site where the activity is or is to be undertaken or to any alternative site where the activity is to be undertaken;

- (iv) the municipal councillor of the ward in which the site or alternative site is situated and any organisation of ratepayers that represent the community in the area;
 - (v) the municipality which has jurisdiction in the area;
 - (vi) any organ of state having jurisdiction in respect of any aspect of the activity; and
 - (vii) any other party as required by the competent authority.
-
- » Place an advertisement in one local newspaper.
 - » Open and maintain a register of I&APs and Organs of State.
 - » Release of a BA Report for a 30-day review and comment period.
 - » Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process and during the 30-day review period and the responses provided by the project team.

In compliance with the requirements of Chapter 6: Public Participation of the EIA Regulations, 2014 (as amended), and the approved Public Participation Plan, the following summarises the key public participation activities implemented. The schematic below provides an overview of the tools that are available to I&APs and stakeholders to access project information and interact with the public participation team to obtain project information and resolve any queries that may arise, and to meet the requirements for public participation.

i. Stakeholder identification and register of I&APs

- Register as an I&AP on the online platform via completion of a form and provision of contact information, by responding to an advert, or sending a 'please call me' which will be responded to
- State interest in the project
- Receive all project related information via email

ii. Advertisements and notifications

- Advertisements, site notices and/or radio announcements and notifications provide information and details on where to access project information
- Notifications regarding the EIA process and availability of project reports for public review to be sent via email, post or SMS notifications

iii. Public Involvement and consultation

- Distribution of a BID providing details on the project and how I&APs can become involved in the process
- Submission of comments or queries via the online platform to the PP team
- Virtual presentations (both English and Afrikaans) available via the online platform
- Availability of project information via the online platform
- An opportunity for I&APs and stakeholders to request virtual meetings with the project team

iv. Comment on the BA Report

- Availability of the project reports via the online platform for 30-day comment period
- Submission of comments via the online platform, email or post to the PP team
- Comments recorded and responded to, as part of the process

v. Identification and recording of comments

- Comments and Responses Report, including all comments received, and included within the final Report for decision-making

i. Stakeholder identification and Register of Interested and Affected Parties

42. A proponent or applicant must ensure the opening and maintenance of a register of I&APs and submit such a register to the competent authority, which register must contain the names, contact details and addresses of –
- (a) All persons who, as a consequence of the public participation process conducted in respect of that application, have submitted written comments or attended meetings with the proponent, applicant or EAP;
 - (b) All persons who have requested the proponent or applicant, in writing, for their names to be placed on the register; and
 - (c) All organs of state which have jurisdiction in respect of the activity to which the application relates.

I&APs have been identified through a process of networking and referral, obtaining information from Savannah Environmental's existing stakeholder database, liaison with potentially affected parties in the greater surrounding area and a registration process involving the completion of a reply form. Key stakeholders and affected and surrounding landowners have been identified and registered on the project database. Other stakeholders are required to formally register their interest in the project through either directly contacting the Savannah Environmental Public Participation team via phone, text message (SMS and WhatsApp), email or fax, or registering their interest via the online stakeholder engagement platform. An initial list of key stakeholders identified and registered is listed in **Table 6.3**.

Table 6.3: Initial list of Stakeholders identified for the inclusion in the project database during the public participation process for Geelstert 1

Organs of State
National Government Departments²⁷
Department of Environmental Affairs
Department of Mineral Resources
Department of Energy
Department of Agriculture Forestry and Fisheries
Department of Water and Sanitation
Government Bodies and State-Owned Companies
Eskom Holdings SOC Limited
National Energy Regulator of South Africa (NERSA)
South African Civil Aviation Authority (CAA)
South African Heritage Resources Agency (SAHRA)
South African National Roads Agency Limited (SANRAL)
South African Radio Astronomy Observatory (SARAO)

²⁷ These government departments are soon to be known as the Department of Environment, Forestry and Fisheries (DEFF), Department of Resources and Energy (DMRE), Department of Agriculture, Land Reform and Rural Development (DALRD) and the Department of Human Settlements, Water and Sanitation.

Telkom SA SOC Limited

Transnet SA SOC Limited

Provincial Government Departments

Northern Cape Department of Agriculture

Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform (DAEARD&LR)

Northern Cape Department of Roads and Public Works

Ngwao Boswa Kapa Bokone (NBKB) – provincial Heritage Authority

Local Government Departments

Namakwa District Municipality

Khâi-Ma Local Municipality – including the Ward Councillor, ward committee members, community representative or local community forum members

Commenting Stakeholders

BirdLife South Africa

Endangered Wildlife Trust (EWT)

SENTECH

Landowners

Affected landowners, tenants and occupiers

Neighbouring landowners, tenants and occupiers

As per Regulation 42 of the EIA Regulations, 2014 (as amended), all relevant stakeholder and I&AP information has been recorded within a register of I&APs (refer to **Appendix C2** for a listing of the recorded parties). In addition to the above-mentioned EIA Regulations, point 4.1 of the Public Participation Guidelines has also been followed. The register of I&APs contains the names²⁸ of:

- » all persons who requested to be registered on the database through the use of the online stakeholder engagement platform or in writing and disclosed their interest in the project;
- » all Organs of State which hold jurisdiction in respect of the activity to which the application relates; and
- » all persons who submitted written comments or attended virtual meetings and viewed the narrated presentations on the Savannah Environmental online platform during the public participation process.

I&APs have been encouraged to register their interest in the BA process from the onset of the project, and the identification and registration of I&APs will be on-going for the duration of the BA process. The database of I&APs will be updated throughout the BA process and will act as a record of all I&APs involved in the public participation process.

²⁸ Contact details and addresses have not been included in the I&AP database as this information is protected by the Protection of Personal Information Act (No 4 of 2013).

ii. Advertisements and Notifications

- 40.(2)(a) Fixing a notice board at a place conspicuous to and accessible by the public at the boundary, on the fence or along the corridor of –
- (i) The site where the activity to which the application or proposed application relates is or is to be undertaken; and
 - (ii) Any alternative site.
- 40.(2)(b) Giving written notice, in any of the manners provided for in section 47D of the Act, to –
- (i) The occupiers of the site and, if the proponent or applicant is not the owner or person in control of the site on which the activity is to be undertaken, the owner or person in control of the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;
 - (ii) Owners, persons in control of, and occupiers of land adjacent to the site where the activity is or is to be undertaken and to any alternative site where the activity is to be undertaken;
 - (iii) The municipal councillor of the ward in which the site and alternative site is situated and any organisation of ratepayers that represent the community in the area;
 - (iv) The municipality which has jurisdiction in the area;
 - (v) Any organ of state having jurisdiction in respect of any aspect of the activity; and
 - (vi) Any other party as required by the competent authority.
- 40.(2)(c) Placing an advertisement in –
- (i) One local newspaper; or
 - (ii) Any official Gazette that is published specifically for the purpose of providing public notice of applications or other submissions made in terms of these Regulations;
- 40.(2)(d) Placing an advertisement in at least one provincial newspaper or national newspaper, if the activity has or may have an impact that extends beyond the boundaries of the metropolitan or district municipality in which it is or will be undertaken: Provided that this paragraph need not be complied with if an advertisement has been placed in an official Gazette referred to in paragraph (c)(ii); and
- 40.(2)(e) Using reasonable alternative methods, as agreed to by the competent authority, in those instances where a person is desirous of but unable to participate in the process due to –
- (i) Illiteracy;
 - (ii) Disability; or
 - (iii) Any other disadvantage.

The BA process was announced with an invitation to the Organs of State, potentially affected and neighbouring landowners and general public to register as I&APs and to actively participate in the process. This was achieved via the following:

- » Compilation of a background information document (BID) (refer to **Appendix C4**) providing technical and environmental details on the project and how to become involved in the BA process. The BID and the BA process notification letters announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/IAPs of Geelstert 1, and providing background information of the project and inviting I&APs to register on the project's database were distributed via email on **13 July 2020**. The evidence of the distribution is contained in **Appendix C** of the BA Report. The BID is also available electronically on the Savannah Environmental website (www.savannahsa.com/public-documents/energy-generation/geelstert-1-and-geelstert-2-solar-pv-facilities-and-associated-grid-connection/).

- » Placement of site notices announcing the BA process at visible points along the boundary of the study area (i.e. the boundaries of the affected property), in accordance with the requirements of the EIA Regulations on **24 June 2020**. Photographs and the GPS co-ordinates of the site notices are contained in **Appendix C3**.
- » Placement of an advertisement in the Gemsbok Newspaper on **19 August 2020** at the commencement of the 30-day review and comment period (**Appendix C3**). This advert:
 - * announced the project and the associated BA process,
 - * announced the availability of the BA report, the review period, and where it is accessible for review, and invited comment on the BA Report,
 - * provided all relevant details to access the Savannah Environmental online stakeholder engagement platform.
- » A copy of the newspaper advert as sent to the newspaper is included in **Appendix C3** of the BA Report. The newspaper advert tear sheet will be included in the Final BA Report in **Appendix C3**.
- » A Radio Live Read by Radio NFM (98.1FM) on **20 August 2020** at the commencement of the 30-day review and comment period (**Appendix C4**). Further Radio Live Read segments have also been undertaken at Radio NFM as a reminder of the availability of the BA report for review and comment on **31 August 2020** and **14 September 2020**. Radio NFM is the local radio station covering the study area.
- » The BA Report has been made available for review by I&APs for a 30-day review and comment period from **20 August 2020** to **21 September 2020**. An electronic version of the BA Report (CD and/or Dropbox access link) have been circulated to Organs of State via courier and/or email at the commencement of the 30-day review period. The full BA Report is also available on the Savannah Environmental website. The evidence of distribution of the BA Report will be included in the final BA Report, which will be submitted to the DEA.

iii. Public Involvement and Consultation

In order to accommodate the varying needs of stakeholders and I&APs within the surrounding area, as well as capture their views, comments, issues and concerns regarding the project, various opportunities have been and will continue to be provided to I&APs to note their comments and issues. I&APs are being consulted through the following means:

Table 6.4: Public involvement for Geelstert 1

Activity	Date
Placement of site notices.	24 June 2020
Distribution of the BID, process notification letters and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database.	13 July 2020
The BID and electronic reply form was also made available on the online stakeholder engagement platform.	
Advertising of the availability of the BA Report for a 30-day review and comment period in Gemsbok Newspaper, including details on how to access the BA Report via the online stakeholder engagement platform.	19 August 2020
Radio Live Read by the Radio NFM (98.1FM) advertising the availability of the	31 August 2020

BA Report for a 30-day review and comment period, and the details of how to get involved and how contact with Savannah Environmental can be made.	14 September 2020
Distribution of notification letters announcing the availability of the BA Report for a 30-day review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the surrounding area (including neighbouring landowners) and key stakeholder groups.	19 August 2020
30-day review and comment period of the BA Report.	20 August 2020 – 21 September 2020
Virtual meetings through the use of virtual platforms as determined through discussions with the relevant stakeholder group: <ul style="list-style-type: none"> » Landowners » Authorities and key stakeholders (including Organs of State, local municipality and official representatives of community-based organisations). » Where an I&AP does not have access to a computer and/or internet to participate in a virtual meeting telephonic discussions (including WhatsApp video call) will be set-up and minuted for inclusion. The preferred language of the I&AP has been considered when setting up these discussions. 	To be held during the 30-day review and comment period
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs.	Throughout BA process

iv. Registered I&APs entitled to Comment on the BA Report

- 43.(1) A registered I&AP is entitled to comment, in writing, on all reports or plans submitted to such party during the public participation process contemplated in these Regulations and to bring to the attention of the proponent or applicant any issues which that party believes may be of significance to the consideration of the application, provided that the interested and affected party discloses any direct business, financial, personal or other interest which that party may have in the approval or refusal of the application.
- (2) In order to give effect to section 24O of the Act, any State department that administers a law relating to a matter affecting the environment must be requested, subject to regulation 7(2), to comment within 30 days.
- 44.(1) The applicant must ensure that the comments of interested and affected parties are recorded in reports and plans and that such written comments, including responses to such comments and records of meetings, are attached to the reports and plans that are submitted to the competent authority in terms of these Regulations.
- (2) Where a person desires but is unable to access written comments as contemplated in subregulation (1) due to –
- (a) A lack of skills to read or write;
 - (b) Disability; or
 - (c) Any other disadvantage;
- Reasonable alternative methods of recording comments must be provided for.

I&APs registered on the database have been notified by means of a notification letter of the release of the BA Report for a 30-day review and comment period, invited to provide comment on the BA Report, and informed of the manner in which, and timeframe within which such comment must be made. The report has been made available in soft copies to I&APs due to restrictions and limitations on public spaces during the national state of disaster related to COVID-19. No hard copies of the report have been made available for review and comment.

The BA Report has also been made available on the Savannah Environmental website (i.e. online stakeholder engagement platform (www.savannahsa.com/public-documents/energy-generation/geelstert-1-and-geelstert-2-solar-pv-facilities-and-associated-grid-connection/)). The notification was distributed prior to commencement of the 30-day review and comment period, on **19 August 2020**. Where I&APs were not able to provide written comments (including SMS and WhatsApp), other means of consultation, such telephonic discussions were used to provide the I&APs with a platform to verbally raise their concerns and comments on the proposed development. Submission of comments has been enabled through the use of the Savannah Environmental online stakeholder engagement platform.

All comments raised as part of the discussions and written comments submitted during the 30-day review and comment period will be recorded and included in **Appendix C9** of the BA Report.

v. Identification and Recording of Comments

Comments raised by I&APs over the duration of the BA process have been synthesised into a Comments and Responses (C&R) Report which is included in **Appendix C9** of the BA Report. These include comments raised through the use of the Savannah Environmental online stakeholder engagement platform. The C&R Report includes detailed responses from members of the EIA project team and/or the project proponent to the issues and comments raised during the public participation process.

Following the distribution of the process notification letter and BID on 13 July 2020, specific comments have been raised and recorded, and addressed as part of this BA Report. The main comments submitted to Savannah Environmental prior to the release of the BA report pertain to the impact on avifauna (submitted by Samantha Ralston-Paton of BirdLife South Africa) and specifically the presence of Red Lark Habitat in the area; the need for an assessment of heritage impacts as per the requirements of the National Heritage Resources Act (submitted by Natasha Higgitt and Phillip Hine of the South African Heritage Resources Agency); and the potential impact of the project on areas formally set aside as biodiversity offsets by the Black Mountain Mine for the Gamsberg Mine operating in the Aggeneys area (submitted by Mark Botha of Conservation Strategy, Tactics and Insight).

The comment raised on the impact of avifauna, and specifically the Red Lark, has been addressed and fully assessed (including the provision of appropriate mitigation measures) through the undertaking of an Avifauna Impact Assessment (**Appendix E**). The requirements for the assessment of impacts on heritage resources has been complied with through the undertaking of a Heritage Screening Report (**Appendix H**) which considers the archaeological and palaeontological resources, and the sensitivity thereof, within the area proposed for development. The comments pertaining to the location of the proposed project within areas considered for biodiversity offsets has been resolved through further consultation with the I&AP and officials from the DENC²⁹.

²⁹ The Northern Cape Department of Environment and Nature Conservation is now referred to as the Department of Agriculture, Environmental Affairs, Rural Development and Land Reform.

Specific project information, as per the request of the I&AP, was submitted for their consideration in order to further advise and confirm the location of the biodiversity offset areas in relation to the project. It was confirmed via email that Geelstert 1 does not fall within an area set aside for biodiversity offsets, which was also confirmed by Conrad Geldenhuys of the DENC.

Further to the above, meeting notes of all the telephonic discussions and virtual meetings conducted during the 30-day review and comment period of the BA Report will be included in **Appendix C8**.

The C&R Report will be updated with all comments received during the 30-day review and comment period and will be included as **Appendix C9** in the final BA Report that will be submitted to the DEA for decision-making.

6.4 Assessment of Issues Identified through the BA Process

Issues identified as requiring investigation, as well as the specialist consultants involved in the assessment of these impacts are indicated in **Table 6.5** below.

Table 6.5: Specialist consultants appointed to evaluate the potential impacts associated with Geelstert 1

Specialist Name	Specialist Company	Specialist Expertise	Area of	Appendices
Simon Todd	3Foxes Biodiversity Consulting (Pty) Ltd	Ecology		Appendix D
Eric Hermann	3Foxes Biodiversity Consulting (Pty) Ltd	Avifauna		Appendix E
Gerhard Botha	Nkurenkuru Ecology & Biodiversity	Freshwater		Appendix F
Garry Paterson	Agricultural Research Council: Soil, Climate, Water (SCW)	Soils and Agricultural Potential		Appendix G
Jenna Lavin	CTS Heritage (Pty) Ltd	Heritage		Appendix H
Jon Marshall	Environmental Planning and Design (Pty) Ltd	Visual		Appendix I
Lisa Opperman and Neville Bews	Savannah Environmental (Pty) Ltd and Neville Bews and Associates	Social		Appendix J
Amory Le Roux-Arries	Knight Piésold	Traffic		Appendix K

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of Geelstert 1. Issues were assessed in terms of the following criteria:

- » The **nature**, a description of what causes the effect, what will be affected, and how it will be affected;
- » The **extent**, wherein it is indicated whether the impact will be local (limited to the immediate area or site of development), regional, national or international. A score of between 1 and 5 is assigned as appropriate (with a score of 1 being low and a score of 5 being high);
- » The **duration**, wherein it is indicated whether:
 - * The lifetime of the impact will be of a very short duration (0–1 years) – assigned a score of 1;
 - * The lifetime of the impact will be of a short duration (2-5 years) - assigned a score of 2;
 - * Medium-term (5–15 years) – assigned a score of 3;
 - * Long term (> 15 years) - assigned a score of 4;
 - * Permanent - assigned a score of 5.

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

The **significance** is determined by combining the criteria in the following formula:

$S = (E+D+M) P$; where

S = Significance weighting.

E = Extent.

D = Duration.

M = Magnitude.

P = Probability.

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

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

As the proponent has the responsibility to avoid or minimise impacts and plan for their management (in terms of the EIA Regulations, 2014 (as amended)), the mitigation of significant impacts is discussed. An assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation

measures. An Environmental Management Programme (EMPr) that includes all the mitigation measures recommended by the specialists for the management of significant impacts is included as **Appendix M**.

6.5 Outcomes of the DEA Web-Based Screening Tool

In terms of GN R960 (promulgated on 5 July 2019) and Regulation 16(1)(b)(v) of the 2014 EIA Regulations (as amended), the submission of a Screening Report generated from the national web based environmental screening tool is compulsory for the submission of applications in terms of Regulations 19 and 21 of the EIA Regulations.

The requirement for the submission of a Screening Report (included as **Appendix L** of the BA Report) for Geelstert 1 is applicable as it triggers Regulation 19 of the EIA Regulations, 2014 (as amended). **Table 6.6** provides a summary of the specialist assessments identified in terms of the screening tool and responses to each assessment from the project team considering the development area under consideration.

Table 6.6: Sensitivity ratings from the DEA's web-based online Screening Tool associated with the development of Geelstert 1

Specialist Assessment	Sensitivity Rating as per the Screening Tool (relating the to need for the study)	Project Team Response
Agricultural Impact Assessment	Low	The findings of a Soils, Land Use and Agriculture Impact Assessment indicate that the development footprint under consideration for the development of Geelstert 1 is associated with a low agricultural potential. The Soils, Land Use and Agriculture Impact Assessment is included in this BA Report as Appendix G .
Landscape/Visual Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	A Visual Impact Assessment has been undertaken for Geelstert 1 and is included in this BA Report as Appendix I .
Archaeological and Cultural Heritage Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	A Heritage Screening Report (which covers both archaeological and cultural aspects of the study area and the development area) has been undertaken for Geelstert 1 and is included in this BA Report as Appendix H .
Palaeontology Impact Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified based on the technology proposed.	The Heritage Screening Report (included as Appendix H) of the BA Report includes an assessment of palaeontological resources within the study area and development area.

Terrestrial Biodiversity Impact Assessment	Very High	An Ecological Impact Assessment (including flora and fauna) has been undertaken for the Geelstert 1 and is included as Appendix D of the BA Report.
Aquatic Biodiversity Impact Assessment	Very High	A Freshwater Resource Study & Assessment has been undertaken for the Geelstert 1 and is included as Appendix F of the BA Report.
Avian Impact Assessment	High	An Avifauna Impact Assessment has been undertaken for the Geelstert 1 and is included as Appendix E of the BA Report.
Civil Aviation Assessment	Low	The Geelstert 1 development footprint is located approximately 12km east of the Aggeneys Aerodrome. The Civil Aviation Authority (CAA) will be consulted during the 30-day review and comment period of the BA Report to provide written comments on the proposed development.
Defence Assessment	Low	The nearest South African Defence Force (SANDF) Army Base is the 8 South African Infantry Battalion (Mechanized Infantry) located near Upington in the Northern Cape Province. The base is located approximately 266km north-east of the Geelstert 1 development footprint.
RFI Assessment	Very High	The Geelstert 1 development footprint under consideration is outside the radius of the Karoo Central Astronomy Advantage Area declared in terms of the Astronomy Geographic Advantage Act (Act No. 21 of 2007) of 2007. The South African Radio Astronomy Observatory (SARAO) will however be consulted during the 30-day review and comment period of the BA Report to provide written comments on the proposed development. A map showing the location of the Geelstert Grid Connection corridor in relation to the Karoo Central Astronomy Advantage Area has been included as Appendix O of the BA Report.
Geotechnical Assessment	Screening Report did not include a rating for this theme.	A Geotechnical Assessment for Geelstert 1 will be undertaken by the proponent after the project has been granted EA by the Competent Authority and the project has been awarded preferred bidder status under the DMRE's REIPPPP.
Socio-Economic Assessment	Screening Report did not include a rating for this theme; however, the specialist assessment was identified.	A Social Impact Assessment for the purposes of the BA process has been undertaken for the purposes of the BA process and has been included as Appendix J of the BA Report. A Socio-Economic Impact Assessment for the project will be undertaken by the proponent after the project has been granted EA by the Competent Authority and the project has been awarded preferred bidder

		status under the DMRE's REIPPP.
Plant Species Assessment	Low	An Ecological Impact Assessment (including flora and fauna) has been undertaken for Geelster 1 and is included as Appendix D of the BA Report.
Animal Species Assessment	Low	

6.6 Assumptions and Limitations of the BA Process

The following assumptions and limitations are applicable to the studies undertaken within this BA process:

- » All information provided by the developer and I&APs to the environmental team was correct and valid at the time it was provided.
- » It is assumed that the development area and development footprint for the solar PV facility identified by the developer represents a technically suitable site for the establishment of Geelster 1 which is based on the design undertaken by technical consultants for the project.
- » This report and its investigations are project-specific, and consequently the environmental team did not evaluate any other power generation alternatives.

Refer to the specialist studies in **Appendices D – K** for specialist study specific limitations.

6.7 Legislation and Guidelines that have informed the preparation of this Basic Assessment Report

The following legislation and guidelines have informed the scope and content of this BA Report:

- » National Environmental Management Act (Act No. 107 of 1998);
- » EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended);
- » Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations;
- » 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 the National Environmental Management Act, 1998, when applying for environmental authorisation; and
- » International guidelines – the Equator Principles, the IFC Performance Standards, the Sustainable Development Goals, World Bank Environmental and Social Framework, and the and World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines).

Table 6.7 provides an outline of the legislative permitting requirements applicable to Geelster 1 as identified at this stage in the project process.

Table 6.7: Applicable Legislation, Policies and/or Guidelines associated with the development of Geelster 1

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
National Legislation			
Constitution of the Republic of South Africa (No. 108 of 1996)	<p>In terms of Section 24, the State has an obligation to give effect to the environmental right. The environmental right states that:</p> <p><i>"Everyone has the right –</i></p> <ul style="list-style-type: none"> » <i>To an environment that is not harmful to their health or well-being, and</i> » <i>To have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that:</i> <ul style="list-style-type: none"> * <i>Prevent pollution and ecological degradation,</i> * <i>Promote conservation, and</i> * <i>Secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development."</i> 	Applicable to all authorities	There are no permitting requirements associated with this Act. The application of the Environmental Right however implies that environmental impacts associated with proposed developments are considered separately and cumulatively. It is also important to note that the "right to an environment clause" includes the notion that justifiable economic and social development should be promoted, through the use of natural resources and ecologically sustainable development.
National Environmental Management Act (No 107 of 1998) (NEMA)	<p>The 2014 EIA Regulations have been promulgated in terms of Chapter 5 of NEMA. Listed activities which may not commence without EA are identified within the Listing Notices (GNR 327, GNR 325 and GNR 324) which form part of these Regulations (GNR 326).</p> <p>In terms of Section 24(1) of NEMA, the potential impact on the environment associated with these listed activities must be assessed and reported on to the competent authority charged by NEMA with granting of the relevant environmental authorisation.</p> <p>Considering the location of the study area is within the Springbok Renewable Energy Development Zone (REDZ 8) and the requirements GNR114 of 16 February 2018, a Basic Assessment Process is required to be undertaken for</p>	DEA – Competent Authority Northern Cape DAEARD&LR – Commenting Authority	The listed activities triggered by the proposed project have been identified and are being assessed as part of the BA process currently underway for the project. The BA process will culminate in the submission of a final BA Report to the competent authority in support of the application for EA.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>the proposed project. All relevant listing notices for the project (GN R327, GN R325 and GN R324) will be applied for</p>		
<p>National Environmental Management Act (No 107 of 1998) (NEMA)</p>	<p>In terms of the "Duty of Care and Remediation of Environmental Damage" provision in Section 28(1) of NEMA every person who causes, has caused or may cause significant pollution or degradation of the environment must take reasonable measures to prevent such pollution or degradation from occurring, continuing or recurring, or, in so far as such harm to the environment is authorised by law or cannot reasonably be avoided or stopped, to minimise and rectify such pollution or degradation of the environment.</p> <p>In terms of NEMA, it is the legal duty of a project proponent to consider a project holistically, and to consider the cumulative effect of a variety of impacts.</p>	<p>DEA Northern Cape DAEARD&LR</p>	<p>While no permitting or licensing requirements arise directly by virtue of the proposed project, this section finds application through the consideration of potential cumulative, direct, and indirect impacts. It will continue to apply throughout the life cycle of the project.</p>
<p>Environment Conservation Act (No. 73 of 1989) (ECA)</p>	<p>The Noise Control Regulations in terms of Section 25 of the ECA contain regulations applicable for the control of noise in the Provinces of Limpopo, North West, Mpumalanga, Northern Cape, Eastern Cape, and KwaZulu-Natal Provinces.</p> <p>The Noise Control Regulations cover the powers of a local authority, general prohibitions, prohibitions of disturbing noise, prohibitions of noise nuisance, use of measuring instruments, exemptions, attachments, and penalties.</p> <p>In terms of the Noise Control Regulations, no person shall make, produce or cause a disturbing noise, or allow it to be made, produced or caused by any person, machine, device or apparatus or any combination thereof (Regulation 04).</p>	<p>DEA Northern Cape DAEARD&LR</p> <p>Khâi-Ma Municipality</p>	<p>Noise impacts are expected to be associated with the construction phase of the project. Considering the location of the development area in relation to residential areas and provided that appropriate mitigation measures are implemented, construction noise is unlikely to present a significant intrusion to the local community. There is therefore no requirement for a noise permit in terms of the legislation.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>National Water Act (No. 36 of 1998) (NWA)</p>	<p>A water use listed under Section 21 of the NWA must be licensed with the Regional DWS, unless it is listed in Schedule 1 of the NWA (i.e. is an existing lawful use), is permissible under a GA, or if a responsible authority waives the need for a licence.</p> <p>Water use is defined broadly, and includes consumptive and non-consumptive water uses, taking and storing water, activities which reduce stream flow, waste discharges and disposals, controlled activities (activities which impact detrimentally on a water resource), altering a watercourse, removing water found underground for certain purposes, and recreation.</p> <p>Consumptive water uses may include taking water from a water resource (Section 21(a)) and storing water (Section 21(b)).</p> <p>Non-consumptive water uses may include impeding or diverting of flow in a water course (Section 21(c)), and altering of bed, banks or characteristics of a watercourse (Section 21(i)).</p>	<p>Regional Department of Water and Sanitation</p>	<p>The Geelster 1 development footprint is located within the regulated area of depression wetlands present within the development area to the west and outside of the development footprint of the solar PV facility. As a result, a water use authorisation for the project will be required from DWS; however, the process will only be completed once a positive EA has been received and the project selected as Preferred Bidder by the DMRE. This is in line with the requirements from DWS.</p>
<p>Minerals and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA)</p>	<p>In accordance with the provisions of the MPRDA a mining permit is required in accordance with Section 27(6) of the Act where a mineral in question is to be mined, including the mining of materials from a borrow pit.</p> <p>Section 53 of the MPRDA states that any person who intends to use the surface of any land in any way which may be contrary to any object of the Act, or which is</p>	<p>Department of Mineral Resources and Energy (DMRE)</p>	<p>Any person who wishes to apply for a mining permit in accordance with Section 27(6) must simultaneously apply for an Environmental Authorisation in terms of NEMA. No borrow pits are expected to be required for the construction of the project, and as a result a mining permit or EA in this regard is not required to be obtained.</p> <p>In terms of Section 53 of the MPRDA approval is required from the Minister of Mineral Resources and Energy to ensure</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	likely to impede any such object must apply to the Minister for approval in the prescribed manner.		that the proposed development does not sterilise a mineral resource that might occur on site.
National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA)	<p>The National Dust Control Regulations (GNR 827) published under Section 32 of NEM:AQA prescribe the general measures for the control of dust in all areas, and provide a standard for acceptable dustfall rates for residential and non-residential areas.</p> <p>In accordance with the Regulations (GNR 827) any person who conducts any activity in such a way as to give rise to dust in quantities and concentrations that may exceed the dustfall standard set out in Regulation 03 must, upon receipt of a notice from the air quality officer, implement a dustfall monitoring programme.</p> <p>Any person who has exceeded the dustfall standard set out in Regulation 03 must, within three months after submission of the dustfall monitoring report, develop and submit a dust management plan to the air quality officer for approval.</p>	Northern Cape DAEARD&LR / Namakwa District Municipality	In the event that the project results in the generation of excessive levels of dust the possibility could exist that a dustfall monitoring programme would be required for the project, in which case dustfall monitoring results from the dustfall monitoring programme would need to be included in a dust monitoring report, and a dust management plan would need to be developed. However, with mitigation measures implemented, Geelster 1 is not anticipated to result in significant dust generation.
National Heritage Resources Act (No. 25 of 1999) (NHRA)	<p>Section 07 of the NHRA stipulates assessment criteria and categories of heritage resources according to their significance.</p> <p>Section 35 of the NHRA provides for the protection of all archaeological and palaeontological sites, and meteorites.</p> <p>Section 36 of the NHRA provides for the conservation and care of cemeteries and graves by SAHRA where this is not the responsibility of any other authority.</p>	<p>South African Heritage Resources Agency (SAHRA)</p> <p>Ngwao Boswa Kapa Bokone (NBKB) – provincial heritage authority</p>	<p>A desktop Heritage Screening Report has been undertaken as part of the BA process (refer to Appendix H of this BA Report). No sites of heritage significance were identified within the development footprint or development area of Geelster 1.</p> <p>Should a heritage resource be impacted upon, a permit may be required from SAHRA or Ngwao Boswa Kapa Bokone (NBKB) in accordance with of Section 48 of the NHRA, and the SAHRA Permit</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>Section 38 of the NHRA lists activities which require developers or any person who intends to undertake a listed activity to notify the responsible heritage resources authority and furnish it with details regarding the location, nature, and extent of the proposed development.</p> <p>Section 44 of the NHRA requires the compilation of a Conservation Management Plan as well as a permit from SAHRA for the presentation of archaeological sites as part of tourism attraction.</p>		<p>Regulations (GN R668). This will be determined as part of the final walk through survey prior to the commencement of the construction phase of the development.</p>
<p>National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)</p>	<p>Section 53 of NEM:BA provides for the MEC / Minister to identify any process or activity in such a listed ecosystem as a threatening process.</p> <p>Three government notices have been published in terms of Section 56(1) of NEM:BA as follows:</p> <ul style="list-style-type: none"> » Commencement of TOPS Regulations, 2007 (GNR 150). » Lists of critically endangered, vulnerable and protected species (GNR 151). » TOPS Regulations (GNR 152). <p>It provides for listing threatened or protected ecosystems, in one of four categories: critically endangered (CR), endangered (EN), and vulnerable (VU) or protected. The first national list of threatened terrestrial ecosystems has been gazetted, together with supporting information on the listing process including the purpose and rationale for listing ecosystems, the criteria used to identify listed ecosystems, the implications of listing ecosystems, and summary statistics and national maps of listed ecosystems (NEM:BA: National list of ecosystems that are threatened and in need of protection, (Government Gazette 37596,</p>	<p>DEA</p> <p>Northern Cape DENC</p>	<p>Under NEM:BA, a permit would be required for any activity that is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>Two (2) listed terrestrial mammals may occur within the development area; these include the Vulnerable Leopard <i>Panthera pardus</i> and the Black-footed Cat <i>Felis negripes</i>. Given the extremely low vegetation cover within the study area, it is unlikely that Leopards are present within the development area. The habitat is however broadly suitable for the Black-footed Cat, which favours a mix of open and densely vegetated areas. This species is widely distributed across the arid and semi-arid areas of South Africa and the development of Geelstert 1 would not amount to a significant habitat loss for these species.</p> <p>As per the findings of the Ecological</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	GNR 324), 29 April 2014).		Impact Assessment (Appendix D), the development footprint of Geelster 1 is located within the Bushmanland Arid Grassland vegetation, which is the second most extensive vegetation type in South Africa, occupying an area of approximately 45 478km ² . Given the extensive nature of the vegetation type, the development of Geelster 1 would not significantly impact the extent of intact habitat within this vegetation. In addition, the Bushmanland Arid Grassland is not considered to be a threatened terrestrial ecosystem.
National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)	<p>Chapter 5 of NEM: BA pertains to alien and invasive species, and states that a person may not carry out a restricted activity involving a specimen of an alien species without a permit issued in terms of Chapter 7 of NEM: BA, and that a permit may only be issued after a prescribed assessment of risks and potential impacts on biodiversity is carried out.</p> <p>Applicable, and exempted alien and invasive species are contained within the Alien and Invasive Species List (GNR 864).</p>	DEA Northern Cape DAEAR&LR	No NEMBA-listed alien invasive plant species were identified within the development footprint of Geelster 1. A generic Alien Plant and Open Space Management Plan (included as Appendix C of the EMPr) has been included in the EMPr and the recommended mitigation measures of the plan should be implemented during the project life cycle phases of the proposed development.
Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)	<p>Section 05 of CARA provides for the prohibition of the spreading of weeds.</p> <p>Regulation 15 of GN R1048 published under CARA provides for the classification of categories of weeds and invader plants, and restrictions in terms of where these species may occur.</p>	Department of Agriculture, Land Reform and Rural Development (DALRD)	CARA will find application throughout the life cycle of the project. In this regard, soil erosion prevention and soil conservation strategies need to be developed and implemented. In addition, a weed control and management plan must be implemented.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>Regulation 15E of GN R1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.</p>		<p>In terms of Regulation 15E (GN R1048) where Category 1, 2 or 3 plants occur a land user is required to control such plants by means of one or more of the following methods:</p> <ul style="list-style-type: none"> » Uprooting, felling, cutting or burning. » Treatment with a weed killer that is registered for use in connection with such plants in accordance with the directions for the use of such a weed killer. » Biological control carried out in accordance with the stipulations of the Agricultural Pests Act (No. 36 of 1983), the ECA and any other applicable legislation. » Any other method of treatment recognised by the executive officer that has as its object the control of plants concerned, subject to the provisions of sub-regulation 4. » A combination of one or more of the methods prescribed, save that biological control reserves and areas where biological control agents are effective shall not be disturbed by other control methods to the extent that the agents are destroyed or become ineffective.
<p>National Forests Act (No. 84 of 1998) (NFA)</p>	<p>According to this Act, the Minister may declare a tree, group of trees, woodland or a species of trees as protected. Notice of the List of Protected Tree Species under the National Forests Act (No. 84 of 1998) was</p>	<p>Department of Agriculture, Land Reform and Rural Development (DALRD)</p>	<p>A licence is required for the removal of protected trees. It is therefore necessary to conduct a survey that will determine the number and relevant details pertaining to</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>published in GNR 734.</p> <p>The prohibitions provide that “no person may cut, damage, disturb, destroy or remove any protected tree, or collect, remove, transport, export, purchase, sell, donate or in any other manner acquire or dispose of any protected tree, except under a licence granted by the Minister”.</p>		<p>protected tree species present in the development footprint for the submission of relevant permits to authorities prior to the disturbance of these individuals.</p> <p>The Ecological Impact Assessment undertaken as part of the BA Report included the identification of any protected tree species which may require a license in terms of the NFA (No. 84 of 1998) within the development footprint (refer to Appendix D of this BA Report).</p> <p>No NFA-listed tree species were identified within the development footprint of Geelster 1.</p>
<p>National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)</p>	<p>Chapter 4 of the NVFFA places a duty on owners to prepare and maintain firebreaks, the procedure in this regard, and the role of adjoining owners and the fire protection association. Provision is also made for the making of firebreaks on the international boundary of the Republic of South Africa. The applicant must ensure that firebreaks are wide and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land, it does not cause soil erosion, and it is reasonably free of inflammable material capable of carrying a veldfire across it.</p> <p>Chapter 5 of the Act places a duty on all owners to acquire equipment and have available personnel to fight fires. Every owner on whose land a veldfire may start or burn or from whose land it may spread must have such equipment, protective clothing and trained personnel for extinguishing fires, and ensure that in his or</p>	<p>DEA</p>	<p>While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of Geelster 1, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and trained personnel for firefighting purposes.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>her absence responsible persons are present on or near his or her land who, in the event of fire, will extinguish the fire or assist in doing so, and take all reasonable steps to alert the owners of adjoining land and the relevant fire protection association, if any.</p>		
<p>Hazardous Substances Act (No. 15 of 1973) (HAS)</p>	<p>This Act regulates the control of substances that may cause injury, or ill health, or death due to their toxic, corrosive, irritant, strongly sensitising or inflammable nature or the generation of pressure thereby in certain instances and for the control of certain electronic products. To provide for the rating of such substances or products in relation to the degree of danger, to provide for the prohibition and control of the importation, manufacture, sale, use, operation, modification, disposal or dumping of such substances and products.</p> <ul style="list-style-type: none"> » Group I and II: Any substance or mixture of a substance that might by reason of its toxic, corrosive etc., nature or because it generates pressure through decomposition, heat or other means, cause extreme risk of injury etc., can be declared as Group I or Group II substance » Group IV: any electronic product, and » Group V: any radioactive material. <p>The use, conveyance, or storage of any hazardous substance (such as distillate fuel) is prohibited without an appropriate license being in force.</p>	<p>Department of Health (DoH)</p>	<p>It is necessary to identify and list all Group I, II, III, and IV hazardous substances that may be on site and in what operational context they are used, stored or handled. If applicable, a license would be required to be obtained from the Department of Health (DoH).</p>
<p>National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA)</p>	<p>The Minister may by notice in the Gazette publish a list of waste management activities that have, or are likely to have, a detrimental effect on the environment.</p> <p>The Minister may amend the list by –</p>	<p>DEA) – Hazardous Waste Northern Cape DAE ARD&LR – General Waste</p>	<p>No waste listed activities are triggered by Geelster 1, therefore, no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<ul style="list-style-type: none"> » Adding other waste management activities to the list. » Removing waste management activities from the list. » Making other changes to the particulars on the list. <p>In terms of the Regulations published in terms of NEM:WA (GNR 912), a BA or EIA is required to be undertaken for identified listed activities.</p> <p>Any person who stores waste must at least take steps, unless otherwise provided by this Act, to ensure that:</p> <ul style="list-style-type: none"> » The containers in which any waste is stored, are intact and not corroded or in » Any other way rendered unfit for the safe storage of waste. » Adequate measures are taken to prevent accidental spillage or leaking. » The waste cannot be blown away. » Nuisances such as odour, visual impacts and breeding of vectors do not arise, and » Pollution of the environment and harm to health are prevented. 		<p>required during construction and operation. The National Norms and Standards for the Storage of Waste (GNR 926) published under Section 7(1)(c) of NEM:WA will need to be considered in this regard.</p>
<p>National Road Traffic Act (No. 93 of 1996) (NRTA)</p>	<p>The technical recommendations for highways (TRH 11): "Draft Guidelines for Granting of Exemption Permits for the Conveyance of Abnormal Loads and for other Events on Public Roads" outline the rules and conditions which apply to the transport of abnormal loads and vehicles on public roads and the detailed procedures to be followed in applying for exemption permits are described and discussed.</p> <p>Legal axle load limits and the restrictions imposed on</p>	<p>South African National Roads Agency (SANRAL) – national roads</p> <p>Northern Cape Department of Transport, Safety and Liaison</p>	<p>An abnormal load / vehicle permit may be required to transport the various components to site for construction. These include route clearances and permits required for vehicles carrying abnormally heavy or abnormally dimensioned loads and transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>abnormally heavy loads are discussed in relation to the damaging effect on road pavements, bridges, and culverts.</p> <p>The general conditions, limitations, and escort requirements for abnormally dimensioned loads and vehicles are also discussed and reference is made to speed restrictions, power/mass ratio, mass distribution, and general operating conditions for abnormal loads and vehicles. Provision is also made for the granting of permits for all other exemptions from the requirements of the National Road Traffic Act and the relevant Regulations.</p>		<p>substation components may not meet specified dimensional limitations (height and width) which will require a permit.</p>
Provincial Policies / Legislation			
<p>Northern Cape Nature Conservation Act (Act No. 9 of 2009)</p>	<p>This Act provides for the sustainable utilisation of wild animals, aquatic biota and plants; provides for the implementation of the Convention on International Trade in Endangered Species of Wild Fauna and Flora; provides for offences and penalties for contravention of the Act; provides for the appointment of nature conservators to implement the provisions of the Act; and provides for the issuing of permits and other authorisations. Amongst other regulations, the following may apply to the current project:</p> <ul style="list-style-type: none"> » Boundary fences may not be altered in such a way as to prevent wild animals from freely moving onto or off of a property; » Aquatic habitats may not be destroyed or damaged; » The owner of land upon which an invasive species is found (plant or animal) must take the necessary steps to eradicate or destroy such species; 	<p>Northern Cape DAEARD&LR</p>	<p>A collection/destruction permit must be obtained from Northern Cape DENC for the removal of any protected plant or animal species found on site.</p> <p>Species of conservation concern that may be present within the development footprint include, <i>Boscia foetida subsp. foetida</i> and <i>Hoodia gordonii</i>. Should these species be confirmed within the development footprint during any phase of the project, permits will be required from the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development & Land Reform.</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	The Act provides lists of protected species for the Province.		

6.7.2 Best Practice Guidelines Birds & Solar Energy (2017)

The Best Practice Guidelines: Birds & Solar Energy (2017) proposed by the Birds and Renewable Energy Specialist Group (BARESG) (convened by BirdLife South Africa and the Endangered Wildlife Trust) contain guidelines for assessing and monitoring the impact of solar generation facilities on birds in Southern Africa. The guidelines recognise the impact that solar energy may have on birds, through for example the alteration of habitat, the displacement of populations from preferred habitat, and collision and burn mortality associated with elements of solar hardware and ancillary infrastructure, and the fact that the nature and implications of these effects are poorly understood.

The guidelines are aimed at EAPs, avifaunal specialists, developers and regulators and propose a tiered assessment process, including:

- (i) Preliminary avifaunal assessment – an initial assessment of the likely avifauna in the area and possible impacts, preferably informed by a brief site visit and by collation of available data; also including the design of a site-specific survey and monitoring project should this be deemed necessary.
- (ii) Data collection – further accumulation and consolidation of the relevant avian data, possibly including the execution of baseline data collection work (as specified by the preliminary assessment), intended to inform the avian impact study.
- (iii) Impact assessment – a full assessment of the likely impacts and available mitigation options, based on the results of systematic and quantified monitoring if this was deemed a requisite at preliminary assessment.
- (iv) Monitoring – repetition of baseline data collection, plus the collection of mortality data. This helps to develop a complete before and after picture of impacts, and to determine if proposed mitigation measures are implemented and are effective or require further refinement. Monitoring may only be necessary for projects with the potential for significant negative impacts on birds (i.e. large area affected and / or vulnerable species present).

In terms of the guidelines, the quantity and quality of baseline data required to inform the assessment process at each site should be set in terms of the size of the site and the predicted impacts of the solar technology in question, the anticipated sensitivity of the local avifauna (for example, the diversity and relative abundance of priority species present, proximity to important flyways, wetlands or other focal sites) and the amount of existing data available for the area.

Data collection could vary from a single, short field visit (Regime 1, for e.g. at a small or medium sized site with low avifaunal sensitivity), to a series of multi-day survey periods, including the collection of various forms of data describing avian abundance, distribution and movement and spread over 12 months (Regime 3, for e.g. at a large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna). **Table 6.8** is taken from the best practise guidelines and provides a summary of the recommended assessment regimes in relation to proposed solar energy technology, project size, and likely risk).

Table 0.8: Recommended avian assessment regimes in relation to proposed solar energy technology, project size, and known impact risks.

Type of technology*	Size**	Avifaunal Sensitivity***		
		Low	Medium	High
All except CSP power tower	Small (< 30ha)	Regime 1	Regime 1	Regime 2

Type of technology*	Size**	Avifaunal Sensitivity***		
		Low	Medium	High
	Medium (30 – 150ha)	Regime 1	Regime 2	Regime 2
	Large (> 150ha)	Regime 2****	Regime 2	Regime 3
CSP power tower	All	Regime 3		

Regime 1: One site visit (peak season); minimum 1 – 5 days.

Regime 2: Pre- and post-construction; minimum 2 – 3 x 3 – 5 days over 6 months (including peak season); carcass searches.

Regime 3: Pre- and post-construction; minimum 4 – 5 x 4 – 8 days over 12 months, carcass searches.

* Different technologies may carry different intrinsic levels of risk, which should be taken into account in impact significance ratings

** For multi-phased projects, the aggregate footprint of all the phases should be used. At 3ha per MW, Small = < 10MW, Medium = 10 – 50MW, Large = > 50MW.

*** The avifaunal sensitivity is based on the number of priority species present, or potentially present, the regional, national or global importance of the affected area for these species (both individually and collectively), and the perceived susceptibility of these species (both individually and collectively) to the anticipated impacts of development. For example, an area would be considered to be of high avifaunal sensitivity if one or more of the following is found (or suspected to occur) within the broader impact zone:

- 1) Avifaunal habitat (e.g. a wetland, nesting or roost sites) of regional or national significance.
- 2) A population of a priority species that is of regional or national significance.
- 3) A bird movement corridor that is of regional or national significance.
- 4) A protected area and / or Important Bird and Biodiversity Area.

An area would be considered to be of medium avifaunal sensitivity if it does not qualify as high avifaunal sensitivity, but one or more of the following is found (or suspected to occur) within the broader impact zone

- 1) Avifaunal habitat (e.g. a wetland, nesting or roost sites) of local significance.
- 2) A locally significant population of a priority species.
- 3) A locally significant bird movement corridor.

An area would be considered to be of low avifaunal sensitivity if it does not meet any of the above criteria.

**** Regime 1 may be applied to some large sites, but only in instances where there is abundant existing data to support the assessment of low sensitivity.

The Geelstert 1 development footprint has been classified as a Regime 2 site, as the area has been defined as a medium sensitive area in terms of the BirdLife South Africa Guidelines. The development footprint considered for the development of Geelstert 1 is located 8km south-east of the Aggeneys Solar PV Facility, which is currently operational, therefore an impact on birds is anticipated in the area. Seasonal monitoring over three monitoring periods (that is, a five-day field survey in October 2018; a four-day field survey in April 2019; and a one-day field survey in June 2020) were completed and have informed the findings of the Avifauna Impact Assessment (refer to **Appendix E** of the BA Report).

6.7.3 The IFC EHS Guidelines

The IFC EHS Guidelines are technical reference documents with general and industry specific examples of Good International Industry Practice (GIIP). The following IFC EHS Guidelines have relevance to the proposed project:

- » IFC EHS General Guidelines
- » IFC EHS Guidelines for Electric Power Transmission and Distribution

The General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines, however no Industry Sector EHS Guidelines have been developed for PV solar power to date. The application of the General EHS Guidelines should be tailored to the hazards and risks associated with a project and should take into consideration site-specific variables which may be applicable, such as host country context, assimilative capacity of the environment, and other project factors. In instances where host country regulations differ from the standards presented in the EHS Guidelines, whichever is the more stringent of the two in this regard should be applied.

The General EHS Guidelines include consideration of the following:

- » Environmental:
 - * Air Emissions and Ambient Air Quality
 - * Energy Conservation
 - * Wastewater and Ambient Water Quality
 - * Water Conservation
 - * Hazardous Materials Management
 - * Waste Management
 - * Noise
 - * Contaminated Land
- » Occupational Health and Safety:
 - * General Facility Design and Operation
 - * Communication and Training
 - * Physical Hazards
 - * Chemical Hazards
 - * Biological Hazards
 - * Radiological Hazards
 - * Personal Protective Equipment (PPE)
 - * Special Hazard Environments
 - * Monitoring
- » Community Health and Safety:
 - * Water Quality and Availability
 - * Structural Safety of Project Infrastructure
 - * Life and Fire Safety (L&FS)
 - * Traffic Safety
 - * Transport of Hazardous Materials
 - * Disease Prevention
 - * Emergency Preparedness and Response
- » Construction and Decommissioning:
 - * Environment
 - * Occupational Health and Safety
 - * Community Health and Safety

6.7.4 IFC's Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (2015)

While no Industry Sector EHS Guidelines have been developed for solar PV facilities, the IFC has published a Project Developer's Guide to Utility-Scale Solar Photovoltaic Power Plants (IFC, 2015). Chapter 8 of the

Project Developer's Guide pertains to Permits, Licensing and Environmental Considerations, and states that in order to deliver a project which will be acceptable to international lending institutions, environmental and social assessments should be carried out in accordance with the requirements of the key international standards and principles, namely the Equator Principles and IFC's Performance Standards.

Some of the key environmental considerations for solar PV facilities contained within the Project Developer's Guide include:

Construction Phase Impacts

Construction activities lead to temporary air emissions (dust and vehicle emissions), noise related to excavation, construction and vehicle transit, solid waste generation and wastewater generation from temporary building sites and worker accommodation. In addition, Occupational Health and Safety (OHS) is an issue that needs to be properly managed during construction in order to minimise the risk of preventable accidents leading to injuries and / or fatalities. Proper OHS risk identification and management measures should be incorporated in every project's management plan and standard Engineering, Procurement and Construction (EPC) contractual clauses.

Response:

Impacts associated with the construction phase of the development have been identified and assessed as part of the detailed independent specialist studies undertaken as part of the BA process. Where applicable, appropriate mitigation measures with which to minimise the significance of the construction phase impacts have been identified and included in the EMPr prepared for Geelstert 1 and attached as **Appendix M** to this BA Report.

Water Usage

Although water use requirements are typically low for solar PV facilities, clusters of PV facilities may have a high cumulative water use requirement in arid areas where local communities rely upon scarce groundwater resources. In such scenarios, water consumption should be estimated and compared to local water abstraction by communities (if any), to ensure no adverse impacts on local people. O&M methods in relation to water availability and use should be carefully reviewed where risks of adverse impacts to community usage are identified.

Response:

Geelstert 1 would require approximately 10 000m³ of water during the 12 -18-month construction period, and approximately 5 000m³ of water per year over the 20-year operational lifespan. The water required will be sourced directly from the Khâi-Ma Local Municipality following a Service Level Agreement between the municipality and the proponent. Alternatively, water will be trucked into the development footprint or will be sourced from the Municipality's nearest Water Treatment Plant via a metered standpipe.

The recommendation that measures with which to minimise the project's water requirements must be investigated by the proponent is included in **Appendix M**.

Land Matters

As solar power is one of the most land-intensive power generation technologies, land acquisition procedures and in particular the avoidance or proper mitigation of involuntary land acquisition/resettlement are critical to the success of the project. This includes land acquired either temporarily or permanently for the project site itself and any associated infrastructure – i.e., access roads, powerlines, construction camps (if any) and switchyards. If involuntary land acquisition is unavoidable, a Resettlement Action Plan (RAP) (dealing with physical displacement and any associated economic displacement) or Livelihood Restoration Plan (LRP) (dealing with economic displacement only) will be required. This is often a crucial issue with respect to local social license to operate and needs to be handled with due care and attention by suitably qualified persons.

Response:

Geelstert 1 is proposed on the Remaining Extent of the Farm Bloemhoek 61. The property is privately owned and consent has been obtained from the landowner. In addition, there are no occupants currently residing on the property identified for the development of Geelstert 1, as a result, no involuntary land acquisition or resettlement is required or will take place as a result of the project.

Landscape and Visual Impacts

Key impacts can include the visibility of the solar panels within the wider landscape and associated impacts on landscape designations, character types and surrounding communities. Common mitigation measures to reduce impacts can include consideration of layout, size and scale during the design process and landscaping / planting in order to screen the modules from surrounding receptors. Note that it is important that the impact of shading on energy yield is considered for any new planting requirements. Solar panels are designed to absorb, not reflect, irradiation. However, glint and glare should be a consideration in the environmental assessment process to account for potential impacts on landscape / visual and aviation aspects.

Response:

Potential visual impacts associated with the development of Geelstert 1 have been assessed as part of the Visual Impact Assessment specialist study (**Appendix I**) conducted as part of the BA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative visual impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report.

Ecology and Natural Resources

Potential impacts on ecology can include habitat loss / fragmentation, impacts on designated areas and disturbance or displacement of protected or vulnerable species. Receptors of key consideration are likely to include nationally and internationally important sites for wildlife and protected species such as bats, breeding birds and reptiles. Ecological baseline surveys should be carried out where potentially sensitive habitat, including undisturbed natural habitat, is to be impacted, to determine key receptors of relevance to each site. Mitigation measures can include careful site layout and design to avoid areas of high ecological value or translocation of valued ecological receptors. Habitat enhancement measures

could be considered where appropriate to offset adverse impacts on sensitive habitat at a site, though avoidance of such habitats is a far more preferable option.

Response:

Potential ecological and avifaunal impacts associated with the development of Geelstert 1 have been assessed as part of the Ecology and Avifauna Impact Assessments (refer to **Appendix D** and **E**) conducted as part of the BA process. Measures with which to avoid, or if avoidance is not possible minimise, and mitigate any negative ecological and avifaunal impacts have been identified and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report. Areas of ecological and avifaunal sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to Chapter 10 and **Appendix O**) and have been utilised to inform the development layout so that such areas are avoided.

Cultural Heritage

Potential impacts on cultural heritage can include impacts on the setting of designated sites or direct impacts on below-ground archaeological deposits as a result of ground disturbance during construction. Where indicated as a potential issue by the initial environmental review / scoping study, field surveys should be carried out prior to construction to determine key heritage and archaeological features at, or in proximity to, the site. Mitigation measures can include careful site layout and design to avoid areas of cultural heritage or archaeological value and implementation of a 'chance find' procedure that addresses and protects cultural heritage finds made during a project's construction and/or operation phases.

Response:

Heritage impacts associated with the development of Geelstert 1 have been assessed as part of the Heritage Screening Assessment (refer to **Appendix H**) conducted as part of the BA process, which includes the consideration of heritage, archaeological, and palaeontological resources. Measures to avoid, or if avoidance is not possible minimise, and mitigate any negative heritage impacts (including those on heritage, archaeology, and palaeontology) have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix M** to this BA Report.

Transport and Access

The impacts of transportation of materials and personnel should be assessed in order to identify the most appropriate transport route to the site while minimising the impacts on project-affected communities. The requirement for any oversized vehicles/abnormal loads should be considered to ensure access is appropriate. On-site access tracks should be permeable and developed to minimise disturbance to sensitive environmental features. Where project construction traffic has to traverse local communities, traffic management plans should be incorporated into the environmental and social management plan and EPC requirements for the project.

Response:

The project development area can be readily accessed via the national route (N14) which is located ~9km west of the development footprint. The N14 national route provides access to the area from Springbok, Pofadder, Kakamas, Keimoes, Upington and Johannesburg. The Loop 10 Road, transecting with the N14 and routing along the northern boundary of the development footprint, and the Gamoep

Road (R358), which runs along the eastern boundary of the development footprint, will be used to access the area. From the Gamoep Road (R358), a 3.5km long access road with a width of up to 8m will be developed to provide access to the development footprint of Geelstert 1.

The national, regional, secondary and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar PV facility. Some of the components (i.e. on-site substation) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTO) by virtue of the dimensional limitations. A permit will be required in accordance with Section 81 of the National Road Traffic Act (No. 93 of 1996) (NRTA) which pertains to vehicles and loads which may be exempted from provisions of the Act.

A Traffic Impact Assessment has been undertaken for Geelstert 1 and is included in the BA Report as **Appendix J** of the BA Report.

Drainage / Flooding

A review of flood risk should be undertaken to determine if there are any areas of high flood risk associated with the site. Existing and new drainage should also be considered to ensure run-off is controlled to minimise erosion.

Response:

A Stormwater Management Plan has been prepared for the project and is included in **Appendix G** of the EMPr. The EMPr is included as **Appendix M** of the BA Report.

Consultation and Disclosure

It is recommended that early stage consultation is sought with key authorities, statutory bodies, affected communities and other relevant stakeholders. This is valuable in the assessment of project viability and may guide and increase the efficiency of the development process. Early consultation can also inform the design process to minimise potential environmental impacts and maintain overall sustainability of the project. The authorities, statutory bodies and stakeholders that should be consulted vary from country to country but usually include the following organisation types:

- » Local and / or regional consenting authority.
- » Government energy department / ministry.
- » Environmental agencies / departments.
- » Archaeological agencies / departments.
- » Civil aviation authorities / Ministry of Defence (if located near an airport).
- » Roads authority.
- » Health and safety agencies / departments.
- » Electricity utilities.
- » Military authorities.

Community engagement is an important part of project development and should be an on-going process involving the disclosure of information to project-affected communities. The purpose of community engagement is to build and maintain over time a constructive relationship with communities

located in close proximity to the project and to identify and mitigate the key impacts on project-affected communities. The nature and frequency of community engagement should reflect the project's risks to, and adverse impacts on, the affected communities.

Response:

A Public Participation Process as prescribed by Chapter 6 of the EIA Regulations, 2014 (GN R326) is being conducted as part of the BA process being undertaken for the project. This Public Participation Process includes consultation with key authorities, affected and surrounding landowners, local communities, and other relevant stakeholders. A Public Participation Plan which takes into consideration the restrictions and limitations imposed by Section 27(2) of the National Disaster Management Act (Act No. 57 of 2002) of 2002 as a result of COVID-19 and the Directions issued by the Minister of DEFF in terms of consultations with I&APs has been approved by the Department. A written proof of the Public Participation Plan approval has been included in **Appendix B** of the BA Report.

Consultation between surrounding communities and the proponent would also need to be undertaken during the planning and design phase of the proposed development.

Environmental and Social Management Plan (ESMP)

Whether or not an ESIA or equivalent has been completed for the site, an ESMP should be compiled to ensure that mitigation measures for relevant impacts of the type identified above (and any others) are identified and incorporated into project construction procedures and contracts. Mitigation measures may include, for example, dust suppression during construction, safety induction, training and monitoring programs for workers, traffic management measures where routes traverse local communities, implementation of proper waste management procedures, introduction of periodic community engagement activities, implementation of chance find procedures for cultural heritage, erosion control measures, fencing off of any vulnerable or threatened flora species, and so forth. The ESMP should indicate which party will be responsible for (a) funding, and (b) implementing each action, and how this will be monitored and reported on at the project level. The plan should be commensurate to the nature and type of impacts identified.

Response:

Impacts associated with the construction phase of development have been identified and assessed as part of the independent specialist studies undertaken as part of the BA process. Appropriate mitigation measures with which to minimise the significance of negative impacts have been identified and are included in the EMP_r prepared for the project and attached as **Appendix M** to this BA Report. The EMP_r is comprehensive for the nature and extent of the planned project.

CHAPTER 7: DESCRIPTION OF THE RECEIVING ENVIRONMENT

This chapter provides a description of the local environment. This information is provided in order to assist the reader in understanding the possible effects of the project on the environment within which it is proposed to be developed. Aspects of the biophysical, social and economic environment that could be directly or indirectly affected by, or could affect, Geelstert 1 have been described. This information has been sourced from both existing information available for the area as well as collected field data by specialist consultants and aims to provide the context within which this BA process is being conducted.

7.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of the EIA Regulations, 2014 - Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(h)(iv) the environmental attributes associated with the alternatives focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	<p>The environmental attributes associated with the study area, the development area, development footprint, as well as the surrounding environment, are described and considered within this chapter and include the following:</p> <ul style="list-style-type: none"> » The regional setting within which the Geelstert 1 development footprint is located is described in section 7.2. » The climatic conditions of the area within which Geelstert 1 is located is discussed in section 7.3. » The biophysical characteristics of the development footprint, and the surrounding areas is described in section 7.4. This includes the topography and terrain, geology, soils and agricultural potential and the ecological profile of the site (i.e. vegetation, fine-scale habitats, critical biodiversity areas and broad-scale processes, freshwater features, terrestrial fauna and avifauna). » The heritage of the development footprint and the surrounding areas (including the archaeology, palaeontology and cultural landscape) is discussed in section 7.5. » The visual quality of the affected environment is discussed in section 7.6. » The current traffic conditions for the area surrounding the development footprint are included in section 7.7. » The social context within which the development footprint is located is described in section 7.8.

A more detailed description of each aspect of the affected environment is included in the specialist reports contained within the **Appendices D - K**.

7.2. Regional Setting

The Geelster 1 study area and the development area is located within the northern portion and in close proximity to the northern boundary of the Northern Cape Province. The Province is situated in the north-western corner of South Africa and has a land area of 372,889 km², therefore occupying approximately 30% of South Africa's land area and making it the largest province in South Africa even though it has the smallest population.

The town of Aggeneys is located to the west of the study area and is the closest town. This mining town is largely restricted to service employees of the mining operations in the immediate area. Other towns within the surrounding area of the study area include Pella, located ~ 36km to the north, Pofadder, located ~50km to the north-east, Steinkopf, located ~115km to the west, and Springbok, located ~ 104km to the south west. Aggeneys includes a primary and secondary school, police station, clinic, golf course and tarred airstrip. Aggeneys is located between Pofadder and Springbok in the Khâi-Ma Local Municipality and within the greater Namakwa District Municipality. The study area for Geelster 1 falls within ward 4 of the Khâi-Ma Local Municipality. A regional map of the study area and the development area is provided in **Figure 7.1**.

Farming settlements are located within the greater municipal area, which include Dwagga Soutpan, Vrugbaar, Raap-en-Skraap and Klein Pella. The municipal area is characterised by vast tracts of flat, undeveloped land and arid Karoo landscape, with ephemeral rivers, scattered mountainous areas and inselbergs.

Two large mines are located in the region. The Gamsberg Mine is 7km north-east of the study area and exploits one of the largest known, undeveloped zinc orebodies in the world and comprises of an open pit mine and a dedicated processing plant. The Black Mountain Mine is located 14km west of the study area, adjacent to the town of Aggeneys and the majority of the residents of Aggeneys are predominantly employees of the Black Mountain Mine. The Black Mountain Mine comprises of two underground shafts, Deep and Swartberg shafts and a processing plant. The mine produces zinc, lead, silver and copper.

Access to Aggeneys, the study area and development area is via the N14 national road. The N14 separates the town of Aggeneys and the study area, with the town located to the north of the N14 and the study area located to the south of the N14. The Loop 10 and the Gamoep (R358) I roads provide direct access to the study area and development area and are located along the northern (i.e. Loop 10) and the eastern (i.e. Gamoep) boundaries of the study area.

The study area for Geelster 1 is also located within the Springbok Renewable Energy Development Zone (REDZ) or REDZ 8. These zones are geographical areas of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities, and which have been earmarked for the development of renewable energy facilities within South Africa. This will result in the development of multiple renewable energy developments (including solar PV facilities) being developed within the Aggeneys area, which will ultimately lead to a concentrated node of renewable energy facilities. The 40MW Aggeneys Solar Facility is the only operational solar PV facility within the vicinity of the study area. The solar PV facility is located 8km north-west of the study area and comprises 140 000 modules with a generating capacity of 40MW, which have been installed over an area of ~110ha.

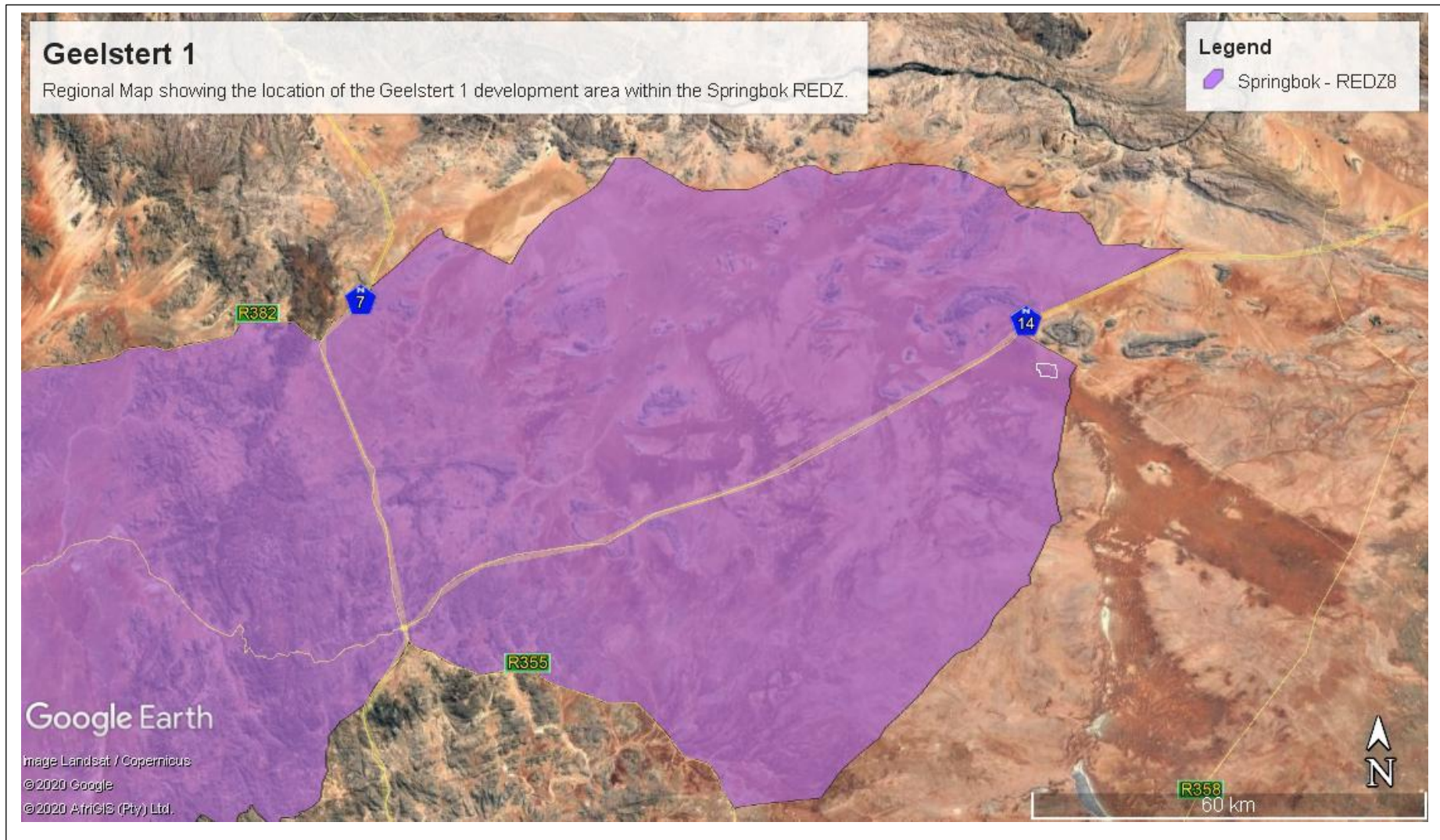


Figure 7.1: A Regional Map showing the location of the Geelstert 1 development area within the Springbok REDZ.

The Aggeneis Main Transmission Substation (MTS) is located approximately 13km south-west of the development area for Geelstert 1 with the Aries/Aggeneis 400kV, Aggeneis/Harib 220kV and the Aggeneis/Nama 220kV overhead power lines connecting into the substation. The Aggeneis/Aries 400kV power line runs parallel to the northern boundary of the Geelstert 1 development area. In terms of Eskom's 2020-2029 Transmission Development Plan (TDP), the document currently stipulates the following planned grid infrastructure roll-outs for the Aggeneis MTS:

- » TDP scheme Gromis-Nama-Aggeneis 400kV lines (IPP)
- » TDP scheme Aggeneis-Paulputs 2nd 220 kV line (built at 400 kV)
- » TDP scheme Aggeneis 400/132 kV transformation strengthening 1 (IPP).

7.3. Climatic Conditions

Aggeneis receives about 34mm of rain annually, with most of the rainfall occurring mainly during autumn. The area receives the lowest rainfall (0mm) in December and the highest (9mm) in March. The average midday temperatures for Aggeneis range from 17.7°C in July to 31.6°C in January. The region experiences the lowest temperatures during July when the temperature drops to 3°C on average during the night. Refer to **Figures 7.2**.

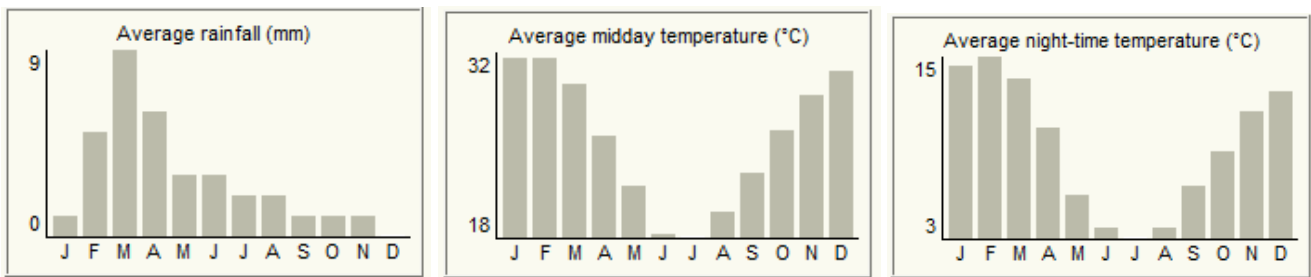


Figure 7.2: Histograms showing the general climatic conditions associated with the Aggeneis area.

7.4. Biophysical Characteristics of the Study Area and Development Area

7.4.1. Topography, Terrain and Land Use

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

The Orange River (Gariiep River) flows from north-west to south-east approximately 37km north of the study area. The Orange River is a major regional river system that receives its source from the mountains on the western edge of Lesotho and is joined by the Vaal which flows into the sea on the West Coast where it forms the border between South Africa and Namibia.

The development area is located within a broad valley that drains towards the Orange River. The development area is set at an elevation of 840 m – 870 m above mean sea level (amsl). The valley floor surrounding the study area is incised by a number of shallow watercourses that drain towards the Orange

River. These watercourses are non-perennial and only run for short periods of time during and after summer and autumn rains. The surface terrain in the region of the study area is predominantly sandy to gravelly and traversed by a number of very shallow, intermittently-flowing drainage lines (also known as ephemeral watercourses). The Koa River Palaeovalley traverses the study area in an east-west direction and is located outside and to the south of the development footprint for Geelstert 1.

The majority of the development area and the surrounding area comprises fairly flat-lying terrain between inselbergs or isolated steep rocky outcrops. The inselbergs in the vicinity of the development area are concentrated to the north-east and north-west where they form the upper valley slopes and ridgelines. The Ghaamsberg rises to approximately 1 100 amsl to the north of Geelstert 1, albeit the mountain comprises the Gamsberg Mine. In addition, within the vicinity of the development area, there are also two isolated areas of rocky outcrop within the valley floor to the south.

7.4.2. Geology, Soils and Agricultural Potential

i. Geological Setting of the Study Area and Development Area

The geology of the Aggeneys region consists of scattered basement inliers on the southern margins of the Gamsberg which are composed of a variety of resistant-weathering igneous and high grade metamorphic rocks - mainly gneisses, schists, quartzites and amphibolites - of Late Precambrian (Mokolian/ Mid-Proterozoic) age. These ancient basement rocks, which underlie the development area are assigned to the Namaqua-Natal Province and are approximately one to two billion years old. The flatter portions of the area, including those located within the development area, are underlain by a spectrum of mostly unconsolidated superficial sediments of Late Cenozoic age. These include Quaternary to Recent sands and gravels of probable braided fluvial (alluvial fan) or sheet wash origin, as well as a veneer of down-wasted surface gravels and colluvial (rocky scree) deposits. The alluvial and colluvial sediments are locally overlain, and perhaps also underlain, by unconsolidated aeolian (i.e. wind-blown) sands of the Gordonia Formation (Kalahari Group) that are Pleistocene to Holocene in age. Orange-hued linear sand dunes with northwest-southeast trending crests are well seen in the Koa River Palaeovalley area. All these superficial sediments can be broadly subsumed into the Late Cretaceous to Recent Kalahari Group.

The Koa River Palaeovalley is an important Cenozoic geological feature in the Aggeneys area and traverses the study area. It represents a defunct south bank tributary of the River Orange of Neogene/ Late Tertiary (Miocene – Pliocene) age that fed into the palaeo-Orange River near Henkries. The palaeovalley is marked by intermittent pans and a veneer of orange-brown Kalahari wind-blown sands.

ii. Soils and Agricultural Potential of the Study Area and Development Area

The study area, including the development area, is underlain by Quaternary sediments, mostly sandy. Dunes also occur in the landscape. The development area of Geelstert 1 is covered by two (2) land types, which include Af21 and Af26, both of which have a high base status with red soils and dunes (refer to **Figure 7.3**).

Table 7.1 below provides the details of the soils and land types present within the development area of Geelstert 1.

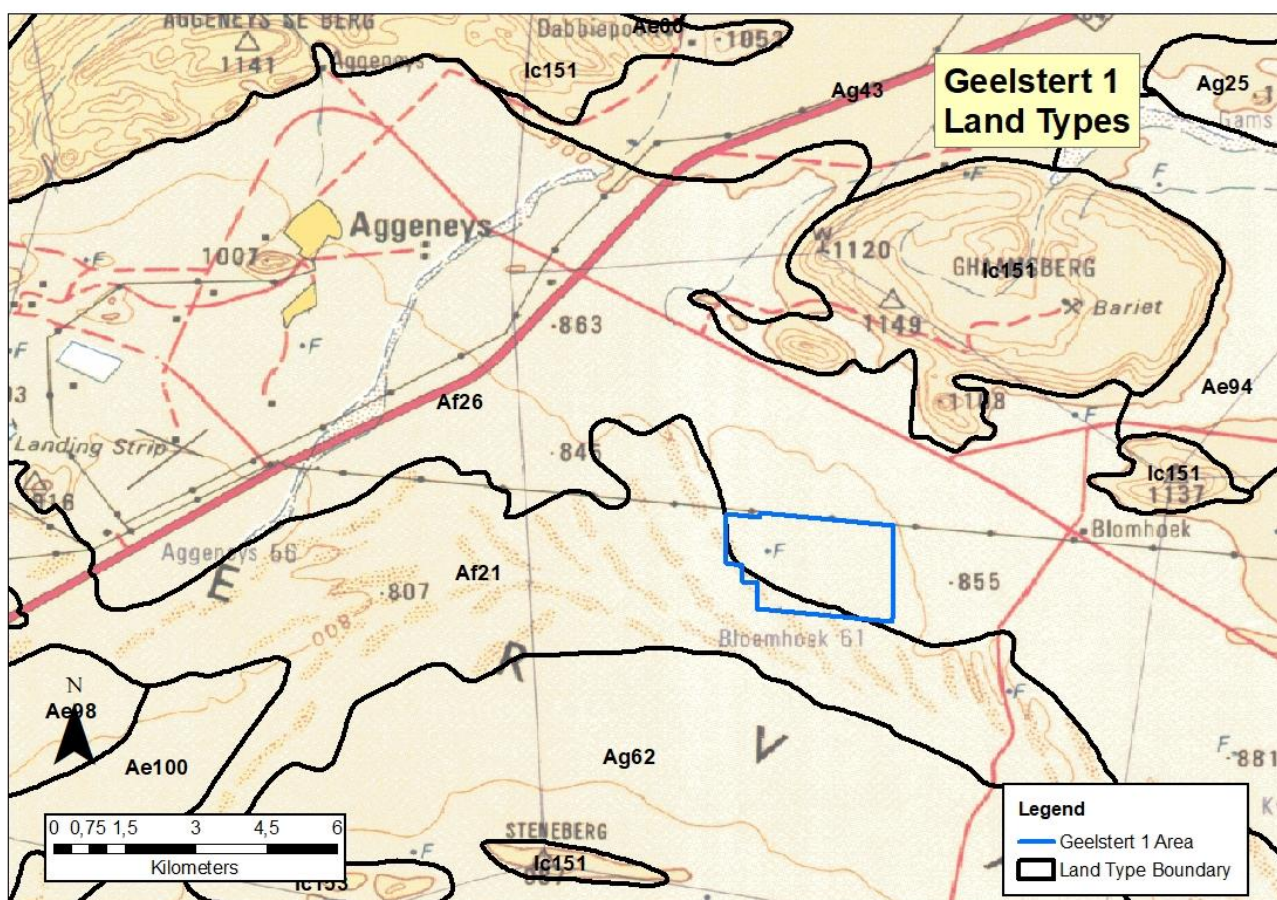


Figure 7.3: Land types present within in the study area and development area of Geelster 1.

Table 7.1: Details of the soils and land types present within the Geelster 1 development area

Land Type	Dominant Soils	Depth (mm)	Percent of land type	Characteristics	Agricultural Potential (%)
Af21	Hutton 31	>1200	75%	Red, sandy, structureless dune soils	High: 0.0 Mod: 0.0
	Hutton 32/35	300-700	16%	Red, sandy, structureless soils, on calcrete/dorbank	Low: 100.0
Af26	Hutton 30/31	>1200	63%	Red, sandy, structureless soils, occasional dunes	High: 0.0 Mod: 0.0
	Fernwood 21	>1200	17%	Grey, sandy, structureless soils	Low: 100.0

The majority of the development area is located within land type Af26, which consists largely of deep, sandy soils. A small section of the southern portion of the development area, is located within the land type Af21, which consists of red structureless soils that also consist of occasional dunes. As a result of the location of the development area at the foot of the inselbergs to the north, much shallower soils is present, with soils classified as belonging to the Garies (orthic topsoil on red apedal subsoil on cemented dorbank) and Knersvlakte (orthic topsoil on cemented dorbank) forms, with depths of less than 450 mm. Some outcrops of gravel and dorbank are also present at the surface.

No soils with a high agricultural potential are present within the development area with the soils being generally of low potential at best, as a result of a combination of the shallow depth and the sandy texture which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall patterns in the area means that there is little potential for rain-fed arable agriculture. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the development area, is present.

In general, the soils that do occur within the development area are suited for extensive grazing at best, however, the grazing capacity is very low, at around 26-40 ha/large stock unit.

The soils present in the development area are not considered susceptible to erosion by water. However, if the vegetation cover is disturbed (for example by overgrazing and construction activities) and considering the sandy nature of the topsoil, as well as the dry climate, there is a significant possibility of removal of some or all of the topsoil by wind action.

7.4.3. Ecological Profile of the Study Area and the Development Area

i. Broad-Scale Vegetation Patterns

According to the national vegetation map, the Geelstert 1 development footprint (refer to **Figure 7.4**) is restricted to the Bushmanland Sandy Grassland vegetation type which has a conservation type of Least Concern. The southern boundary of the development footprint consists of deeper sands and sands of the Bushmanland Sandy Grassland Vegetation type, which characterises the majority of the area making up the Koa River paleovalley. The Boesmanland Vloere is also present within the development area, to the west of the development footprint.

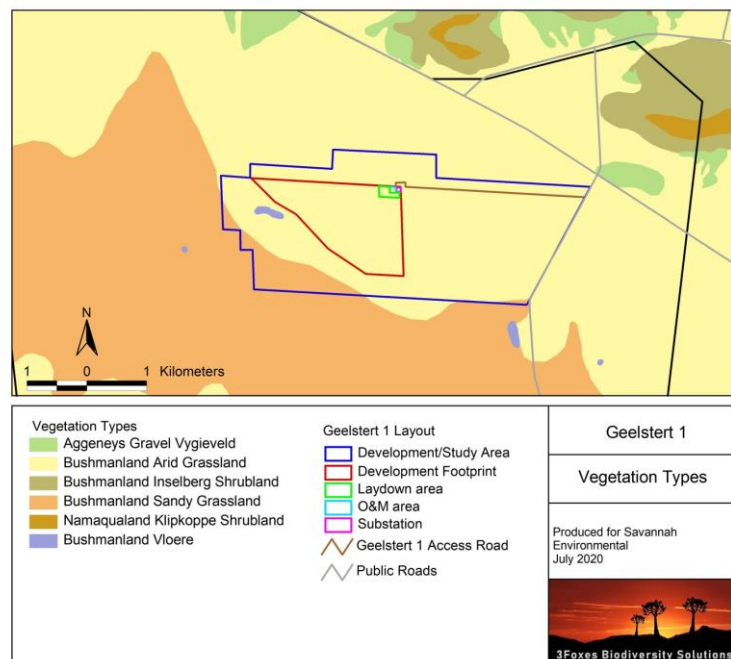


Figure 7.4. Broad-scale overview of the vegetation types within and around the development footprint of Geelstert 1.

The Bushmanland Arid Grassland vegetation type is an extensive vegetation type and is the second most extensive vegetation type in South Africa, occupying an area of 45 478 km². It is associated largely with red-yellow apedal (without structure), freely drained soils, with a high base status and mostly less than 300mm deep. Due to the arid nature of the unit, which receives between 70mm and 200mm annual rainfall, it has not been significantly impacted by intensive agriculture and more than 99% of the original extent of the vegetation type is still intact. Six (6) endemic species are listed for the vegetation type, which is a relatively low number considering the extensive nature of the vegetation type.

Although there are a variety of other vegetation types in the area, these are outside of the development footprint and would not be directly affected by the development.

iii. Habitats and plant communities

Bushmanland Arid Grassland on Sandy Plains

This habitat is typical of the area between the deep sands of the Koa River Palaeovalley and the shallow pediments which occur at the base of the Ghaamsberg and the other inselbergs to the north of the development area. The area is associated with a band of shallow, coarse red sands dominated by perennial grass with scattered shrubs which comprises the majority of the development area and development footprint of Geelstert 1 (refer to **Figure 7.5**). Dominant plant species present within this habitat include *Stipagrostis ciliata*, *S.obtusa*, *S.anomala*, *Aristida adscensionis* and *Enneapogon scaber*, and low woody shrubs such as *Hermannia spinosa*, *Lycium cinereum*, *Salsola rabieana*, *Asparagus capensis*, *Galenia africana*, *Tetragonia arbuscula*, *Melolobium candicans*, *Eriocephalus spinescens*, *Zygophyllum retrofractum*, *Pteronia glomerata*, *Rhigozum trichotomum* and *Aptosimum spinescens* as well as forbs such as *Zygophyllum simplex*, *Tribulis zeyheri*, *Leysera tenella*, *Galenia sarcophylla*, *Hypertelis salsoloides*, *Sesamum capense*, *Cucumis myriocarpus*, *Gazania lichtensteinii*, *Augea capensis* and *Mesembryanthemum crystalinum*. The abundance of listed or protected species is low and apart from a low density of *Hoodia gordonii*, no other significant species were observed.



Figure 7.5: A view of the Bushmanland Arid Grassland habitat within the development area.

Bushmanland Sandy Grassland

The southern section of the development area consists of the Koa River Palaeovalley, which comprises of undulating red dunes (refer to **Figure 7.6**). Dominant plant species within this habitat include, *Stipagrostis lomeria*, *S.brevifolia*, *Cladoraphis spinosa*, *Leucophrys mesocoma* and *Brachiaria lomerate*; shrubs such as *Phaeoptilum spinosum*, *Rhigozum trichotomum* and *Hermannia gariepina* and forbs such as *Limeum sulcatum*, *Requienia sphaerosperma*, *Sesamum capense*, *Tribulis cristatus*, *Citrullus lanatus*, *Asparagus retrofractus* and *Gisekia pharnacioides var pharnacioides*. This habitat is associated with Red Lark, and development within this area is not permitted.



Figure 7.6: A view of the red dunes, a habitat for the Red Lark avifauna species located to the south of the development footprint of Geelstert 1, with slight infringement into the development area. The development footprint of Geelstert 1 is located ~ 1km to the north of this area.

Bushmanland Pans

There is a depression wetland/pan located within the development area, however outside of the development footprint of Geelstert 1. The depression wetland is devoid of vegetation; however, it is fringed by *Lycium pumilum*, *Zygophyllum retrofactum* and *Rhigozum trichotomum* (refer to **Figure 7.7**). Although this depression wetland may be ephemeral, it represents a breeding site for many temporary water invertebrates and would attract waders and other water birds to the area.



Figure 7.7: A photograph of the depression wetland located within the development area and to the west of the development footprint. The depression is located outside the development footprint.

iv. Listed and Protected Plant Species

Although there are a large number of listed and protected plant species known from the wider area, these are associated with specific habitats and vegetation types outside of the development area. The Ghaamsberg, as well as other massifs and hills in the area are generally associated with a high abundance of plant species of conservation concern. These are often associated with the Aggeneys Gravel Vygieveld vegetation type, or other specific habitats such as the quartzite outcrops and the gravel plains. Within the development area of Geelstert 1, these habitats are not present, and species of conservation concern present are restricted to more widespread species such as the provincially protected *Boscia foetida subsp. foetida* and *Hoodia gordonii*.

v. Critical Biodiversity Areas (CBA) and Broad-Scale Processes

An extract of the Northern Cape Critical Biodiversity Areas (CBAs) map for the development area and development footprint is illustrated below in **Figure 7.8**. The development footprint lies within an Ecological Support Area (ESA), which are areas identified as important buffer areas for CBAs or which may be important for ecological processes such as landscape connectivity. To the south of the development area lies within a CBA, which comprises the red dunes associated with the Red Lark avifauna species. The Ghaamsberg located to the north of the development area is also classified as a CBA. These CBAs are located outside the development footprint of Geelstert 1 and will not be directly impacted by the development of the solar PV facility. The outcomes of the field assessment undertaken for the proposed development indicates that the development area comprises of open grassland typical of the Bushmanland Grassland vegetation type.

In terms of conservation planning, the development area does not fall within the Northern Cape Protected Area Expansion Strategy Focus Area (NCPAES) and is therefore not considered significant for meeting conservation targets. The development area however falls within the older Kamiesberg-Bushmanland-Augrabies Focus Area defined by NPAES, 2011. These NPAEs have been superseded by the 2016 NPAES, although the spatial coverages have not been made available, therefore this creates difficulty in determining whether the development area falls within a NPAES, although it appears to fall within a gap between areas identified as NPAES.

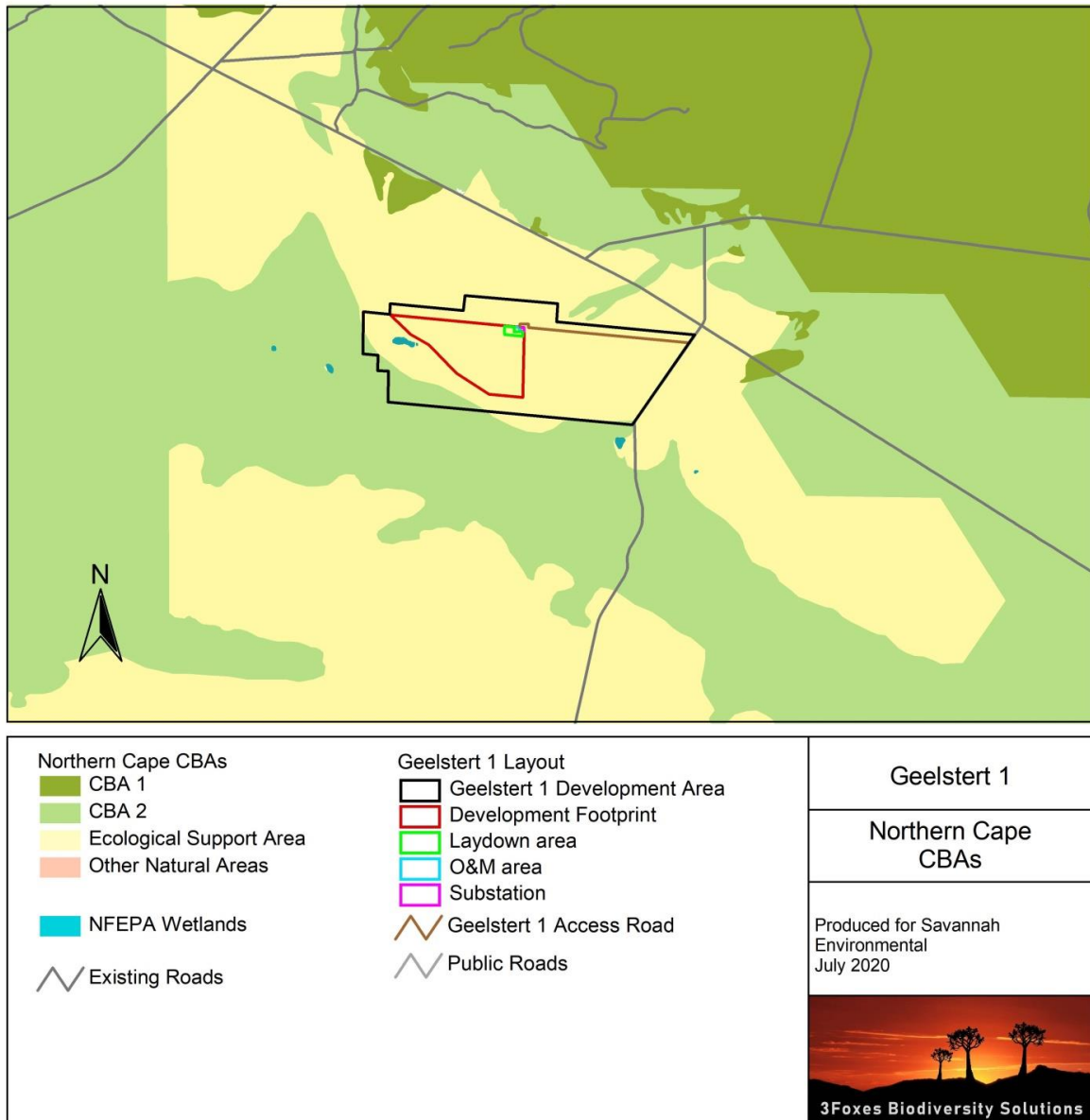


Figure 7.8: Northern Cape Critical Biodiversity Areas map overlain with the Geelstert 1 development footprint and development area. The development footprint of Geelstert 1 is located outside of any CBAs.

vi. Terrestrial Fauna

Mammals

The mammalian community at the development area is likely to be of a moderate to low diversity. Although more than 50 species of terrestrial mammals are known from the wider area, the extent and habitat diversity of the development area is too low to support a very wide range of mammals. Species that can be confirmed present in the area include Caracal, Black-backed Jackal, African Wildcat, Cape Fox, Chacma Baboon, Rock Hyrax, South African Ground Squirrel, Steenbok, Duiker, Springbok, Gemsbok, Cape Porcupine, Yellow Mongoose, Cape Grey Mongoose, Small-spotted Genet, Striped Polecat, Cape Hare, Springhare, Aardvark, Aardwolf and Round-eared Elephant Shrew.

Species associated with the rocky outcrops of the area include Rock Hyrax, Klipspringer, Pygmy Rock Mouse, Namaqua Rock Mouse and Western Rock Elephant Shrew. The open plains which characterise the development footprint are likely to be dominated by species associated with open hard or sandy ground such as various gerbils including the Hairy-footed Gerbil, Cape Hare, Steenbok, Cape Fox, Bat-eared Fox, Aardvark and Aardwolf. There are also burrows of Ground Squirrels and Yellow Mongoose present and these appear to be the most common fauna within the development footprint and the surrounding area. There are no areas of particular significance for mammals within the development footprint as the habitat is repetitive and broadly homogenous.

Two listed species may occur in the area, including the Black-footed Cat *Felis nigripes* (Vulnerable) and Leopard *Panthera pardus* (Vulnerable). Given the extremely low cover within the development area, it is not likely that Leopard are present within the affected area. The habitat is however broadly suitable for the Black-footed Cat, which favours a mix of open and more densely vegetated areas. This species is however widely distributed.

Reptiles

Although reptile diversity in the surrounding area is high with as many as 60 species known from the area, only a fraction of these are likely to be present within the study area. A large proportion of the reptiles of the area consist of species associated with the inselbergs and rocky hills along the Orange River and would not occur on the open plain's characteristic of the development area and development footprint. More typical plains species are likely to dominate the study area such as Verroxx's Tent Tortoise *Psammobates tentorius verroxii*, Namaqua Sand Lizard *Pedioplanis namaquensis*, Spotted Desert Lizard *Meroles suborbitalis*, Southern Rock Agama *Agama atra* and Plain Sand Lizard *Pedioplanis inornata*.

There are no specialised reptile habitats within the development area, which are restricted to the open plains habitat that is widespread in the area.

Amphibians

Only eight frog species are known from the area around the study area and even this is a gross overestimate of the number of amphibian species likely to occur. There are only a few freshwater features within the development area (outside the development footprint) and only species able to live

independently of water will be present. As such, the only species likely to be present within the development area would be the Karoo Toad *Vandijkophrynus gariiepensis*.

vii. Avifauna

Avian Microhabitats

Two avifaunal microhabitats were identified within the development area and are directly associated with two vegetation types. The Bushmanland Arid Grassland vegetation type represents the plains habitat, while the Bushmanland Sandy Grassland represents the dune habitat. Only the plains habitat, which features sparsely vegetated sandy flats, occurs within the development footprint for Geelster 1 (**Figure 7.9**). The dune habitat (refer to **Figure 7.11**) is located outside of the development footprint for Geelster 1 and features deep red sands, which area well vegetated with tall *Stipagrostis* grasses. This habitat is restricted to the southern and south-western boundaries of the development area. The dune habitat appears to be the main habitat occupied by the Red Lark avian species, based on the field surveys undertaken in the area.



Figure 7.9: A view of the plain's habitat within which the development footprint of Geelster 1 is restricted.



Figure 7.10: A view of the dune habitat which falls within the Bushmanland Sandy Grassland vegetation type, which does not occur within development footprint of Geelster 1 but is located to the south-west and within the development area. This habitat is occupied by the Red Lark avian species.

Species Diversity

The bird assemblage recorded within the study area is typical of the Nama-Karoo bioregion. An approximate total of 105 bird species have been recorded within the area and surrounds, of which 54 species were observed. Eight of these are Red-listed while a further four are Near-threatened. One species (Red Lark) is endemic to South Africa, while fourteen species are near-endemic. Twelve species are listed as biome-restricted, which include a number of lark species in particular. Numerous others that have been recorded are arid-zone species, which follow either resident or nomadic life strategies.

A total of 38 bird species were recorded during the transect surveys of 2018 and 2019 during two seasons, with 31 and 28 species recorded in winter and summer. Significantly more species and birds were detected in winter compared to summer, with the total bird abundance being five times greater. The veld

conditions were extremely dry and harsh during the winter survey, owing to very poor rainfall which resulted in a low number of birds being recorded. This illustrates the extremes in bird abundances that occur within the area depending on local conditions and the corresponding response by nomadic bird species.

The four most abundant species recorded during winter were all highly nomadic passerine species, of which the most abundant was the Grey-backed Sparrow-lark *Eremopterix verticalis*, with 10.8 birds/km being detected. These highly nomadic species are known to respond to rainfall events, becoming entirely absent again during unfavourably dry periods. The second and third most abundant species were Lark-like Bunting *Emberiza impetuani* and Stark's Lark *Spizocorys starki*, with 4.5 and 4.1 birds/km, respectively. The fourth most abundant species was the Black-eared Sparrow-lark *Eremopterix australis*, with 2.8 birds/km detected. All these species exhibited dramatically reduced numbers during the summer survey.

The Red Lark was detected at a rate of 0.53 birds/km in winter and 0.68 birds/km in summer, although considering that it was only recorded in the dune habitat (located outside of the Geelstert 1 development footprint) and not within the plains habitat, this relative abundance is rather unrepresentative of the species. In winter (2018) Red Larks were recorded on six (6) of the 30 transects, with a total of 16 sightings, and exclusively within the dune habitat and adjacent sandy flats (located outside of the development footprint) characterised by red sands, tall grasses, and interspersed tall shrubs. In summer, Red Larks were recorded on seven (7) of the 19 transects (12 sightings), all within the same dune habitat as in winter. This suggests that the species is indeed absent from the plains habitat that characterises the Geelstert 1 development footprint. During the winter (June) 2020 survey, Red Larks (although only four sightings) were recorded within the known range in the development area on the edge of the dune habitat. No Red Larks were recorded within the development footprint of Geelstert 1.

Other biome-restricted species which occurred within the development area include Tractrac Chat, Sociable Weaver *Philetairus socius*, Karoo Chat *Cercomela schlegelii*, and Karoo Long-billed Lark *Certhilauda subcoronata*. However, most of these species were marginal to the study area, being recorded more frequently on the north-east boundary that borders the Loop 10 road.

Red-listed species

A total of nine red-listed non-passerine species have been reported for the area during SABAP 1 and the SABAP 2 period. Of these, seven are listed as threatened and two as Near-Threatened. The most important of these include Martial Eagle *Polemaetus bellicosus* (Endangered), Ludwig's Bustard (Endangered) and Verreaux's Eagle *Aquila verreauxii* (Vulnerable), all of which are considered to have local populations of moderate importance. Ludwig's Bustard and Martial Eagle were both seen foraging within the vicinity of the study area, while Verreaux's Eagle was seen directly adjacent to the development area. An adult Martial Eagle was also seen roosting on the pylon structure of the large existing power line that traverses the study area (i.e. Aggeneis-Aries 400kV power line) during both the winter and summer field survey. Two separate Martial Eagle nests were located on pylons to the west and east of the development footprint, both approximately 9km from the centre of the development footprint (**Figure 7.11**).



Figure 7.11: Location of two Martial Eagle nests (orange markers) in relation to the Geelstert 1 development footprint (black border, centred). Both nests are approximately 9km and 6.5km from the centre of the development footprint and are considered to be located at an acceptable distance from Geelstert 1.

viii. Freshwater Features

The development area for Geelstert 1 is located in Quaternary Catchment Area D82C and within the Orange Water Management Area (WMA). Five (5) depression wetlands (refer to **Figure 7.12**) are located within the development area for Geelstert 1, however these all fall outside the development footprint of the solar PV facility. These depression wetlands are located to the west of the development footprint, at a distance of between 30m – 75m. Larger ephemeral streams/washes are present within the study area; however, these features are located outside the development area and footprint of the solar PV facility at a distance of approximately 800m and will not be described or considered further in this BA Report as they are outside of the zone of influence of the Geelstert 1 project.

The depression wetlands are associated with relatively small catchments, which the development footprint of Geelstert 1 will slightly encroach on. All five (5) depression wetlands identified share similar geomorphological characteristics and range in size between 782m² and 70 174m². The depression wetlands vary in shape between an oval to a kidney-like shape (refer to **Figure 7.12**). These features are largely endorheic (isolated from other surface water ecosystems) and have limited to no direct connection with groundwater and tend to be recharged by unchanelled overland flow and interflow following significant rainfall events in the area

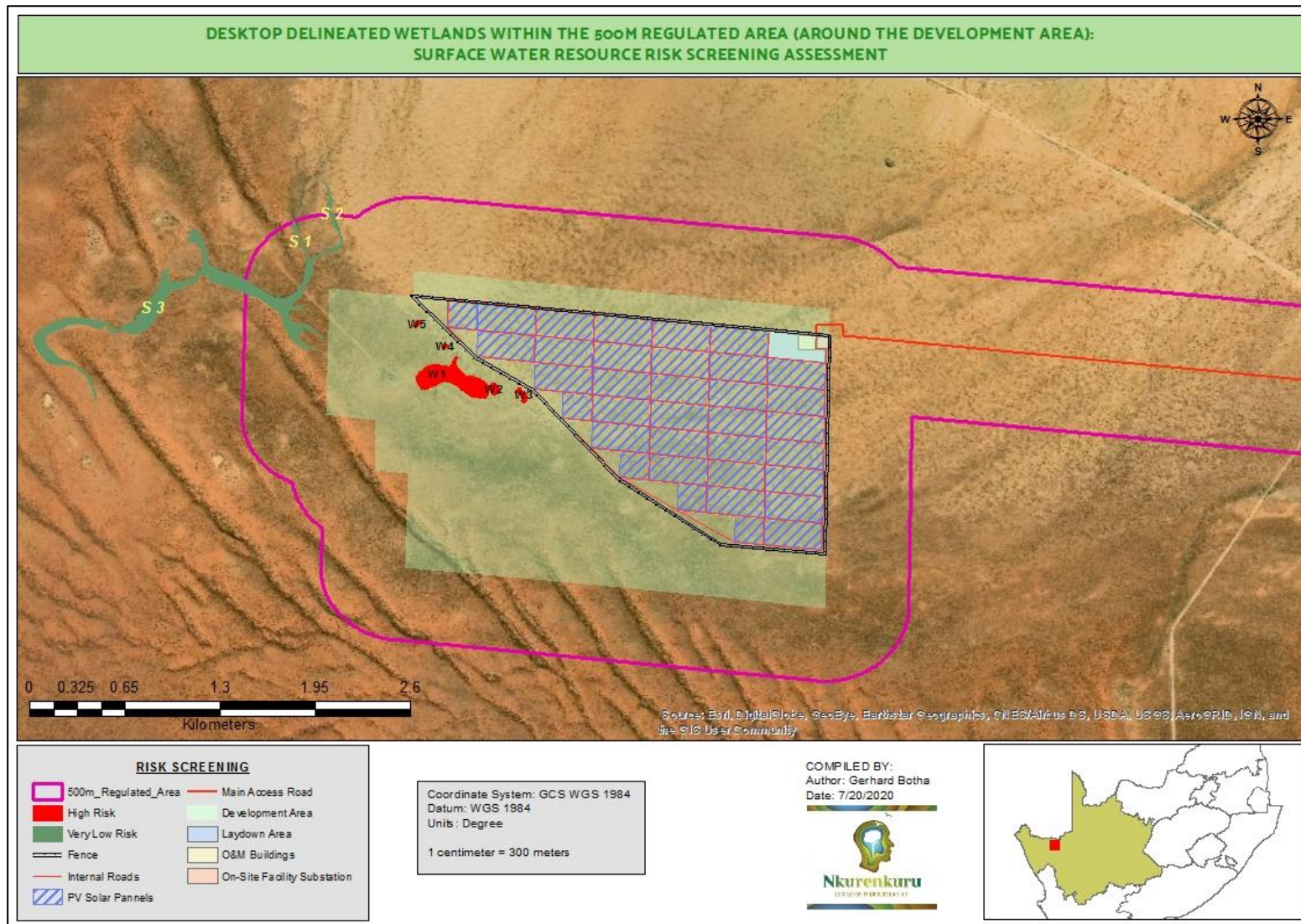


Figure 7.12: A map showing the depression wetlands and ephemeral washes/streams within the development area of Geelster 1 and its vicinity.

The depression wetlands consist of similar soil types and consist largely of an orthic A-horizon and a faded E-horizon. The dominant soil type for the depression wetlands is the Fernwood soil type. The central portions of the depression wetlands are typically devoid of vegetation (refer to **Figure 7.13**) as a result of the high saline properties associated with the soils in the area, however sparse shrubs of *Lycium cinereum* and *Stipagrostis ciliata* are found on the peripheries of these features. Other species that are associated with the peripheries of the wetlands include, *Rhigozum trichotomum*, *S. uniplumis* and *Arctotheca calendula*.



Figure 7.13: Photographs showing the sparse vegetation associated with the depression wetlands identified within the development area of Geelster 1. Shrubs are typically located at the peripheries of the depression wetlands.

7.5. Integrated Heritage including Archaeology, Palaeontology and the Cultural Landscape

7.5.1. Heritage and the cultural landscape

The general area is dominated by heritage associated with copper mining activities, including the nearby Black Mountain Mine which is still being mined for copper deposits to date. Prior to 1652, the Khoisan and Nama people from the area extracted raw or native copper from the gneiss and granite hills that make up the surrounding Namaqualand Copper Belt. This copper was beaten into decorative items, which were also worn as bangles and neck adornments.

Other heritage resources known from the area include, corbelled buildings and other structures associated with the colonial frontier. Based on the information available, no such structures are located within the proposed development area.

7.5.2. Archaeology

Prior to colonial settlement, the Aggeneys area was occupied by the Khoe and San people as evidenced by the number of Khoe and San names still evident in the area such as Aggeneys. Archaeological resources known from this area include Early Stone Age (ESA) and Middle Stone Age (MSA) resources that occur in lower densities. All known archaeological resources from the area are associated with the sand

dunes and the outcrops. MSA stone artefact scatters are sparsely distributed across the study area and are typically found on gravel pavements between the vegetation. In general, the study area lacks discrete archaeological sites and there are no buildings of heritage significance known from the area.

7.5.3. Palaeontology

The Geelstert 1 development area is overlain with Quaternary cover sands associated with a low palaeontological sensitivity and is underlain by granites of the Koeipoort Formation and quartzites of the Wortel Formation. The surrounding area has been subject to numerous palaeontological impact assessments and the outcomes of these assessments have shown that the general area is also associated with Proterozoic granite-gneiss basement rocks of the Namaqua-Natal Metamorphic Province, which do not contain fossils due to their igneous origin or are just too highly metamorphosed.

7.6. Visual Quality

i. Landscape Character

Landscape character is defined as "a distinct, recognisable and consistent pattern of elements in the landscape that makes one landscape different from another". The landscape surrounding the development area is arid, comprising relatively flat drainage plains with inselbergs or rocky outliers such as the Aggeneys Mountains, Black Mountain and Ghaamsberg rising above wide plains. Areas to the south of the development area appear relatively natural, while to the north, east and west there are extensive areas of mining such as the Gamsberg and Black Mountain mines. The Gamsberg Mine is located 7km north-east of the development area and the Black Mountain Mine 15km west of the development area. The small town of Aggeneys lies north-west of the development area.

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

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

Landform and drainage

Most of the study area comprises fairly flat-lying terrain between inselbergs or isolated steep rocky outcrops. The inselbergs in the vicinity of the development area are concentrated to the north, north-east, and north-west where they form the upper valley slopes and ridgelines. Immediately to the north and north-west, a large rocky outcrop (Ghaamsberg) rises to approximately 1 100 m amsl. There are also two (2) isolated areas of rocky outcrop within the valley floor to the south of the development area for Geelstert 1.

Nature of development and land uses

The landcover can be divided into the following types:

- » Natural Area

- * The main landcover surrounding the development area is natural area. This area is likely to be used largely for stock rearing and low intensity grazing. As this has not resulted in mass clearance of vegetation, the majority of the area retains a relatively natural appearance. Situated within this landcover are occasional homesteads that are scattered sparsely throughout the area. The low density of development is no doubt a product of the low agricultural potential / carrying capacity of the area.
- » Urban development
 - * Urban development in the small town of Aggeneys, includes housing, sports grounds and commercial uses. Particularly within the well-established areas of these settlements, streets are relatively broad and are lined with street trees. Gardens generally have mature woody ornamental plants. The density of development and the extent of vegetation is likely to serve to screen most external views from the urban area.
- » Degraded Areas
 - * Degraded areas are also evident and appear to be associated with mining activities.
- » Mining Developments
 - * Include the Black Mountain Mine and the Gamsberg Mine that are underground and open cast mining operations located to the west and north-east of the proposed development. The Gamsberg Mine is located 7km north-east of the development area. The Black Mountain Mine is located directly to the south of the town of Aggeneys and 15km west of the development area.

Vegetation Patterns

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

While there are obvious botanical differences, in terms of visual considerations all vegetation types are relatively low in nature and are comprised largely of grass species. They are, therefore, unlikely to provide significant visual absorption capacity (VAC) and will contribute to an open landscape character within which long distance views are possible.

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

In addition to the natural vegetation present within the Aggeneys area, taller woody vegetation occurs to a limited extent within the following areas:

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

vegetation to develop. This also has the benefit of providing shelter and shade for livestock. The contrast between this vegetation and surrounding areas makes the location of water points obvious from a distance.

ii. Visual Receptors

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

» Area receptors

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

» Linear receptors

- * The N14 national road at its closest runs approximately 8km to the north-west of the development footprint. Because this route carries a high proportion of recreational and tourism related traffic it is considered sensitive to potential change in views of the surrounding landscape as a result of the proposed development.
- * The Loop 10 Road runs parallel to the northern boundary of the study area. This road joins the N14 approximately 8km to the north-west of the development area. While it the Loop 10 Road is gravel, it serves as the only east-west route in the region, linking a number of regional routes all of which run in a general north-south direction. This road runs for more than 200km, however there appears to be few settlements or farmsteads that are served by it. It is likely that it is used mainly by local people and mining operators. It may also possibly be used by more "adventure minded" tourists.
- * The Gamoep Road (R358) runs roughly parallel with the eastern boundary of the study area and at its closet, this road is approximately 2.2km from the development footprint. This road is mainly used by local people and mining operators.

» Point Receptors

- * Four (4) small buildings have been identified within the Approximate Limit of Visibility (ALV) of Geelstert 1. These buildings include two (2) homesteads and two (2) minor industrial operations. The homesteads are likely to be used by local stock farmers who probably will be concerned with the productivity of the land rather than the change in the views of the surrounding landscape. Should either of these homesteads be used for tourism-related activities, this will increase the sensitivity of the landscape. The closest homestead from the development footprint of Geelstert 1 is located 3.4km.

7.7 Traffic Conditions

The Loop 10 Road provides direct access to the development area of Geelstert 1, as well as to the operations of the Gamsberg Mine from the N14. The intersection of the Loop 10 road and the N14 has been recently upgraded to a blacktop surfacing through the maintenance contract on the N14. The Loop Road intersects with the Gamoep Road (R358) 250m north-east of the boundary of the development area of Geelstert 1. The Gamoep Road (R358) runs from the intersection in a south direction and will provide

direct access to the development footprint of Geelstert 1. The Loop 10 and Gamoep roads are formal gravel roads with formal drainage provisions. The roads are associated with soft sand conditions, however with stabilisation, the roads should be adequate to carry low daily traffic load volumes with regular maintenance.

7.8 Social Context

The Geelstert 1 development area is located within the Khâi-Ma Non-Urban (NU) area and has a population of 2 148 people and a population density of 0.14/km². Land uses within close proximity to the development area includes the Black Mountain Mine, the Gamsberg Mine, the Aggeneys Aerodrome, the residential area of Aggeneys, the N14 national road and livestock farming activities associated with the surrounding areas. There are no major social receptors located within or directly adjacent to the development area. Social receptors that could be affected are the local travellers making use of the N14 and surrounding gravel roads. Other social receptors include the settlements surrounding the development area, as well as the agricultural activities including livestock grazing. Due to the fact that renewable energy development has already been authorised within the surrounding area of the social features, the development of the proposed project will not introduce solar energy as a land use to the area with one solar PV facility already operational within the vicinity of the Geelstert 1 development area. The distance of the development area to these social receptors also provides a buffer in terms of direct impact. In addition, very limited tourism/leisure activities are available within the Aggeneys area and include the Black Mountain Golf Course. Other tourism facilities outside of Aggeneys includes the Amam Melkbos Campsite located ~50km north-west and the Klein Pella Campsite located ~34km north-east.

Table 7.2 provides a baseline summary of the socio-economic profile of the Khâi-Ma LM within which Geelstert 1 is proposed. The data presented in this section have been derived from the 2011 Census, the Local Government Handbook South Africa 2019, the Northern Cape Provincial Spatial Development Framework (PSDF), and the Integrated Development Plans of the Namakwa DM and Khâi-Ma LM³⁰.

Table 7.2: Baseline description of the socio-economic characteristics of the area proposed for Geelstert 1

Location characteristics
» The project is proposed within the Northern Cape Province, which is South Africa's largest, but least populated Province.
» The project is proposed within the Khâi-Ma LM and the Namakwa DM.
» The Khâi-Ma LM covers an area of land 15 715km ² in extent.
Population characteristics
» The Khâi-Ma LM has a total population of 12 465 with a growth rate of 0.83%.
» In terms of the age structure 22.2% of the population is under 15 years of age, 71.6% of the population falls between 15 and 64, with 6.2% of the population being over 65.

³⁰ While information was derived from the Local Government Handbook South Africa 2019, Northern Cape PSDF, Namakwa DM and Khâi-Ma LM IDP, these sources largely make use of statistical information derived from the Census 2011. The information presented in this Chapter may therefore be somewhat outdated but is considered sufficient for the purposes of this assessment (i.e. to provide an overview of the socio-economic characteristics against which impacts can be identified and their significance assessed).

- » The Khâi-Ma LM is male dominated, with males comprising approximately 52.6% of the LM population, while the Namakwa DM is female dominated, with females comprising approximately 50.3% of the DM population.
- » Coloureds comprise the predominant population group within the Khâi-Ma LM and Namakwa DM.
- » Within the Khâi-Ma LM 88.1% of the population is coloured, 2.7% is black African, 8.1% is white and 0.9% is Indian/Asian.
- » The dominant language spoken in the Khâi-Ma LM is Afrikaans at 96.6%. The remaining spoken languages in the area includes English (0.8%), IsiXhosa (0.9%), IsiZulu (0.2%), Setswana (0.6%) and others (0.8%).
- » The Khâi-Ma LM, Namakwa DM, and Northern Cape provincial, and South African national population age structures are all youth dominated. A considerable proportion of the respective populations therefore comprise individuals within the economically active population between the ages of 15 and 64 years of age

Economic, education and household characteristics

- » The Khâi-Ma LM has a dependency ratio of 39.6, which correlates to some extent with the Namakwa DM (47.1), Northern Cape Province (35.8), and South Africa (34.5).
- » Education levels within the Khâi-Ma LM are low with approximately 22.2% of the population over 20 years of age not having completed Grade 12 / Matric. This means that the majority of the population can be expected to have a relatively low-skill level and would either require employment in low-skill sectors, or skills development opportunities in order to improve the skills level of the area.
- » The unemployment rate of the Khâi-Ma LM is high which places strain on the municipal services delivery as people cannot afford to pay for municipal services. In 2011 it was found that 77% of residents receive subsidies from government for their basic services. The unemployment rate of the Namakwa DM is 20.1%.
- » In 2011, the unemployment rate was highest across the Northern Cape at 27.4% and lowest across the Namakwa DM at 20.1%. The Khâi-Ma LM had an unemployment rate of 22.1% over the same period. Regarding youth unemployment, at 34.5%, it is highest across the Province and lowest within the Khâi-Ma LM at a rate of 23.6%.
- » The Namakwa DM has approximately 40% females as household heads and approximately 62% male household heads while having around 0.25% household heads under the age of 18.
- » The primary economic activities within the Khâi-Ma LM comprise agriculture, tourism, community, social and personal services.
- » The majority of households within the Khâi-Ma LM comprise formal dwellings (92.4%) and the average household size is 3.

Services

- » The two hospitals are available within the Namakwa DM which includes the Abraham Esau Hospital in Calvinia and the Dr Van Niekerk Hospital in Springbok. No hospitals are located within the Khâi-Ma LM.
- » The majority of households within the Khâi-Ma LM are well serviced with regards to flush toilets connected to sewage, refuse removal, piped water and electricity, with the LM often exhibiting similar levels of service provision than that of the Namakwa DM.

CHAPTER 8: ASSESSMENT OF IMPACTS

This chapter serves to assess the significance of the positive and negative environmental impacts (direct and indirect) expected to be associated with the development of Geelster 1 and its associated infrastructure.

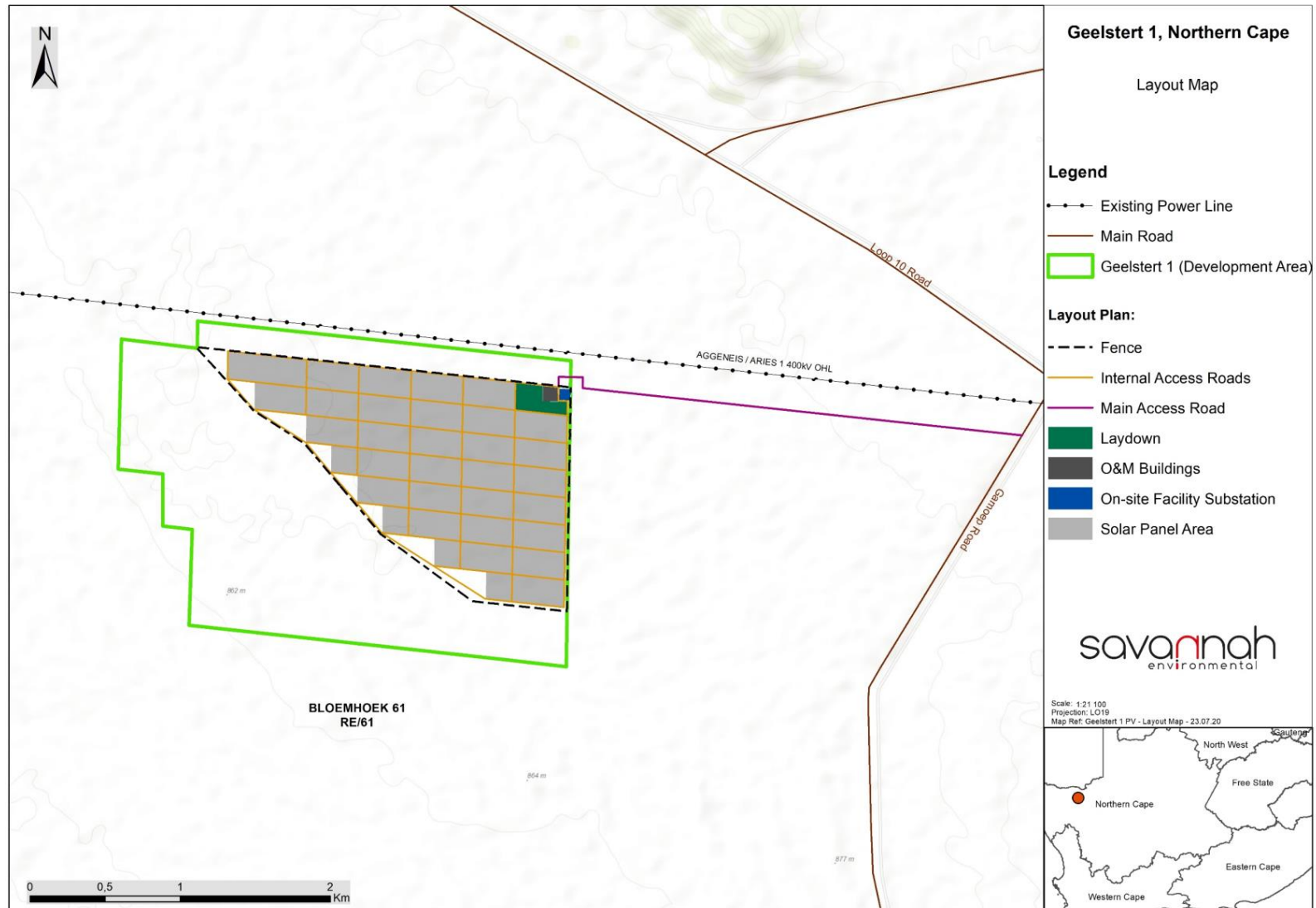
This assessment has considered the construction of a solar PV facility with a contracted capacity of up to 125MW_{AC}, within a development footprint of approximately 245ha. The project will comprise the following key infrastructure and components:

- » Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- » Centralised inverter stations or string inverters;
- » A temporary laydown area;
- » Cabling between the panels, to be laid underground where practical;
- » An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV, with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- » An access road with a maximum width of 8m;
- » Internal access roads within the PV panel array area with a maximum width of 5m;
- » Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The development footprint is accessible from the N14 national road via the existing Loop 10 Road, which runs parallel to the north-eastern corner of the study area, and the Gamoep Road (R358) which runs parallel to the eastern boundary of the study area.

The full extent of the development area (578ha) located within the study area (i.e. Remaining Extent of the farm Bloemhoek 61) was considered within the Basic Assessment by the independent specialists and the EAP. The development footprint (245ha) (which will house the PV panels and associated infrastructure) will be located within the development area. On-site sensitivities were identified through the review of existing information, desk-top evaluations and field surveys undertaken by the independent specialists.

The development footprint was designed by the proponent through consideration and avoidance of the sensitive environmental features and areas identified through the pre-feasibility screening desktop study and the BA process, which included ground-truthed information provided by the ecological, avifauna and freshwater specialists.



The development of Geelstert 1 will comprise the following phases:

- » *Pre-Construction and Construction* – will include pre-construction surveys; site preparation; establishment of access roads, laydown areas, and facility infrastructure; construction of foundations involving excavations; the transportation of components/construction equipment to site, manoeuvring and operating vehicles for unloading and installation of equipment; laying cabling; and commissioning of new equipment and site rehabilitation. The construction phase for Geelstert 1 is estimated to last 12 - 18 months.
- » *Operation* – will include the operation of the solar PV facility and the generation of electricity, which will be fed into the national grid via the facility on-site substation and an overhead power line³¹. The operation phase of Geelstert 1 is expected to be approximately 20 years (with maintenance).
- » *Decommissioning* – depending on the economic viability of the solar PV facility, the length of the operation phase may be extended beyond a 20-year period. At the end of the project's life, decommissioning will include site preparation, disassembling of the components of the solar PV facility, clearance of the relevant infrastructure at the site and rehabilitation. Note that impacts associated with decommissioning are expected to be similar to those associated with construction activities. Therefore, these impacts are not considered separately within this chapter.

Environmental issues associated with construction and decommissioning activities may include, among others, threats to biodiversity, ecological processes and freshwater resources, including habitat alteration and impacts to fauna and avifauna, impacts to sites of heritage value, soil erosion and loss of agricultural land, and nuisance from the movement of vehicles transporting equipment and materials.

Environmental impacts associated with the operation phase include visual impacts, night-time lighting impacts, habitat alteration and impacts to fauna and avifauna, and potential invasion by alien and invasive plant species.

8.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

Requirement	Relevant Section
3(h)(v) the impacts and risks identified including the nature, significance, consequence, extent, duration and probability of the impacts, including the degree to which these impacts (aa) can be reversed, (bb) may cause irreplaceable loss of resources, and (cc) can be	The impacts and risk associated with the development of Geelstert 1, including the nature, significance, consequence, extent, duration and probability of the impacts and the degree to which the impact can be reversed and cause an irreplaceable loss of resources

³¹ The grid connection point for Geelstert 1 will be the existing Aggeneis Main Transmission Substation (MTS). In order to connect Geelstert 1 to the national grid a grid connection solution comprising of specific grid connection infrastructure needs to be developed. The grid connection infrastructure will include a collector substation and a double-circuit overhead power line with a capacity of up to 220kV, which will be assessed as part of a separate Basic Assessment process.

Requirement	Relevant Section
avoided, managed or mitigated.	are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.2, 8.8.3, 8.9.3 and 8.10.2.
3(h)(vii) positive and negative impacts that the proposed activity and alternatives will have on the environment and on the community that may be affected focusing on the geographical, physical, biological, social, economic, heritage and cultural aspects	The positive and negative impacts associated with the development of Geelstert 1 are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.2, 8.8.3, 8.9.3 and 8.10.2.
3(h)(viii) the possible mitigation measures that could be applied and the level of residual risk.	The mitigation measures that can be applied to the impacts associated with Geelstert 1 are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.2, 8.8.3, 8.9.3 and 8.10.2.
3(i) a full description of the process undertaken to identify, assess and rank the impacts the activity will impose on the preferred location through the life of the activity, including (i) a description of all environmental issues and risks that were identified during the environmental impact assessment process and (ii) an assessment of the significance of each issue and risk and an indication of the extent to which the issue and risk could be avoided or addressed by the adoption of mitigation measures,.	A description of all environmental impacts identified for Geelstert 1 during the BA process, and the extent to which the impact significance can be reduced through the implementation of the recommended mitigation measures provided by the specialists are included in sections 8.3.2, 8.4.2, 8.5.2, 8.6.2, 8.7.1, 8.8.2, 8.9.2 and 8.10.1.
3(j) an assessment of each identified potentially significant impact and risk, including (i) cumulative impacts, (ii) the nature, significance and consequences of the impact and risk, (iii) the extent and duration of the impact and risk, (iv) the probability of the impact and risk occurring, (v) the degree to which the impact and risk can be reversed, (vi) the degree to which the impact and risk may cause irreplaceable loss of resources and, (vii) the degree to which the impact and risk can be avoided, managed or mitigated.	An assessment of each impact associated with the development of Geelstert 1, including the nature and significance, the extent and duration, the probability, the reversibility, and the potential loss of irreplaceable resources, as well as the degree to which the significance of the impacts can be mitigated are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.2, 8.8.3, 8.9.3 and 8.10.2.
3(m) based on the assessment, and where applicable, impact management measures from specialist reports, the recording of the proposed impact management outcomes for the development for inclusion in the EMPr.	Mitigation measures recommended by the various specialists for the reduction of the impact significance are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.2, 8.8.3, 8.9.3 and 8.10.2.

8.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of Geelstert 1 relate to the direct loss of vegetation and species of special concern, disturbance of fauna, avifauna and a loss of habitat, impacts on wetlands through the possible increase in surface water run-off, and impacts on soils. In order to assess the impacts associated with Geelstert 1, it is necessary to understand the extent of the area that will be affected by the development.

A development area³² of 578ha has been identified within the study area (i.e. ~12 378,97ha) for the development of the solar PV facility. The actual development footprint³³ of 245ha (i.e. actual area of disturbance) will house the PV panels and other associated infrastructure and will be entirely contained within the development area. Therefore, considering the above the area of disturbance within the study area (i.e. ~12 378,97ha) will be ~2% of the total area/affected property.

8.3. Potential Impacts on Ecology (Ecology, Flora and Fauna)

The significance of the ecological impacts expected with the development of Geelstert 1 has been assessed as medium to low, depending on the impact being considered, with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

Potential ecological impacts resulting from the development of Geelstert 1 will stem from a variety of different activities and risk factors associated with the pre-construction, construction, operation and decommissioning phases and would include impacts on vegetation and protected plant species, direct faunal impacts and impacts on broad-scale ecological processes. Potential impacts and the relative significance of the impacts are summarised below.

8.3.1 Results of the Ecological Impact Assessment

Three field assessments were undertaken for the study area and development area in June 2018, April 2019 and June 2020. The outcomes of the field assessments show that the Geelstert 1 development footprint, located within the development area, is restricted to low sensitivity areas. The development area has a low diversity of fauna and flora with a low abundance of species of conservation concern and therefore the area is considered suitable for the development of Geelstert 1.

The development footprint for the Geelstert 1 solar PV facility avoids sensitive features present within the development area (refer to **Figure 8.2**) which include the dune system and deep sands of the Koa River Palaeovalley located to the south; the depression wetland located directly to the west; and the quartz patches with associated species of conservation concern which occur widely in the area. The development footprint of Geelstert 1 is located within an Ecological Support Area (ESA) and outside a Critical Biodiversity Area (CBA)³⁴ which comprises the southern section³⁴ of the development area where the dune system and the deep sands of the Koa River Palaeovalley are located. There are no highly significant biodiversity features within the development footprint and no likely impacts associated with the development that cannot be mitigated to a low significance.

³² The development area is the area identified within the Remaining Extent of Bloemhoek 61 within which the required infrastructure for Geelstert 1 will be sited. The facility layout of the infrastructure and the area to be covered by the infrastructure is known as the development footprint.

³³ The area within the development area to be covered by the infrastructure components of Geelstert 1. The development footprint has an extent of 245ha.

³⁴ The impact of Geelstert 1 on the ESA and CBA is included in **Chapter 9** of the BA Report.

Figure 8.2 below illustrates the ecological sensitivity associated with the Geelstert 1 development area and development footprint.

8.3.2 Description of Ecological Impacts

The following potential impacts have been identified and are considered to be relevant to the development of Geelstert 1.

Impacts on vegetation and protected plant species

Some protected species occur and would be impacted by the development of Geelstert 1. Vegetation clearing during construction will lead to the loss of currently intact habitat within the development footprint and is an inevitable consequence of the proposed solar PV facility. This impact is expected to occur during the construction phase as this is when the clearance of vegetation will take place, although the consequences will persist long after the completion of the construction phase.

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will have an impact on fauna. Sensitive and shy fauna will move away from the area during the construction phase as a result of the noise and human activities present, while some slow-moving species would not be able to avoid the construction activities and might be killed. Some impact on fauna is highly likely to occur during the construction phase as well as the operation phase and this impact will therefore be assessed for the construction and operation phase.

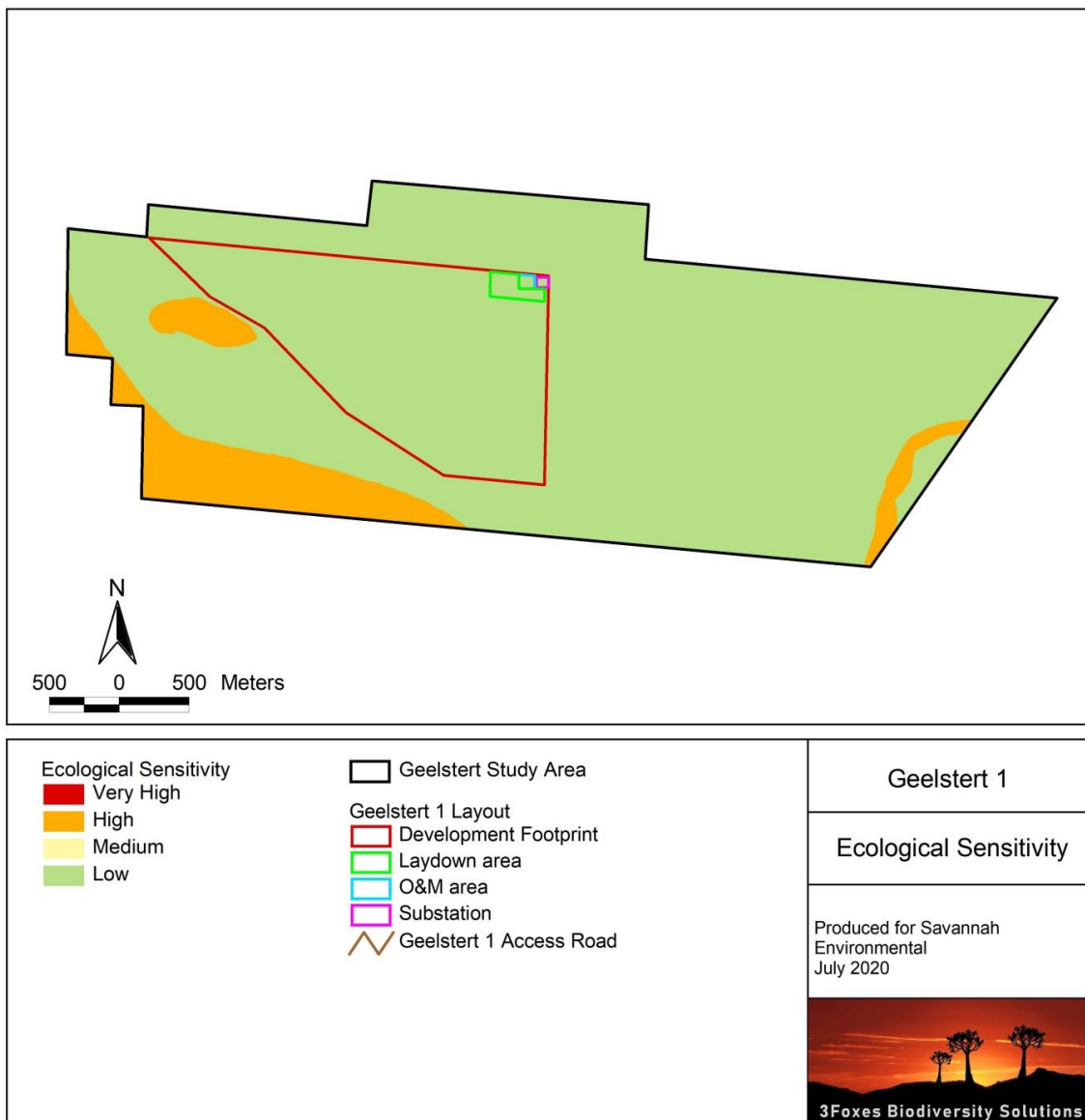


Figure 8.2: Ecological sensitivity map of the Geelstert 1 development area and development footprint. Areas of high ecological sensitivity are located outside the development footprint.

8.3.3 Impact tables summarising the significance of impacts on ecology during construction, operation and decommissioning (with and without mitigation)

Planning and Construction Phase Impacts

Nature: <u>Impacts on vegetation and listed or protected plant species due to construction activities</u>		
Impacts on vegetation will occur due to disturbance and vegetation clearing associated with the construction of the solar PV facility. In addition, there will be some loss of individuals of protected plant species.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Moderate (3)
Probability	Definite (5)	Definite (5)

Significance	Medium (45)	Medium (40)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	This impact cannot be well mitigated because the loss of vegetation and any individuals of protected species is unavoidable and is a certain outcome of the development.	
Mitigation:		
<ul style="list-style-type: none"> » A pre-construction walk-through of the facility's final layout must be undertaken in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC permit conditions. » Search and rescue for identified species of concern before construction must be undertaken. » Vegetation clearing to commence only after the walk-through has been conducted and necessary permits obtained. » Pre-construction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to. This includes awareness of no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, remaining within demarcated construction areas etc. » Contractor's Environmental Officer (EO) must provide supervision and oversight of vegetation clearing activities within sensitive areas. » Vegetation clearing must be kept to a minimum. No unnecessary vegetation must be cleared. » All construction vehicles must adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area. » Temporary laydown areas must be located within previously transformed areas or areas that have been identified as being of a low sensitivity. These areas should be rehabilitated after use. 		
Residual Impacts:		
As the loss of currently intact vegetation is an unavoidable consequence of the development, the habitat loss associated with the development remains a moderate residual impact even after mitigation and avoidance of more sensitive areas.		

Nature: <u>Direct faunal impacts due to construction activities</u>		
Disturbance, transformation and loss of habitat will have a negative effect on resident fauna during construction. Due to noise and operation of heavy machinery, faunal disturbance will extend well beyond the footprint and extend into adjacent areas. This will however be transient and restricted to the construction phase.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low to Medium (5)	Low (3)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (32)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Although noise and disturbance generated at the site during construction is largely unavoidable, impacts such as those resulting from the presence of construction personnel at the site can be readily mitigated.	
Mitigation:		
<ul style="list-style-type: none"> » All personnel must undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition. » Any fauna threatened by the construction activities must be removed to safety by an appropriately qualified environmental officer. » All construction vehicles must adhere to a low speed limit to avoid collisions with susceptible species such as 		

snakes and tortoises.

- » All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.
- » If trenches need to be dug for electrical cabling or other purpose, these must not be left open for extended periods of time as fauna may fall in and become trapped in them. Trenches which are standing open should have places where there are soil ramps allowing fauna to escape the trench.

Residual Impacts:

It is probable that some individuals of susceptible species will be lost to construction-related activities despite mitigation. However, this is not likely to impact the viability of the local population of any fauna species.

Operation Phase Impacts

Nature: *Faunal impacts due to operation*

The operation and presence of the facility may lead to disturbance or persecution of fauna within or adjacent to the facility.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Low (21)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	To a large extent, but some low-level residual impact due to noise and human disturbance during maintenance is likely.	

Mitigation:

- » Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities must be removed to a safe location.
- » If the site must be lit at night for security purposes, this must be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- » All hazardous materials must be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.
- » All vehicles accessing the site must adhere to a low speed limit (30km/h max for heavy vehicles and 40km/h for light vehicles) to avoid collisions with susceptible species such as snakes and tortoises.
- » If the facility is to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands must be placed on the inside of the fence and not the outside.

Residual Impacts:

Disturbance from maintenance activities will occur at a low level with the result that disturbance would be largely restricted to the development footprint.

Nature: *Habitat degradation due to erosion and alien plant invasion*

Disturbance created during construction will leave the site and its immediate surroundings vulnerable to erosion and alien plant invasion for several years into the operation phase.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)

Duration	Medium-term (2)	Short-term (1)
Magnitude	Medium (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	Low (28)	Low (15)
Status (positive or negative)	Negative	Negative
Reversibility	Medium	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
<ul style="list-style-type: none"> » Erosion management at the site must take place according to the Erosion Management Plan and Rehabilitation Plan. This must make provision for annual monitoring and rehabilitation. » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » There must be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area. » Alien management at the site must take place according to the Alien Invasive Management Plan. » Regular (annual) monitoring for alien plants during operation must be undertaken to ensure that no alien invasive problems have developed as result of the disturbance, as per the Alien Management Plan for the project. » Woody aliens must be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present. 		
Residual Impacts:		
Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact if effectively managed.		

Decommissioning Phase Impacts

Nature: <i>Habitat degradation due to erosion and alien plant invasion</i>		
Disturbance created during decommissioning will leave the development footprint vulnerable to erosion and alien plant invasion for several years.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (3)
Magnitude	Medium (4)	Low (3)
Probability	Likely (4)	Likely (3)
Significance	Medium (36)	Low (21)
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Moderate	Low
Can impacts be mitigated?	Yes, with proper management and avoidance, this impact can be mitigated to a low level.	
Mitigation:		
<ul style="list-style-type: none"> » Erosion management at the site must take place according to the Erosion Management Plan and Rehabilitation Plan. This plan must make provision for monitoring of the site for at least 5 years after decommissioning. » All erosion problems observed must be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » There must be follow-up rehabilitation and revegetation of any remaining bare areas with indigenous perennial shrubs, grasses and trees from the local area. » Alien management at the site must take place according to the Alien Invasive Management Plan. This plan must make provision for alien monitoring and management for at least 5 years after decommissioning. » Regular (annual) monitoring for alien plant during operation must be undertaken to ensure that no erosion 		

problems have developed as result of the disturbance, as per the Alien Management Plan for the project.

- » Woody aliens must be controlled on at least an annual basis using the appropriate alien control techniques as determined by the species present.

Residual Impacts:
Some erosion and alien plant invasion is likely to occur even with the implementation of control measures, but would have a low impact if effectively managed.

Nature: *Direct faunal impacts due to decommissioning activities*

Due to disturbance, noise and the operation of heavy machinery, faunal disturbance due to decommissioning will extend beyond the footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Low (3)
Probability	Highly Probable (4)	Probable (3)
Significance	Low (28)	Low (18)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Although the noise and disturbance generated at the site during decommissioning is probably largely unavoidable, this will be transient and ultimately the habitat would be restored to something useable by the local fauna.	

Mitigation:

- » All personnel must undergo environmental induction with regards to fauna and, in particular, awareness about not harming or collecting species such as snakes, tortoises and owls, which are often persecuted out of superstition.
- » Any fauna threatened by the decommissioning activities must be removed to safety by an appropriately qualified environmental officer.
- » All vehicles must adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- » All hazardous materials must be stored in the appropriate manner to prevent contamination of the site and ultimately removed from the site as part of decommissioning. Any accidental chemical, fuel and oil spills that occur at the site must be cleaned up in the appropriate manner as related to the nature of the spill.
- » The site must be rehabilitated with locally occurring species to restore ecosystem structure and function.

Residual Impacts:
Although some components of disturbance cannot be avoided, the site itself would have low faunal abundance at decommissioning and no significant residual impacts are likely.

8.3.4 Implications for Project Implementation

With the implementation of mitigation measures by the proponent, contractors, and operational staff, the significance of ecological impacts of Geelstert 1 can be reduced to low, with only one impact being of a medium significance following the implementation of the mitigation measures. From the outcomes of the ecological assessment, there are no fatal flaws or high post-mitigation impacts that should prevent the development of Geelstert 1 from proceeding. From the outcomes of the ecological assessment, it is concluded that the development of the solar PV facility and associated infrastructure is acceptable. On-site mitigation is viewed as the most practical and appropriate action, and viable options for reducing the overall impact of the development is detailed below:

- » The deep red dune sands habitat located to the south of the development; and the depression wetland located to the west of the development footprint are no-go areas and should be excluded from development.
- » A pre-construction walk-through of the solar PV facility's final layout must be undertaken in order to locate species of conservation concern that can be translocated as well as comply with the Northern Cape Nature Conservation Act and DENC permit conditions.
- » If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects.
- » If the facility is to be fenced, then no electrified strands should be placed within 30cm of the ground as some species such as tortoises are susceptible to electrocution from electric fences because they do not move away when electrocuted but rather adopt defensive behaviour and are killed by repeated shocks. Alternatively, the electrified strands should be placed on the inside of the fence and not the outside as is the case on the majority of already constructed PV plants.
- » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for annual monitoring and rehabilitation.

8.4. Potential Impacts on Avifauna

The significance of the impacts on avifauna expected with the development of Geelstert 1 has been assessed as medium to low, depending on the impact being considered, with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix E** for more details).

8.4.1 Results of the Avifauna Impact Assessment

The dune habitat to the south and west and located outside of the development footprint is considered to be of a very high avifaunal sensitivity, as this supports a healthy resident population of the Vulnerable Red Lark. The adjoining sandy flats habitat also supports the Red Lark, therefore much of the sandy flats presents a buffer between the development footprint for Geelstert 1 and the dune habitat for the Red Lark. This buffer area is to be of a high sensitivity and is not considered suitable for development.

The presence of the Red Lark was confirmed within the development area, but outside of the development footprint (refer to **Figure 8.3**). The plains habitat further north of the sandy flats does not appear to be suitable habitat for the Red Lark based on the three field surveys undertaken in the area. Since the plains habitat is widely distributed, it is considered to have a low sensitivity. A depression wetland is located to the west of the development footprint has a very high but lies outside of the development footprint.

The development of Geelstert 1 within the low sensitivity plains habitats will result in the least impact on avifauna, provided the recommended mitigation measures are implemented during the construction, operation and decommissioning phases of the development. While the undertaking of the development within the plains habitat would result in some habitat loss for several avifauna species that are widely occurring and of local significance, it will not necessarily impact on red-listed avifauna, which are known to occur within the surrounding area.



Figure 8.3: Illustration of the Red Lark sightings of 2018 and 2019 (shown by the red dots and more recently 2020 (shown by the yellow dots). Red Larks were clearly restricted to the dune habitat while being completely absent from the plain habitat associated with the development footprint in both seasons. Transects walked during the 2020 field survey across the southern section of the development area are illustrated as blue lines.

Figure 8.4 below provides an avifaunal sensitivity map for the Geelstert 1 development footprint, inclusive of the development footprint being assessed.

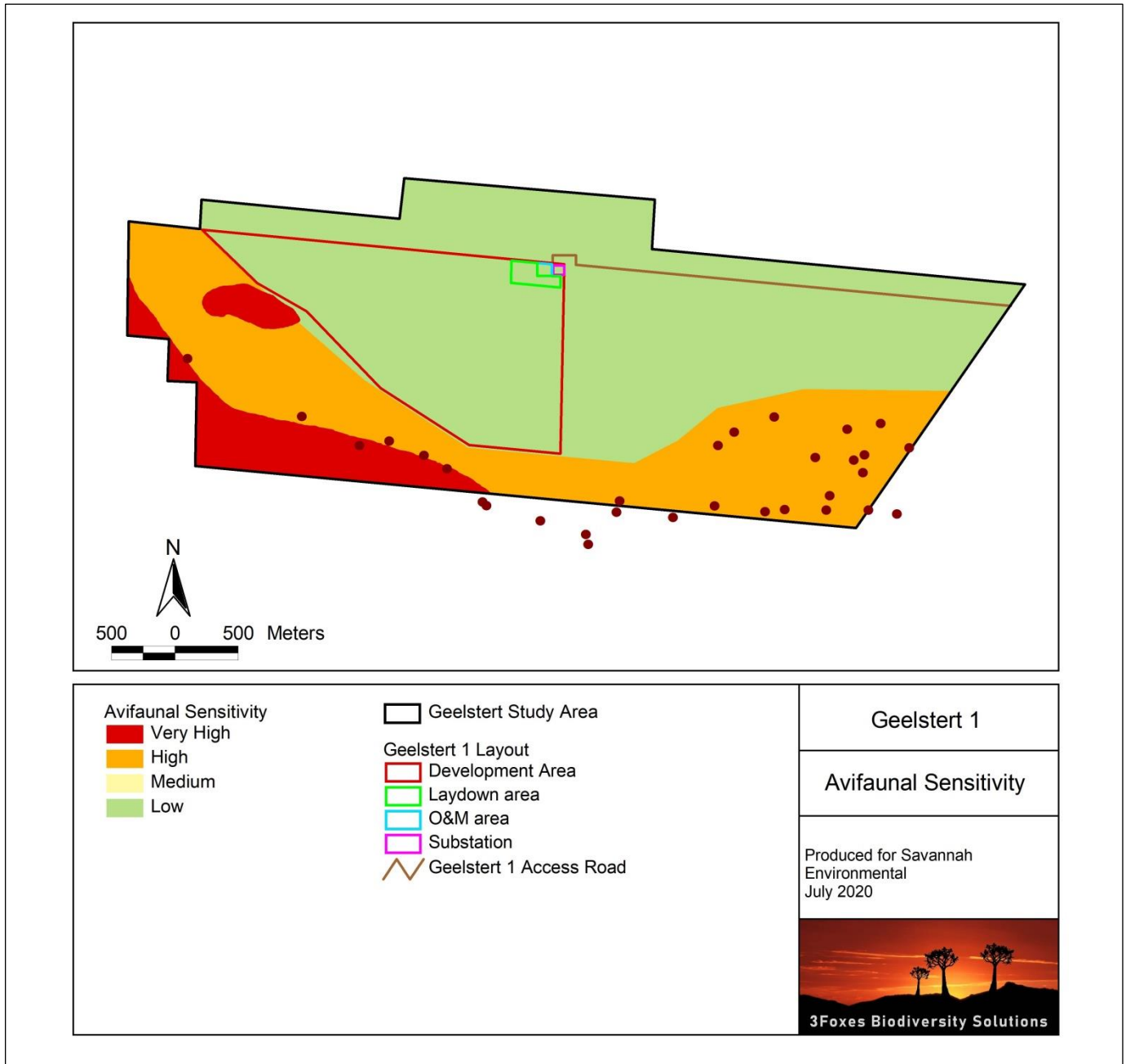


Figure 8.4: Map illustrating the avifaunal sensitivity within the Geelstert 1 development footprint.

8.4.2 Description of Avifaunal Impacts

In this section, the potential impacts and associated risk factors that may be generated by the development are identified. Poorly sited or designed solar PV facilities can have negative impacts on not only vulnerable species and habitats, but also on entire ecosystem functioning. These impacts are extremely variable and are dependent on numerous contributing factors which include the design and specifications of the development, the importance and sensitivity of avian microhabitats present on site and the diversity and abundance of the local avifauna.

The following potential avifauna impacts are expected to occur during the pre-construction, construction, operation and decommissioning phases:

Pre-construction Phase

- » Human presence and uncontrolled access to the site may result in negative impacts on the avifauna through disturbance and specimen abstraction due to poaching and uncontrolled collection of all avifauna for traditional medicine or other purpose.
- » Site clearing and exploration activities for site establishment may have a negative impact on avifauna if this is not conducted in a sensitive manner.

Construction Phase

- » Vegetation clearing for the solar field, access roads, site fencing and associated infrastructure will impact the local avifauna directly through habitat loss. Vegetation clearing will therefore lead potentially to the loss of avifaunal species, habitats and ecosystems as birds are displaced from their habitat.
- » Presence and operation of construction machinery on site. This will create a physical impact as well as generate noise, pollution and other forms of disturbance at the site.
- » Increased human presence can lead to poaching, illegal avifauna collecting (especially larger avifaunal species) and other forms of disturbance such as fire.

Operation Phase

- » The operation of the solar PV facility will generate minor disturbances which may deter some avifauna from the development footprint, especially red-listed avifaunal species which are less tolerant to disturbances. Such indirect impacts are still largely understudied and poorly understood, but preliminary data suggests that bird communities can be altered by solar PV facilities (De Vault *et al.*, 2014; Smith & Dwyer, 2016).
- » Mortality among the local avifauna may result due to direct collisions with solar panels or entrapment along the fenced boundaries of the facility.
- » The areas inside the solar PV facility will require management and if this is not done appropriately, it could impact adjacent intact areas through erosion, alien plant invasion and contamination from pollutants, herbicides or pesticides.

Project specific impacts on particular groups of avifauna are also expected to occur and include:

Habitat loss and disturbance of small passerines

For the smaller passerine species, the most important impacts will involve displacement from the area encompassed by the development footprint as a result of habitat destruction. While numerous species will be impacted, all of these species have large distribution ranges and will therefore only experience population decline within the development footprint, and not regionally or nationally. Some of the most abundant species that will be impacted, and which are also common in neighbouring habitats, include Spike-heeled Lark, Rufous-eared Warbler, Chat Flycatcher, and Tractrac Chat. The loss of habitat will be permanent while disturbance may be continuous during the operation phase of the solar PV facility. The Red Lark has not been recorded in the plains habitat during the three site surveys and is not expected to experience any loss of habitat. If birds are expected to occupy some of the plains habitat bordering the red dune areas and adjoining sandy flats, as determined through recent habitat modelling, it would nevertheless be considered marginal to this plains habitat. The buffer of approximately 250m between the edge of the proposed development footprint and the nearest recorded sightings of the Red Larks on the sandy flats adjoining the dune habitat is considered sufficient enough to ensure that the species will not be negatively impacted by the development.

Habitat loss, disturbance and collision risk of medium terrestrial birds and raptors

Small to medium sized non-passerines that may be impacted to some extent due to habitat loss and displacement include resident raptors such as Greater Kestrel *Falco rupicoloides*, and the ground-dwelling Namaqua Sandgrouse, Karoo Korhaan and Double-banded Courser *Rhinoptilus africanus*. These species may also be susceptible to collisions with associated infrastructure such as the PV panels, but this is not expected to have a major impact on most of these species. The Karoo Korhaan, although seemingly scarce at the development area, may, however, be at more risk based on recent research.

Habitat loss and disturbance of large terrestrial birds and raptors

The group of primary concern is the medium to large non-passerines, which include the large terrestrial birds and diurnal raptors. Many of these are also red-listed, such as Martial Eagle, Ludwig's Bustard, Verreaux's Eagle, and Secretarybird. Besides the loss of foraging habitat that these species will experience, disturbances during construction and operation and maintenance of the solar PV facility is also expected to have a negative impact.

8.4.3 Impact tables summarising the significance of impacts on avifauna during construction, operation and decommissioning (with and without mitigation)

Construction Phase Impacts

Nature: <i>Direct avifauna impacts during construction</i>		
Direct avifaunal impacts during the construction phase are expected to occur. These include habitat loss and disturbance due to vegetation clearing and the operation of heavy machinery on the site and the increased human presence.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low to Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	Medium (45)	Medium (40)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	This impact can only be mitigated to a limited extent as the loss of habitat is unavoidable and is a definite outcome of the development.	
Mitigation:		
<ul style="list-style-type: none"> » Laydown areas must be placed within the development footprint to avoid habitat loss and disturbance to adjoining areas. » The red sand dunes to the south of the development area should be considered a no-go area apart from where there are already existing access roads through this area. » All building waste produced during the construction phase should be removed from the development footprint and be disposed of at a designated waste management facility. Similarly, all liquid wastes should be contained in appropriately sealed vessels/ponds within the development footprint and be disposed of at a designated waste management facility after use. Any liquid and chemical spills should be dealt with accordingly to avoid contamination of the environment. » Pre-construction environmental induction for all construction staff on site must be undertaken to ensure that basic environmental principles are adhered to, and to ensure no harming or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition. » This induction should also include awareness to no littering, appropriate handling of pollution and chemical spills, 		

- avoiding fire hazards, minimising wildlife interactions, remaining within demarcated construction areas etc.
- » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
 - » All construction vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
 - » Any avifauna threatened by the construction activities should be removed to safety by the EO or appropriately qualified environmental officer.
 - » Should any water storage reservoirs be required, these should be covered with fine mesh or other exclusion material in order to exclude and prevent birds from accessing potentially contaminated water contained therein.
 - » If holes or trenches need to be dug, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may fall in and become trapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
 - » No construction activity should occur near active raptor nests should these be discovered prior to or during the construction phase. If active nests are discovered near construction areas, these should be reported to the ECO and should be monitored until the birds have finished nesting and the fledglings have left the nest.
 - » The perimeter fence around the facility should be designed with potential impacts on ground-dwelling avifauna in mind. Single-fence designs, whereby the electrical fencing component is attached to the inside of the mesh fence, are considered preferable as ground-dwelling birds cannot be trapped between these components.

Residual Impacts:

As the loss of currently intact habitat is an unavoidable consequence of the development, the habitat loss associated with the development remains a residual impact even after mitigation and avoidance of more sensitive areas. The sensitivity of the affected habitat is however low and the overall residual impact on avifaunal habitat loss remains low.

Operation Phase Impacts

Nature: Avifauna impacts due to operation activities

Avifaunal impacts due to operational activities are expected to occur during the operation phase of the solar PV facility. These include collisions with PV panels, entrapment along perimeter fencing, and disturbance due to traffic and night lighting.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low to Moderate (5)	Low (4)
Probability	Highly Probable (4)	Probable (3)
Significance	Medium (40)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Yes, to a large degree, but it may be more difficult to prevent collisions and impacts related to the perimeter fence where double-fencing is used as opposed to bird-friendly single-fencing.	

Mitigation:

- » All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death. The use of site security video surveillance records could be used if available, as this will contribute towards understanding bird interactions with solar panels.
- » The red sand dunes to the south of the development area should be considered to be a no-go area to avoid disturbance to avifauna, apart from where there are already existing access roads.
- » If the site must be lit at night for security purposes, this should be done with downward-directed low-UV type lights (such as most LEDs), which do not attract insects. The use of lighting at night should be kept to a minimum, so as not to unnecessarily attract invertebrates to the solar facility and possibly their avian predators, and to minimise

- disturbance to birds flying over the facility at night.
- » If birds' nest on the infrastructure of the facility and cannot be tolerated due to operational risks of fire, electrical shorts, soiling of panels or other concerns, birds should be prevented from accessing nesting sites by using mesh or other manners of excluding them. Birds should not be shot, poisoned, or harmed as this is not an effective control method and has negative ecological consequences. Birds with eggs or nestlings should be allowed to fledge their young before nests are removed.
 - » If there are any persistent problems with avifauna, then an avifaunal specialist should be consulted for advice on further mitigation.
 - » Any movements by vehicle and personnel should be limited to within the footprint of the solar field and other associated infrastructure, especially during routine maintenance procedures.
 - » Should any open reservoirs be required, these should be covered with fine mesh or other exclusion material in order to prevent birds from falling in and drowning.
 - » All vehicles accessing the site should adhere to a low speed limit (40km/h max) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest on roads at night.
 - » Maintenance of the perimeter fencing must ensure that it minimises impacts on ground-dwelling species susceptible to entrapment between the fencing components, where double-fence designs are used (though not recommended). If double-fence designs must be used instead of preferred single-fence designs, the space between the outer mesh fence and inner electrical fence should be kept clear of vegetation which may attract ground-dwelling species to forage there, while also ensuring that there are no gaps/holes in these fences that will allow ground-dwelling birds to enter the space between the two fences.

Residual Impacts:

Although high rates of mortality due to collisions with solar PV facilities has not been recorded in South Africa, there is some risk that this may occur in addition to some likely mortality associated with the perimeter fencing.

Decommissioning Phase Impacts

Nature: *Avifaunal impacts due to decommissioning activities*

Avifaunal impacts are expected to occur due to decommissioning activities. These include disturbance, noise and the operation of heavy machinery. Avifaunal disturbance due to decommissioning will extend beyond the development footprint and impact adjacent areas to some degree. This will however be transient and restricted to the period while machinery is operational. In the long term, decommissioning should restore the ecological functioning and at least some habitat value to the affected areas.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (4)	Low to Moderate (3)
Probability	Definite (5)	Definite (5)
Significance	Medium (35)	Medium (30)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Although the noise and disturbance generated at the site during decommissioning is largely unavoidable, this will be transient and ultimately the habitat should be restored to a state that will be useable by the local avifauna.	

Mitigation:

- » All infrastructure should be removed from the development footprint and disposed of in the appropriate manner.
- » Undertake environmental induction for all personnel on site to ensure that basic environmental principles are adhered to, and to ensure no harming or hunting ground-dwelling species (e.g. bustards, korhaans, thick-knees and coursers), and owls, which are often persecuted out of superstition.
- » This induction should also include awareness to no littering, appropriate handling of pollution and chemical spills, avoiding fire hazards, minimising wildlife interactions, remaining within demarcated decommissioning areas.

- » All waste produced during decommissioning must be disposed of at a designated and licensed waste management facility.
- » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site and ultimately be removed from the site as part of decommissioning.
- » Any accidental chemical, fuel and oil spills that occur should be cleaned up in the appropriate manner as related to the nature of the spill.
- » All vehicles should adhere to a low speed limit (40km/h on site) to avoid collisions with susceptible species such nocturnal and crepuscular species (e.g. nightjars, thick-knees and owls) which sometimes forage or rest along roads.
- » All vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed in undisturbed natural areas outside of the decommissioning area.
- » Any avifauna threatened by the activities should be removed to safety by the EO or appropriately qualified environmental officer.
- » If holes or trenches need to be dug, these should not be left open for extended periods of time as ground-dwelling avifauna or their flightless young may become entrapped in them. Holes should only be dug when they are required and should be used and filled shortly thereafter.
- » The site should be rehabilitated with locally occurring plant species to restore ecosystem structure and function, to allow local avifauna to use the area after rehabilitation.

Residual Impacts:

Disturbance during the decommissioning phase is an unavoidable consequence but will have a low residual impact with implementation of the recommended mitigation measures. The sensitivity of the affected habitat is however low and the overall residual impact on avifaunal habitat loss remains low.

8.4.4 Implications for Project Implementation

With the implementation of mitigation measures by the proponent, contractors, and operational staff, the significance of avifauna impacts associated with Geelstert 1 will be medium to low, depending on the impact being considered. Areas of low sensitivity have been identified within the development footprint, with no areas of medium or high sensitivity present which will be impacted by the development of Geelstert 1. The development footprint is, therefore, considered to be acceptable from an avifauna perspective.

From the outcomes of the avifauna assessment, it is concluded that the development of the solar PV facility and associated infrastructure is acceptable and impacts on avifauna managed by taking the following into consideration:

- » The red sand dunes to the south of the development footprint should be considered as a no-go area apart from where there are already existing access roads through this area.
- » No construction activity should occur near active raptor nests should these be discovered prior to or during the construction phase.
- » The perimeter fence around the facility should be designed with potential impacts on ground-dwelling avifauna in mind.
- » Maintenance of the perimeter fencing must ensure that it minimises impacts on ground-dwelling species.
- » All incidents of collision with panels should be recorded as meticulously as possible, including data related to the species involved, the exact location of collisions within the facility, and suspected cause of death.

8.5. Potential Impacts on Freshwater Features

The significance of the impacts on freshwater features expected with the development of Geelster 1 has been assessed as low, with the implementation of mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

The majority of the impacts on freshwater features within the Geelster 1 development footprint and development area would occur during the construction phase as a result of the disturbance related to construction activities and the associated impacts on freshwater features.

8.5.1 Results of the Freshwater Impact Assessment

Five (5) depression wetlands (**Figure 8.5**) were identified within the development area. A buffer zone of 15m for the depression wetlands is to be implemented. Based on the layout provided by the proponent, the development footprint of Geelster 1 is located well outside this buffer and the closest wetland is located approximately 30m from the development footprint of the solar PV facility. These features are regarded as no-go areas and should be excluded from any development activities.

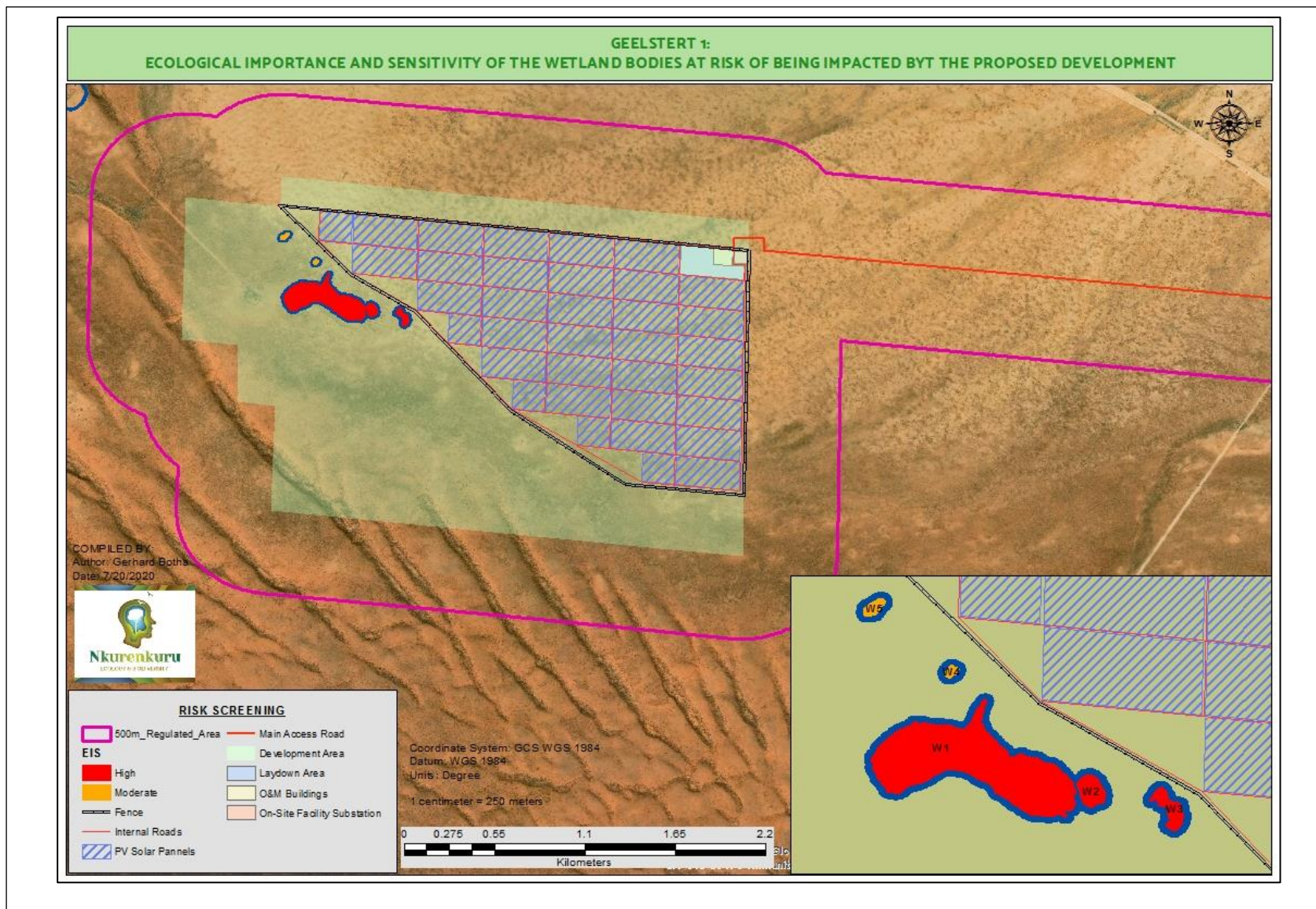


Figure 8.5: Freshwater features sensitivity map for the features that are at risk of being impacted by the development of Geelster 1

8.5.2 Description of Freshwater Impacts

Potential impacts on the depression wetland/freshwater features would result from a variety of activities and risk factors associated with the construction and operation phases of the project.

During the construction phase the following impacts are expected to occur:

» Impact on wetlands through the possible increase in surface water run-off during the construction phase

The primary threat related to the development of Geelstert 1 is increased run-off, sediment inputs, as well as turbidity. This is anticipated to occur during the clearance of vegetation from the development footprint for the PV facility infrastructure.

» Increase in sedimentation and erosion during the construction phase

The primary threat related to the development of Geelstert 1 is increased run-off, sediment inputs as well as turbidity. This is anticipated to occur during the clearance of vegetation from the development footprint for the PV facility infrastructure. An increase in volume and velocity of surface water flow from the cleared construction areas into the wetlands, may result in erosion and an increase in sediment input into the wetlands within the vicinity of the development footprint.

» Impacts on localised surface water quality

During the construction phase, chemical pollutants such as hydrocarbons from equipment and vehicles, cleaning fluids, cement and contaminated water could be washed downslope into the depression wetlands and could eventually affect water quality.

During the operation phase the following impacts are expected to occur:

» Altered run-off patterns due to rainfall interception by PV panel infrastructure and compacted areas resulting in high levels of erosion, sedimentation and turbidity within the depression wetland areas

Disturbance created during the construction could take years to fully stabilise and the presence of hardened surfaces (i.e. roads) will generate a large amount of run-off which will pose a significant erosion risk, if not managed appropriately. For the depression wetlands, the primary threat to these features related to PV developments during the operation phase is such increased run-off, sediment inputs, as well as turbidity.

8.5.3 Impact tables summarising the significance of impacts on freshwater features during construction, operation and decommissioning (with and without mitigation)

Construction Phase Impacts

Nature: Impact on depression wetlands through the possible increase in surface water run-off during the construction phase

For depression wetlands, the primary threat related to PV developments during the construction phase are increased run-off, sediment inputs, as well as turbidity. These occur during vegetation clearing and excavation of soil for foundations and access. An increase in volume and velocity of surface water flow from the cleared construction

areas into the wetlands may result in the loss of natural wetland vegetation and formation of erosion gullies.

The likelihood of these impacts occurring are, however, relatively low due to the geographical location of the development footprint (within a relatively low lying flat to slightly sloping landscape). The potential risk and significance of this impact will furthermore be significantly reduced through the implementation and maintenance of the recommended buffer areas. The potential for these impacts to occur can also furthermore be avoided with diligent and effective mitigation measures in place.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Medium (33)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	Low – if erosion has reached severe levels the impacts will not be remedied easily.	High
Irreplaceable loss of resources?	Moderate Probability	Low Probability
Can impacts be mitigated?	Yes, to a large extent.	

Mitigation:

- » No activities may be allowed outside of the facility development footprint, and especially within the identified wetland areas. These areas are regarded as no-go areas.

As all identified wetlands are located outside of the development footprint, the most likely potential impacts on the wetlands will be of an indirect nature and as such the following mitigation measures, although not directly associated with the wetlands, are recommended:

- » Any areas disturbed during the construction phase should be effectively rehabilitated as fast as possible. Where deemed necessary by the Contractor's EO, artificial rehabilitation (e.g. re-seeding with collected or commercial indigenous seed mixes) should be applied in order to speed up the rehabilitation process in critical areas (e.g. steep slopes and unstable soils).
- » No unnecessary vegetation clearance may be allowed, and vegetation should be allowed to persist under and around the PV panels once operational. Some bush cutting of the larger shrubs within the PV panel array area may be allowed.

Residual Impacts:

Possible impact on the remaining catchment due to changes in run-off characteristics in the development footprint.

Nature: Increased sedimentation and erosion during the construction phase

For depression wetlands, the primary threat related to PV developments during the construction phase is increased run-off, sediment inputs, as well as turbidity. This is during vegetation clearing and excavation of soil for foundations and access. An increase in volume and velocity of surface water flow from the cleared construction areas into the wetlands, may result in erosion and an increase in sediment inputs into the depression wetlands in the vicinity of the development footprint.

The likelihood of these impacts occurring are however relatively low due to the geographical location of the proposed development footprint (within a relatively low lying flat to slightly sloping landscape). The potential risk and significance of this impact will furthermore be significantly reduced through the implementation and maintenance of

the recommended buffer areas. The potential for these impacts to occur can also furthermore be avoided with diligent and effective mitigation measures in place.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Short-term (1)
Magnitude	Moderate (6)	Minor (2)
Probability	Probable (3)	Improbable (2)
Significance	Medium (33)	Low (8)
Status (positive or negative)	Negative	Negative
Reversibility	Low – if erosion has reached severe levels the impacts will not be remedied easily	High
Irreplaceable loss of resources?	Moderate Probability	Low Probability
Can impacts be mitigated?	Yes, to a large extent.	

Mitigation:

As all identified wetlands are located outside of the development footprint, most potential impacts on the wetlands will be of an indirect nature and as such the following mitigation measures, although not directly associated with the wetlands, are recommended in order to avoid the encroachment of erosion into these habitats or a reduction in water quality due to an increase in sedimentation into these systems:

- » Any erosion problems observed because of the development should be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
- » All bare areas, as a result of the development, should be revegetated with locally occurring species, to bind the soil and limit erosion potential.
- » Roads used for project-related activities and other disturbed areas should be regularly monitored for erosion. Problem areas should receive follow-up monitoring to assess the success of the remediation.
- » Silt traps must be used where there is a danger of topsoil or material stockpiles eroding and entering streams and other sensitive areas.
- » Topsoil must be removed and stored separately and should be reapplied where appropriate, as soon as possible to encourage and facilitate rapid regeneration of the natural vegetation on cleared areas.
- » Where practical, phased development and vegetation clearing should be applied so that cleared areas are not left un-vegetated and vulnerable to erosion for extended periods of time.
- » Construction of gabions and other stabilisation features on steep slopes to prevent erosion, if deemed necessary.
- » Where possible, activities at the site must be reduced after large rainfall events when the soils are wet. No driving off of on designated roads should occur at any time, and particularly immediately following large rainfall events.
- » No activities and infrastructure may be allowed or placed within the recommended wetland buffer areas within which the natural vegetation cover should be maintained.

Residual Impacts:

Residual impacts will be negligible after appropriate mitigation measures have been implemented.

Nature: *Impacts on localised surface water quality*

During the construction phase, chemical pollutants (hydrocarbons from equipment and vehicles), cleaning fluids, cement and contaminated water could be washed downslope into depression wetlands and eventually affect water quality.

The likelihood of this impact occurring is however relatively low due to the geographical location of the proposed development footprint (within a relatively low lying flat to slightly sloping landscape). The potential risk and

significance of this impact will furthermore be significantly reduced through the implementation and maintenance of the recommended buffer areas. The potential for these impacts to occur can also furthermore be eluded with diligent and effective mitigation measures in place.

	Without mitigation	With mitigation
Extent	Local (1)	Low (1)
Duration	Long-term (4)	Short-term (1)
Magnitude	High (8)	Moderate (6)
Probability	Improbable (3)	Improbable (2)
Significance	Medium (39)	Low (16)
Status (positive or negative)	Negative	Negative
Reversibility	Low - if erosion has reached severe levels the impacts will not be remedied easily	High
Irreplaceable loss of resources?	Moderate Probability	Low Probability
Can impacts be mitigated?	Yes, to a large extent.	

Mitigation:

- » Strict use and management of all hazardous materials used on site must be implemented.
- » Strict management of potential sources of pollutants (e.g. litter, hydrocarbons from vehicles and machinery, cement during construction etc.).
- » Containment of all contaminated water by means of careful run-off management on the development area must be undertaken.
- » Infrastructure may not be placed within the recommended buffer areas whose natural vegetation cover should be maintained in a natural condition.
- » Due to the low gradient of most of the development footprint any accidental spill or leakage of hazardous or harmful substances can be effectively contained around the source of the spillage. In the case of such an accidental spillage, prompt and effective action is required in order to prevent the spillage from spreading and to successfully rehabilitate the contaminated area.

Residual Impacts:

Residual impacts will be negligible after appropriate mitigation have been implemented.

Operation Phase Impacts

Nature: *Altered run-off patterns due to rainfall interception by PV panel infrastructure and compacted areas resulting in high levels of erosion, sedimentation, and turbidity within the lower lying depression wetland areas.*

Disturbance created during construction could take several years to fully stabilise and the presence of hardened surface (roads) will generate a large amount of runoff which will pose a significant erosion risk, if not managed. For wetlands, the primary threat related to PV developments during the operation phase are increased run-off, erosion, sediment inputs, as well as turbidity.

The likelihood of these impacts occurring are however relatively low due to the geographical location of the proposed development footprint (within a relatively low lying flat to slightly sloping landscape). The potential risk and significance of this impact will furthermore be significantly reduced through the implementation and maintenance of the recommended buffer areas. The potential for these impacts to occur can also furthermore be avoided with diligent and effective mitigation measures in place.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Short-term (1)
Magnitude	Moderate (6)	Small (0)
Probability	Improbable (2)	Very improbable (1)

Significance	Low (24)	Low (2)
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Potential loss of important resources due to disturbance of a stable vegetation cover.	No
Can impacts be mitigated?	Yes, to a large extent.	
Mitigation:		
<ul style="list-style-type: none"> » Regular monitoring of the site (minimum of twice annually) is required to identify possible areas of erosion particularly after large summer thunderstorms have occurred (monitoring and inspections done by the Operations and Management Team). » All mitigation measures pertaining to erosion should be strictly adhered to and promptly executed, which include regular monitoring. » Due to the low gradient of most of the development footprint, any accidental spill or leakage of hazardous or harmful substances can be effectively contained around the source of the spillage and in the case of such an accidental spillage, prompt and effective action is required in order to prevent the spillage from spreading and to successfully rehabilitate the contaminated area. 		
Residual Impacts:		
Due to the extent and nature of the development, altered morphology is unlikely to occur.		

Decommissioning Phase

During the decommissioning phase the same potential impacts identified in the construction phase can be associated with the decommissioning of the solar PV facility. The same impacts, significance ratings and mitigation measures are applicable. Therefore, decommissioning impacts in terms of freshwater are not further considered.

8.5.4 Implications for Project Implementation

With the implementation of mitigation measures by the proponent, contractors, and operational staff, the significance of impacts on freshwater features for Geelstert 1 can be reduced to low. From the outcomes of the studies undertaken, it is concluded that the development of the solar PV facility and associated infrastructure is acceptable subject to the recommendations made by the specialist. On-site mitigation is viewed as the most practical and appropriate action, and viable options for reducing the overall impact of the development on these areas is detailed below:

- » No activities may be allowed outside of the development footprint.
- » All depression wetlands should be regarded as **No-Go Areas** and be excluded from the development footprint.
- » The buffer areas recommended around the depression wetlands should be implemented and maintained in a natural condition to allow efficient functioning of these buffer areas.

8.6. Assessment of Impacts on Soil and Agricultural Potential

The impact of Geelstert 1 on the soils and agricultural potential has been assessed as low with the implementation of the recommended mitigation measures. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix G**).

8.6.1 Results of the Soil Impact Assessment

The entire extent of the Geelstert 1 development area is located within land type Af26, which consists largely of deep, sandy soils. There are no high potential soils present within the study area and development area and the soils are of low potential at best due mainly to a combination of the depth and the sandy texture which will lead to rapid water infiltration and the soils drying out.

In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the development area, can be identified.

In general, the soils that do occur within the study area are suited for extensive grazing at best, however the grazing capacity of the area is very low, at around 26-40 ha/large stock unit.

The soils present in the study area and development area are not considered susceptible to erosion by water. However, if the vegetation cover is disturbed (for example by overgrazing and construction activities) and considering the sandy nature of the topsoil's, as well as the dry climate, there is a significant possibility of removal of some or all of the topsoil by wind action.

8.6.2 Description of Soil and Agricultural Potential Impacts

Two impacts have been identified to be associated with the development of Geelstert 1 from a soils and agricultural potential perspective; these impacts are relevant for the construction, operation and decommissioning phases and include:

» Loss of agricultural land

The major impact on the natural resources of the site would be the loss of potential agricultural land due to the installation of the solar panels and construction of the associated infrastructure. However, in this instance, there is no evidence of any cultivation in the vicinity, so this impact would be of extremely limited significance and would be local in extent, if at all.

» Soil erosion

In this area, the sandy soils, coupled with the dry climate, means that a possible impact would be the increased risk of wind erosion of the topsoil when vegetation cover is removed or disturbed. This would be especially relevant for the construction of access roads and other associated infrastructure.

The main impact on soils would be due to construction related activities for the solar panels and connecting infrastructure (roads, buildings, cables etc.).

8.6.3 Impact tables summarising the significance of impacts on Soil and Agricultural Potential during construction, operation and decommissioning (with and without mitigation)

Construction and Operation Phase Impacts

Nature: Loss of potentially productive agricultural land

The loss of productive agricultural land could potentially occur during the construction phase, through the undertaking

of the construction activities and panel installation, as well as the operation of the solar PV facility.		
	Without mitigation	With mitigation
Extent	Low (1)	Low (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (18)	Low (14)
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
» Minimise the footprint of construction as much as possible.		
Residual:		
The residual impact is likely to be low, since the implementation of the appropriate mitigation measures will enable more or less complete rehabilitation during and after the life of the project.		

Nature: <i>Increased soil erosion hazard by wind</i>		
Increased soil erosion is expected to occur due to the disturbance of the soil as a result of and during construction activities, as well as during the operation phase of the solar PV facility.		
	Without mitigation	With mitigation
Extent	Medium (3)	Low (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	High (8)	Minor (2)
Probability	Highly probable (4)	Improbable (2)
Significance	High (64)	Low (10)
Status (positive or negative)	Negative	Negative
Reversibility	Low	High
Irreplaceable loss of resources?	Very possible	No
Can impacts be mitigated?	Yes	
Mitigation:		
» Minimise the footprint of construction as much as possible.		
» Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible.		
» Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure).		
Residual:		
If mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.		

Decommissioning Phase Impacts

During the decommissioning phase the same potential impacts identified in the construction phase can be associated with the decommissioning of the solar PV facility. The same impacts, significance ratings and mitigation measures are applicable. Therefore, decommissioning impacts in terms of soils and agricultural potential are not further considered.

8.6.4 Implications for Project Implementation

With the implementation of mitigation measures by the proponent, contractors, and operational staff, the significance of impacts of Geelstert 1 is expected to have a low impact on soils and agricultural potential. From the outcomes of the study undertaken, it is concluded that Geelstert 1 can be developed and impacts on soils managed by taking the following into consideration:

- » Minimise the footprint of construction as much as possible.
- » Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure).

8.7. Assessment of Impacts on Heritage Resources

No archaeological and palaeontological impacts of a high significance were identified for the proposed development. The Heritage Screener (refer to **Appendix I**) has shown that it is unlikely that the development of the Geelstert 1 solar PV facility will have a negative impact on archaeological and palaeontological resources. This is based on the fact that there are no heritage resources within the development footprint, therefore no impact is expected.

8.7.1 Impact tables summarising the significance of impacts on Heritage Resources during construction, operation and decommissioning (with and without mitigation)

Construction and Operation Phase Impacts

<i>Nature: Significant archaeological, built environment resources may be impacted by the construction phase of the proposed development.</i>		
A number of archaeological sites are known from the surrounding area; however, these sites are located well outside of the development footprint of the solar PV facility.		
	Without mitigation	With mitigation
Extent	Local (1)	Low (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (7)	Low (7)
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts on heritage resources that do occur are irreversible.	Any impacts on heritage resources that do occur are irreversible
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » A person must be trained as a site monitor to report any archaeological sites found during the project life cycle. Construction managers/Foremen and/or the Environmental Officer (EO) should be informed before construction starts on the possible types of heritage sites and cultural material that they may encounter and the procedures to be followed when they find sites. » Any substantial fossil remains (e.g. vertebrate bones and teeth, shells) encountered during excavation should be reported to SAHRA for possible mitigation by a professional palaeontologist (Contact Details: SAHRA, 111 Harrington Street, Cape Town, PO Box 4637, Cape Town 8000, South Africa. Phone +27(0)21 462 452 and Fax +27(0) 		

21 462 4509 (www.sahra.org.za).

Residual:

- » If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including graves and burials) are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue.
- » Should substantial fossil remain such as vertebrate bones and teeth, plant-rich fossil lenses, fossil wood or dense fossil burrow assemblages be exposed during construction, the responsible ECO/EO/Environmental Representative should safeguard these, preferably in situ, and alert SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact details: Mr P. Hine P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za) so that appropriate action can be taken by a professional palaeontologist, at the Proponent's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a suitably qualified palaeontologist. If mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.

Nature: *Various palaeontological assessments have noted that the bedrock in the general area and the affected area is underlain by unfossiliferous and is of no palaeontological interest.*

The study area for Geelstert 1 is associated with a low palaeosensitivity as shown by the SAHRIS Palaeosensitivity Map.

	Without mitigation	With mitigation
Extent	Local (1)	Low (1)
Duration	Permanent (5)	Short-term (2)
Magnitude	Low (1)	Low (1)
Probability	Improbable (1)	Improbable (1)
Significance	Low (7)	Low (7)
Status (positive or negative)	Neutral	Neutral
Reversibility	Any impacts on heritage resources that do occur are irreversible.	Any impacts on heritage resources that do occur are irreversible
Irreplaceable loss of resources?	Possible	Possible
Can impacts be mitigated?	Yes	

Mitigation:

- » A person must be trained as a site monitor to report any archaeological sites found during the project life cycle. Construction managers/Foremen and/or the Environmental Officer (EO) should be informed before construction starts on the possible types of heritage sites and cultural material that they may encounter and the procedures to be followed when they find sites.
- » Any substantial fossil remains (e.g. vertebrate bones and teeth, shells) encountered during excavation should be reported to SAHRA for possible mitigation by a professional palaeontologist (Contact Details: SAHRA, 111 Harrington Street, Cape Town, PO Box 4637, Cape Town 8000, South Africa. Phone +27(0)21 462 452 and Fax +27(0) 21 462 4509 (www.sahra.org.za).

Residual:

- » If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including graves and burials) are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and

collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue.

- » Should substantial fossil remain such as vertebrate bones and teeth, plant-rich fossil lenses, fossil wood or dense fossil burrow assemblages be exposed during construction, the responsible ECO/EO/Environmental Representative should safeguard these, preferably in situ, and alert SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact details: Mr P. Hine P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za) so that appropriate action can be taken by a professional palaeontologist, at the Proponent's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a suitably qualified palaeontologist. If mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.

Decommissioning Phase

During the decommissioning phase the same potential impacts identified in the construction phase can be associated with the decommissioning of the solar PV facility. The same impacts, significance ratings and mitigation measures are applicable. Therefore, decommissioning impacts in terms of heritage resources potential are not further considered.

8.7.2 Implications for Project Implementation

With the implementation of mitigation measures by the proponent, contractors, and operational staff, the significance of impacts of Geelstert 1 is expected to have a low impact on heritage resources. From the outcomes of the study undertaken, it is concluded that the solar PV facility can be developed and impacts on heritage resources can be managed by taking the following into consideration and the mitigation measures included in the Fossil Chance Procedure (included as **Appendix L** of the EMPr):

- » If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including graves and burials) are uncovered during construction, all work must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue; and
- » Should substantial fossil remain such as vertebrate bones and teeth, plant-rich fossil lenses, fossil wood or dense fossil burrow assemblages be exposed during construction, the responsible ECO/EO/Environmental Representative should safeguard these, preferably in situ, and alert SAHRA, i.e. The South African Heritage Resources Authority, as soon as possible (Contact details: Mr P. Hine P.O. Box 4637, Cape Town 8000. Tel: 021 462 4502. Email: cscheermeyer@sahra.org.za) so that appropriate action can be taken by a professional palaeontologist, at the Proponent's expense. Mitigation would normally involve the scientific recording and judicious sampling or collection of fossil material as well as associated geological data (e.g. stratigraphy, sedimentology, taphonomy) by a suitably qualified palaeontologist. If mitigation is not carried out, long-term wind erosion, with results such as loss of valuable topsoil, may occur.

8.8. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of Geelstert 1. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix H**).

8.8.1 Results of the Visual Impact Assessment

The development footprint is located within a relatively flat area. As a result, the development will be viewed by the majority of the visual receptors identified in the area (i.e. travellers along the N14 and the Loop 10 Road, etc.). However, for other receptors (i.e. the Aggeneys area, etc), views of the development footprint will be screened by the dense vegetation present from these areas. As a result, it is anticipated that the majority of the development footprint will be viewed as a dark line in the landscape and distance will dictate how obvious dark the line is in the landscape.

The surrounding landscape has been shown to generally have a relatively low level of visual absorption capacity. This means that relatively unbroken views of Geelstert 1 are likely to be possible.

Due to its tourism importance, the N14 is identified as one of the visual receptors within the vicinity of the development footprint. Views of the development footprint will be possible from the N14 for a limited extent (refer to **Figure 8.6**) and the PV array is likely to be seen as a relatively dark line that is unlikely to be highly obvious on the horizon. At this distance and due to the relative transparent nature of taller electrical infrastructure, the on-site facility substation is not likely to be highly obvious. It may however be visible above the height of the PV array.

The Loop 10 Road runs parallel to the northern boundary of the development area. The Geelstert PV array will be oriented towards this road. The PV array and the on-site facility substation will largely be screened from this road by the authorised Aggeneys 1 and 2 solar PV projects located to the north of the Geelstert 1 development footprint. The Gamoep Road that runs parallel to the eastern boundary of the development area is at its closest approximately 2.2km from the development area of the Geelstert 1 solar PV facility. The ZTV analysis has shown that the solar PV facility will be visible over 1.9km of this road.

There are a few homesteads within the vicinity of the development area for Geelstert 1. The nearest homestead is approximately 4.6km from the development area and the homestead does not appear to be occupied, although stock pens adjacent to the homestead appear to be used.

Views of the Geelstert 1 solar PV facility will be screened by the arrays of the authorised Aggeneys 1 and Aggeneys 2 solar PV facilities.

Aggeneys is the only settlement in the vicinity, at its closest it is approximately 8.8km from Geelstert 1. This is outside the Approximate Limit of Visibility of the proposed array. It is however within the Approximate Limit of Visibility of taller elements including the on-site facility substation. However, given the density of development and vegetation within the settlement, even if it were visible from the settlement, it is unlikely to be obvious.

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

- » The Aggeneys Aerodrome;
- » The N14;
- » The Loop 10 Road; and
- » The Gamoep Road (R358).

The Aggeneys Aerodrome is located approximately 9.8km to the west of Geelstert 1. It is possible that the solar PV array could have a glare impact on the Aggeneys Aerodrome, however, this impact is unlikely given the distance of Geelstert 1 from the Aerodrome. If glare is to occur, it will only affect the pilot's peripheral vision. It will not affect the straight-ahead pilot's view.

The solar PV facility will be lit by security lights to a level sufficient to ensure that security cameras can operate at night. This is likely to result in the array being obvious at night from surrounding areas. The area to the south and east of Geelstert 1 has no lighting obvious at night, whereas areas to the west, the town of Aggeneys and the existing mining operations, are well lit. Lighting from passing traffic on the N14 is also obvious. There is potential therefore for the project to extend the influence of lighting into an area that would otherwise be relatively dark at night.

The Zone of Theoretical Visibility for Geelstert 1 is illustrated in **Figure 8.6**.

8.8.2 Visual Assessment

Visual impacts will occur during the construction and operation of Geelstert 1. The following potential visual impacts are assessed for the development of the solar PV facility.

- » The proposed development could change the character of a relatively natural area to the south and east of Geelstert 1.
- » The proposed development could change the character of the landscape as seen from the N14.
- » The proposed development could change the character of the landscape as seen from the gravel local roads (i.e. Loop 10 Road and Gamoep Road (R358)) that runs to the north and east of the development area.
- » The proposed development could change the character of the landscape as seen from local homesteads.
- » The proposed development could change the character of the landscape as seen from local settlement areas.
- » Glare could affect travellers on the un-surfaced local roads (i.e. Loop 10 and Gamoep roads) which are located to the north and east of the development area for Geelstert 1.
- » Glare could affect the northern flight path of the Aggeneys Aerodrome.
- » Lighting impacts.

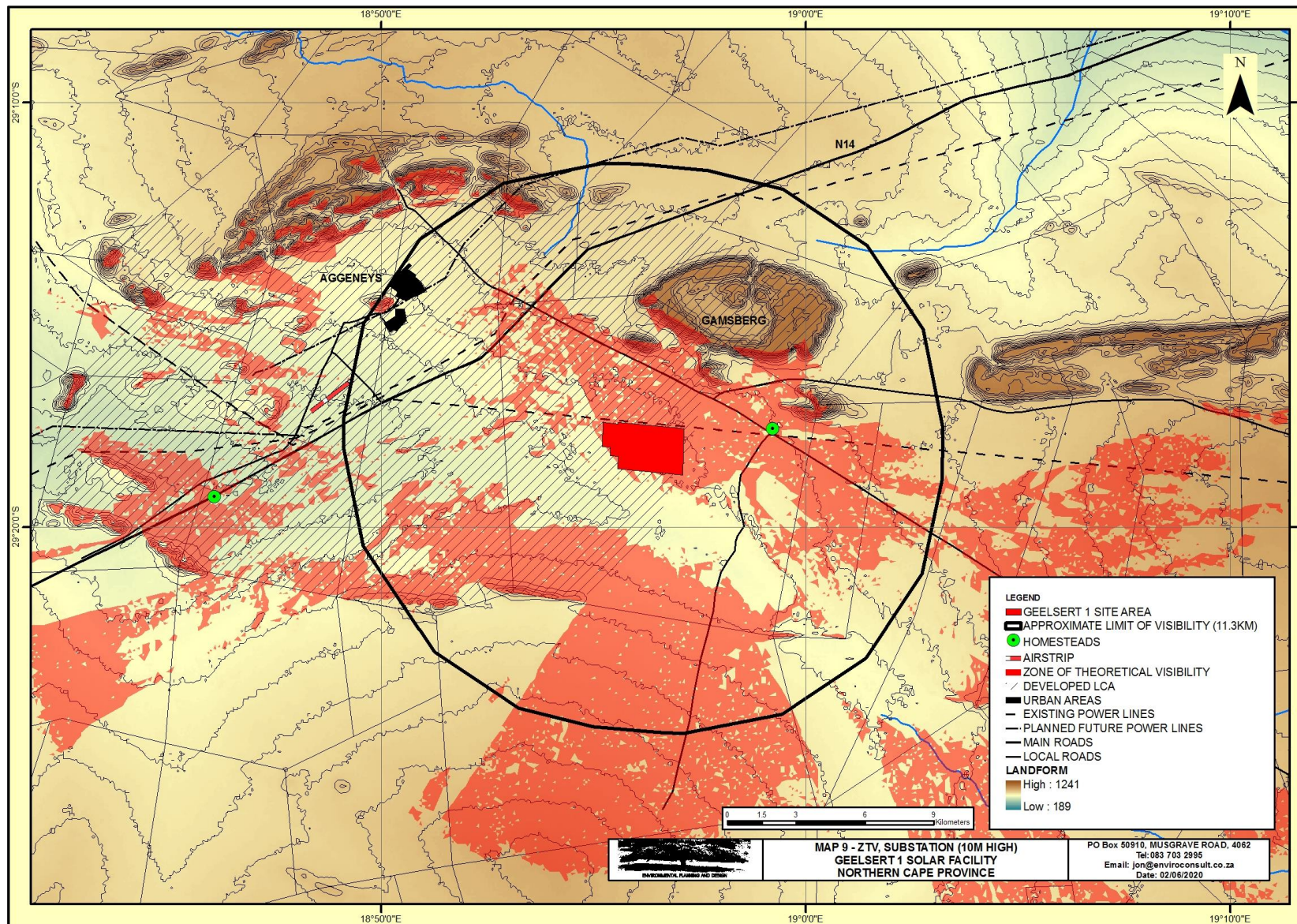


Figure 8.6: Zone of Theoretical Visibility for the PV array associated with the development of Geelstert 1.

8.8.3 Impact table summarising the significance of visual impacts during construction, operation and decommissioning (with and without mitigation)

Construction and Operation Phase Impacts

Nature: *Change in the character of a relatively natural area to the south and east of the Geelstert 1 (Landscape Change).*

Geelstert 1 is located on the eastern edge of a landscape character area that is influenced by development and mining activity. To the south and east, the landscape becomes increasingly less influenced by development. There is a possibility that the proposed development will extend the influence of development into this relatively natural area.

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

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

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

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small to Minor (1)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (21)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operation phase. There will therefore be no irreplaceable loss. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes	

Mitigation:

Planning:

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

Operation:

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

Decommissioning:

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

Residual Impacts:

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

Nature: Change in the character of the landscape as seen from the N14

The ZTV analysis indicates that the proposed PV array could be visible intermittently over approximately 5.0km of the road at a distance of approximately 5.1km. The proposed array forming the bulk of the development is relatively low – not exceeding 3.5m in height. Whilst this could be visible for up to 6.7km the array will be seen in profile as a dark line on the horizon which will start to visually blend with the background around 2.7km from the development.

Taller electrical infrastructure is likely to be visible over a similar section of the road and at the same distance. It is however not likely to be highly obvious.

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

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

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long term (4)
Magnitude	Minor (1)	Minor (1)
Probability	Very improbable (1)	Very improbable (1)
Significance	Low (7)	Low (7)
Status (positive or negative)	The character of the rural outlook from the road is highly unlikely to be modified in any significant way. Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operation phase. There will	No irreplaceable loss.

	therefore be no irreplaceable loss.
Can impacts be mitigated?	Yes, but this is highly unlikely to change the level of impact.
<p>Mitigation:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Plan levels to minimise earthworks to ensure that levels are not elevated; » Plan to maintain the height of structures as low as possible; and » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development. <p><u>Operation:</u></p> <ul style="list-style-type: none"> » Reinstate any areas of vegetation that have been disturbed during construction; » Remove all temporary works; » Monitor rehabilitated areas post-construction and implement remedial actions; and » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development footprint. <p><u>Decommissioning:</u></p> <ul style="list-style-type: none"> » Remove infrastructure not required for the post-decommissioning use of the site; and » Rehabilitate and monitor areas post-decommissioning and implement remedial actions. 	
<p>Residual Impacts:</p> <p>The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.</p>	

Nature: Change in the character of the landscape as seen from the un-surfaced local road (i.e. Loop 10 and Gamoep roads) that runs to the north and east of the development area

The proposed array will possibly be largely screened from the Loop 10 road to the north by the authorised Aggeneys 1 and 2 solar PV projects. A section of the project may however be viewed adjacent to these projects increasing the extent of solar projects that are visible over approximately the western most 4.5km of this road extending to its junction with the N14. The section of the project visible will be viewed at a distance of approximately 2.7km at its closest and will not be highly obvious.

The proposed project will be visible intermittently from approximately 1.9km of the un-surfaced road to the east at a distance of approximately 2.2km.

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small to Minor (1)	Small to Minor (1)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (21)
Status (positive or negative)	Negative, it is unlikely that all travellers on the road will consider the change in view as negative. It is likely however that a proportion of local people as well as tourists will consider the change	Negative

	as a negative impact.	
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operation phase. There will therefore be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes, however, due to the proximity of the project to the road and the low visual absorption capacity of the landscape, mitigation can only visually soften views of the project and not hide it.	
<p>Mitigation:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Plan levels to minimise earthworks to ensure that levels are not elevated; » Plan to maintain the height of structures as low as possible; » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development. <p><u>Operation:</u></p> <ul style="list-style-type: none"> » Reinststate any areas of vegetation that have been disturbed during construction; » Remove all temporary works; » Monitor rehabilitated areas post-construction and implement remedial actions; » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development footprint particularly the development setback area from the local road. <p><u>Decommissioning:</u></p> <ul style="list-style-type: none"> » Remove infrastructure not required for the post-decommissioning use of the site; » Rehabilitate and monitor areas post-decommissioning and implement remedial actions. 		
<p>Residual Impacts:</p> <p>The residual risk relates to loss of natural vegetation cover being obvious on decommissioning of the proposed project. It is therefore critical that effective rehabilitation is undertaken.</p>		

Nature: Change the character of the landscape as seen from local homesteads

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

There are other structures apparent from desktop verifications:

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

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

The homestead is located approximately 3.4km to the east of the proposed project. It is set at a slightly higher level than the site but not so high that an overview of the project will be possible.

The proposed array forming the bulk of the development is relatively low - not exceeding 3.5m in height. Whilst this could be visible it will start to visually blend with the background around 2.7km from the development. The proposed facility substation is unlikely to be highly obvious from this distance.

It is therefore possible that the proposed project may be visible from this homestead however it is unlikely to be highly obvious.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long-term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (16)	Low (16)
Status (positive or negative)	Neutral, given that the property is not inhabited and has no secondary tourism related use, the impact is unlikely to be seen as negative.	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operation phase. There will therefore be no irreplaceable loss. However, given the likely long-term nature of the project, it is possible that a proportion of stakeholders will view the loss of view as irreplaceable.	No irreplaceable loss
Can impacts be mitigated?	Yes, but this is highly unlikely to change the level of impact.	
<p>Mitigation:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Plan levels to minimise earthworks to ensure that levels are not elevated; » Plan to maintain the height of structures as low as possible; » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development. <p><u>Operation:</u></p> <ul style="list-style-type: none"> » Reinststate any areas of vegetation that have been disturbed during construction; » Remove all temporary works; » Monitor rehabilitated areas post-construction and implement remedial actions; » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development footprint. <p><u>Decommissioning:</u></p> <ul style="list-style-type: none"> » Remove infrastructure not required for the post-decommissioning use of the site; » Rehabilitate and monitor areas post-decommissioning and implement remedial actions. 		
<p>Residual Impacts:</p> <p>The residual risk relates to the infrastructure being left in place on decommissioning of the solar PV facility. It is therefore critical that effective rehabilitation is undertaken.</p>		

Nature: <i>Character of the landscape as seen from local settlement areas</i>		
The only settlement area that might be affected is the small town of Aggeneys. The ZTV assessment indicates that elements associated with Geelstert 1 are unlikely to be visible from Aggeneys.		
	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very Improbable (1)	Very improbable (1)
Significance	Low (6)	Low (6)
Status (positive or negative)	Neutral, it is unlikely that there will be a	Neutral

	significant change in the character of the view from Aggeneys.	
Reversibility	High	High
Irreplaceable loss of resources?	The proposed development can be dismantled and removed at the end of the operation phase. There will therefore be no irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	No mitigation required.	
Mitigation: No mitigation is required.		
Residual Impacts: No residual risks.		

Nature: Glare impacts that could affect travellers on the un-surfaced local road (i.e. Loop 10 Road) that runs to the north

As the Loop 10 Road that runs adjacent to the northern boundary of the development area gradually rises from the site towards the N14, it is possible that glare could affect this section of the road particularly during early mornings in the winter months. As the road rises away from the site, this section of road could only be affected when the sun is at its lowest.

The road (Gamoep Road) immediately east of the site also rises slightly. The angle of the array relative to the road also means that glare may affect this section of the road during late afternoons when the sun is lowest on the horizon.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Very improbable (1)
Significance	Low (16)	Low (6)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: <u>Operation:</u> » Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the northern / eastern edge of the array		
Residual Impacts: There are no residual risks.		

Nature: Glare impacts that could affect the northern flight path of Aggeneys Aerodrome

Aggeneys Aerodrome is approximately 12km to the west of Geelster 1.

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)

Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Very improbable (1)
Significance	Low (16)	Low (6)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation:		
Operations:		
» If glare does occur, it will only affect the peripheral vision of a pilot and it is therefore anticipated to be of a low significance. However, should glint and glare become a problem, the proponent should consult the owner of the Aggeneys Aerodrome and the Civil Aviation Authority (CAA) regarding the implementation of practical mitigation measures, such as screen fencing during the project life cycle of the solar PV facility.		
Residual Impacts:		
There are no residual risks.		

Nature: <i>Potential visual impact of operational, safety and security lighting of the facility at night on observers</i>		
Planned lighting levels of O&M buildings are low and will be sufficient for the use of these areas during night-time. It is also planned to light the substation for security reasons.		
To the south and east of the development area there is no lighting obvious at night whereas to the west the town of Aggeneys and the existing mining operations are well lit. Lighting from passing traffic on the N14 is also obvious. Therefore, there is potential for the project to slightly extend the influence of lighting into an area that would otherwise be relatively dark at night. With mitigation that might include the use of motion sensors, this impact is anticipated as being negligible.		
	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Improbable (2)
Significance	Low (24)	Low (12)
Status (positive or negative)	The appearance of lighting that is likely to be similar to local homesteads is unlikely to be seen as a negative impact particularly given that local mining operations are relatively well lit.	If the lights are generally not visible, then the occasional light is unlikely to be seen as negative.
Reversibility	High	High
Irreplaceable loss of resources?	High	High
Can impacts be mitigated?	Yes	
Mitigation:		
» Use low key lighting around buildings and operational areas that is triggered only when people are present;		
» Plan to utilise infra-red security systems or motion sensor triggered security lighting;		
» Ensure that lighting is focused on the development with no light spillage outside of the site; and		
» Keep lighting low, no tall mast lighting should be used.		
Residual Impacts:		
No residual risks have been identified.		

Decommissioning Phase Impacts

During the decommissioning phase the same potential impacts identified in the construction phase can be associated with the decommissioning of the solar PV facility. The same impacts, significance ratings and mitigation measures are applicable. Therefore, decommissioning impacts from a visual perspective are not further considered.

8.8.4 Implications for Project Implementation

Overall, the significance of the visual impacts is expected to be low as a result of the generally undeveloped character of the landscape and low number of potential visually sensitive receptors. From the outcomes of the visual impact assessment, it is concluded that the development of the solar PV facility and associated infrastructure can be developed and impacts on visual receptors managed by taking the following into consideration:

- » Plan levels to minimise earthworks to ensure that levels are not elevated;
- » Plan to maintain the height of structures as low as possible; and
- » Should glint and glare become a problem, the proponent should consult the owner of the Aggeneys Aerodrome and the Civil Aviation Authority (CAA) regarding the implementation of practical mitigation measures, such as screen fencing during the project life cycle of the solar PV facility.

8.9. Assessment of Social Impacts

Potential social impacts and the relative significance of the impacts associated with the development of Geelstert 1 are summarised below (refer to **Appendix J**). Both positive and negative social impacts are expected to occur with the development of the solar PV facility.

8.9.1 Results of the Social Impact Assessment

It was identified that most social impacts associated with the development of Geelstert 1 will have a short-term duration associated with the construction phase of the project. Of these impacts all can be mitigated to acceptable levels and there are no fatal flaws associated with the construction of the project.

Having carefully considered all the social impacts associated with the development of Geelstert 1 it is likely that the benefits attached to the generation of renewable energy and local economic and social development will offset the negative impacts associated with the construction and operation of the solar PV facility. On this basis the project is considered acceptable, subject to the implementation of the recommended mitigation measures.

8.9.2 Description of Social Impacts

During the construction and operation phases of Geelstert 1, both positive and negative impacts are expected to occur.

The positive and negative social impacts identified and assessed for the construction phase includes which will be for a 12-18-month period:

- » Direct and indirect employment opportunities
- » Economic multiplier effects
- » Influx of jobseekers and change in population
- » Safety and security impacts
- » Impacts on daily living and movement patterns
- » Nuisance impacts, including noise and dust
- » Visual impacts and sense of place impacts

The potential positive and negative social impacts that could arise as a result of the operation of the proposed project include the following:

- » Direct and indirect employment opportunities
- » Development of non-polluting renewable energy infrastructure
- » Contribution to Local Economic Development (LED) and social upliftment
- » Visual impact and sense of place impacts
- » Impacts associated with the loss of agricultural land

8.9.3 Impact tables summarising the significance of social impacts during construction, operation and decommissioning (with and without mitigation measures)

Construction Phase Impacts

Nature: *The creation of direct and indirect employment opportunities during the construction phase of the project.*

It is anticipated that the construction of Geelstert 1 will result in the creation of approximately 400 employment opportunities at the peak of construction, comprising a mixture of skilled (15%), semi-skilled (25%), and low-skilled (60%) opportunities. Employment opportunities generated as a result of the project will be temporary in nature and will last for the duration of the construction period (i.e. 12 -18 months). The majority of the general labour force will, as far as possible, be sourced from the local labour pool, providing employment opportunities to residents of communities surrounding the project (where the required skill sets are available). Where relevant skills are unavailable from the local labour pool, these would need to be sought elsewhere. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the area.

A number of indirect employment opportunities will also be created. Indirect employment opportunities will predominantly be created in the service industry, through the opportunity for the provision of secondary services to the construction team. Services may include, but are not limited to, accommodation, transportation, catering, and laundry services.

Skills development will also be undertaken as part of the construction phase. The skills development will broaden the skills of employees associated with the project and enable possible future opportunities where these become available.

	Without enhancement	With enhancement
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (36)	Medium (44)

Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	
Enhancement:		
<ul style="list-style-type: none"> » A local employment policy must be adopted to maximise opportunities made available to the local labour force. » Labour must be sourced from the local labour pool where possible. If the necessary skills are unavailable, labour should be sourced from (in order of preference) the greater Khâi-Ma LM, Namakwa DM, Northern Cape Province, South Africa, or elsewhere. Where required, training and skills development programmes must be initiated prior to the commencement of the construction phase. » Labour force suppliers must as far as possible be sourced locally. » Where feasible local suppliers and contractors, that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria, must be used as far as possible to ensure that the benefits resulting from the project accrue as far as possible to the local communities which are also likely to be most significantly impacted / affected by the project. » The recruitment selection process must seek to promote gender equality and the employment of women wherever possible. » Proof of skills development must be provided to the upskilled individual. 		
Residual impacts:		
<ul style="list-style-type: none"> » Improved pool of skills and experience in the local area. » Improved overall quality of life. » Economic growth for small-scale entrepreneurs. 		

Nature: Significance of the impact from the economic multiplier effects from the use of local goods and services.

There are likely to be opportunities for local businesses and service providers to provide services and materials, and in doing so benefit from the construction phase of the proposed project. Off-site accommodation in the nearest town (Aggeney), and smaller settlements, may be required for contract workers and certain employees. The economic multiplier effects from the use of local goods and services will include, but is not limited to, construction materials and equipment, and workforce essentials such as catering, trade clothing, safety equipment, accommodation, transportation and other goods.

In terms of business opportunities for local companies, expenditure during the construction phase will create business opportunities for the regional and local economy. The increase in demand for new materials and services in the nearby area may stimulate local business and local economic development. There is likely to be a direct increase in industry and indirect increase in secondary businesses where gaps in the market open up.

	Without enhancement	With enhancement
Extent	Local- Regional (3)	Local- Regional (3)
Duration	Short term (2)	Short term (2)
Magnitude	Minor (2)	Low (4)
Probability	Probable (3)	Highly Probable (4)
Significance	Low (21)	Medium (36)
Status (positive or negative)	Positive	Positive
Reversibility	N/A	N/A
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhanced)	
Enhancement:		
<ul style="list-style-type: none"> » A local procurement policy must be adopted to maximise the benefit to the local economy and the existing local 		

SMMEs.

- » A database of local companies, specifically Historically Disadvantaged Individuals (HDIs) which qualify as potential service providers (e.g. construction companies, security companies, catering companies, waste collection companies, transportation companies etc.) must be created and companies listed thereon must be invited to bid for project-related work where applicable.
- » Local procurement must be encouraged along with engagement with local authorities and business organisations to investigate the possibility of procurement of construction materials, goods and products from local suppliers where feasible.

Residual impacts:

- » Improved local service sector, growth in local business.

Nature: *In-migration of labourers in search of employment opportunities, and a resultant change in population, and increase in pressure on local resources and social networks, or existing services and infrastructure.*

An influx of people looking for employment or other economic opportunities could result in increased pressure being placed on economic and social infrastructure, and a change in the local population. Population change refers to the size, structure, density as well as demographic profile of the local community.

An influx of jobseekers into an area, could lead to a temporary increase in the level of crime, cause social disruption (including an increase in HIV and AIDS and unwanted pregnancies) and put pressure on basic services. This includes municipal services such as sanitation, electricity, water, waste management, health facilities, transportation and the availability of housing. It could also potentially create conflict between locals and outsiders due to potential differences in racial, cultural and ethnic composition. A further negative impact that could result due to an influx of jobseekers into an area is an increase in unemployment levels due to an oversupply of available workforce, particularly with respect to semi- and unskilled workers.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Low (4)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (24)	Low (18)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

- » Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.
- » Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work.
- » Engage with local community representatives prior to construction to facilitate the adoption of the "locals first" procurement policy.
- » Provide transportation for workers (from towns such as Aggeneys and others) to ensure workers can easily access their place of employment and do not need to move closer to the site.
- » Compile and implement a grievance mechanism.
- » Appoint a Community Liaison Officer (CLO) to assist with the procurement of local labour.
- » Prevent the recruitment of workers at the site.
- » Implement a method of communication whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
- » Establish clear rules and regulations for access to the proposed site.
- » Appoint a security company and implement appropriate security procedures to ensure that workers do not remain onsite after working hours.
- » Inform local community organisations and policing forums of construction activities and times and the duration of the construction phase.

Residual impacts:

- » Possibility of outside workers remaining in the area after construction is completed and subsequent pressures on local infrastructure, resources and services.

Nature: Temporary increase in safety and security concerns associated with the influx of people during the construction phase.

The commencement of construction activities can be associated with an increase in crime within an area. The perceived loss of security during the construction phase of a project due to an influx of workers and / or outsiders to the area (as in-migration of newcomers, construction workers or jobseekers are usually associated with an increase in crime), may have indirect effects such as increased safety and security concerns for neighbouring properties, damage to property, increased risk of veld fire, stock theft, poaching, crime and so forth.

The labour force will not permanently reside within the area or have any reason to be on-site after hours.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	High (8)	Moderate (6)
Probability	Probable (3)	Improbable (2)
Significance	Medium (36)	Low (20)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

- » Working hours must be kept within daylight hours during the construction phase.
- » Employees must be easily identifiable and must adhere to the security rules of the site.
- » Provide transportation for workers (from towns such as Aggeneys and others) to ensure workers do not need to move closer to the site.
- » The perimeter of the construction site must be appropriately secured to prevent any unauthorised access to the site. The fencing of the site must be maintained throughout the construction and operation phases.

- » The appointed EPC contractor must appoint a security company and implement appropriate security procedures and measures.
 - » Access in and out of the construction site must be strictly controlled by a security company appointed for the project.
 - » A Community Liaison Officer (CLO) must be appointed to implement a grievance mechanism. A communication protocol must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
 - » A stakeholder management plan must be implemented by the EPC contractor to address neighbouring farmer concerns regarding safety and security.
- Residual impacts:**
- » Residual impacts related to losses through crime and lasting damage to properties.

Nature: *Temporary increase in traffic disruptions and movement patterns during the construction phase.*

Project components and equipment will be transported to site using road transport. The N14 national road provides the primary access to the study area, while the development area itself can be accessed via the Loop 10 and Gamoep gravel roads. The mines and local farmers utilize the gravel access roads to access their farms/operations and the surrounding areas.

Increased traffic due to construction vehicles could cause disruptions to the local community and increase safety hazards. The use of local roads and transport systems may cause road deterioration and congestion. This impact could be magnified since roads of a gravel nature are not necessarily designed to carry heavy traffic and are prone to erosion, however the mines do make use of the gravel roads including the use of heavy vehicles. Noise, vibrations, dust and visual pollution from heavy vehicle traffic during the construction phase could also negatively impact local residents and road users.

Where specific land use activities are being undertaken on affected and adjacent properties, these may be impacted. This could impact land use of portions of the affected property for agricultural activities (i.e. grazing), as well as affected and surrounding landowners which use their properties for livestock grazing, game farming and mining activities.

	Without mitigation	With mitigation
Extent	Local-Regional (3)	Local (2)
Duration	Short term (2)	Short term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Probable (3)	Probable (3)
Significance	Medium (33)	Low (24)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	

Mitigation:

- » Working hours must preferably be restricted to daylight hours during the construction phase. Where deviation of the working hours is required it must be approved by the relevant authorities and surrounding landowners must be notified.
- » All vehicles must be road worthy and drivers must be licensed, obey traffic rules, follow speed limits and made aware of the potential road safety issues.
- » Construction vehicles should be inspected regularly by the EPC contractor to ensure their road worthiness.
- » Adequate and strategically placed traffic warning signs and control measures must be implemented along the N14 and gravel access roads (including the Loop 10 and Gamoep gravel roads) to warn road users of the construction activities taking place for the duration of the construction phase. Warning signs must be visible at all times, and especially at night. Signage must be maintained throughout the construction phase.
- » Implement penalties for reckless driving as a way to enforce compliance to traffic rules.
- » Avoid heavy vehicle activity through residential areas during "peak" hours (when children are taken to school, people driving to work, etc.).
- » The developer and EPC contractor must ensure that all fencing along access roads is maintained in the present condition or repaired if disturbed or damaged due to construction activities.
- » The developer and EPC Contractor must ensure that the roads utilised for construction activities are either maintained in the present condition or upgraded if damaged (i.e. wear and tear) due to construction activities.
- » A protocol communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process.
- » Communication channels between the affected and surrounding landowners and the EPC contractor must be established.
- » Undertake information sessions with the surrounding communities prior to construction in order to ensure that communities are fully informed of the project to be developed in its final form. This must be undertaken through the appointment of a Community Liaison Officer (CLO).

Residual impacts:

- » None anticipated.

Nature: *Nuisance impacts in terms of temporary increase in noise and dust.*

Nuisance impacts associated with construction related activities include noise, dust, and possible disruption to adjacent properties and the land use activities being undertaken on the adjacent properties at the time of construction.

Site clearing activities increase the risk of dust and noise being generated, which can in turn negatively impact on adjacent properties, especially where noise sensitive land use activities are being undertaken. The movement of heavy construction vehicles and construction activities (including the operation of equipment) also have the potential to create noise in the development area, as well as along the N14 national road, and the Loop 10 and Gamoep gravel roads. The primary sources of noise during construction would be from construction equipment, vehicle and truck traffic. Noise levels can be audible over a large distance although are generally short in duration.

Dust would be generated from construction activities as well as trucks / vehicles driving on gravel access roads. This impact will negatively impact sensitive receptors within the vicinity of the construction activities. The impact of noise and dust on sensitive receptors can be reduced through the application of appropriate mitigation measures.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	High (8)	Low (4)
Probability	Highly probable (4)	Probable (3)
Significance	Medium (44)	Low (21)
Status (positive or negative)	Negative	Negative

Reversibility	Reversible
Irreplaceable loss of resources?	No
Can impacts be mitigated?	Yes
Mitigation:	
<ul style="list-style-type: none"> » The movement of heavy vehicles associated with the construction phase through populated areas must be timed to avoid weekends, public holidays and holiday periods, where feasible. » Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. » A speed limit of 45km/hr must be implemented on gravel roads. Should the speed limit be exceeded appropriate action must be taken against the offender of the rules. » Ensure all vehicles are road worthy, drivers are licensed and are made aware of the potential noise and dust issues. » A CLO must be appointed. A method of communication must be implemented whereby procedures to lodge complaints are set out in order for the local community to express any complaints or grievances with the construction process. 	
Residual impacts:	
Residual damage from construction activities.	

Nature: Intrusion impacts from construction activities will have an impact on the area's "sense of place".

Intrusion impacts such as aesthetic pollution (i.e. building materials, construction vehicles, etc.), noise and light pollution will impact the "sense of place" for the local community and the surrounding landowners, specifically where land use activities sensitive to visual impacts and impacts on the "sense of place" are undertaken.

Construction related activities have the potential to negatively impact a local area's "sense of place", as well as the landscape character. Such an impact is likely to be present during the construction phase. It is however expected that the project will mostly affect areas and receptors that have already been exposed to other industrial infrastructure associated with the existing mining activities (i.e. for which the sense of place has already been altered).

Given the location of Geelstert 1 on a private property, within an area characterised as having a low population density, and given the project's location to existing mining activities and associated infrastructure the visual impact, change in landscape character and impact on the area's sense of place, from a social perspective, is anticipated to be of a low significance.

The identification of the significance of the impact on sense of place for the construction phase was undertaken through the consideration of the Visual Impact Assessment (Environmental Planning and Design, 2020) undertaken for the project. The visual impact is expected to be of a low significance from a visual perspective due to the relatively low viewer incidence in close proximity to the project. The Visual Impact Assessment has informed the visual impact from a social perspective.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Small (0)
Probability	Improbable (2)	Improbable (2)
Significance	Low (10)	Low (6)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation:		

- » Limit noise generating activities to daylight working hours and avoid weekends and public holidays.
- » The movement of heavy vehicles associated with the construction phase must be timed to avoid weekends, public holidays, and holiday periods where feasible.
- » Dust suppression measures must be implemented for heavy vehicles such as wetting of gravel roads on a regular basis and ensuring that vehicles used to transport sand and building materials are fitted with tarpaulins or covers.
- » All vehicles must be road-worthy, and drivers must be licensed and made aware of the potential road safety issues and need for strict speed limits.
- » Communication, complaints, and grievance channels must be implemented and contact details of the CLO must be provided to the local community in the study area.
- » Ensure proper management and tidiness of the construction site.
- » Implement the relevant mitigation measures as recommended in the Visual Impact Assessment.

Residual impacts:

None anticipated.

Operation Phase Impacts

Nature: The creation of employment opportunities and skills development opportunities during the operation phase for the country and local economy.

During the operation phase, it is expected that approximately 60 full-time employment opportunities will be available, depending on the operational requirements of the facility. These employment opportunities will include low-skilled (70%), semi-skilled (25%) and skilled (5%) opportunities. The employment opportunities generated as a result of the project will be long term and will last for the duration of operation (i.e. approximately 20 years). None of the employees appointed during the operation phase will be housed on-site. In addition to the direct employment opportunities it is anticipated that additional, however limited, indirect employment opportunities will be generated during the operation of the project.

	Without enhancement	With enhancement
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Minor (1)
Probability	Highly probable (4)	Highly probable (4)
Significance	Low (24)	Low (28)
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	

Enhancement:

- » A local employment policy must be adopted to maximise the opportunities made available to the local community.
- » The recruitment selection process must seek to promote gender equality and the employment of women wherever possible.
- » Vocational training programs must be established to promote the development of skills of the employees.
- » Proof of skills development must be provided to the upskilled individuals.

Residual impacts:

- » Improved pool of skills and experience in the local area.

Nature: Development of non-polluting, renewable energy infrastructure.

South Africa currently relies predominantly on coal-generated electricity and as a result, the country's carbon emissions are considerably higher than those of most developing countries. The use of solar technology for power generation is considered a non-consumptive use of a natural resource which produces zero greenhouse gas emissions during its operation. The generation of renewable energy (RE) utilising solar power will contribute positively to South Africa's electricity market. Given South Africa's reliance on Eskom as a power utility, the benefits associated with provision of electricity by an IPP are regarded as an important contribution, and the advancement of RE has been identified as a priority for South Africa.

Increasing the contribution of the RE sector to the local economy would contribute to the diversification of the local economy and provide greater economic stability. The growth in the RE sector as a whole could introduce new skills and development into the area. This is especially true with regards to solar power specifically considering the number of other solar power projects proposed and operational within the broader area.

The development of RE projects have the potential to contribute to the stability of the economy and could contribute to the local economy through employment generation (direct, indirect, and local service providers) and revenue generation for the LM. While the overall contribution of the project to South Africa's total energy requirements is small, the facility will also contribute towards offsetting the total carbon emissions associated with energy generation in South Africa. It should however be noted that such a benefit is associated with all RE projects and not only solar power projects in particular.

	Without enhancement	With enhancement
Extent	Local- Regional- National (4)	N/A
Duration	Long term (4)	N/A
Magnitude	Low (4)	N/A
Probability	Highly probable (4)	N/A
Significance	Medium (48)	N/A
Status (positive or negative)	Positive	N/A
Reversibility	Yes	
Irreplaceable loss of resources?	Yes (impact of climate change)	
Can impacts be mitigated?	No	
Mitigation/Enhancement: » None required.		
Residual impacts: Reduce carbon emissions through the use of renewable energy and contribute to reducing global warming.		

Nature: Contribution to LED and social upliftment during the operation of the project.

Projects which forms part of the DoE's REIPPP Programme are required as part of their bidding requirements to contribute towards LED and social upliftment initiatives within the area in which they are proposed. In addition, they are required to spend a percentage of their revenue on socio-economic and enterprise development, as well as allocate ownership shares to local communities that benefit previously disadvantaged communities around the project. A portion of the dividends generated by each development also need to be invested into LED projects and programmes. Geelstert 1 therefore has the potential to contribute positively towards socio-economic development and improvements within the local area.

Socio-economic spin-offs from the project could contribute towards upliftment of the surrounding communities. An in-depth Community Needs Assessment (CNA) is required to ensure that the beneficiary community's needs are understood and sufficiently addressed by the proposed development programmes in order to contribute meaningfully towards local economic growth and development.

	Without enhancement	With enhancement
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Extent	Local-Regional (3)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Highly probable (4)	Definite (5)
Significance	Medium (44)	High (65)
Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes (enhance)	
Enhancement:		
<ul style="list-style-type: none"> » A CNA must be conducted to ensure that the LED and social upliftment programmes proposed by the project are meaningful. » Ongoing communication and reporting is required to ensure that maximum benefit is obtained from the programmes identified, and to prevent the possibility for such programmes to be misused. » The programmes must be reviewed on an ongoing basis to ensure that they are best suited to the needs of the community at the time (bearing in mind that these are likely to change over time). 		
Residual impacts:		
Social upliftment of the local communities through the development and operation of the project.		

Nature: *Visual impacts and sense of place impacts associated with the operation phase of Geelstert 1.*

An area's sense of place is created through the interaction of various characteristics of the environment, including atmosphere, visual resources, aesthetics, climate, lifestyle, culture, and heritage. An area's sense of place is however subjective and largely dependent on the demographics of the population residing within the area and their perceptions regarding trade-offs. For example, while some individuals may prefer not to see any form of infrastructure development, others may be interested in large-scale infrastructure, or engineering projects, and operation of the facility, and consider the impact to be less significant. Such a scenario may especially be true given that the project comprises a renewable energy project and could therefore be seen as benefitting the local environment, when compared to non-renewable energy generation projects.

An impact on the sense of place is one that alters the visual landscape to such an extent that the user experiences the environment differently, and more specifically, in a less appealing or less positive light. The social impacts associated with the impact on sense of place relate to the change in the landscape character and visual impact of Geelstert 1. Given the location of Geelstert 1 on a private property, within an area characterised as having a low population density, and given the project's location within close proximity to existing mining activities and the associated infrastructure, the visual impact and impact on the area's sense of place associated with the operation of Geelstert 1 is anticipated to be of a low significance from a social perspective. The alteration of the sense of place in view of the local residents and road users will start during the construction phase and remain for the project's operational lifetime.

The identification of the significance of the impact on sense of place for the operation phase was undertaken through the consideration of the Visual Impact Assessment (Environmental Planning and Design, 2020) undertaken for the project. The visual impact is expected to be of a low significance from a visual perspective due to the relatively low viewer incidence in close proximity to the project. The Visual Impact Assessment has informed the visual impact from a social perspective.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Minor (2)

Probability	Improbable (2)	Improbable (2)
Significance	Low (18)	Low (14)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Maintain and manage the facility to be in a good and neat condition to ensure that no degradation of the area and site takes place and impacts the visual quality of the area. » Implement the relevant mitigation measures as recommended in the Visual Impact Assessment for the change in character and sense of place and landscape character. 		
Residual impacts:		
The visual impact of Geelstert 1 will remain until the infrastructure is completely decommissioned and removed. Thereafter the impact will be removed.		

Nature: Loss of agricultural land and overall productivity as a result of the operation of the proposed project on an agricultural property.

The development area of Geelstert 1 is located on deep, sandy soils which are red and structureless with occasional dunes. In addition, there are no high agricultural potential soils present due to a combination of the sandy textures leading to rapid water infiltration.

The low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would therefore be possible only by irrigation, and no indications of any irrigated areas is available within and surrounding the development area.

Considering the agricultural potential of the site, the significance of the impact on the loss of agricultural land will be low from a social perspective.

The Soils Impact Assessment (ARC, 2020) was considered for the identification of the significance relating to the impact on loss of agricultural land.

	Without mitigation	With mitigation
Extent	Site (1)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (15)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Keep the project footprint as small as possible. » Implement mitigation measures recommended by the soil's specialist. 		
Residual impacts:		
None expected to occur.		

Decommissioning Phase Impacts

Typically, major social impacts associated with the decommissioning phase are linked to the loss of jobs and associated income and will be similar to the impacts during the construction phase. This has implications for the households who are directly affected, the communities within which they live, and the relevant local authorities. However, in the case of Geelstert 1 it is anticipated that the proposed solar PV facility will be refurbished and upgraded to prolong its lifespan, where possible and decommissioning will only take place once the economic viability of the project has come to an end.

8.9.4 Implications for Project Implementation

The social impacts identified will be either of a low, medium, or high significance. No negative impacts with a high significance rating have been identified to be associated with the development of Geelstert 1, only positive social impacts are considered to be of a high significance. All negative social impacts are within acceptable limits from a social perspective. The recommendations proposed for the project are considered to be appropriate and suitable for the mitigation of the negative impacts and the enhancement of the positive impacts.

Based on the findings of the social impact assessment, the following recommendations are made:

- » A Community Liaison Officer (CLO) must be appointed to assist with the management of social impacts and to deal with community issues, if feasible.
- » Develop and implement a recruitment protocol in consultation with the municipality and local community leader. Ensure that the procedures for applications for employment are clearly communicated.
- » It is recommended that local labour be sourced, wherever possible, to ensure that benefits accrue to the local communities. Efforts should be made to involve local businesses during the construction phase where possible.
- » Local procurement of services and equipment is required where possible in order to enhance the multiplier effect.
- » Involve the community in the project process as far as possible (encourage co-operative decision making and partnerships with local entrepreneurs).
- » Employ mitigation measures to minimise the dust and noise pollution and damage to existing roads.
- » Safety and security risks should be considered during the planning / construction phase of the proposed project. Access control, security and management should be implemented to limit the risk of crime increasing in the area.

8.10. Assessment of Impacts on Traffic

Traffic impacts have been identified and assessed for the development of Geelstert 1. The details of the impact assessment are also provided within the traffic impact assessment (refer to **Appendix K**).

8.10.1 Results of the Traffic Impact Assessment

The national, regional, secondary, and proposed internal access roads will be used to transport all components and equipment required during the construction phase of the solar PV facility. Some of the components (e.g. substation transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No.93 of 1996), by virtue of the dimensional limitations.

The routes leading to the site and proposed to be used for transportation of project components, are Provincial and National Roads.

The development footprint is located south of the Loop 10 Road which is a gravel road that also provides access to an existing mine. The mine maintains the road by grading it regularly and this would need to be maintained once construction starts. The resultant traffic from the mine is on average fourteen heavy vehicle trips per day.

It is estimated that the total number of heavy vehicle trips across the construction phase for Geelstert 1 would vary between 4 500 and 6 000. These trips would be made over an estimated construction period of between 12 and 18 months. In the worst case, the calculated number of trips would be between 15 and 25 per day. The impact of this on the road network would however be negligible, as the additional peak hourly traffic would, at most, be 2 trips. This low construction and post construction traffic would have no significant impact on the existing traffic service levels.

During the peak of the construction phase, it is estimated that approximately 400 employees would be employed. These employees will come from the towns of Aggeneys (11km), Pofadder (57.5km) or Springbok (116km). Employees will need to be transported from the towns to site by bus or taxi. This would equate to 5 - 7 additional trips during the peak hours, if transported by 60-seater busses, or 20-27 additional trips if 15-seater minibus taxis are used.

It is assumed that once the plant is fully operational, it will require a staff compliment of approximately 60 full time employees. It is also assumed that the managers, supervisors, and key staff will constitute 30% of the permanent workforce. This workforce will travel to work by private vehicles. Assuming vehicle occupancy of 1.2 persons per vehicle, the total trips generated will be as calculated below:

» Vehicles per peak hour = $(60 \text{ employees} \times 30\%) / 1.2 \text{ persons per vehicle} = 15 \text{ vehicles}$

The total trips per day is equal to 30.

The unskilled employees will therefore constitute the remaining 70% of the total workforce. These employees will travel to work by bus or minibus taxi. Assuming vehicle occupancy of 15 persons per taxi, then the total trips generated will be calculated as follows:

» Vehicles per peak hour = $(60 \text{ employees} \times 70\%) / 15 \text{ persons per vehicle} = 3 \text{ trips}$

The total trips per day is equal to 6.

The total number of trips generated by the permanent workforce during the operation phase in the AM and PM peak period will therefore total 18 vehicles per hour. Combined with the expected trips of 1-2 vehicles per hour generated during the operation period, the additional traffic should not have a significant effect on the internal roads, access roads or surrounding road network.

8.10.1 Description of Traffic Impacts

Traffic impacts are expected during the construction and operation phases of Geelstert 1, as per the impact's tables included in section 8.10.2 below.

8.10.2 Impact tables summarising the significance of impacts on traffic during the construction, operation and decommissioning phases (with and without mitigation)

Construction Phase Impacts

Nature: <i>Construction phase traffic impacts</i>		
Traffic will be generated during the construction of Geelstert 1. These impacts will relate to the transportation of project components and employees.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Low (18)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Stagger infrastructure delivery to the site. » Staff and general trips should occur outside of peak traffic periods. » Where possible, construction materials must be sourced from local suppliers to limit the impact on the regional network. 		
Residual Impacts:		
The impact on local traffic will remain low.		

Operation Phase Impacts

Nature: <i>Operation phase traffic impacts</i>		
Traffic will be generated during the operation of Geelstert 1. These impacts will relate to the presence of the operation and maintenance staff at the facility.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (14)	Low (12)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Staff and general trips should occur outside of peak traffic periods 		

Residual Impacts:

None expected to occur.

Decommissioning Phase Impacts

During the decommissioning phase the same potential impacts identified in the construction phase can be associated with the decommissioning of the solar PV facility. The same impacts, significance ratings and mitigation measures are applicable. Therefore, decommissioning impacts from a traffic perspective are not further considered

8.10.3 Implications for Project Implementation

The traffic impacts associated with the development of Geelster 1 will be low following the implementation of the mitigation measures. No impacts of medium or high significance are expected to occur and as such the development of the solar PV facility is considered to be acceptable from a traffic perspective. The following mitigation measures have been recommended:

- » Stagger infrastructure delivery to the site.
- » Construction materials to be sourced from local suppliers as much as possible to limit the impact on the regional network.
- » Staff and general trips should occur outside of peak traffic periods.
- » Permits should be obtained from the relevant authorities for the transport of abnormal loads.

8.11. Contribution of the Project to Climate Change Mitigation

South Africa is a country with an economy dependent on coal for the majority of its electricity, an energy-intensive industrial sector, and an energy sector responsible for 82% of total GHG emissions, making it the 12th highest world emitter of GHG³⁵.

It has been reported internationally that the move towards renewable energy for electricity generation needs has resulted in decreased greenhouse gas emissions. The International Energy Agency announced in March 2015 that 2014 carbon dioxide (CO₂) emissions from the energy sector levelled off for the first time in 40 years. This has happened without being linked to an economic downturn. This was attributed to the increase in the use of renewable energy sources by China and Organisation for Economic Co-operation and Development (OECD) countries³⁶. As GHG emissions associated with the provision of energy services are a major cause of climate change, this move to renewable energy and subsequent reduction in CO₂ emissions is considered as a positive contribution towards climate change mitigation.

The South African Government recognises the need to diversify the mix of energy generation technologies within the country and to reduce the country's reliance on fossil fuels which contribute towards climate

³⁵ Greenhouse Gas Inventory for South Africa: 2000-2010

³⁶ <http://ecowatch.com/2015/03/23/renewables-mitigate-climate-change/>

change and are, therefore, not environmentally friendly. This is in accordance with the prescriptions of the United Nations Convention on Climate Change 1994 (UNFCCC) and its associated Kyoto protocol of 1997.

Consequently, the South African Government has recognised the need to move towards cleaner energy and has, therefore, set targets for cleaner energy technologies (including of 6000MW solar PV contribution to new power generation capacity) by 2030 (IRP, 2019). Renewable energy plays a key role in mitigating global greenhouse gas emissions by radically lowering the emissions profile of the global energy system (International Renewable Energy Agency (IRENA), 2015). Geelstert 1 will assist in reducing the country's CO₂ emissions associated with energy supply relative to fossil fuels (e.g. coal). Development of numerous such facilities will have a cumulative positive impact on CO₂ emissions as this will reduce reliance on power generation from fossil fuels. This will aid the country in meeting the commitments made under the COP 21 Agreement, to which the Government is a signatory.

This is considered to be a significant positive impact for the environment and society at an international level.

8.12. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Geelstert 1. Should this alternative be selected, there would be no environmental impacts on the site due to the construction and operation activities of a solar PV facility.

8.12.1 Results of the Assessment of the Do Nothing Alternative

a) Land use and agriculture

There are no high potential soils present within the development area and the soils are of low potential at best due mainly to a combination of the depth and the sandy texture which will lead to rapid water infiltration and the soils drying out. In addition, the low rainfall in the area means that there is little potential for rain-fed arable agriculture in the area. Arable production would, therefore, be possible only by irrigation, and no indications of any irrigated areas within, and surrounding the development area, can be identified.

In general, the soils that do occur within the development area are suited for extensive grazing at best and furthermore the grazing capacity of the area is very low, at around 26-40 ha/large stock unit.

Considering the state of the agricultural potential and the land capability of the development area, and study area, the undertaking of productive agricultural activities will not be possible and will be highly restricted if attempted. The development of Geelstert 1 provides an opportunity to undertake an efficient and productive land use activity on a property which is currently restricted in use, as described above.

The development footprint of Geelstert 1 is ~2% of the total extent of the study area (Remaining Extent of the Farm Bloemhoek 61, 12 378,97ha in extent). Therefore, the current land-use will be possible to be retained, while also generating renewable energy from the solar resource available for the area. The impact on agricultural activities as a result of the project is, therefore, expected to be low.

The implementation of the 'do-nothing' alternative would leave the land-use restricted to the current land use (i.e. grazing and the presence of wildlife), losing out on the opportunity to generate renewable energy from solar energy in addition to current land use activities. Therefore, from a land-use perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of a viable and compatible land use for the study area which allows the current land-use activities to continue. The compatibility of the land uses was envisaged and considered before the surrounding area (including this study area) was demarcated as a REDZ area through a pre-feasibility desktop screening assessment.

In addition, the landowner would obtain an income from the facility (as the proponent would pay a percentage of the revenue generated to the landowner in accordance with the lease agreement for the use of the land). This would contribute towards the financial stability of the landowner which could in turn contribute to the financial viability of the current land use on the study area. The implementation of the 'do nothing' alternative would retain the current land-use, fore-going the opportunity to generate renewable energy from the solar resource and supplementing the income of the landowner.

The 'do nothing' alternative would result in a lost opportunity for the landowner (in terms of implementing a compatible land use option, while still retaining the current land use, as well as a loss in long-term revenue) and the country (in terms of renewable energy). From this perspective the no-go alternative is not preferred when considering land use and agricultural potential of the study area.

b) Socio-economic impact

Social: The impacts of pursuing the no-go alternative are both positive and negative as follows:

- » The benefits would be that there is no disruption from an influx of jobseekers into the Aggeneys area, annoyance impacts (noise and dust during construction), visual impacts and safety and security impacts. The impact is therefore neutral.
- » There would also be an opportunity lost in terms of job creation, skills development and associated economic business opportunities for the local economy, as well as a loss of the opportunity to generate energy from a renewable resource without creating detrimental effects on the environment.

Foregoing the proposed development would not necessarily compromise the development of renewable energy facilities in South Africa. However, the socio-economic benefits for local communities at this location and within the surrounding area would be forfeited.

Therefore, from a socio-economic perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of socio-economic benefits, when considering the current socio-economic conditions of the area.

New Business: Some of the positive spin off effects that are to ensue from the project expenditure will be localised in the communities located near the site, such as the towns of Aggeneys and Pofadder. The local services sector and specifically the trade, transportation, catering, and accommodation, renting services, personal services and business services are expected to benefit the most from the project activities during the construction phase. New business sales that will be stimulated as a result of the establishment of the solar PV facility, albeit for a temporary period, will be lost with the implementation of the 'do nothing' alternative. Therefore, from a business perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of new business opportunities.

Employment: Geelstert 1 is likely to create approximately ~400 (at its peak) employment opportunities (temporary) for a period of ~12 to 18 months, depending on the final design, during the construction phase. Of this approximately 60% of the opportunities will be available to low skilled workers (construction labourers, security staff, drivers, equipment operators etc.), 25% will be available to semi-skilled personnel (electricians, site managers etc.) and 15% of employment opportunities will be for skilled individuals (engineers, project managers, site managers etc.). The development of Geelstert 1 within the Khâi-Ma Local Municipality will aid in a reduction of the unemployment rate, however if the facility is not developed then the unemployment rate will not be positively influenced by the proposed development. The upliftment and socio-economic benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative. Therefore, from an employment perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of employment opportunities.

Skills development: The establishment of Geelstert 1 will offer numerous opportunities for skills transfer and development. This is relevant for both on-site activities and manufacturing activities. Various PV facilities are proposed to be developed in the area, which is demarcated as a REDZ, and in the Northern Cape Province, which means that the transfer of skills from foreign experts to the local engineers and construction workers will take place, similar to what has taken place where PV facilities have been constructed and operated within the Province and the rest of the country. The skills training and transfer benefits for individuals within local communities would be forfeited with the implementation of the 'do nothing' alternative.

Municipal goals: The implementation of Geelstert 1 would contribute towards addressing the Local Municipality's key issue regarding high levels of poverty and unemployment, skills shortage, and inequalities, through the creation of employment opportunities, the provision of skills training opportunities, and local economic growth, including growth in personal income levels of those community members who would be employed on the project.

The no-go alternative will therefore result in the above economic benefits not being realised and a subsequent loss of income and opportunities to local people. From this perspective the no-go alternative is not preferred.

c) Regional scale impact

At a broader scale, the benefits of additional capacity to the electricity grid and those associated with the introduction of renewable energy would not be realised. The Northern Cape has an ample solar resource. Although Geelstert 1 is only proposed to contribute a contracted capacity of up to 125MW, this would assist in meeting the electricity demand throughout the country and would also assist in meeting the government's goal for renewable energy and the energy mix. The generation of electricity from renewable energy resources offers a range of potential socio-economic and environmental benefits for South Africa. These benefits include:

- » Increased energy security;
- » Resource saving (i.e. fossil fuels and water);
- » Exploitation of South Africa's significant renewable energy resource;
- » Pollution reduction;
- » Climate friendly development;

- » Support for international agreements;
- » Employment creation;
- » Acceptability to society; and
- » Support to a new industry sector.

At present, South Africa is some way off from fully exploiting the diverse gains from renewable energy and from achieving a considerable market share in the renewable energy industry. South Africa's electricity supply remains heavily dominated by coal-based power generation, with the country's significant renewable energy potential being largely untapped to date.

The Integrated Resource Plan (IRP) includes 17.8GW of renewables, 9.6GW of nuclear, 6.25GW of coal, and approximately 8.9GW of other generation sources such as hydro, and gas. Based on the IRP 2019 there is currently 1 474MW of installed PV capacity, while an additional 814MW has been committed between 2020 and 2022, and an additional 4 000MW capacity has been allocated between 2025 and 2030. This plan is, however, yet to be finalised and promulgated. The IRP essentially drives the assortment of energy to be implemented for South Africa which is known as the energy mix of the country, considering various generation technologies.

8.12.2 Conclusion

The 'do-nothing' alternative will do little to influence the renewable energy targets set by government due to competition in the sector, and the number of renewable energy projects being bid to the Department of Energy. However, as the study area experiences ample solar resource, not developing Geelstert 1 would see such an opportunity being lost. As current land use activities can continue on the study area once the project is operational, the loss of the land to this project during the operation phase (~2% of the study area) is not considered significant. In addition, the Northern Cape Province will not benefit from additional generated power being evacuated directly into the Province's grid. Therefore, from a regional perspective, the 'do-nothing' alternative is not preferred as there is a perceived loss of benefits for the regional area.

From the specialist studies undertaken, no environmental fatal flaws were identified to be associated with Geelstert 1. All impacts associated with the project can be mitigated to acceptable levels. If the solar PV facility is not developed the following positive impacts will not be realised:

- » Job creation from the construction and operation phases.
- » Economic benefit to participating landowner due to the revenue that will be gained from leasing the land to the proponent.
- » Meeting of energy generation mix in a most economic and rapid manner.
- » Provision of clean, renewable energy in an area where it is optimally available.

As detailed above, the 'do-nothing' alternative will result in a number of lost opportunities. The 'do nothing' alternative is therefore not preferred and not proposed to be implemented for the development of Geelstert 1.

CHAPTER 9: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, a solar PV facility may have impacts (positive and negative) on natural resources, the social environment and the people living in an area surrounding a proposed project. The preceding impact assessment chapter has reported on the assessment of the impacts associated with Geelstert 1 largely in isolation (from other similar developments).

The Geelstert 1 study area and development area proposed for the development of the solar PV facility is located within the Springbok REDZ or REDZ 8. The REDZ areas are geographical areas or zones identified by the Department of Environmental Affairs as being of strategic importance for the development of large scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy developments.

The DMRE, under the REIPPP Programme, released a request for proposals (RFP) in 2011 to contribute towards Government's renewable energy target and to stimulate the industry in South Africa. The REIPPP Programme has been rolled out in bid windows (rounds) since 2011, in which developers submit planned renewable energy projects for evaluation and selection. The bid selection process considers a number of qualification and evaluation criteria. The proposed tariff and socio-economic development contributions by the project bidder are the main basis for selection after the qualification criteria have been met.

As a result of the REIPPP Programme and the promulgation of the REDZ zones, there has been a substantial increase in interest in solar PV facility developments in South Africa (largely in the Northern Cape and North West Provinces), with a number of PV facilities selected as Preferred Bidder projects and 22 solar PV facilities currently operational (Energyblog, 2018³⁷). It is therefore important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts³⁸ are considered and avoided where possible.

This chapter assesses the potential for the impacts associated with Geelstert 1 to become more significant when considered in combination with the other known or proposed solar PV facility projects within the area.

³⁷<https://www.energy.org.za/data-and-tools>

³⁸ Cumulative impacts in relation to an activity are defined in the Environmental Impact Assessment Regulations (Government Notice R326) as the past, current and reasonably foreseeable future impact of an activity, considered together with the impact of activities associated with that activity, that in itself may not be significant, but may become significant when added to existing and reasonably foreseeable impacts eventuating from similar or diverse activities.

9.1 Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of this Basic Assessment Report includes the following information required in terms of Appendix 1: Content of Basic Assessment Reports:

Requirement	Relevant Section
3(j)(i) an assessment of each identified potentially significant impact and risk, including cumulative impacts.	The cumulative impacts associated with the development of Geelstert 1 are included and assessed within this chapter as a whole.

9.2 Approach taken to Assess Cumulative Impacts

The cumulative impacts that have the potential to be compounded through the development of the solar PV facility and its associated infrastructure in proximity to other similar developments include impacts such as those listed below. The role of the cumulative assessment is to test if such impacts are relevant to Geelstert 1 within the development area being considered for the development:

- » Unacceptable loss of threatened or protected vegetation types, habitat or species through clearing, resulting in an impact on the conservation status of such flora, fauna or ecological functioning;
- » Unacceptable risk to freshwater features through disturbance associated with construction activities and increased runoff and erosion during the operation phase;
- » Unacceptable risk to avifauna through habitat loss, displacement and collision with PV panels;
- » Unacceptable loss of high agricultural potential areas presenting a risk to food security and increased soil erosion;
- » Unacceptable loss of heritage resources (including palaeontological and archaeological resources);
- » Complete or whole-scale change in the sense of place and character of an area and unacceptable visual intrusion;
- » Unacceptable impact to socio-economic factors and components; and
- » Unacceptable risk and degradation due to traffic related impacts.

It is important to explore the potential for cumulative impacts as this will lead to a better understanding of these impacts and the potential for mitigation that may be required. The scale at which the cumulative impacts are assessed is important. For example, the significance of the cumulative impact on the regional or national economy will be influenced by solar PV facility developments throughout South Africa, while the significance of the cumulative impact on the visual amenity may only be influenced by solar PV facility developments that are in closer proximity to each other. For practical purposes a sub-regional scale of 30km has been selected for this cumulative impact evaluation.

Figure 9.1 indicates the location of Geelstert 1 in relation to all other known and viable (i.e. projects with a valid Environmental Authorisation) solar PV facilities located within a radius of 30km from the development area. These projects were identified using the Department of Environmental Affairs Renewable Energy Database and current knowledge of projects being proposed in the area. In the case of Geelstert 1, there are several solar PV facilities located within a 30km radius of the development area (refer to **Figure 9.1** and

Table 9.1), all at various stages of approval³⁹. The potential for cumulative impacts is summarised in the sections that follow and has been considered within the specialist studies (refer to **Appendices D – K**).

Table 9.1: Solar PV facilities located within the surrounding area (within a 30km radius) of the Geelster 1 development area

Project Name	Location	Approximate distance from Geelster 1	Project Status
Geelster 2 (1 x 125MW PV)	Remaining Extent of the Farm Bloemhoek 61	Adjacent to the development area of Geelster 1 to the east.	EIA in process
ABO Wind Aggeneys 1 (1 x 100MW PV)	Remaining Extent of the Farm Bloemhoek 61	~1km north of Geelster 1 within the same study area and/or affected property.	EA Approved
ABO Wind Aggeneys 2 (1 x 100MW PV)	Remaining Extent of the Farm Bloemhoek 61	~1km north-east of Geelster 1 within the same study area and/or affected property.	EA Approved
Biotherm Aggeneys PV Solar Energy Facility (1 x 40MW PV)	Portion 1 of the Farm Aroams 57	~5km to the north west	Facility constructed and Operational
Biotherm Enamandla (4 x 75MW PV)	Remaining Extent of the Farms Hartebeest Vlei 86	~15km to the south	EA Approved
Building Energy Sol Invictus (2 x 150MW PV and 4 x 75MW PV)	Portion 5 of the Farm Ou Taaibosmond	~30km to the west	EA Approved
PVAfrica Zuurwater (5 x 75MW PV and 1 x 60MW PV)	Portion 3 of the Farm Zuurwater 62	~20km to the west	EA Approved
Boesmanland Solar (1 x 75MW PV)	Portion 6 of the Farm Zuurwater 62	~15km to the west	EA Approved
Mainstream Solar (1 x 250MW PV/CPV)	Portion 2 of the Farm Namies South 212	~25km to the east	EA Approved
Black Mountain Mine Solar (1 x 19MW PV)	Portion 1 of the Farm Aggeneys 65	~10km to the west	EA Approved

It should be noted that not all the solar PV facilities presently under consideration by various solar energy developers will be built for operation. Not all proposed developments will be granted the relevant permits by the relevant authorities (DEA, DMRE, NERSA and Eskom) due to the following reasons:

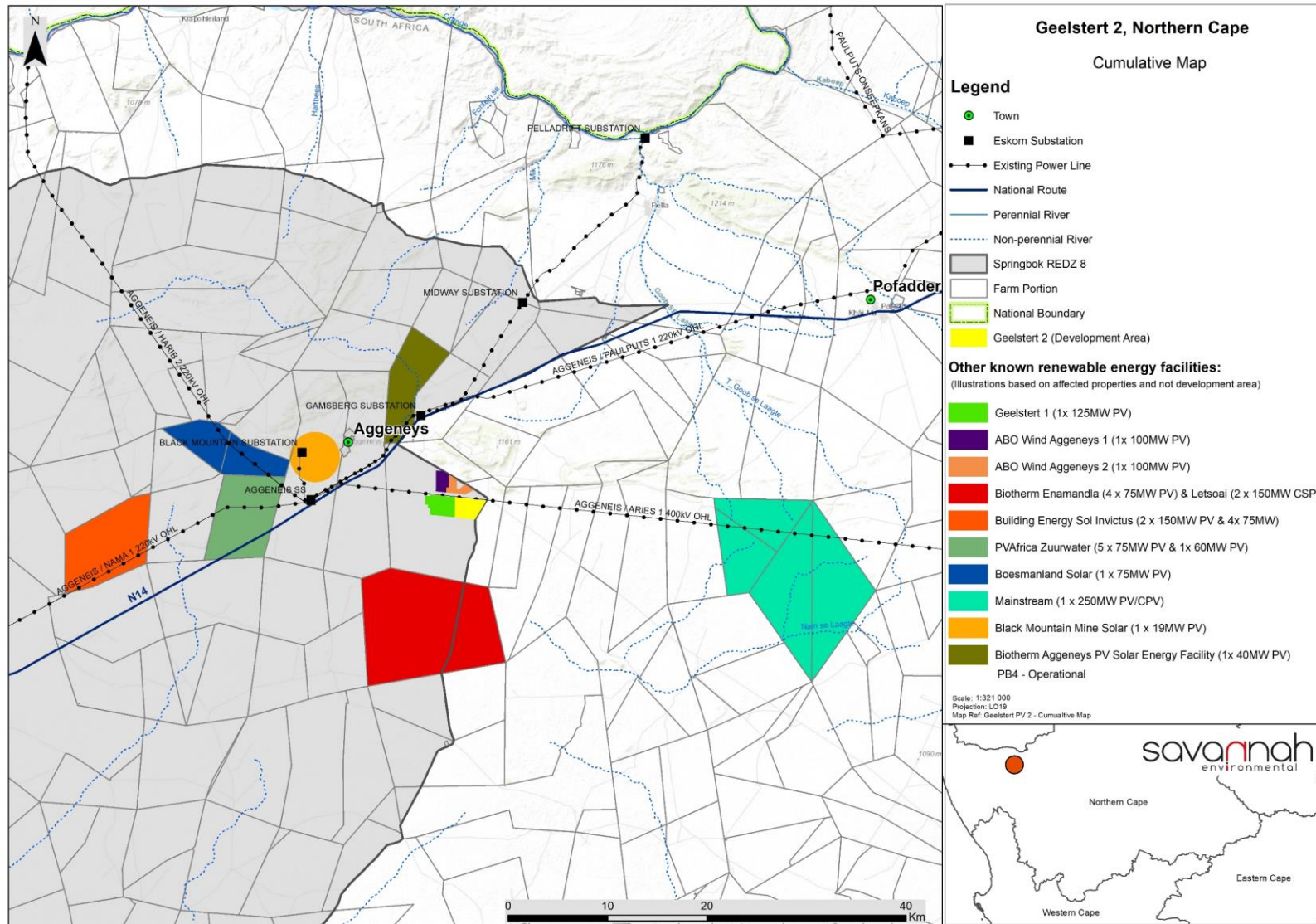
- » There may be limitations to the capacity of the existing or future Eskom grid located within the area;
- » Not all applications will receive a positive environmental authorisation;

³⁹ Applications for Environmental authorisation for numerous PV facilities have been undertaken within the area, however some of these applications have lapsed and are no longer considered to be valid and are therefore not considered as part of the cumulative impact assessment.

- » There are stringent requirements to be met by applicants in terms of the REIPPPP and a highly competitive process that only selects the most competitive projects;
- » Not all proposed solar PV facilities will be able to reduce the associated negative impacts to acceptable levels or be able to mitigate the impacts to acceptable levels (fatally flawed);
- » Not all proposed facilities will eventually be granted a generation license by NERSA and sign a Power Purchase Agreement with Eskom; and
- » Not all developers will be successful in securing financial support to advance their projects further.

As there is, therefore, a level of uncertainty as to whether all the above-mentioned solar PV facilities will be implemented, this results in it being difficult to quantitatively assess the potential cumulative impacts. The cumulative impacts of other known solar PV facilities in the surrounding area and Geelster 1 are therefore qualitatively assessed in this Chapter. The following potential impacts are considered:

- » Cumulative impacts on ecological processes
- » Cumulative impacts on avifauna
- » Cumulative impacts on freshwater features
- » Cumulative impacts on soil and agricultural potential
- » Cumulative heritage impacts
- » Cumulative visual impacts
- » Cumulative socio-economic impacts
- » Cumulative traffic impacts



9.3 Cumulative Impacts on Ecological Processes

Transformation of intact habitat has been identified as the primary ecological cumulative impact (refer to **Appendix D**). The transformation of intact habitat on a cumulative basis would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for fauna and flora and impair their ability to respond to environmental fluctuations. Due to the presence of a number of other renewable energy and mining developments in the area, the transformation of intact habitat is a cumulative impact associated with the development of Geelstert 1.

The ecological impacts associated with Geelstert 1 and the other solar PV facilities within the surrounding area will be of a medium to low significance, depending on the cumulative impact being considered.

Nature: <i>Reduced ability to meet conservation obligations and targets due to cumulative habitat loss</i>		
The development of Geelstert 1 will contribute to cumulative habitat loss and other cumulative impacts in the wider Aggeney's area which may reduce the ability to meet the conservation obligations and targets.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Low (5)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Medium (33)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To some degree, but the majority of the impact results from the presence of the facilities which cannot be mitigated.	
Mitigation:		
<ul style="list-style-type: none"> » Ensure that the fencing around the facility is friendly with fauna. This includes not having any electrified strands within 30cm of the ground as well as implementing a design that prevents fauna and avifauna from becoming trapped between the inner and outer layer of the fence. » Ensure that an alien management plan and erosion management plan compiled for each project are effectively implemented at the site. 		

Nature: <i>Negative impact on broad-scale ecological processes</i>		
Development of Geelstert 1 may impact on broad-scale ecological processes such as the ability of fauna to disperse. In terms of residual impacts, the presence of the solar PV facility will represent an obstacle for some fauna which would contribute to fragmentation in the area.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	Only partly, as a significant proportion of the impact results from the presence	

and operation of the facilities which cannot be well mitigated.

Mitigation:

- » Ensure that the mitigation hierarchy is applied with a particular emphasis on reducing the development footprint, rehabilitating disturbed areas and minimising degradation around the site.
- » An open space management plan should be developed for the relevant project sites by each project developer, which should include management of biodiversity within the affected areas, as well as that in the adjacent areas around the facilities under the control of the developers.

9.4 Cumulative Impacts on Avifauna

Cumulative impacts on avifauna have been identified (**Appendix E**) and include:

- » The loss of unprotected vegetation types on a cumulative basis from the surrounding area may impact avifauna, as habitat loss is a major contributor to declines in avifauna. The aggregation of numerous solar PV facilities in a region has the potential to compound environmental impacts, and because the loss of vegetation has been mostly understudied, it should be considered during the early stages of land use planning.
- » Transformation of intact habitat would contribute to the fragmentation of the landscape and would potentially disrupt the connectivity of the landscape for avifauna and impair their ability to respond to environmental fluctuations. This is particularly a concern with regards to species and ecosystems with limited geographical distributions.

The cumulative avifauna impacts, considering the development of Geelstert 1 and the other solar PV facilities within the surrounding area will be of a medium significance.

Nature: *Habitat loss*

The development of Geelstert 1 and other solar energy developments will contribute to cumulative habitat loss and other cumulative impacts in the wider Aggeneys area.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Local (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Low to Moderate (5)
Probability	Improbable (2)	Probable (3)
Significance	Low (18)	Medium (33)
Status (positive or negative)	Negative	Negative
Reversibility	Moderate	Moderate
Irreplaceable loss of resources?	Low	Low
Can impacts be mitigated?	To some degree, but the majority of the long-term impact results from the presence of the facility and other developments in the area, which cannot be mitigated	

Mitigation:

- » Minimise the development footprint as far as possible for each facility. A cover of indigenous grasses should be encouraged and maintained within each facility. This prevents the invasion of weeds and is the easiest to manage in the long-term. Furthermore, the grasses can be maintained low through livestock (sheep) grazing which is being successfully used at existing solar PV facilities. This will assist in maintaining natural vegetative cover which may support avifaunal population, as opposed to complete clearing of all vegetation.
- » The facilities should be fenced off in a manner which allows small fauna to pass through the facility, but that does not result in ground-dwelling avifauna (e.g. bustards, korhaan, thick-knees, coursers) being trapped and electrocuted along the boundary fences. In practical terms this means that each facility should be fenced-off to

include only the development footprints and should include as little undeveloped ground or natural veld as possible. In addition, there must not be electrified ground-strands present within 30cm of the ground and the electrified strands must be located on the inside of the fence and not the outside. Furthermore, the fence should preferably be a single-design fence and not a double-design fence (with a 1m space between the mesh and electric fence components).

9.5 Cumulative Impacts on Freshwater Features

The cumulative impacts to freshwater features would be as a result of similar renewable energy developments within the same catchment which may result in the direct physical alteration and degradation of watercourses (refer to **Appendix F**). Indirectly, from a catchment level, transformation of land use and associated change in surface roughness resulting in consequent hydrological alterations in the catchment drainage are also of concern. Increased sedimentation and erosion may also occur.

The impacts to freshwater features associated with Geelstert 1 and the other solar PV facilities within the surrounding area will be of a low significance.

Nature: *Cumulative impacts due to nearby renewable energy developments that influence the run-off and stormwater flow patterns and dynamics (due to excessive clearing of vegetation)*

The interception of rainfall by the impervious surface of the solar panels produces an “umbrella effect” that delineates a sheltered area. By contrast, the contour receives the collected fluxes, of which the intensity or amounts may locally exceed those of the control conditions, depending on the dimensions, height and tilting angle of the panels as well as on wind velocity and direction.

Cumulatively this alteration could cause excessive accelerated erosion of plains, lower lying small ephemeral to larger intermittent drainage lines, wetlands and river systems.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (1)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Small (1)	Moderate (6)
Probability	Very Improbable (1)	Improbable (2)
Significance	Low (6)	Low (26)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	Moderate Probability
Can impacts be mitigated?	Yes, to a large extent.	

Mitigation:

- » The development footprints of the individual developments must be kept to a minimum and natural vegetation should be encouraged to return to disturbed areas. This must be undertaken by each respective developer.
- » An open space management plan must be developed for the individual developments by each respective applicant, which should include management of biodiversity within the fenced area, as well as that in the adjacent rangeland.

The following on-site mitigation measures are recommended throughout the operational phase of the facilities in order to minimise the contribution of this development to the described impact:

- » Regular monitoring of the site is recommended (minimum of twice annually) to identify possible areas of erosion, particularly after large summer thunderstorms have occurred.
- » The higher level of shading anticipated from PV panels may prevent or slow down the re-establishment of some desirable species, therefore re-establishment should be monitored, and species composition adapted if

- vegetation fails to establish sufficiently.
- » Alternatively, soil surfaces where no revegetation seems possible will have to be covered with gravel or small rock fragments to increase porosity of the soil surface, slow down runoff and prevent wind and water erosion.
 - » Monitor the area below and around the panels regularly after larger rainfall events to determine where erosion may be initiated and then mitigate by modifying the soil micro-topography and revegetation efforts accordingly (some bush cutting of larger shrubs may be allowed).
 - » Due to the nature and larger runoff surfaces of the PV panels, the development footprint should, where possible, be adequately landscaped and rehabilitated to contain expected accelerated erosion.
 - » Stormwater run-off must be adequately controlled to prevent localised rill and gully erosion.
 - » Any erosion problems observed must be rectified as soon as possible and monitored thereafter to ensure that they do not re-occur.
 - » Roads and other disturbed areas must be regularly monitored for erosion. Problem areas must receive follow-up monitoring to assess the success of the remediation.

9.6 Cumulative Impacts Soil and Agricultural Potential

Cumulative impacts on soils are predominantly related to an increase of wind erosion within the area (refer to **Appendix G**).

The likelihood of cumulative impacts for wind erosion may be significant if not mitigated. When considering the other solar PV facility developments within the surrounding area, it is assumed that the impact of erosion and appropriate mitigation measures at a site-specific level for each of the facilities have been considered and the mitigation measures recommended are sufficient for the management and mitigation of erosion. Therefore, considering that the impact of erosion at each facility will be low in extent, subject to the implementation of the recommended mitigation measures, and managed for each facility separately, the cumulative impact for erosion is considered to be low.

Under these circumstances, the loss associated with erosion is, therefore, considered to be acceptable loss, without detrimental consequences. If there is large scale development of solar energy facilities in the area, any failure to prevent wind erosion of topsoil on one project could lead to that material being deposited on any or all neighbouring properties.

The significance of the cumulative soil impacts will be of a low significance for Geelstert 1 and the other solar PV facilities within the surrounding area.

Nature: <i>Cumulative impacts from a soils perspective, including wind erosion</i>		
Cumulative impact of Geelstert 1 and other solar PV facilities within the area in terms of wind erosion. Should appropriate mitigation measures not be implemented correctly it could lead to a significant risk of accelerated soil erosion by wind.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Low (1)	Low (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Improbable (2)
Significance	Low (10)	Low (12)
Status (positive or negative)	Negative	Negative
Reversibility	High	High

Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Minimise the footprint of construction as much as possible. » Where soil is removed/disturbed, ensure it is stored for rehabilitation and re-vegetated as soon as possible. » Implement all appropriate soil conservation measures, including contouring, culverts etc. (for road construction), geotextiles and slope stabilisation (for all infrastructure). » Ensure that equal responsibility and co-operation is accepted if more than one facility will be using the same access road, or if the possibility exists of sediment transfer (by wind or water) from one site to another. 		

9.7 Cumulative Impacts on Heritage (including archaeology and palaeontology)

No heritage and palaeontological cumulative impacts were identified for the proposed development as the Heritage Screener (refer to **Appendix H**) has shown that it is unlikely that the development of the Geelstert 1 will have a negative impact on archaeological and palaeontological resources from a cumulative perspective. Therefore, no cumulative impact assessment table has been provided for heritage impacts. However, given the heritage sensitivity of the surrounding area, the following is recommended:

- » If concentrations of historical and pre-colonial archaeological heritage material and/or human remains (including graves and burials) are uncovered during the construction phase, all work in the vicinity must cease immediately and be reported to the South African Heritage Resources Agency (SAHRA) so that systematic and professional investigation/excavation can be undertaken. Phase 2 mitigation in the form of test-pitting/sampling or systematic excavations and collections of the pre-colonial shell middens and associated artefacts will then be conducted to establish the contextual status of the sites and possibly remove the archaeological deposit before development activities continue.
- » A person must be trained as a site monitor to report any archaeological sites found during the development. The Construction Manager/Foreman and/or the Environmental Officer (EO) should be informed prior to the commencement of the construction phase of the possible types of heritage sites and cultural material they may encounter and the procedures to follow should heritage sites be found.

9.8 Cumulative Visual Impacts

Cumulative visual impacts have been identified and assessed for the development of Geelstert 1 (refer to **Appendix I**).

Due to the fact that Geelstert 1 and other solar PV facilities to the east will extend the visual influence of development into an area that currently appears relatively natural, the cumulative impact on landscape character is assessed as having a medium significance. However, the cumulative contribution that can be attributed to the proposed project is low due to the relatively small extent of impact associated with it.

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

Cumulative visual impacts affecting the gravelroads to the north and east of the project are also assessed as likely to have a medium significance due to the location of Geelstert 1 and other proposed projects.

The cumulative contribution of the proposed project is also assessed as low due to the relatively small impact extent and the nature of the road.

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

Nature: Landscape change

The proposed project will extend the general influence of development and specifically solar projects into a relatively natural rural area to the south and east of the Geelstert 1 development area. The project is one of four proposed projects on the same property.

In addition, there are solar projects proposed on fourteen properties within 30km of Geelstert 1, eight of which are located within the relatively natural Rural Landscape Character Area.

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

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

Mitigation:

Planning:

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

Operation:

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

Decommissioning:

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

Nature: Character of the landscape as seen from the N14

Geelster 1 is very unlikely to have any significant impact on the N14. A detailed visual analysis of other solar projects in the area has not been undertaken, however given the location of other projects in closer proximity to the road, it seems likely that other solar projects in the area could have a significant impact.

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

Mitigation:

Planning:

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

Operation:

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

Decommissioning:

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

Nature: Change in the character of the landscape as seen from the un-surfaced local road (i.e. Loop 10 and Gamoep roads) that run to the north and east of the Geelster 1 development area

The project will be visible from both roads however at a distance of 2.7km from the Loop 10 road and 2.2km from the Gamoep road. The development is therefore not likely to be highly obvious.

Other authorised projects will also be closer to the Loop 10 road and will partly screen the development.

It is also possible that other solar projects will be developed within 30km and to the east of Geelster 1 all of which fall within and are likely to affect the relatively natural Rural Landscape Character Area. The project areas within the Rural Landscape Character Area are likely to result in greater landscape change than those within the Developed Landscape Character Area.

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

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long-term (4)	Long-term (4)

Magnitude	Minor to Low (1)	Moderate to Low (5)
Probability	Probable (3)	Probable (3)
Significance	Low (21)	Medium (36)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown
<p>Mitigation:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Plan levels to minimise earthworks to ensure that levels are not elevated; » Plan to maintain the height of structures as low as possible; and » Minimise disturbance of the surrounding landscape and maintain existing vegetation around the development. <p><u>Operation:</u></p> <ul style="list-style-type: none"> » Reinststate any areas of vegetation that have been disturbed during construction; » Remove all temporary works; » Monitor rehabilitated areas post-construction and implement remedial actions; and » Minimise disturbance and maintain existing vegetation as far as is possible both within and surrounding the development footprint particularly the development setback area from the local road. <p><u>Decommissioning:</u></p> <ul style="list-style-type: none"> » Remove infrastructure not required for the post-decommissioning use of the site; and » Rehabilitate and monitor areas post-decommissioning and implement remedial actions. 		

Nature: Cumulative impact on local homesteads

Geelstert 1 was assessed as likely to have an improbable, neutral impact with a low significance on views from local homesteads. This was due to the fact that only one homestead will be affected that is located some distance from the development footprint. The homestead also appears to be uninhabited.

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

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

Because the majority of the homesteads / unoccupied buildings are likely to be used for agricultural purposes only, the impact status is likely to be neutral.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Low (4)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Medium (33)
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	Unknown
<p>Mitigation:</p> <p><u>Planning:</u></p>		

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

Operation:

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

Decommissioning:

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

Nature: Cumulative impact on settlement areas

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

Geelstert 1 was assessed as likely to have a very improbable impact of low significance on this settlement.

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

Cumulative impacts are therefore anticipated to be low.

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

Mitigation:

No mitigation required

Nature: Cumulative impact of glare on the gravel roads (i.e. Loop 10 and Gamoeop roads) to the north and east of the Geelstert 1 development area

It is possible that glare from Geelstert 1 could affect travellers on the roads to the north and east during early morning and early evening respectively. While a detailed assessment of other projects has not been undertaken, it is possible that the proposed projects within the same property and other projects on different properties to the east cause additional glare impact. The probability of glare being an issue will increase to "probable" and due to the distribution and placement of the possible projects the extent increases to "regional".

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

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

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Should glare prove problematic on these roads, mitigation might include the implementation of a screen fence along the edge of an array.

Nature: *Cumulative impact of glare affecting Aggeneys Aerodrome*

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

Geelstert 1 is unlikely to add significantly to glare issues associated with solar PV development in the area.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Should glare prove problematic, mitigation might include a slight adjustment to the angle of repose of solar panels, however, the applicant has indicated that this is not a feasible mitigation method and they will be investigating alternative methods with the owner of the air strip if glare proves problematic.

Nature: *Night-time lighting impacts*

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

There is a risk that Geelstert 1 will extend the influence of lighting into the more natural Rural Landscape Character Area although it will largely affect areas that are currently influenced by development.

If additional solar developments do occur on the properties to the east, it is highly possible that these developments

will extend lighting into the Rural Landscape Character Area. If appropriate mitigation measures are applied as recommended then cumulative impacts are anticipated to be low.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site (1)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Small to minor (1)	Small to minor (1)
Probability	Improbable (2)	Improbable (3)
Significance	Low (12)	Low (24)
Status (positive or negative)	If the lights are generally not visible, then the occasional light is unlikely to be seen as negative. The impact will therefore be neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Use low key lighting around buildings and operational areas that is triggered only when people are present; » Utilise infra-red security systems or motion sensor triggered security lighting; » Ensure that lighting is focused on the development with no light spillage outside the site; and » Keep lighting low, no tall mast lighting should be used. 		

9.9 Cumulative Social Impacts

The potential for social cumulative impacts is likely to occur and includes both positive and negative impacts (refer to **Appendix J**). The significance of the negative social cumulative impacts will be low. The significance of the positive social impacts will be of a high significance.

The negative cumulative impacts include large-scale in-migration of people and a change in the sense of place. The positive cumulative impacts include the positive economic impacts which include employment opportunities, business opportunities and skills development.

Nature: *An increase in employment opportunities, skills development and business opportunities with the establishment of more than one solar power facility.*

Geelstert 1 and the establishment of other solar power projects within the area has the potential to result in significant positive cumulative impacts, specifically with regards to the creation of a number of socio-economic opportunities for the region, which in turn, can result in positive social benefits. The positive cumulative impacts include creation of employment, skills development and training opportunities, and downstream/spin-off business opportunities. The cumulative benefits to the local, regional, and national economy through employment and procurement of services are more considerable than that of Geelstert 1 alone.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local- Regional-National (4)	Local- Regional-National (4)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Definite (5)
Significance	Medium (36)	High (70)

Status (positive or negative)	Positive	Positive
Reversibility	N/A	
Irreplaceable loss of resources?	N/A	
Can impacts be mitigated?	Yes (enhanced)	
Confidence in findings	High	
Enhancement:		
<p>The establishment of a number of solar power projects in the area has the potential to have a positive cumulative impact on the area in the form of employment opportunities, skills development and business opportunities, where these opportunities are localized. The positive benefits will be enhanced if local employment policies are adopted and local services providers are utilized by the developers to maximize the project opportunities available to the local community.</p>		
Residual impacts:		
<p>Improved pool of skills and experience in the local area. Improved standard of living through the creation of employment opportunities. Economic growth for small-scale entrepreneurs.</p>		

Nature: Negative impacts and change to the local economy with an in-migration of labourers, businesses and jobseekers to the area.

While the development of a single solar power project may not result in a major influx of people into the area, the development of several projects at the same time may have a cumulative impact on the in-migration and movement of people. Further potential impact related to in-migration of people into the area includes additional pressure on municipal services and housing, however this impact will need to be addressed in the municipal IDP process and considerations.

In addition, the fact that the project is proposed within REDZ 8, which has specifically been earmarked for the development of large scale solar PV energy facilities, implies that the surrounding area is likely to be subject to a considerable number future applications and expansion of solar energy facilities. Levels of unemployment, and the low level of earning potential may attract individuals to the area in search of better employment opportunities and standards of living.

It is very difficult to control an influx of people into an area, especially in a country where unemployment rates are high. It is therefore important that the project proponents implement and maintain strict adherence with a local employment policy in order to reduce the potential of such an impact occurring.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (2)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Low (4)
Probability	Very Improbable (1)	Improbable (2)
Significance	Low (8)	Low (22)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	Yes	
Confidence in findings	High	
Mitigation:		
Develop a recruitment policy / process (to be implemented by contractors), which will source labour locally.		

Work together with government agencies to ensure that service provision is in line with the development needs of the local area.
Form joint ventures with community organisations, through Trusts, which can provide local communities with benefits, such as employment opportunities and services.
Develop and implement a recruitment protocol in consultation with the municipality and local community leaders. Ensure that the procedures for applications for employment are clearly communicated.

Residual impacts

Possibility of outside workers remaining in the area after the construction is completed and the subsequent potential pressures on local infrastructure, services and poverty problems.

Nature: *Visual impact and impact on the sense of place and landscape character*

The location of Geelstert 1, within the Springbok REDZ will contribute to the consolidation of infrastructure to this locality and avoid a potentially scattered proliferation of solar energy generation structures throughout the region. However, the location of the development within a REDZ reduces the impact on the sense of place from a social perspective as the area has been identified and established for the development of large-scale solar energy facilities.

The identification of the significance of the cumulative impact on sense of place was undertaken through the consideration of the Visual Impact Assessment (Environmental Planning and Design, 2020) undertaken for the project. The Visual Impact Assessment identified that the impact on sense of place will be of a medium significance.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Local (2)	Local-Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Improbable (2)	Probable (3)
Significance	Low (20)	Medium (39)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	
Irreplaceable loss of resources?	No	
Can impacts be mitigated?	No, only best practice measures can be implemented	
Confidence in findings	High	

Mitigation:

Maintain and manage the facilities to be in a good and neat condition to ensure that no degradation of the area and sites takes place and impacts the visual quality of the area.

Implement the relevant mitigation measures as recommended in the Visual Impact Assessment.

Residual impacts

The visual impact will remain until the infrastructure is completely decommissioned and removed. Thereafter the impact will be removed.

9.10 Cumulative Traffic Impacts

Cumulative traffic impacts have been identified for the construction and operation phase of Geelstert 1. Cumulative impacts have been identified considering the construction and operation of Geelstert 1 and other solar PV facilities within the area (refer to **Appendix K**).

The cumulative traffic impacts associated with Geelstert 1 and the other solar PV facilities within the surrounding area will be of a medium significance.

Nature: *Construction phase cumulative impacts associated with the development of Geelstert 1*

Cumulative traffic impacts are expected to occur during the construction of Geelstert 1 and other proposed developments in the area, assuming construction is being undertaken simultaneously (which is considered unlikely).

	Without mitigation	With mitigation
Extent	Regional (3)	Regional (3)
Duration	Medium-term (3)	Medium-term (3)
Magnitude	Moderate (6)	Moderate (6)
Probability	Very likely (4)	Very likely (3)
Significance	Medium (48)	Medium (36)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Delivery of abnormal components must be staggered for each of the developments under construction.
- » Approved construction programmes for each of the developments must be staggered.
- » Staff and general trips should occur outside of peak traffic periods.

Nature: *Operation phase cumulative impacts associated with the development of Geelstert 1*

Cumulative traffic impacts are expected to occur during the operation of Geelstert 1 and other developments within the surrounding area, assuming the operations will be undertaken simultaneously (which is considered unlikely).

	With mitigation	Without mitigation
Extent	Regional (4)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Moderate (3)
Probability	Very likely (3)	Very likely (3)
Significance	Medium (36)	Medium (30)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » Vehicle trips to be staggered outside peak periods

9.11 Conclusion regarding Cumulative Impacts

The assessment of the cumulative impacts was undertaken through the consideration of the Geelstert 1 impacts in isolation and compared to the cumulative impacts of other solar PV facilities within a 30km radius from the development area.

Cumulative impacts are expected to occur with the development of Geelstert 1 throughout all phases of the project life cycle and within all areas of study⁴⁰ considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Geelstert 1 is to test and determine whether the cumulative impacts associated with multiple solar energy facility developments will be acceptable within the landscape and whether the cumulative loss, from an environmental and social perspective, will be acceptable without whole-scale change.

The significance of the cumulative impacts associated with the development of Geelstert 1 are predominately low to medium, depending on the impacts being considered, with cumulative impacts on the social environment being highly positive in some instances. A summary of the cumulative impacts is included in **Table 9.2** below.

Table 9.2: Summary of the cumulative impact significance for Geelstert 1 within the study area

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium to low (depending on the impact being considered)
Avifauna	Low	Medium
Freshwater	Low	Low
Soil and agricultural potential	Low	Low
Heritage	Low	Low
Visual	Low	Medium to low (depending on the impact being considered)
Social	Negative social impacts – Low	Negative social impacts – Low
	Positive social impacts – Medium	Positive social impacts - High
Traffic	Medium	Medium

The following can be concluded regarding the cumulative impacts of Geelstert 1:

- » **Ecological processes:** There will be no unacceptable loss of threatened or protected vegetation types, habitats or species due to the development of the Geelstert 1 and other solar PV facilities within the surrounding area. Cumulative impacts on the transformation of intact habitats and broad-scale ecological processes will be of a low significance.
- » **Avifauna:** There will be no unacceptable risk to avifauna or loss of avifauna habitats (as the development footprint for Geelstert 1 is located outside the Red Lark habitat) or species due to the development of the Geelstert 1 and other solar PV facilities within the surrounding area. Cumulative impacts because of the loss of unprotected vegetation types from the surrounding area which may impact avifauna habitat is of medium significance.

⁴⁰ Cumulative impacts from a heritage perspective will only be applicable to the construction phase of the proposed development.

- » **Freshwater features:** There will be no unacceptable loss of freshwater features or resources due to disturbance associated with construction activities and increased run-off and erosion during the operation phase. Cumulative impacts resulting in hydrological alterations in the catchment drainage and increased sedimentation and erosion will be of a low significance.
- » **Soils and Agricultural Potential:** There will be no unacceptable loss of high agricultural potential areas presenting a risk to food security or increased soil erosion associated with the development of Geelstert 1 and other solar PV facilities within the surrounding areas. Cumulative impacts will be of a low significance.
- » **Heritage (including archaeology and palaeontology):** There will be no unacceptable loss of heritage resources associated with the proposed project and other solar PV facilities and associated grid infrastructure developments within the surrounding areas.
- » **Visual:** There will be no unacceptable impact on the visual quality of the landscape associated with the development of Geelstert 1 and other solar PV facilities within the surrounding area. Cumulative visual impacts relate to the change in the character of the landscape as seen from the N14 and the un-surfaced local roads (i.e. Loop 10 and Gamoep roads) that run parallel to the northern and eastern boundaries of the development area, cumulative impact on local homesteads, settlements, and glint and glare. The character of the landscape to the north and west of the development area is already impacted from a visual perspective by the undertaking of the mining activities in the area, i.e. Black Mountain Mine (west) and Gamsberg Mine (north). The significance of the visual cumulative impacts will be medium to low. No impacts of a high significance have been identified.
- » **Social:** Both positive and negative social cumulative impacts have been identified. The positive impacts relate to positive economic impacts and the negative impact relates to a change in the local economy as a result of in-migration from jobseekers, businesses and labourers into the area. There will be no unacceptable risk or impacts to the social aspects and characteristics of the town of Aggeneys with the development of Geelstert 1 and other solar PV facilities within the surrounding area.
- » **Traffic:** There will be no unacceptable impact on traffic associated with the development of Geelstert 1 and other solar PV facilities within the surrounding area. Cumulative traffic impacts relate mainly to an increase of the traffic for the area. The significance of the impacts will be medium. No impacts of a high significance have been identified.

Based on the specialist cumulative assessment and findings, the development of Geelstert 1 and its contribution to the overall impact of all solar PV facilities to be developed within a 30km radius, it can be concluded that the Geelstert 1 cumulative impacts will be of a low to medium significance, depending on the impact being considered, with one positive social cumulative impact being of a high significance. There are, however, no impacts or risks identified to be considered as unacceptable with the development of Geelstert 1 and other solar PV facilities within the surrounding area. In addition, no impacts which will result in whole-scale change are expected.

CHAPTER 10: CONCLUSIONS AND RECOMMENDATIONS

Geelster Solar Facility 1 (Pty) Ltd, proposes the development of a 125MW_{AC} solar PV facility, as well as associated infrastructure on a site located 11km south-east of Aggeneys in the Northern Cape Province. The solar PV facility will be known as **Geelster 1** and is located on the Remaining Extent of the Farm Bloemhoek 61. The study area⁴¹ falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A development area⁴² has been identified within the study area by the proponent for the development of Geelster 1. Within this identified development area, a development footprint⁴³ or facility layout has been defined. This development footprint has been fully considered within this Basic Assessment (BA) process and assessed in terms of its suitability from an environmental and social perspective. The development area is larger than the area needed for the construction of a 125MW_{AC} PV facility, and provided the opportunity for the optimal placement of the infrastructure, ensuring avoidance of all identified environmental sensitivities.

Geelster 1 will have a contracted capacity of up to 125MW_{AC} and will include specific infrastructure, namely:

- » Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- » Centralised inverter stations or string inverters;
- » A temporary laydown area;
- » Cabling between the panels, to be laid underground where practical;
- » An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection.
- » An access road with a maximum width of 8m;
- » Internal access roads within the PV panel array area with a maximum width of 5m;
- » Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The development footprint for Geelster 1 is accessible via the Gamoep Road (R358) off the Loop 10 Road which runs parallel to eastern boundary of the study area in a north-south direction.

⁴¹ The study area is defined as the Remaining Extent of the Farm Bloemhoek 61, which has an extent of ~12 378,97ha.

⁴² The development area is that identified area (located within the study area) where the Geelster 1 facility is planned to be located. The development area is ~578ha in extent.

⁴³ The development footprint is the defined area (located within the development area) where the PV panel array and other associated infrastructure for Geelster 1 is planned to be constructed. This is the actual footprint of the facility, and the area which would be disturbed. The Geelster 1 development footprint is ~245ha in extent.

Geelstert Solar Facility 1 (Pty) Ltd has confirmed that the development area is suitable for a solar PV facility development from a technical perspective due to the available solar resource, access to the electricity grid, current land use, land availability and site-specific characteristics including accessibility.

A summary of the recommendations and conclusions for the proposed project as determined through the BA process is provided in this Chapter.

10.1. Legal Requirements as per the EIA Regulations, 2014 (as amended), for the undertaking of a Basic Assessment Report

This chapter of the BA Report includes the following information required in terms of Appendix 1: Content of the BA Reports

Requirement	Relevant Section
3(k) where applicable, a summary of the findings and impact management measures identified in any specialist report complying with Appendix 6 to these Regulations and an indication as to how these findings and recommendations have been included in the final report	A summary of the findings of the specialist studies undertaken for Geelstert 1 has been included in section 10.2.
3(l) an environmental impact statement which contains (i) a summary of the key findings of the environmental impact assessment, (ii) a map at an appropriate scale which superimposes the proposed activity and its associated structures and infrastructure on the environmental sensitivities of the preferred site indicating any areas that should be avoided, including buffers and (iii) a summary of the positive and negative impacts and risks of the proposed activity and identified alternatives.	An environmental impact statement containing the key findings of the environmental impacts of Geelstert 1 has been included as section 10.5. An Environmental Sensitivity and Layout map of Geelstert 1 has been included as Figure 10.1 which overlays the development footprint of the solar PV facility with the environmental sensitive features located within the development area. A summary of the positive and negative impacts associated with Geelstert 1 has been included in section 10.2.
3(n) any aspects which were conditional to the findings of the assessment either by the EAP or specialist which are to be included as conditions of authorisation.	All conditions required to be included in the Environmental Authorisation of Geelstert 1 have been included in section 10.6.
3(p) a reasoned opinion as to whether the proposed activity should or should not be authorised, and if the opinion is that it should be authorised, any conditions that should be made in respect of that authorisation.	A reasoned opinion as to whether Geelstert 1 should be authorised has been included in section 10.6.
(h) (xi) a concluding statement indicating the preferred alternatives, including preferred location of the activity	A concluding statement indicating the preferred alternatives, including the preferred location of the activity is included in section 10.5.

10.2. Evaluation of Geelstert 1

The preceding chapters of this report together with the specialist studies contained within **Appendices D-K** provide a detailed assessment of the potential impacts that may result from the development of Geelstert 1. This chapter concludes the environmental assessment of the solar PV facility by providing a summary of the results and conclusions of the assessment of the development footprint proposed for Geelstert 1. In doing so, it draws on the information gathered as part of the BA process, the knowledge gained by the environmental specialists and the Environmental Assessment Practitioner (EAP) and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the independent specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. These measures include, amongst others, the avoidance of sensitive features and the undertaking of monitoring, as specified by the specialists. Some mitigation measures have already been considered through the micro-siting of the solar PV facility.

The potential environmental impacts associated with Geelster 1 identified and assessed through the BA process include:

- » Impacts on ecology, flora and fauna.
- » Impacts on avifauna.
- » Impacts on freshwater features.
- » Impacts to soils and agricultural potential.
- » Impacts on heritage resources
- » Visual impacts on the area as a result of the facility.
- » Positive and negative social impacts.
- » Traffic impacts.

10.2.1 Impacts on Ecology

The Ecological Impact Assessment (**Appendix D**) is based on the findings of three full field assessments undertaken in June 2018, March 2019, and June 2020. The ecological impacts identified to be associated with Geelster 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction phase of the solar PV facility, and long-term for the operation phase of the solar PV facility.

The Ecological Impact Assessment assessed the impact of Geelster 1 on the sensitive ecological features present within the development area for the life-cycle of the project. The Geelster 1 development area is located within the Bushmanland Arid Grassland Vegetation type, the second most extensive vegetation type in South Africa, occupying an area of 45 478km². This vegetation type is associated with open grasslands, which are considered to be of a low sensitivity. In addition, the development area and development footprint of the solar PV facility falls within an Ecological Support Area (ESA). The dune habitat associated with the Red Lark in the area, to the south of the development footprint is considered to be a Critical Biodiversity Area (CBA). A small portion of the dune habitat is located within the development area, however the development footprint of the solar PV facility falls outside of this area.

The ecological assessment identified impacts for the construction, operation, and decommissioning phases of the project. During the construction phase (and the decommissioning phase), the impacts include impacts on vegetation and listed or protected plant species and direct faunal impacts. The significance of the construction phase impacts ranges from medium to low, following the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified following the implementation of the recommended mitigation measures.

During the operation phase, the anticipated impacts include faunal impacts and habitat degradation due to erosion and alien plant invasion. The significance of the impacts for the operation phase will be low, following the implementation of the mitigation measures recommended by the specialist. No impacts of a high or medium significance were identified.

From the findings of the Ecological Impact Assessment (**Appendix D**) it can be concluded that no impacts of high ecological significance were identified which would hinder the development of Geelstert 1 and its associated infrastructure within the defined development footprint. The proposed development is considered to be appropriate and acceptable from an ecological perspective and will not result in detrimental impacts to ecosystems and habitat features present within the development footprint and within the surrounding properties. The specialist has, therefore, indicated that the development may be authorised, constructed, and operated, subject to the implementation of the recommended mitigation measures.

10.2.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of three full field assessments undertaken in June 2018, March 2019, and June 2020. The avifauna impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction phase of the solar PV facility, and long-term of the lifetime of the solar PV facility.

During the construction phase (and decommissioning phase) of Geelstert 1, direct avifauna impacts include habitat loss and disturbance related to vegetation clearance, the operation of heavy machinery (noise) and increased human presence. The significance of the construction phase impacts will be medium, with the implementation of the mitigation measures recommended by the specialist. No impacts of high significance are expected to occur during the construction phase of Geelstert 1.

Impacts on avifauna during the operation phase of Geelstert 1 include collisions with PV panels, entrapment along perimeter fencing, and disturbance due to traffic and night lighting. The significance of the impacts will be low, with the implementation of the recommended mitigation measures. No impacts of high or medium significance are expected to occur during the operation of the solar PV facility.

From the results of the avifauna assessment, it can be concluded that the development footprint for Geelstert 1 is a suitable environment for the location of a solar PV facility.

Considering that the study area falls within the Nama-Karoo bioregion and supports the typical avifaunal assemblage for the area, there are no impacts associated with the development that are considered to be of a high residual significance and which cannot be mitigated to a low acceptable level.

Although there are Threatened and Near-Threatened avifauna species within the surrounding area, most of these species are not common in the area and therefore probably occur in low numbers. Species such as the Martial Eagle, Verreaux's Eagle and the Ludwig Bustard's were recorded within the study area and the surrounding environment due to the availability of suitable foraging habitat.

The development area supports a few species and/or features of concern, such as communal nesting or roosting sites of Red-listed species. The Red Lark occurs within the development area, within the dune habitat which is located approximately 500m to the south from the boundary of the development footprint. Therefore, the sensitive habitat for the Red Lark is considered to be adequately buffered from the development footprint of the solar PV facility.

From the results of the avifauna impact assessment, it can be concluded that no fatal flaws will be associated with the development of Geelstert 1 within the defined development footprint.

10.2.3 Impacts on Freshwater Features

The Freshwater Resource Study and Assessment (**Appendix F**) is based on the findings of a field assessment undertaken from 21 July – 22 July 2020. The freshwater resource impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be long-term for the construction (including decommissioning) and operation phase of the solar PV facility.

Five (5) depression wetlands and three (3) ephemeral streams/washes were identified within the development area and its vicinity. The results of the screening assessment undertaken by the specialist indicated that only the depression wetlands would potentially be impacted by the development of Geelstert 1 either directly or indirectly. The ephemeral washes are within the 500m radius of the development area of Geelstert 1 and are located in separate micro-catchments or some distance downslope and downstream of the development footprint. Therefore, it is highly unlikely that the proposed development will impact these washes. All five (5) depression wetlands are located outside of the defined development footprint, at a distance of between 30 and 75m west of the development footprint. However, the development footprint of the solar PV facility extends slightly into the catchments of these depression wetlands, therefore the development may potentially impact these wetlands.

During the construction phase, potential impacts include an impact on the depression wetlands through the possible increase in surface water run-off; an increase in sedimentation and erosion and impacts on the localised surface water quality. The significance of the construction phase impacts will be low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified prior to the implementation of the mitigation measures.

During the operation phase, the impact relates to altered run-off patterns due to rainfall interception by PV panel infrastructure and compacted areas resulting in high levels of erosion, sedimentation, and turbidity within the lower lying depression wetland areas. The significance of the impact will be low, following the implementation of the recommended mitigation measures by the specialist. No impacts of a high significance were identified for the project.

Considering that the depression wetlands identified are located outside the development footprint, there are no fatal flaws associated with the development of the solar PV facility from a freshwater feature's perspective. From the results of the assessment undertaken, it can be concluded that the development of Geelstert 1 will have an overall negative impact of low significance with the implementation of the recommended mitigation measures on the depression wetlands. The construction of Geelstert 1 and the associated infrastructure is therefore supported from a freshwater feature's perspective and considered acceptable subject to obtaining of the necessary water use authorisation from the Department of Human Settlements, Water and Sanitation.

10.2.4 Impacts on Soil and Agricultural Potential

The Soils Impact Assessment (**Appendix G**) is based on the findings of a field assessment undertaken in November 2018. Impacts include the loss of agricultural land through the undertaking of construction activities and panel installation; and increased wind erosion due to a disturbance of the soil. The soil

impacts identified to be associated with Geelstert 1 will be negative and local in extent. The duration of the impacts will be short-term for the construction (including decommissioning) and operation phase of the solar PV facility.

No fatal flaws have been identified in terms of soils and agricultural potential, and all impacts can be mitigated to be within low and acceptable levels of impact. Therefore, the development footprint of Geelstert 1 is considered to be acceptable.

10.2.5 Impacts on Heritage Resources

The Heritage Screening Assessment (**Appendix H**) indicated that the impacts anticipated as a result of the proposed development of Geelstert 1 will be neutral and local in extent. The duration of the impacts will be short-term for the construction (including decommissioning) phase. No operation phase impacts were assessed for Geelstert 1 from a heritage perspective.

Heritage impacts during the construction phase of the Geelstert 1 include an impact on the significant archaeological, built environment resources, however this impact is unlikely to occur owing to the lack of significant heritage sites located within the development footprint. Heritage sites are, however, present within the surrounding landscape of the development footprint. In addition, the bedrock associated with the Aggeneys area and the development footprint is mainly unfossiliferous and is of no palaeontological interest. As a result, the impact of the Geelstert 1 on heritage and palaeontological resources is of low significance. Therefore, there are no fatal flaws associated with the development of the solar PV facility from a heritage perspective. In conclusion, the specialist has indicated that the development of Geelstert 1 is supported from a heritage perspective, subject to the implementation of the recommended mitigation measures.

10.2.6 Visual Impacts

The Visual Impact Assessment (**Appendix I**) is based on the findings of a field assessment undertaken in January 2019. The duration of the construction and operation phase impacts will be long-term and local in extent for the solar PV facility.

The Visual Impact Assessment identified negative impacts on visual receptors for the construction and the operation phase of Geelstert 1. The impacts include a change in the character of a relatively natural area to the south and east of Geelstert 1; a change in the character of the landscape as seen from the N14, the Loop 10 gravel road, the Gamoep gravel roads and local homesteads; a change in the landscape as seen from local settlement areas (specifically Aggeneys); glare impacts which could affect travellers on the Loop 10 and Gamoep roads and the northern flight path of the Aggeneys Aerodrome; and visual impacts related to the operational, safety and security lighting of the solar PV facility. The significance of the impacts is low with the implementation of the recommended mitigation measures. No impacts of a high or medium significance are anticipated.

The Visual Impact Assessment concluded that the development of Geelstert 1 will impact visually on an area where there is currently a strong influence of industrial development including mining infrastructure, therefore changes to the landscape quality are unlikely to be visually intrusive. As a result, no fatal flaws as a result of the development are anticipated from a visual perspective. In conclusion, the development of Geelstert 1 is considered to be acceptable.

10.2.7 Social Impacts

The Social Impact Assessment (**Appendix J**) identified that most social impacts associated with the development of Geelstert 1 will have a short-term duration associated with the construction phase and long-term duration during the operation phase of the project. Both positive and negative impacts have been identified for both the construction and operation phases of the development.

During the construction phase, negative impacts include an influx of jobseekers and a change in the population of the area; safety and security impacts; impacts on daily living and movement patterns; and nuisance impacts, which include noise and dust. The significance of the negative construction phase impacts will be low, within the implementation of the recommended mitigation measures by the specialist. The positive social impact of the construction phase includes the creation of direct and indirect employment opportunities during the construction phase. The significance of the positive impacts will be medium following the implementation of the recommended enhancement measures.

Social impacts associated with the operation of Geelstert 1 will be both positive and negative. The negative impacts are related to an influx of jobseekers and a change in the population within the study area; and to the transformation in the sense of place. Both impacts will be of a low significance with the implementation of the recommended mitigation measures. The positive impacts for the operational phase of the solar PV facility include the creation of employment opportunities and skills development opportunities for the local economy and the country; the development of non-polluting renewable energy infrastructure; and a contribution to Local Economic Development (LED) and social upliftment. The significance of the positive social impacts during the operation phase will be medium to high, with the implementation of the recommended enhancement measures.

From a social perspective, it is concluded that the development of Geelstert 1 is acceptable subject to the implementation of the recommended mitigation measures. There are no fatal flaws associated with the development of the solar PV facility.

10.2.8 Impacts on Traffic

The Traffic Impact Assessment (**Appendix K**) identified that the construction and operation phase traffic impacts associated with the development of Geelstert 1 will be short- and long-term and will have a regional extent.

During the construction phase, traffic will be generated through the transportation of project components and employees to the site. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

During the operation phase, traffic will be generated and will relate to the presence of the operation and maintenance staff at the solar PV facility. The significance of the construction phase impacts will be low, with the implementation of the mitigation measures recommended by the specialist.

No fatal flaws and no impacts of high significance are expected. The development of Geelstert 1 is therefore considered to be acceptable from a traffic perspective.

10.2.9 Assessment of Cumulative Impacts

Cumulative impacts and benefits on various environmental and social receptors will occur to varying degrees with the development of several renewable energy facilities in South Africa. The degree of significance of these cumulative impacts is difficult to predict without detailed studies based on more comprehensive data/information on each of the receptors and the site-specific developments. The alignment of renewable energy developments with South Africa's National Energy Response Plan and the global drive to move away from the use of non-renewable energy resources and to reduce greenhouse gas emissions is undoubtedly positive. The economic benefits of renewable energy developments at a local, regional, and national level have the potential to be significant.

Geelstert 1 is located within the Springbok REDZ, or REDZ 8. The REDZ areas are zones identified by the Department of Environmental Affairs as a geographical area of strategic importance for the development of large-scale solar photovoltaic and wind energy development activities. Therefore, the REDZ areas are considered as nodes for the development of renewable energy projects and it is expected that several solar PV facilities will be developed within these focus areas. Currently, one solar PV energy facility is operational and located within the vicinity of the development area for Geelstert 1. The BioTherm Aggeneys Solar PV facility is located 9km north-west of the development area for Geelstert 1.

Considering all aspects, cumulative impacts associated with Geelstert 1 have been assessed to be acceptable, with no unacceptable loss or risk expected (refer to **Table 10.1** and Chapter 9).

Table 10.1: Summary of the cumulative impact significance for Geelstert 1

Specialist assessment	Overall significance of impact of the proposed project considered in isolation	Cumulative significance of impact of the project and other projects in the area
Ecology	Low	Medium to low (depending on the impact being considered)
Avifauna	Low	Medium
Freshwater	Low	Low
Soil and agricultural potential	Low	Low
Heritage	Low	Low
Visual	Low	Medium to low (depending on the impact being considered)
Social	Negative social impacts – Low	Negative social impacts – Low
	Positive social impacts – Medium	Positive social impacts - High
Traffic	Medium	Medium

Based on the specialist cumulative assessment and findings regarding the development of Geelstert 1 and its contribution to the overall impact of all solar PV facilities to be developed within a 30km radius of the development area, it can be concluded that there are no impacts or risks identified to be considered as unacceptable with the development of Geelstert 1 and other solar PV facilities within the surrounding area. In addition, no impacts that will result in whole-scale change are expected.

10.3. Environmental Sensitivity Mapping

From the specialist investigations undertaken for Geelstert 1, the following sensitive areas/environmental features have been identified and demarcated within the development area (refer to **Figure 10.1** and **Appendix M**). These features have been considered by the proponent and avoided by the development footprint proposed for Geelstert 1.

- » A very high sensitivity rating from an ecological, freshwater and avifauna perspective has been allocated to the larger depression wetland located adjacent to the development footprint of the solar PV facility. This larger depression wetland forms part of a suite of five (5) depression wetlands identified within the development area. However all of these occur outside of the development footprint of the solar PV facility. The depression wetlands are located between 30 -75m from the boundary of the development footprint. The five (5) depression wetlands are allocated a very high freshwater sensitivity and all the depression wetlands located with the development area are regarded as no-go areas. A 15m buffer is to be implemented around the depression wetlands. No development is permitted within these areas or the buffer areas. The development footprint of Geelstert 1 is located outside of this buffer area.
- » The dune habitat associated with the presence of the Red Lark, located outside the development footprint to the south has a very high ecological and avifauna sensitivity. The buffer area (approximately 250m in extent) comprising the sandy flats with red soils also supports the Red Lark and this area is associated with a high sensitivity. Neither the dune habitat nor buffer area are considered suitable for the placement of solar PV infrastructure. The plain's habitat located to the north of the sandy flats appears to not support any Red Lark based on the three field surveys undertaken in th area by the specialist. Therefore, this area is associated with a low sensitivity.
- » An ephemeral stream is present to the north-west of the development area. The ephemeral stream is located outside the development area of Geelstert 1. A 35m buffer must be implemented around this feature and has been allocated a very-high freshwater sensitivity and is regarded as a no-go area.

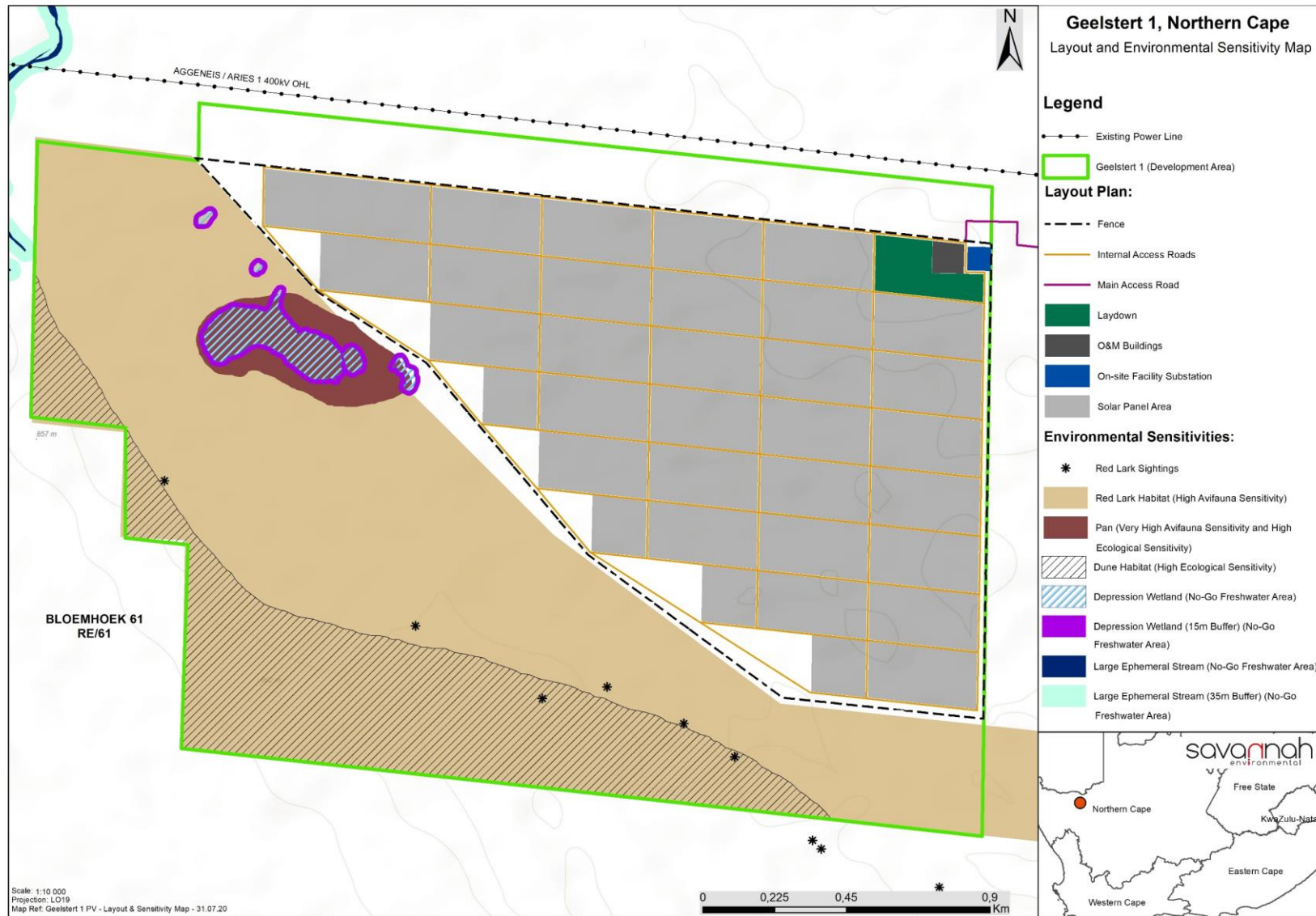


Figure 10.1: Environmental sensitivity map overlain with the Geelster 1 development footprint

10.4. Environmental Costs of the solar PV Facility versus Benefits of the solar PV Facility

Environmental costs (including those to the natural environment, economic and social environment) can be anticipated at a local and site-specific level and are considered acceptable provided the mitigation measures as outlined in the BA Report and the EMP are implemented and adhered to. No fatal flaws have been identified. These environmental costs could include:

- » **A loss of biodiversity, flora and fauna due to the clearing of land for the construction and utilisation of land for the solar PV facility** - The cost of loss of biodiversity is considered to be limited due to the placement of infrastructure within vegetation considered to be of a low sensitivity.
- » **Loss of avifauna habitat** – The cost of the loss of habitat is considered to be limited to due to the placement of the solar PV facility's infrastructure within the plain's habitat which is associated with a low sensitivity and has shown to not support the Red Lark avifauna species.
- » **Visual impacts associated with the solar PV Facility** - The development of Geelstert 1 may have a visual impact within a 11.3km radius of the solar PV facility, which will be of a low significance, with the implementation of recommended mitigation measures, considering the current landscape and the existing industrial developments.
- » **Change in land-use and loss of land available for agricultural activities within the development footprint** - The environmental cost is anticipated to be very limited due the fact that the development footprint does not impact on any areas of moderate or high agricultural potential.
- » **An increase in traffic** - The construction, operation and decommissioning of Geelstert 1 will create an increase in traffic, however this increase will be minimal and of a low significance following the implementation of the recommended mitigation measures.

Benefits of Geelstert 1 include the following:

- » The project will result in important economic benefits at the local (specifically Aggeneys) and regional scale through job creation, income and other associated downstream economic development. These will persist during the pre-construction, construction, operation and decommissioning phases of the project.
- » The project contributes towards the Provincial and Local goals for the development of renewable energy as outlined in the respective IDPs.
- » The project serves to diversify the economy and electricity generation mix of South Africa through the addition of solar energy development.
- » Contribution to the development and growth of the Springbok REDZ and the associated benefits in terms of the concentration of solar facilities within a node.
- » The water requirement for a solar PV facility is negligible compared to the levels of water used by coal-based technologies. This generation technology is therefore supported in dry climatic areas.
- » South Africa's per capita greenhouse gas emissions are amongst the highest in the world due to the reliance on fossil fuels. Geelstert 1 will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of Geelstert 1 are expected to occur at a national, regional and local level. As the costs to the environment at a site-specific level have been largely limited through the appropriate placement of

infrastructure in areas considered to be of a low sensitivity and acceptable for the proposed development, the benefits of the project are expected to outweigh the environmental costs of the solar PV facility.

10.5. Overall Conclusion (Impact Statement)

The construction and operation of a solar PV facility with a contracted capacity of up to 125MW_{AC} on a study area located near Aggeneys in the Khâi-Ma Local Municipality, of the greater Namakwa District Municipality has been proposed by Geelstert Solar Facility 1 (Pty) Ltd. A technically viable development area and development footprint was proposed by the proponent and assessed as part of the BA process. The assessment of the development footprint within the development area was undertaken by independent specialists and their findings have informed the results of this BA Report.

The specialist findings have indicated that there are no identified environmental fatal flaws associated with the implementation of Geelstert 1 within the development footprint. The proponent has proposed a technically viable and suitable layout for the development footprint, which has been assessed as part of the independent specialist studies. The facility layout assessed through this BA process is considered as the most appropriate development footprint for Geelstert 1 and is considered to be acceptable within all fields of specialist study undertaken for the project. All impacts associated with the preferred layout can be mitigated to acceptable levels or enhanced through the implementation of the recommended mitigation or enhancement measures. The preferred layout map (including the details of the project) is included as **Figure 10.2**.

Through the assessment of the development of Geelstert 1 within the study area and development area, it can be concluded that the development of the solar PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.6. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the proponent, the avoidance of the sensitive environmental features within the development area, as well as the potential to further minimise the impacts to acceptable levels through mitigation, it is the reasoned opinion of the EAP that the development of Geelstert 1 is acceptable within the landscape and can reasonably be authorised (**Figure 10.2**). The development of Geelstert 1 within the Springbok REDZ is also supported by the Strategic Environmental Assessment (SEA) undertaken by the CSIR on behalf of DEA for the determination of the REDZ focus areas.

The following infrastructure would be included within the environmental authorisation issued for the project:

- » Bifacial or monofacial PV panels, mounted on fixed-tilt or tracking mounting structures with a maximum height of 3.5m;
- » Centralised inverter stations or string inverters;
- » A temporary laydown area;
- » Cabling between the panels, to be laid underground where practical;

- » An on-site facility substation stepping up from 22kV or 33kV to 132kV or 220kV with an extent of up to 1ha to facilitate the connection between the solar PV facility and the grid connection solution;
- » An access road with a maximum width of 8m;
- » Internal access roads within the PV panel array area with a maximum width of 5m;
- » Operation and Maintenance buildings including a gate house and security building, control centre, offices, warehouses, a workshop and visitors centre.

The following key conditions would be required to be included within an authorisation issued Geelstert 1:

- » The red sand and dune habitats are no-go areas and must be excluded from development.
- » The depression wetlands are no-go areas and a 15m buffer must be included around these features. No development is permitted within these features or within the applied buffer areas.
- » All mitigation measures detailed within this BA Report, as well as the specialist reports contained within **Appendices D to K**, are to be implemented.
- » The EMPr as contained within **Appendix L** of this BA Report should form part of the contract with the Contractors appointed to construct and maintain the solar PV facility in order to ensure compliance with environmental specifications and management measures. The implementation of this EMPr for all life cycle phases of Geelstert 1 is considered key in achieving the appropriate environmental management standards as detailed for this project.
- » Following the final design of Geelstert 1, a final layout must be submitted to DEA for review and approval prior to commencing with construction activities.
- » A pre-construction walk-through of the final development footprint for species of conservation concern that would be affected and that can be translocated must be undertaken prior to the commencement of the construction phase.
- » Permits from the relevant national and provincial authorities, i.e. the Northern Cape Department of Agriculture, Environmental Affairs, Rural Development and Land Reform and National Department of Environment, Forestry and Fisheries must be obtained before the individual species are disturbed.
- » The necessary water use authorisation must be obtained from the Department of Human Settlements, Water and Sanitation for impacts to a watercourse prior to the commencement of the construction phase.
- » A Chance Find Procedure must be developed and implemented in the event that archaeological or palaeontological resources are found. In the case where the proposed development activities bring these materials to the surface, work must cease and SAHRA must be contacted immediately.

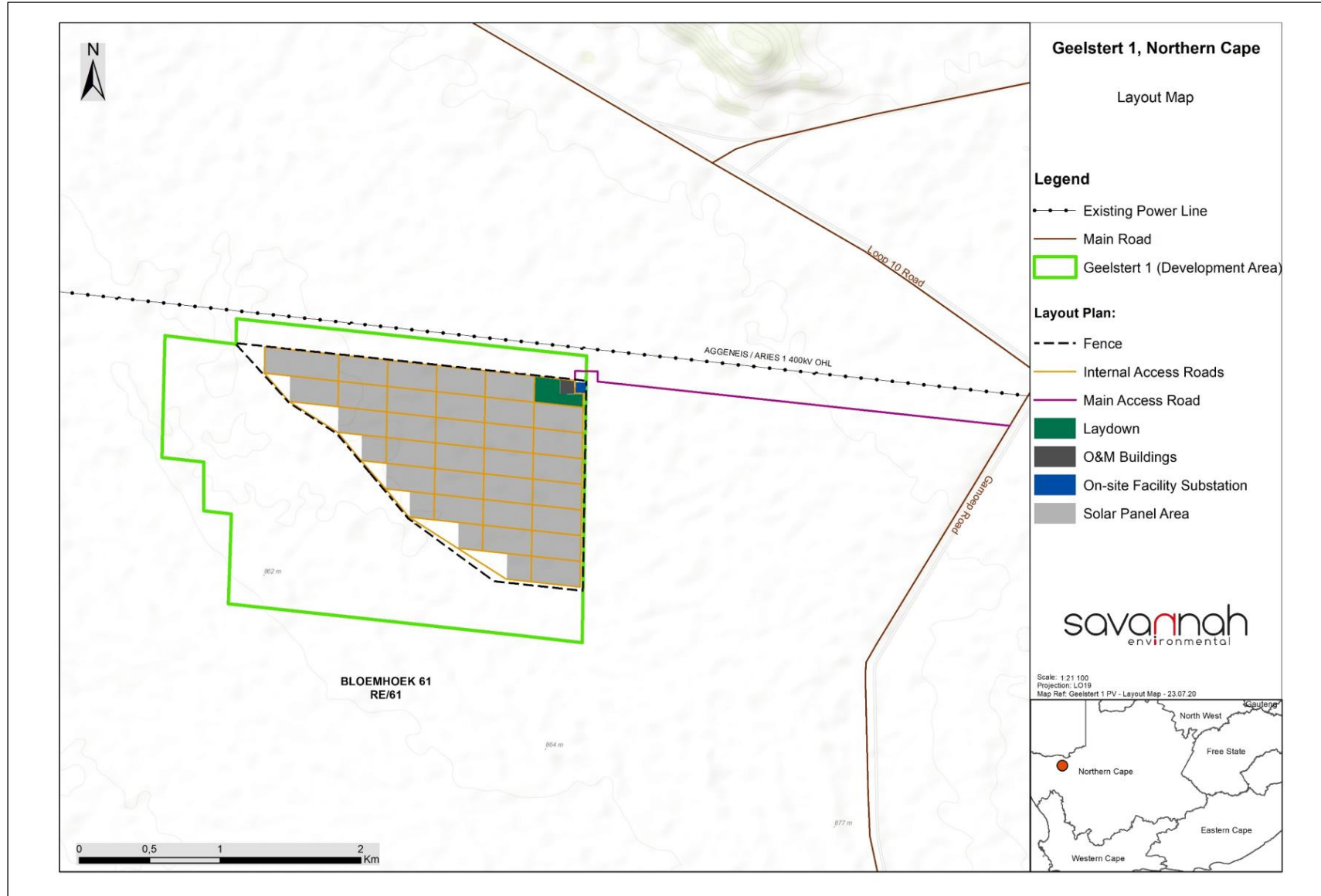


Figure 10.2: Preferred layout map of the preferred development footprint of Geelstert 1, as was assessed as part of the BA process (A3 map included in **Appendix M**)

CHAPTER 11: REFERENCES

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