

Aggeneys 1

Northern Cape Province

Basic Assessment Report

May 2019

DEA Reference No. 14/12/16/3/3/1/2019

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PROJECT DETAILS

DEA Reference No.	:	14/12/16/3/3/1/2019
Title	:	Environmental Impact Assessment Process: <u>Final</u> Basic Assessment Report for Aggeneys 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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Report Revision	:	Revision 0
Date	:	<u>May</u> 2019

When used as a reference this report should be cited as: Savannah Environmental (2019) Final Basic Assessment for Aggeneys 1 and Associated Infrastructure, Northern Cape Province.

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PURPOSE OF THE BA REPORT AND INVITATION TO COMMENT

ABO Wind Aggeneys 1 PV (Pty) Ltd, a Special Purpose Vehicle (SPV), the Applicant, proposes the development of a 100MW (AC) solar photovoltaic (PV) facility, as well as associated infrastructure on a site located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Aggeneys 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 site is the area within the study 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 final Basic Assessment Report (BA Report).

In terms of NEMA, the 2014 EIA Regulations (GNR 326), and Listing Notices (Listing Notice 1 (GNR 327), Listing Notice 2 (GNR 325), and Listing Notice 3 (GNR 324)), the development of Aggeneys 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 2014 EIA Regulations (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 project site within the Springbok REDZ.

The BA Report was available for review from **24 April 2019 to 27 May 2019** at the following locations:

- » Aggeneys Public Library, Havelock Street (next to OK Furniture), Aggeneys
- » www.savannahSA.com

This final BA Report includes all comments received, as well as responses to those comments (refer to **Appendix C8**). Where applicable, this final BA Report has been amended to address these comments. All amendments and/or additions to this Report have been underlined for ease of reference.

EXECUTIVE SUMMARY

ABO Wind Aggeneys 1 PV (Pty) Ltd, a Special Purpose Vehicle (SPV), the Applicant, proposes the development of a 100MW (AC) solar photovoltaic (PV) facility, as well as associated infrastructure on a site located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Aggeneys 1. A study area has been identified for the development of Aggeneys 1 which constitutes the entire extent of the Remaining Extent of the Farm Bloemhoek 61. The study area is located approximately 11km south-east of the town of Aggeneys (measured from the centre of the study area) (**Figure 1**). The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A smaller and more defined project site has been identified by the Applicant for the development of Aggeneys 1 within the larger study area. The project site is located within the central portion of the study area, along the northern boundary. The project site is the area within the study 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 final Basic Assessment Report (BA Report).

The project site is also located within Renewable Energy Development Zones (REDZ) 8, otherwise known as the Springbok REDZ. The REDZ are zones identified by the Department of Environmental Affairs (DEA) as geographical areas of strategic importance for the development of large scale solar PV and wind energy development activities, and which have been earmarked for the development of renewable energy facilities within South Africa (as per GNR114 of February 2018). Due to the location of Aggeneys 1 within the Springbok REDZ a Basic Assessment process is being undertaken

Aggeneys 1 will have a contracted capacity of up to 100MW. The facility will also include specific infrastructure, namely:

- » Arrays of PV panels with a contracted capacity of up to 100MW.
- » Mounting structures to support the PV panels.
- » Cabling between the project components, to be laid underground where practical.
- » On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- » An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing around the project site.

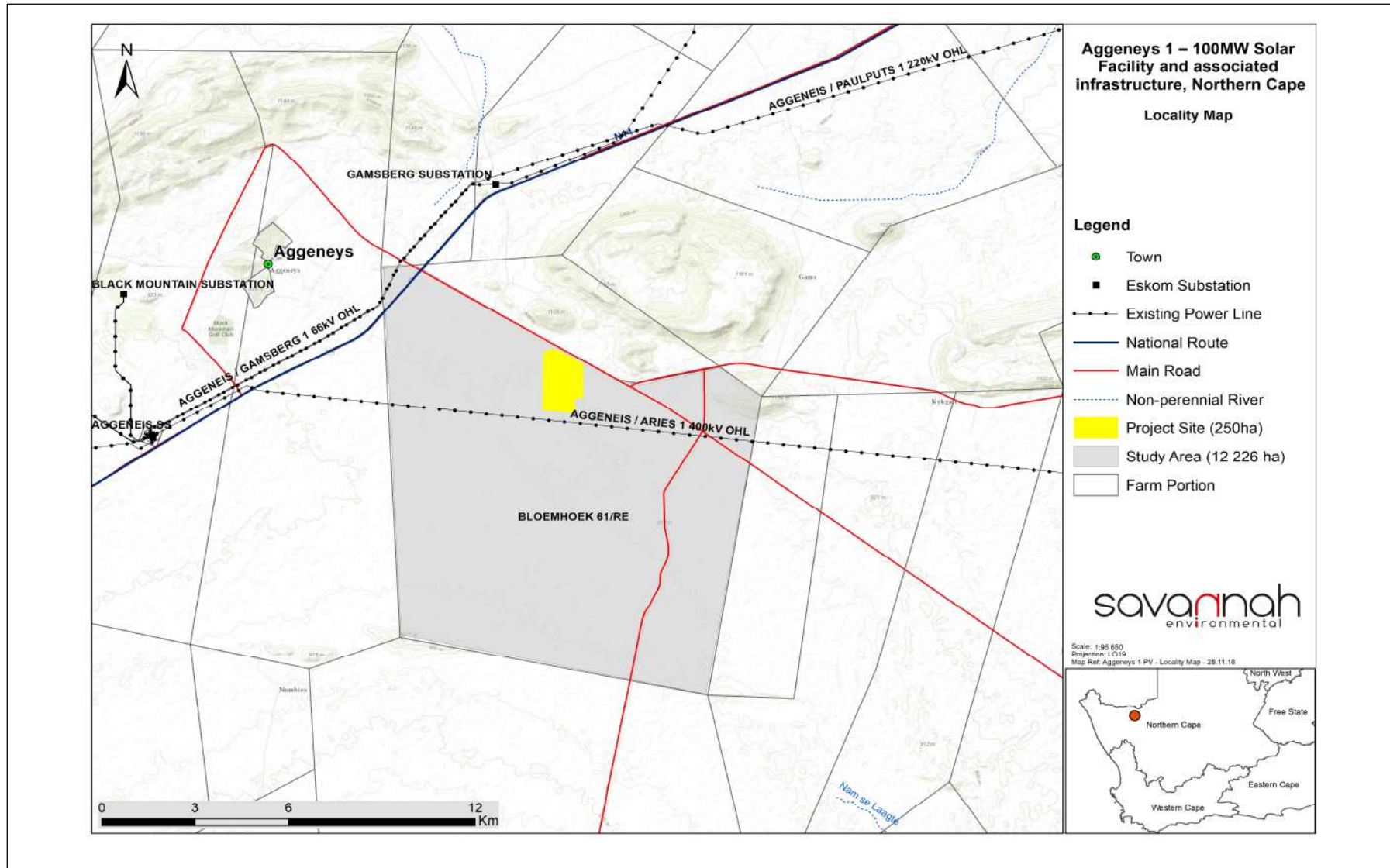


Figure 1: Locality map illustrating the location of the project site under investigation for the establishment of Aggeneys 1

No environmental fatal flaws were identified in the detailed specialist studies conducted, and no impacts of unacceptable significance are expected to occur with the implementation of the recommended mitigation measures. The potential environmental impacts associated with Aggeneys 1 identified and assessed through the BA process include:

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

Impacts on Ecology

The Ecological Impact Assessment assessed the impact of Aggeneys 1 on the sensitive ecological features present within the project site for the life-cycle of the project. The assessment identified impacts within 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 range from medium to low, following the implementation of the mitigation measures recommended by the specialist. No impacts of high significance were identified prior to the implementation of mitigation.

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 significance were identified.

From the findings of the Ecological Impact Assessment it can be concluded that no impacts of high ecological significance were identified which would hinder the development of Aggeneys 1 and its associated infrastructure within the. 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 project site 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 is based on the findings of two site visits undertaken in mid-winter (26 to 28 June 2018) and again in late summer (20 to 22 March 2019). The avifauna impacts identified to be associated with Aggeneys 1 will be negative and local in extent. The duration of the impacts will be long-term, for the lifetime of the PV facility.

During the construction phase (and decommissioning phase) of Aggeneys 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 Aggeneys 1.

Impacts on avifauna during the operation phase of Aggeneys 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 a high 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 project site for Aggeneys 1 is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the study area supports a typical bioregional avifaunal assemblage within an extensive vegetation type, and that there are no known breeding or roosting sites of red-listed priority species within close proximity (<3 km), there are no impacts associated with the development that are considered to be of high residual significance and which cannot be mitigated to a low acceptable level. Therefore the development of Aggeneys 1 is considered to be acceptable from an avifaunal perspective.

From the results of the avifauna impacts assessment, it can be concluded that no fatal-flaws will be associated with the development of Aggeneys 1.

Impacts on Freshwater Features

The assessment of freshwater features assessed the impact of Aggeneys 1 on the freshwater features present within the project site for the life-cycle of the project.

During the construction phase, impacts include vegetation clearance in watercourses, impacts to water quality in the watercourses and impacts associated with the movement of vehicles through watercourses. 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 mitigation.

During the operation phase, the impact relates to the movement of vehicles through watercourses located within the development footprint. The significance of the impact will be low following the implementation of the mitigation measures by the recommended specialist. No impacts of a high significance were identified for the project.

From the findings it can be concluded that the development of Aggeneys 1 will have an overall negative impact of low significance with the implementation of the recommended mitigation measures. The construction of the solar PV facility and the associated infrastructure is therefore supported from a freshwater features perspective and considered acceptable subject to obtaining of the necessary water use license from the Department of Water and Sanitation.

Impacts on Soil and Agricultural Potential

Two impacts have been identified to be associated with the development of Aggeneys 1 from a soils perspective. These impacts include the loss of potentially productive agricultural land through the undertaking of construction activities and panel installation; and increased wind erosion due to disturbance

of the soil. Both impacts are expected to occur during the construction and operation phases. No fatal flaws have been identified from a soils and agricultural potential perspective and all impacts can be mitigated to be within low and acceptable levels of impact. Therefore, the development of Aggeneys 1 is considered to be acceptable from a soils and agricultural perspective.

Impacts on Heritage Resources

The heritage impacts expected during the construction phase include impacts to palaeontological resources, archaeological resources and graves and impacts to the cultural landscape. There are no heritage resources present within the development footprint, although several isolated stone artefacts attributable to background scatter were noted. Impacts to heritage resources were identified to be associated with Aggeneys 1 for the construction phase. No impacts are expected to occur during the operation phase of the solar PV facility.

The significance of the impacts ranges from medium to low, with the implementation of the recommended mitigation measures. No impacts of high significance are expected, and the development of Aggeneys 1 is considered to be acceptable from a heritage perspective.

Visual Impacts

The Visual Impact Assessment identified negative impacts on visual receptors during the construction and the operation phase of Aggeneys 1. The impacts includes a change in the character of a relatively natural area, a change in the character of the landscape as seen from the N14, the Loop 10 road and local homesteads, a change in the landscape as seen from local settlement areas, glare impacts which could affect travellers on the Loop 10 road 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 on observers. The significance of the impacts ranges between medium and low, with the implementation of the recommended mitigation measures. No impacts of a high significance are expected to occur.

The Visual Impact Assessment concluded that the development of Aggeneys 1 will largely impact visually on an area where there currently is strong influence of urban and urban fringe development and therefore changes to the landscape quality are unlikely to be problematic. In conclusion, the development of Aggeneys 1 is considered to be acceptable from a landscape and visual impact perspective.

Social Impacts

The Social Impact Assessment identified that most social impacts associated with the development of Aggeneys 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 nuisance, dust and noise impacts, an increase in crime, an increased risk of HIV and AIDS, an influx of construction workers and job seekers to the area, exposure to hazards, disruption of daily living patterns and disruption of services supplied and impacts on infrastructure. The significance of the negative construction phase impacts ranges between low, medium and medium to high, with the implementation of recommended mitigation measures. The positive social impacts associated with the construction of Aggeneys 1 includes positive economic impacts and the

stimulation of the area's economy. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures.

Impacts associated with the operation of the solar PV facility will be both positive and negative. The negative impacts are related to a transformation in the sense of place which has a significance of medium to high, with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of Aggeneys 1 relates to positive economic impacts, including the creation of jobs, business opportunities and a source of revenue for local authorities. The significance of the positive impacts will be medium to high with the implementation of the recommended enhancement measures.

Impacts on Traffic

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, and the development of Aggeneys 1 is therefore considered to be acceptable from a traffic perspective.

The nominated preferred on-site substation location alternative from a traffic perspective is Alternative 1.

Assessment of Cumulative Impacts

The Aggeneys 1 solar PV facility is located within the Springbok Renewable Energy Development Zone (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 developments and it is expected that several solar PV facilities will be developed within these focus areas.

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

Figure 2 provides an environmental sensitivity map of the preferred alternatives for Aggeneys 1.

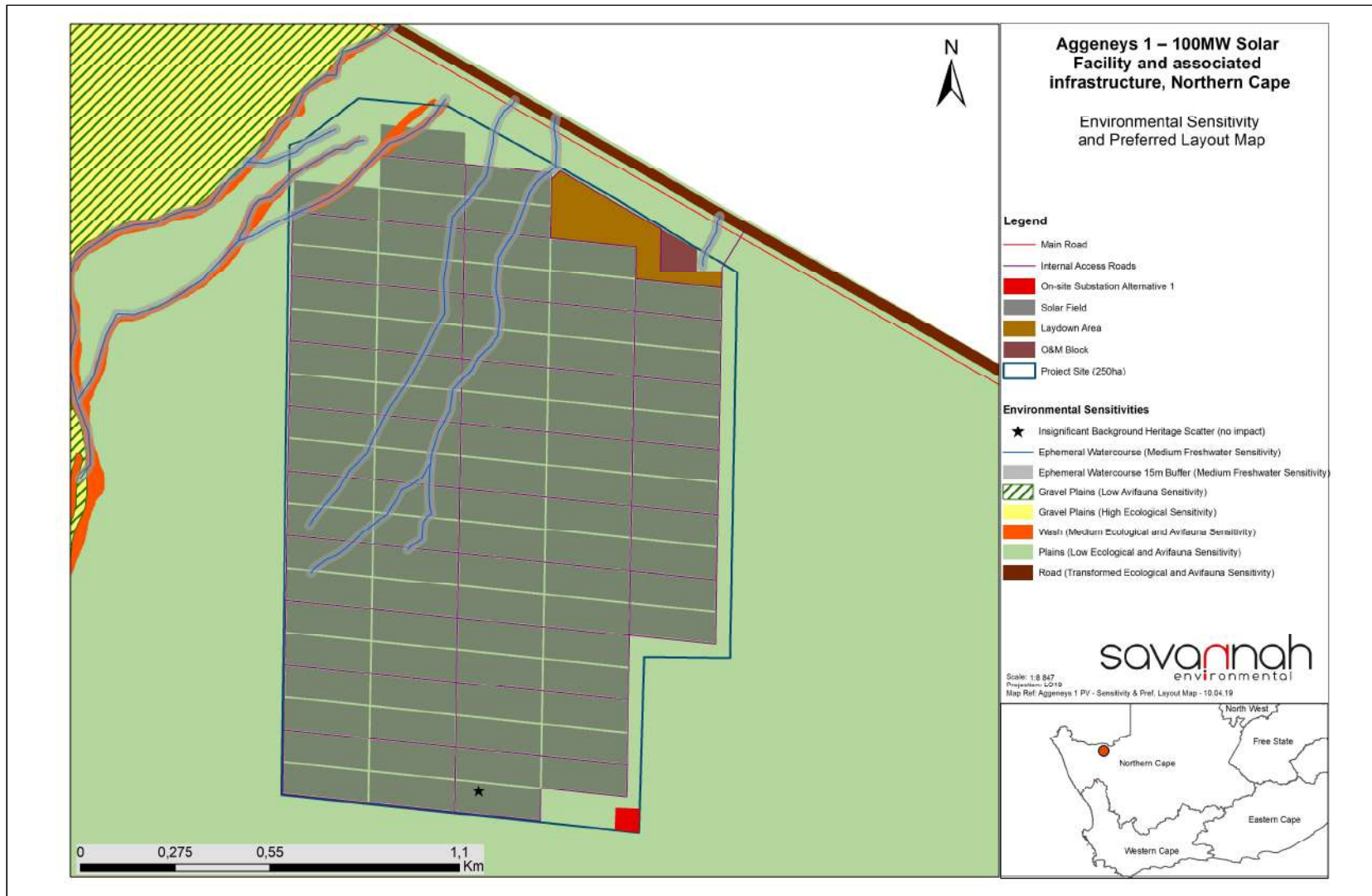


Figure 2: Final preferred layout map of the preferred development footprint for Aggeneys 1, as was assessed as part of the BA process, overlain with the environmental sensitivities (refer to Appendix M for A3 map)

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.

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 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: An operational plan that organises and co-ordinates mitigation, rehabilitation and monitoring measures in order to guide the implementation of a proposal and its ongoing maintenance after implementation.

Heritage: That which is inherited and forms part of the National Estate (Historical places, objects, fossils as defined by the National Heritage Resources Act of 2000).

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

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 to the ECO and the site manager (or engineer) by the EPC Contractor in collaboration with his/her EO.

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.

Perennial and non-perennial: Perennial systems contain flow or standing water for all or a large proportion of any given year, while non-perennial systems are episodic or ephemeral and thus contains flows for short periods, such as a few hours or days in the case of drainage lines.

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: means—

- 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 to this Act; or
- b) any other substance, material or object that is not included in Schedule 3 that may be defined as a waste by the Minister

Watercourse: as per the National Water Act 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

Wetlands: land which is transitional between terrestrial and aquatic systems where the water table is usually at or near the surface, or the land is periodically covered with shallow water, and which under normal circumstances supports or would support vegetation typically adapted to life in saturated soil (Water Act 36 of 1998); land where an excess of water is the dominant factor determining the nature of the soil development and the types of plants and animals living at the soil surface (Cowardin et al., 1979).

ACRONYMS

BGIS	Biodiversity Geographic Information System
BNCA	Bophuthatswana Nature Conservation Act (No. 03 of 1973)
CBA	Critical Biodiversity Area
DAFF	Department of Agricultural, Forestry and Fisheries (National)
DEA	Department of Environmental Affairs (National)
DWS	Department of Water and Sanitation
CBA	Critical Biodiversity Area
CBIPPP	Coal Baseload Independent Power Producer Procurement
CR	Critically Endangered
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated Solar Power
DM	District Municipality
DoE	Department of Energy
EAP	Environmental Assessment Practitioner
EGIS	Environmental Geographic Information System
EIA	Environmental Impact Assessment
EMF	Environmental Management Framework
EMP	Environmental Management Plan
EMPr	Environmental Management Programme
EN	Endangered
EP	Equator Principles
ESA	Ecological Support Area
GA	General Authorisation
GHG	Greenhouse Gas
IBA	Important Bird Area
IDP	Integrated Development Plan
IEM	Integrated Environmental Management
IEP	Integrated Energy Plan
IFC	International Finance Corporation
IPP	Independent Power Producer
IRP	Integrated Resource Plan
IUCN	International Union for Conservation of Nature
I&AP	Interested and Affected Party
km	Kilometre
kWh	Kilowatt hour
LC	Least Concern
LM	Local Municipality
LNG	Liquid Natural Gas
m	Metre
m ²	Square meters
m ³	Cubic meters
m amsl	Metres Above Mean Sea Level
MTS	Main Transmission Substation

MW	Megawatts
NDP	National Development Plan
NEMA	National Environmental Management Act (No. 107 of 1998)
NEM:AQA	National Environmental Management: Air Quality Act (No. 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act (No. 10 of 2004)
NEM:WA	National Environmental Management: Waste Act (No. 59 of 2008)
NFA	National Forests Act (No. 84 of 1998)
NFEPA	National Freshwater Ecosystem Priority Area
NHRA	National Heritage Resources Act (No. 25 of 1999)
NT	Near Threatened
NWA	National Water Act (No. 36 of 1998)
ONA	Other Natural Area
PA	Protected Area
PV	Photovoltaic
RE	Renewable Energy
READ	North West Department of Rural, Environmental, and Agricultural Development
REIPPP	Renewable Energy Independent Power Producer Procurement
SABAP	South African Bird Atlas Project
SAHRA	South African Heritage Resources Agency
SAHRIS	South African Heritage Resources Information System
SAIAB	South African Institute for Aquatic Biodiversity
SANBI	South African National Biodiversity Institute
SANParks	South African National Parks
SDF	Spatial Development Framework
TOPS	Threatened or Protected Species
TNCO	Transvaal Nature Conservation Ordinance (No. 12 of 1983)
UNESCO	United Nations Educational, Scientific and Cultural Organisation
VU	Vulnerable
WB	World Bank
WUL	Water Use License
WWF	World Wide Fund for Nature

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CHAPTER 1: INTRODUCTION

ABO Wind Aggeneys 1 PV (Pty) Ltd, a Special Purpose Vehicle (SPV), the Applicant, proposes the development of a 100MW (AC) solar photovoltaic (PV) facility, as well as associated infrastructure on a site located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Aggeneys 1. A study area has been identified for the development of Aggeneys 1 which constitutes the entire extent of the Remaining Extent of the Farm Bloemhoek 61. The study area is located approximately 11km south-east of the town of Aggeneys (measured from the centre of the study area) (**Figure 1.1**). The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A smaller and more defined project site¹ has been identified by the Applicant for the development of Aggeneys 1 within the larger study area. The project site is located within the central portion of the study area, along the northern boundary. The project site is the area within the study 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 Report (BA Report). It is considered that the project site is of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities.

From a regional perspective, the greater Aggeneys area is considered favourable for the development of a commercial solar electricity generating facility by virtue of the prevailing climatic conditions (primarily as the economic viability of a solar PV facility is directly dependent on the annual solar irradiation values for a particular area), relief and aspect, the extent of the site, the availability of a direct grid connection (i.e. point of connection to the Eskom National grid) and the availability of land on which the development can take place. The project site is also located within Renewable Energy Development Zones (REDZ) 8, otherwise known as the Springbok REDZ.

The REDZ are zones identified by the Department of Environmental Affairs (DEA) as geographical areas of strategic importance for the development of large-scale solar PV and wind energy development activities, and which have been earmarked for the development of renewable energy facilities within South Africa (as per GNR114 of February 2018).

Aggeneys 1 is planned to be bid into the Department of Energy's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) with the aim of evacuating the generated power into the Eskom national electricity grid and aiding in the diversification and stabilisation of the country's electricity supply, in line with the objectives of the Integrated Resource Plan (IRP). Aggeneys 1 will have a contracted capacity of 100MW², which will be fed into the existing national grid.

¹ The project site is the identified location within the larger study area within which the proposed solar PV facility will be sited. The project site will house the PV panels and other associated infrastructure to be constructed for Aggeneys 1. The project site is ~250ha in extent.

² The facility capacity is planned as 100MW(AC).

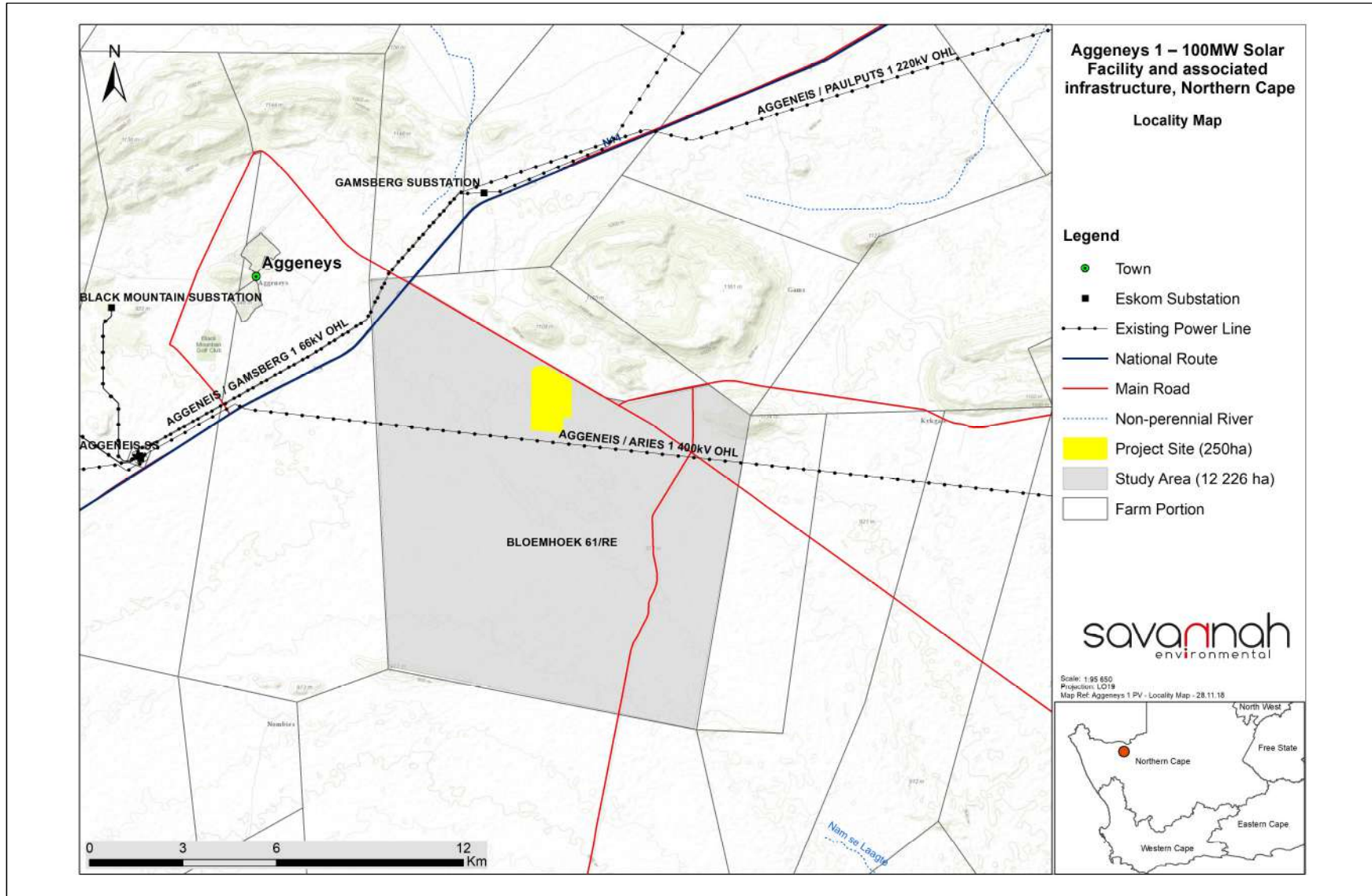


Figure 1.1: Locality map illustrating the location of the study area and the project site for Aggeneys 1 being considered within the Basic Assessment

In order to connect Aggeneys 1 to the national grid a grid connection solution will need to be developed and implemented. The grid connection solution includes the development of specific grid connection infrastructure, which includes a collector substation with a capacity of up to 220kV and a single circuit power line with a capacity of up to 220kV. The power line will connect Aggeneys 1 to the existing Eskom Aggeneys Main Transmission Substation (MTS) in order to complete the connection and enable the evacuation of the generated electricity to the national grid. The grid connection solution will be assessed within a separate BA process and therefore does not form part of the footprint of the project site being assessed within this final BA Report.

1.1 Project Overview

As a precursor to initiating a Basic Assessment Process for Aggeneys 1, ABO Wind Aggeneys 1 PV (Pty) Ltd embarked on a site identification and selection process to determine areas suitable for the development of a solar PV facility near Aggeneys in the Northern Cape Province. The results of the site identification and site selection were informed by the findings of a pre-feasibility desktop screening and fatal flaw analysis. The results thereof are discussed in the subsequent chapters of the report.

Aggeneys 1 will have a contracted capacity of up to 100MW. The facility will also include specific infrastructure, namely:

- » Arrays of PV panels with a contracted capacity of up to 100MW.
- » Mounting structures to support the PV panels.
- » Cabling between the project components, to be laid underground where practical.
- » On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- » An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing around the project site.

The project site is accessible via an existing gravel road off the N14 national road, which traverses the north-eastern corner of the study area.

Table 1.1 provides the details of the Aggeneys 1 study area.

Table 1.1: A detailed description of the Aggeneys 1 study area

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)	C0530000000006100000
Current zoning	Agricultural

Site Co-ordinates (centre of the project site)	29°16'52.78"S 18°56'22.62" E Corner points of the larger study area and the project site are included in Appendix N.
--	--

The key infrastructure components associated with the development of Aggeneys 1 are described in greater detail in Chapter 2 of this final BA Report.

1.2 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 development (i.e. construction and operation) of Aggeneys 1 (a solar PV facility) is subject to the requirements of the Environmental Impact Assessment (EIA) Regulations of 2014, published in terms of Section 24(5) of NEMA. In terms of the EIA Regulations of 2014 (as amended on 07 April 2017) promulgated under Section 24 and 24D of the NEMA, various aspects of Aggeneys 1 are listed as activities that may have a detrimental impact on the environment. The main listed activity triggered by the proposed development of Aggeneys 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. Aggeneys 1 will have a contracted capacity of 100MW (AC).

The procedure to be followed in applying for environmental authorisation for a large-scale project located within a REDZ was formally gazetted on 16 February 2018 (in Government Notice GN114). As the proposed development is located within the Springbok REDZ, one of the eight (8) designated REDZ, Aggeneys 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 environmental authorisation.

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 Aggeneys 1, as well as potential environmental impacts and mitigation measures associated with the construction, operation, and decommissioning phases are assessed in this final BA Report. Environmental issues associated with Aggeneys 1 are considered through detailed specialist assessments in order to test the environmental suitability of the preferred project site; to delineate areas of sensitivity within the project site and to also define the layout of the components of Aggeneys 1. Therefore, site-specific specialist assessments of the study area, and specifically the proposed project site have been undertaken during the BA process.

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

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). Therefore, this Chapter of the final 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 has been included in section 1.4 and 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.	The location of Aggeneys 1 is included in section 1.3, Table 1.1 and Figure 1.1 . The information provided includes the 21-digit Surveyor General code of the affected properties and the farm name. Additional information is also provided regarding the location of the development which includes the relevant province, local and district municipalities, ward and current land zoning.

The final BA Report describes and assesses the environmental suitability of Aggeneys 1. The final BA Report is structured according to the following chapters:

- » **Chapter 1** provides background to Aggeneys 1 and the BA process.
- » **Chapter 2** provides a description of the solar PV facility.
- » **Chapter 3** provides the site selection information and identified project alternatives.
- » **Chapter 4** outlines the strategic regulatory and legal context for energy planning in South Africa and specifically for Aggeneys 1.
- » **Chapter 5** describes the need and desirability of Aggeneys 1 within the study area.
- » **Chapter 6** outlines the approach to undertaking the BA process.
- » **Chapter 7** describes the existing biophysical and socio-economic environment within and surrounding the study area and project site proposed for the development.
- » **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 for 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.

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

In accordance with Regulation 12 of the 2014 EIA Regulations (GNR 326) ABO Wind Aggeneys 1 PV (Pty) Ltd has appointed Savannah Environmental (Pty) Ltd (Savannah Environmental) as the independent Environmental consultant to undertake the Basic Assessment and prepare the final BA Report for Aggeneys 1. Neither Savannah Environmental nor any of its specialists are subsidiaries of, or are affiliated to ABO Wind Aggeneys 1 PV (Pty) Ltd. Furthermore, Savannah Environmental does not have any interests in secondary developments that may arise out of the authorisation of the proposed solar 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 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.

The Savannah Environmental team has considerable experience in environmental impact assessments and environmental management and has been actively involved in undertaking environmental studies for a wide variety of projects throughout South Africa, including those associated with electricity generation and transmission.

The Savannah Environmental team in this project includes:

- » **Lisa Opperman** - the principle of this report. She holds a Bachelor degree with Honours in Environmental Management and has four 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.
- » **Reuben Maroga** - the co-author of this report. He holds a Bachelor degree in Environmental Management and an Honours degree in Geology and has two years of experience in the environmental management field. His key focus is on undertaking environmental impact assessments, public participation, environmental management plans and programmes.
- » **Thalita Botha** - the co-author of this report. She holds a Bachelor degree with Honours in Environmental Management and has three 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 the EIA for this project. Jo-Anne holds a Master of Science Degree in Botany (M.Sc. Botany) from the University of the Witwatersrand, and is registered as a Professional Natural Scientist (400024/2000) with the South African Council for Natural Scientific Professions (SACNASP). She has over 20 years of experience in the field of environmental assessment and management, and the management of large environmental assessment and management projects. During this time she has managed and coordinated a multitude of large-scale infrastructure EIAs, and is also well versed in the management and leadership of teams of specialist consultants, and dynamic stakeholders. Jo-Anne has been responsible for providing technical input for projects in the environmental management field, specialising in Strategic Environmental Advice, EIA studies, environmental permitting, public participation, EMPs and EMPs, environmental policy, strategy and guideline formulation, and integrated environmental management (IEM). 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** – Board Member of IAPSA (International Association for Public Participation South Africa). She holds a Higher Secretarial Diploma and has over 21 years of experience in public participation, stakeholder engagement, awareness creation processes and facilitation of various meetings (focus group, public meetings, workshops, etc.). 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 final BA Report (refer to **Table 1.2**).

Table 1.2: Specialists which form part of the EIA project team

Company	Specialist Area of Expertise	Specialist Name
3Foxes Biodiversity Consulting	Ecology and Avifauna Impact Assessment.	Simon Todd
3Foxes Biodiversity Consulting	Avifauna	Eric Hermann
Savannah Environmental	Freshwater Impact Assessment Peer Review	Shaun Taylor Gideon Raath Steve Burton
Agriculture Research Council – Soil, Climate and Water	Soils and Agricultural Potential Impact Assessment	Garry Paterson
Environmental Planning and Design	Visual Impact Assessment	Jon Marshall
ASHA Consulting	Heritage and Palaeontological Impact Assessment	Jayson Orton
Natura Viva CC	Palaeontology Impact Assessment	John E. Almond
Neville Bews and Associates	Social Impact Assessment	Neville Bews
Knight Piésold Consulting	Stormwater Management Plan	Andrew Cleghorn
Knight Piésold Consulting	Traffic Impact Assessment	Andrew Cleghorn

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

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 final 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 project site is included in section 2.3.

2.2 Project and Site Description

The project site (i.e. 250ha) proposed for Aggeneys 1 is located within the Remaining Extent of Bloemhoek 61 situated approximately 11km south-east of Aggeneys in the Northern Cape Province. The study area falls within Ward 4 of the Khâi-Ma Local Municipality and within the greater Namakwa District Municipality.

The full extent of the study area, within which the project site has been placed, was considered within a Pre-Feasibility Desktop Screening and Fatal Flaw Analysis, which was undertaken prior to the initiation of the current BA process to identify and take into consideration environmental constraints and sensitivities that could be present in the study area. Within the study area a project site for the solar PV facility (approximately 250ha in extent) has been appropriately located and has been considered for this BA process. The project site is located along the northern boundary of the study area, east of the N14 national road and south of the Loop 10 gravel road (refer to **Figure 1.1**).

Based on the Pre-Feasibility Desktop Screening, sensitivities and areas that were to be excluded from the project site were identified within the study area. In order to avoid these areas of potential sensitivity and ensure that detrimental environmental impacts are minimised as far as possible, the Developer identified the preferred and most suitable project site within which the infrastructure of the solar PV facility is now proposed to be located. The project site will accommodate the development footprint of Aggeneys 1, which will include the PV panels, an on-site substation, inverters, buildings and access roads (**Figure 2.1**).

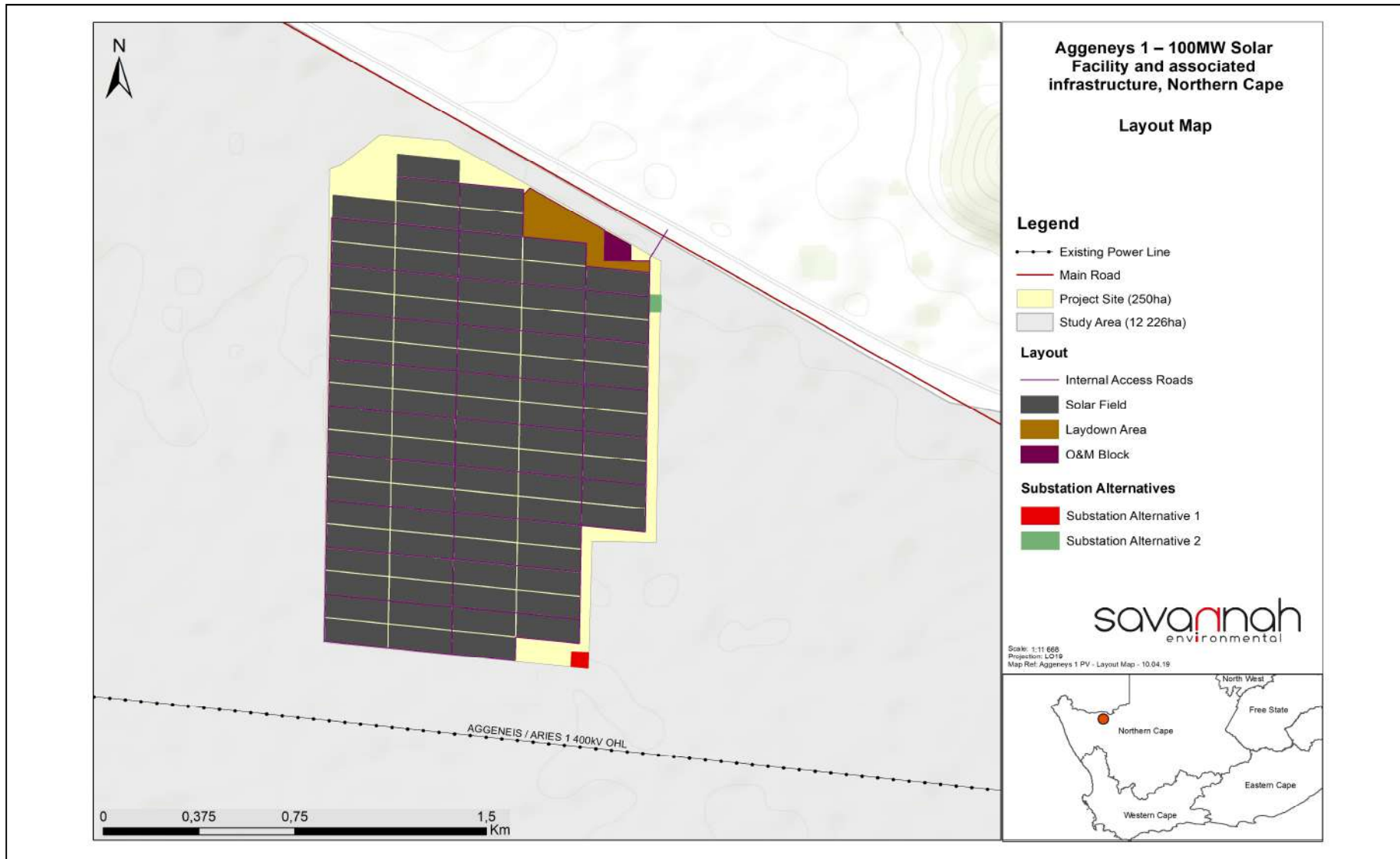


Figure 2.1: Map illustrating the proposed facility layout for Aggeneys 1 within the project site

Table 2.1 provides the details of Aggeneys 1, including the main infrastructure and services.

Table 2.1: Details of the Aggeneys 1 solar PV facility and associated infrastructure

Component	Description / Dimensions
Total Extent of the Affected Property (i.e. the Remaining Extent of the Farm Bloemhoek 61)	~12 226ha
Total Extent Project Site (i.e. total area to be occupied by Aggeneys 1)	~250ha
Contracted capacity of the facility	Up to 100MW(AC)
Technology	Static or tracking photovoltaic systems.
PV panels	<ul style="list-style-type: none"> » Height: ~3.5m from ground level (installed). » Up to a maximum of 233ha » Between 300 000 – 400 000 panels required. » Fixed-tilt, single-axis tracking, and/or double-axis tracking systems.
On-site Substation	<ul style="list-style-type: none"> » Located within the development area and in close proximity to the site access point. » Up to a maximum of 1ha » Stepping up from 22kV or 33kV to 132kV or 220kV
Site Access	<ul style="list-style-type: none"> » Direct access to the study area and project site is provided by the unsurfaced gravel road (Loop 10) running from the N14 national route (located along the western boundary of the study area).
Laydown Areas	<ul style="list-style-type: none"> » ~5ha (Temporary Laydown Area)
Temporary infrastructure required during the construction phase (estimated to be ~ 18 months)	<ul style="list-style-type: none"> » Construction equipment camps » Construction yard; and » Storage areas.
Other infrastructure	<ul style="list-style-type: none"> » Gate House and Security Office » Control Centre » Office Building » Warehouses and storage under roof » Rainwater Tank » Perimeter Fences

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

As a precursor to initiating the BA process, ABO Wind Aggeneys 1 PV (Pty) Ltd embarked on a solar resource monitoring programme, 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 greater Aggeneys area was identified by the applicant as having the potential for the installation of a PV facility on the basis of key technical criteria being met (i.e. favourable climatic conditions (solar renewable energy facilities are directly reliant on average solar radiation values for a particular area), access and capacity of the electricity grid and connection cost, accessibility of the affected properties, compatibility of current land use and local site topography). In addition, the area is located within the Springbok Renewable Energy Development Zone (REDZ 8), and the Northern Strategic Transmission Corridor, which both are areas designated by Government for the development of large-scale solar PV facilities and grid infrastructure.

From the initial pre-feasibility analysis, the applicant excluded properties from the feasible land parcels where:

- a) 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 land parcels that would be negatively affected by the development of Aggeneys 1. These activities include mining activities related to the current mining operations being undertaken by the Black Mountain mining company, areas under cultivation that are not considered to be compatible for the development of a solar PV facility, and parcels of land or areas where other solar PV facilities have been proposed or authorised.
- b) properties were considered to present greater environmental constraints which would have a higher environmental impact if selected for the development and reduce the chances of success for the project (i.e. environmentally constrained), and
- c) properties that presented greater technical constraints (i.e. complex grid connections) would influence the cost effectiveness of the facility and therefore influence the economic feasibility thereof.

When considering the study area (i.e. the Remaining Extent of the Farm Bloemhoek 61), compatibility issues with specific areas within the larger study area were identified. These compatibility issues mainly relate to the presence of the existing Aggeneys-Aries 400kV power line which traverses the northern portion of the study area, as well as the presence of multiple solar PV facilities located within the study area.

The detail regarding site-specific characteristics, and how these provide further motivation for the selection of the specific study area selected for Aggeneys 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. Aggeneys 1 will have a contracted capacity of up to 100MW. The project site proposed for Aggeneys 1, and assessed as part of this BA process, is ~250ha in extent, which provides for sufficient space for the solar PV facility and allows for the avoidance of any environmental sensitivities located within the study area. The landowner of the property on which the solar PV facility infrastructure is proposed (i.e. Blomhoek Plase (Pty) Ltd) has consented to the development of the facility on the property, and will willingly allow the developer to lease the 250ha area proposed for the development.

The following are key considerations:

- » The study area conditions are optimal for a development of this nature, with the study area 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 2% which is suitable for a development of this nature.
- » The project site would comprise ~2% of the total extent of the larger study area.

The study area is therefore considered suitable and favourable from a technical perspective for the construction and operation of Aggeneys 1, allowing for avoidance of sensitivities and other constraints within the greater study area.

Site access: Access to the study 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

national route (N14) which is aligned with the western boundary of the study area. Access routes within the surrounding areas are also an important characteristic to consider. The N14 national route provides access to the area from Upington, Pofadder, Springbok and Johannesburg.

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 Aggeneys 1. The affected property is currently used for livestock grazing. Furthermore, the landowner is currently considering options for the alternative use for their land other than for grazing. Other activities present within the study area and within the surrounding areas of the study area include power line servitudes associated with the existing and approved grid infrastructure, mining activities and the future development of other solar PV facilities that have been authorised. It is considered that the development of Aggeneys 1 is compatible with the study area and will not present a conflicting land-use. The location of the project site proposed for Aggeneys 1 is also considered to be acceptable within the study area as it avoids all conflicting land uses.

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 in close proximity to 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 general 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 Montiaian Substation
- » Aggeneis Main Transmission Substation (MTS)

The grid connection point for Aggeneys 1 will be the existing Aggeneis Main Transmission Substation. In order to connect Aggeneys 1 to the national grid (i.e. Aggeneis Main Transmission Substation) 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 new single-circuit up to 220kV overhead power line, which will be assessed as part of a separate Basic Assessment process.

Local labour and poverty alleviation: The study area is located ~11km from the town of Aggeneys, 42km from Pella, and 58km from the town of Pofadder. These areas and settlements will act as the source of local labour during the construction and operation phases of Aggeneys 1.

2.4 PV Technology considered for Aggeneys 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 (DC³) to alternating current (AC⁴). 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 100MW 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).

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

³ 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/>.)

⁴ An alternating current (AC) occurs when charge carriers in a conductor or semiconductor 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/>).

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.

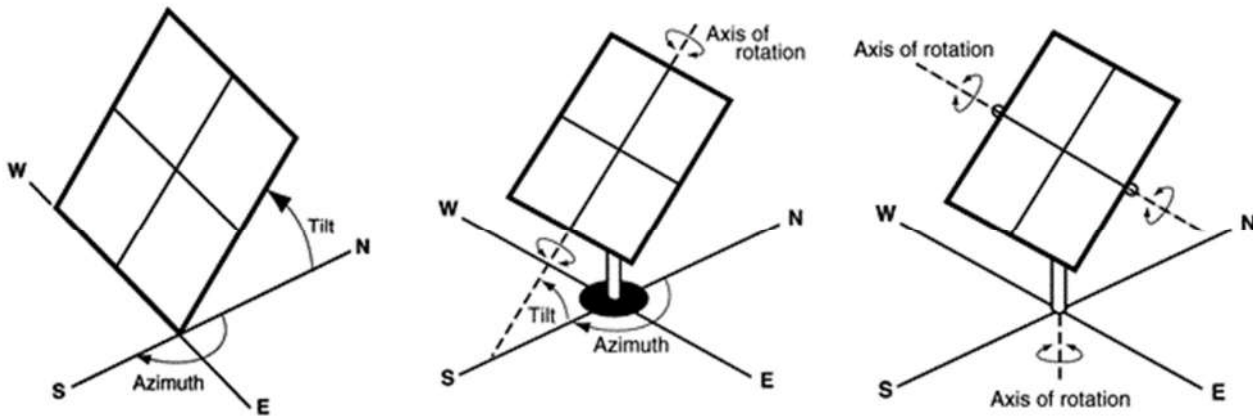


Figure 2.3: Overview of different PV tracking systems (from left to right: fixed-tilt, single-axis tracking, and double-axis tracking (Source: pveducation.com)).

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 Aggeneys 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 substation and the plant'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 project site. 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

Aggeneys 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 Aggeneys 1 will peak during the construction phase and significantly decline during the operation phase. The injection of income into the area in the form of wages will represent an opportunity for the local economy and businesses in the greater Aggeneys area.

Establishment of an Access Road to the Site

The project site is accessible via an existing gravel road off the N14, which traverses the western section of the study area. Within the project site itself, access will be required from new/existing roads for construction purposes (and limited access for maintenance during operation). Internal access roads of a gravel nature and up to 5m in width will be required.

Water Usage and Waste Requirements and the use of Hazardous Substances

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 ~10 000m³ of water over a 12-18 month period will be required. Water for the construction phase will be sourced directly from the Khai-Ma Local Municipality following a Service Level Agreement between the municipality and the developer. 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.

During the construction phase solid waste will be generated. Solid waste will mainly be in the form of construction material, excavated substrate and domestic solid waste. All waste will be disposed of in scavenger proof bins and temporarily placed in a central location for removal by the contractor. Any other waste and excess material will be removed once construction is complete and disposed of at a registered waste facility.

The use of hazardous substances will form part of the construction phase. The substances anticipated to be used includes cement powder associated with the concrete/ brick works; petrol/ diesel for trucks, cranes, bulldozers etc.; limited amounts of transformer oils. The dangerous goods stored during construction (e.g. limited quantities of fuel, oil, lubricants etc.) will be done in compliance with relevant legislation (i.e. stored in covered area/bin and disposal at registered hazardous waste site).

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 local municipality or a Contractor) at a licensed disposal site.

Other services required includes the provision of electricity for the undertaking of the construction activities. 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.

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.

Transport of Components and Equipment to Site

The components for the solar PV facility will be transported to site by road. For Aggeneys 1, transport of components would be via the N14 and Loop 10 roads. Some of the components (i.e. substation transformer) may be defined as abnormal loads in terms of the Road Traffic Act (Act No. 29 of 1989)⁵ by virtue of the dimensional limitations. Typical civil engineering construction equipment will need to be brought to the site (e.g. excavators, trucks, graders, compaction equipment, cement trucks, etc.) as well as components required for the mounting of the PV support structures, construction of the substation and site preparation.

Establishment of Laydown Areas on Site

Laydown and storage areas will be required for the typical construction equipment. Once the required equipment has been transported to site, a dedicated equipment construction camp and laydown area (of approximately 5ha in extent) will be established. The equipment construction camp 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.

Erect PV Cells and Construct Substation and Invertors

The construction phase involves installation of the solar PV panels and 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

⁵ A permit will be required for the transportation of these abnormal loads on public roads.

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 substation.



Figure 2.4: Frame, structural details (Photo courtesy of Igeteam, 2011).

The construction of a substation would require a survey of the site, site clearing and levelling and construction of access road/s (where required), construction of a level terrace and foundations, assembly, erection, installation and connection of equipment, and 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, workshop and maintenance building, 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 project site 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

Aggeneys 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 energy facility will create a maximum of approximately 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 Aggeneys 1. Approximately 5 000m³ of water per annum will be required for the operation of the solar PV facility, which is anticipated to be 20 years. The water required will be sourced directly from the Khai-Ma Local Municipality following a Service Level Agreement between the municipality and the developer. 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 Aggeneys 1 includes 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 staff. The sewage generated over this period will be collected and treated as per normal standards using a septic or conservancy tank. Should the 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 Aggeneys 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 Aggeneys 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 Aggeneys 1 would have degraded by ~15% over 20 years. The expectation is that the project site 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 Aggeneys 1 as part of the BA Process.

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.
(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 3.1.2.

3.1. Alternatives Considered during the BA Process

In accordance with the requirements of Appendix 1 of the 2014 EIA Regulations (GNR 326), a BA Report must contain a consideration of alternatives including site (i.e. development footprint), activity, technology and site access alternatives, as well as the “do-nothing” alternative. Alternatives are required to be assessed in terms of social, biophysical, economic and technical factors.

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 a 100MW solar PV facility and associated infrastructure proposed to be developed by an Independent Power Producer (IPP), and intended to form part of the DoE's REIPPP Programme.

3.1.1. 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 DoE's current Integrated

Resource Plan for Electricity 2010 – 2030 (IRP)⁶, and will continue to be addressed as part of future revisions thereto. In this regard, the need for renewable energy power generation from solar has been identified as part of the technology mix for power generation in the country in the next 20 years. Therefore, fundamentally different alternatives to the proposed project are not considered within this EIA process.

3.1.2. 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. The alternatives proposed for the development of Aggeneys 1 have been assessed at the same level.

3.1.2.1. Property or Location Alternatives

In May 2018, ABO Wind commissioned Savannah Environmental to undertake a high-level environmental screening study for a broader study area of approximately 72 309.26ha in extent (an area of 25.89km x 28.08km). The screening site (i.e. broader study area) was identified by ABO Wind as having the potential for the installation of photovoltaic panels (PV panels) on the basis of the various technical criteria including the solar resource available in the area, accessibility of the study area, accessibility to the Eskom grid and the local site characteristics and topography.

Following the high-level screening assessment, a focus area within the broader study area was identified by the developer for the construction and operation of a solar PV facility on the Remaining Extent of the Farm Bloemhoek 61. The screening assessment identified areas of environmental sensitivity within the Remaining Extent of the Farm Bloemhoek 61, which include, but are not limited to, the Haramoep and Black Mountain Mine Nature Reserve, the Kamiesberg Bushmanland Augrabies NPAES⁷, and the Koa River Channel, which is considered as the main habitat of the Red Lark species, which is a threatened bird species.

⁶ The Integrated Resource Plan (IRP) is legislated policy which regulates power generation planning.

⁷ National Protected Areas Expansion Strategy.

The proposed project site for Aggeneys 1 has taken into consideration the above-mentioned sensitivities, the extent of the project site, and the proximity of the project site to existing grid infrastructure. As a result, no alternative locations are proposed for the development of Aggeneys 1.

ABO Wind Aggeneys 1 PV (Pty) Ltd as the Applicant, considers the preferred project site as being highly favourable and suitable for the establishment of a solar PV facility due to the following site-specific 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 proposed project site is in the region of approximately 2303kWh/m²/annum.
- » **Topography:** The project site consists of gently undulating topography, with slopes of less than 5% over most of the area, and with an altitude range of 850 -1000m above sea level.
- » **Site extent:** The project site is approximately 250ha in extent, which is sufficient for the installation of the solar PV facility allowing for avoidance of site sensitivities. The PV panels of the solar PV facility would occupy an area of up to ~233ha, which is equivalent to approximately 93% of the extent of the project site.
- » **Site access:** Access to the project site is obtained via a gravel road (referred to as Loop 10) that can be accessed from the N14 national road, located approximately 5km north-west of the project site. The N14 national road links Aggeneys to other towns in the Province, such as Pofadder and Springbok.
- » **Grid access:** A key factor in the siting of any energy generation project is that the project must have a viable grid connection. Grid connection options are available via Eskom's Aggeneis MTS, which is located approximately 13km south-west of the project site and provides opportunity for Aggeneys 1 to connect to the national grid while minimising infrastructure (power line less than 20km) and the associated impacts.
- » **Land suitability:** The current land use of the project site is an important consideration in site selection in terms of limiting disruption to existing land use practices. Grazing land was preferred because the majority of farming practices can continue in tandem with the operation of the solar PV facility once the construction and commissioning of Aggeneys 1 is complete. Sites that facilitate easy construction conditions (i.e. relatively flat topography, lack of major rock outcrops, limited watercourse crossing etc.) are also favoured during site selection.
- » **Geographic location:** The project site is located within the Springbok REDZ, which is an identified a node for the development of renewable energy projects, with the following solar energy facilities in close proximity to the project site: the proposed Solar Capital PV facilities, the Aggeneys Solar PV Facility (currently under construction) and the Biotherm Enamandla and Letsoai PV and CSP projects (refer to **Figure 3.1**). The project site is adjacent to an existing cluster or node of proposed solar PV developments, which compliments existing and future land use activities in the Aggeneys area.
- » **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 developer.

Based on above site-specific attributes, the applicant considers the project site located within the larger study area as highly preferred in terms of the development of a solar PV facility, and expects that Aggeneys 1 will be able to draw on synergies with the projects proposed and / or currently authorised within the vicinity of the project site.

The High-Level Screening and Fatal Flaw Scan undertaken prior to the initiation of the current BA process identified and took into consideration environmental constraints and sensitivities that could be present in the broader study area. Furthermore, the purpose of the study was also to red-flag issues of concern prior to initiating the BA process. Considering the overall sensitivity of the study area, it was then concluded that while there are areas to be avoided by the development footprint, there are also areas with sufficient extent outside the no-go areas that are considered acceptable for the development of Aggeneys 1. Therefore, the High-Level Screening and Fatal Flaw Scan concluded that with due consideration of the no-go areas identified at a desktop level, and with the implementation of appropriate mitigation measures, the development of Aggeneys 1 within the project site can be considered as appropriate. As a result, no project site alternatives are proposed as part of this BA process.

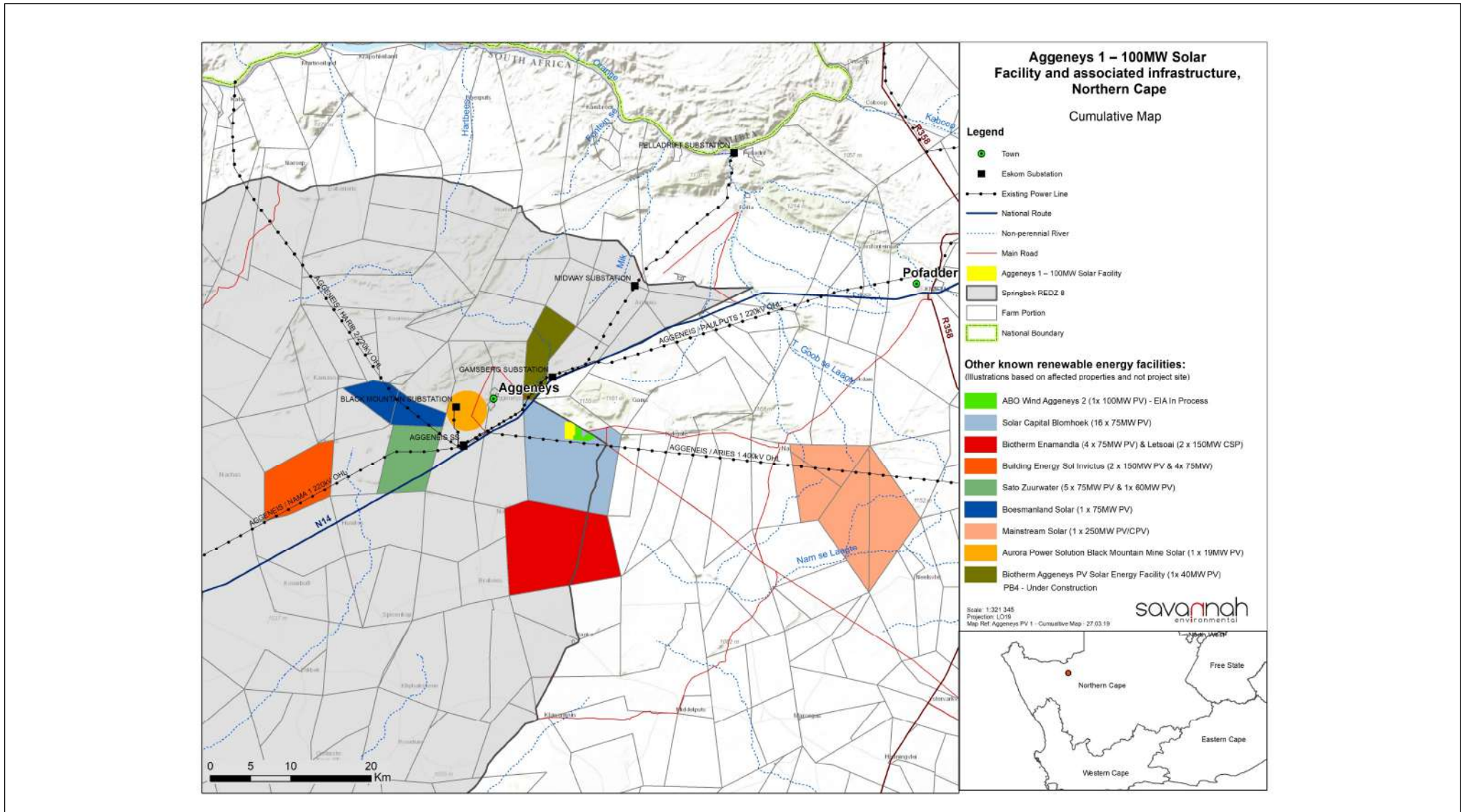


Figure 3.1: A Cumulative Map showing the location of other solar energy facilities in relation to Aggeneys 1

3.1.2.2. Design and Layout Alternatives

Given the size of the project site under investigation (i.e. with a total extent of up to ~250ha) and the size of the PV panel footprint (up to ~233ha), Aggeneys 1 and its associated infrastructure can be appropriately positioned within the project site in a manner that avoids any areas of environmental sensitivity identified during the High-Level Screening and Fatal Flaw Scan. The development footprint will occupy an area of up to approximately 93% of the total project site.

Two alternatives are identified for the placement of the on-site substation within the project site and as part of the development footprint (refer to **Figure 3.2**), and are described in more detail below:

» **On-site substation alternatives:**

* Alternative 1 (preferred from a technical perspective):

Substation Alternative 1, which is the technically preferred alternative, is the location of the on-site substation in the south-eastern corner of the project site. This location of the on-site substation Alternative 1 is the technically preferable option as it would result in a shorter distance between Aggeneys 1 and the Aggeneis MTS, as well as the consolidation of linear infrastructure associated with the power line⁸ considering the location of the power line in relation to existing Eskom power line infrastructure within the area.

* Alternative 2:

On-site substation Alternative 2 is to be located within the northern portion of the project site and along the eastern boundary of the development footprint, to the east of the solar field.

The two on-site substation location alternatives are being assessed as part of this BA process and within this BA Report.

3.1.3. **Technology Alternatives**

The project site has been identified for the development of a solar facility. The site is not considered suitable for wind energy development due to the low average wind speeds across the study area.

Few technology options are available for solar facilities, and the technology selected from those that are available is usually determined by weather and temperature conditions that prevail on site. Solar energy is considered to be the most suitable renewable energy technology for this site, based on the site location, ambient conditions and energy resource availability. Solar PV was determined as the most suitable option for the proposed site as large volumes of water are not required for power generation purposes compared to CSP technology. The PV technology is also preferred when compared to CSP technology because of the lower visual profile.

⁸ To be assessed as part of a separate Basic Assessment Process.

Considering the above, no other technology alternatives are being assessed for the development of Aggeneys 1.

When considering PV as a technology for the development of a solar facility, two types of PV systems could be installed, such as:

- » 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 systems available, which affect the potential for environmental impacts, relate to the extent of the facility, as well as the height of the facility (visual impacts). For example, 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. The preference will therefore be determined on the basis of technical considerations.

The PV facility is 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 system selected for implementation.

3.1.4. The 'Do-Nothing' Alternative

The 'do-nothing' alternative is the option of not constructing Aggeneys 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).

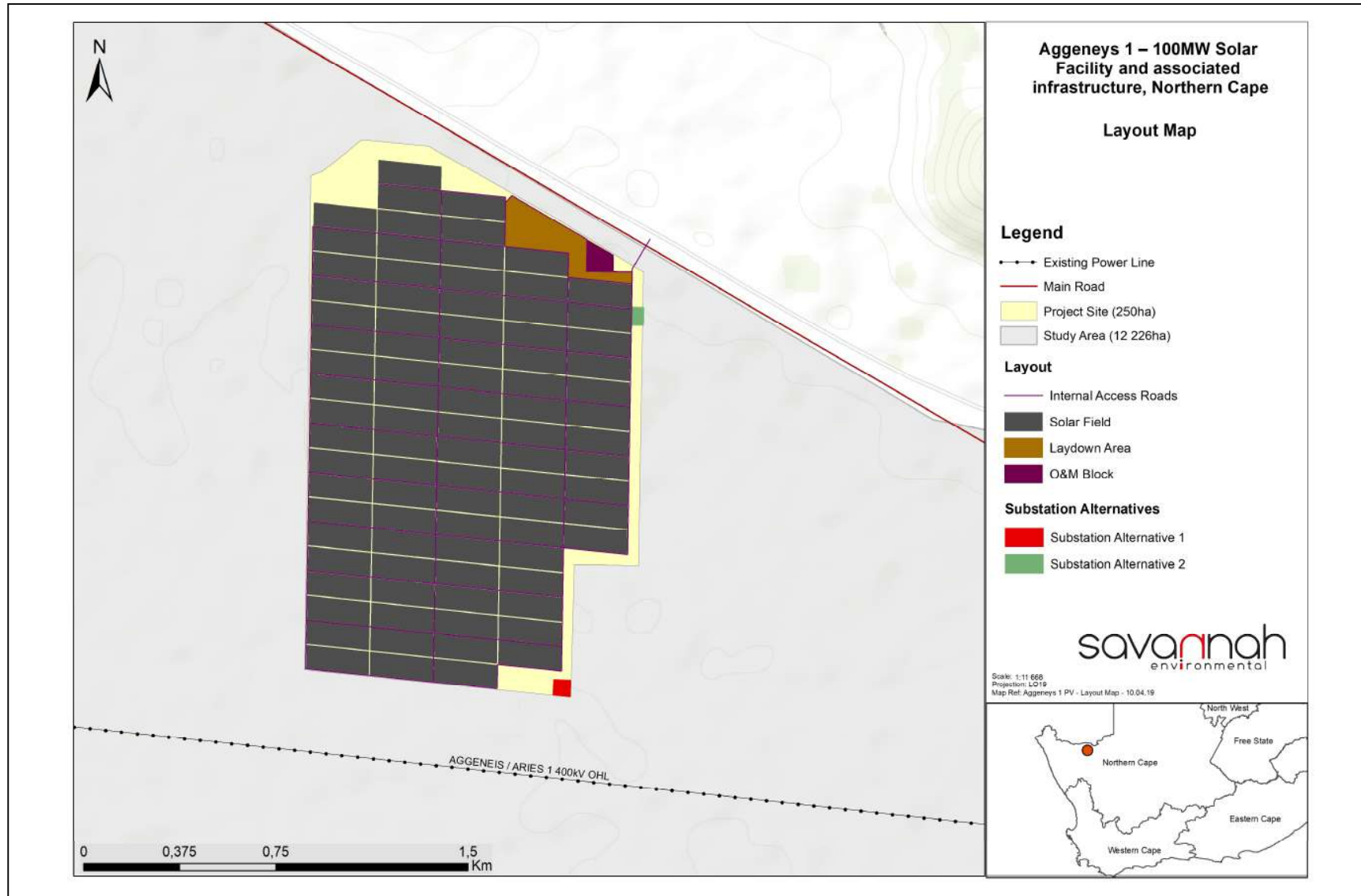


Figure 3.2: Detailed layout for Aggeneys 1 illustrating the development footprint being considered within the project site for the solar PV facility

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 Aggeneys 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 final 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 Aggeneys 1 is proposed is included in section 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 Energy (DoE). 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 Aggeneys 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 PV facility and the related statutory environmental assessment process.

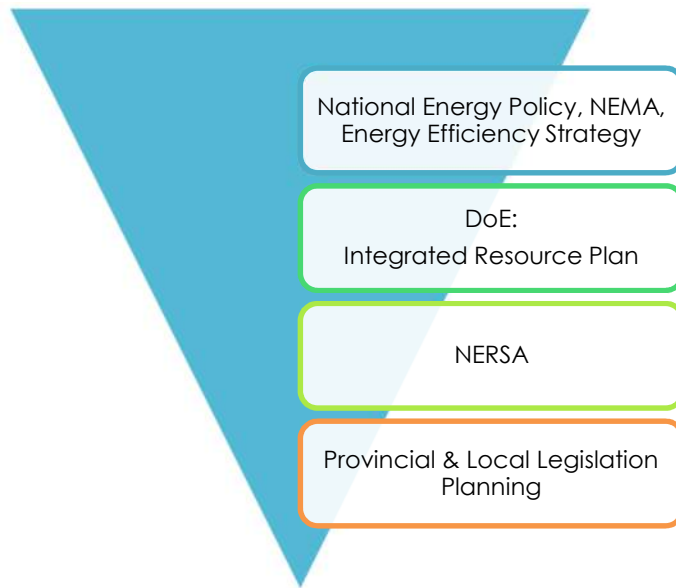


Figure 4.1: Hierarchy of electricity and planning documents

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

- » **Department of Energy (DoE):** This Department is responsible for policy relating to all energy forms, and is responsible for forming and approving the IRP (Integrated Resource Plan for Electricity).
- » **National Energy Regulator of South Africa (NERSA):** This body 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 2014 EIA Regulations as amended on 07 April 2017 (GN R326). The DEA is the competent authority for this project (as per GNR 779 of 01 July 2016), and is charged with granting the relevant Environmental Authorisation (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 Sanitation (DWS):** This Department is responsible for effective and efficient water resources management to ensure sustainable economic and social development. This Department is 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):** This Department is responsible for activities pertaining to the subdivision and rezoning of agricultural land. The forestry section is responsible for the protection of tree species under the National Forests Act (Act No 84 of 1998). This Department is also responsible for the issuing of permits for the disturbance or destruction of protected tree species.
- » **Department of Mineral Resources (DMR):** Approval from the Department of Mineral Resources (DMR) may be required to use land surface contrary to the objects of the Act in terms of Section 53 of the Mineral and Petroleum Resources Development Act (No. 28 of 2002) (MPRDA). In terms of the Act approval from the Minister of Mineral Resources is required to ensure that proposed activities do not sterilise mineral resources that might occur on site.

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

- » **Provincial Government of the Northern Cape – Northern Cape Department of Environment and Nature Conservation (DENC):** This Department is the commenting authority for the project as well as being responsible for issuing of other 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 manage 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 is 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, DoE initiated the Renewable Energy Independent Power Producer Procurement (REIPPP) Programme to procure renewable energy from the private sector in a series of rounds. To date, the DoE has procured more than 6 000MW of renewable energy capacity from 102 independent power producers (IPPs). On 4 April 2018, the Minister of Energy signed the contracts with the Round 4 bidders which will add 2 600MW to the national grid and aid in the diversification and stabilisation of the electricity supply of the country⁹. 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 national planning of the country.

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

4.3.1 The National Energy Act (No. 34 of 2008)

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 into account environmental management requirements and interactions amongst economic sectors, as well as matters relating to renewable energy. The National Energy Act also provides for energy planning, increased generation and consumption of renewable energies, contingency energy supply, holding of strategic energy feedstocks and carriers, adequate investment, appropriate upkeep and access to energy infrastructure. The Act provides measures for the furnishing of certain data and information regarding energy demand, supply and generation, and

⁹ <https://www.ipp-projects.co.za/> (Date accessed: 25 July 2018)

for establishing an institution to be responsible for promotion of efficient generation and consumption of energy and energy research.

The Act provides the legal framework which supports the development of power generation facilities, such as Aggeneys 1.

4.3.2 White Paper on the Renewable Energy Policy of the Republic of South Africa (2003)

The White Paper on Renewable Energy Policy supplements the Government's overarching policy on energy as set out in its White Paper on the Energy Policy of the Republic of South Africa (DME, 1998). The White Paper on Renewable Energy Policy recognises the significance of the medium and long-term potential of renewable energy. The main aim of the policy is to create the conditions for the development and commercial implementation of renewable technologies. The position of the White Paper on Renewable Energy is based on the integrated resource planning criterion of:

“Ensuring that an equitable level of national resources is invested in renewable technologies, given their potential and compared to investments in other energy supply options.”

The White Paper on Renewable Energy sets out the Government's vision, policy principles, strategic goals and objectives for promoting and implementing renewable energy in South Africa. South Africa relies heavily on coal to meet its energy demands because it is well-endowed with coal resources in particular. However, South Africa is endowed with renewable energy resources that can be sustainable alternatives to fossil fuels, but which have so far remained largely untapped.

This White Paper fosters the uptake of renewable energy in the economy and has a number of objectives that include:

- » Ensuring that equitable resources are invested in renewable technologies;
- » Directing public resources for implementation of renewable energy technologies;
- » Introducing suitable fiscal incentives for renewable energy and;
- » Creating an investment climate for the development of renewable energy sector.

The objectives of the White Paper on Renewable Energy are considered in six focal areas, namely:

- i) Financial instruments.
- ii) Legal instruments.
- iii) Technology development.
- iv) Awareness raising.
- v) Capacity building and education.
- vi) Market based instruments and regulatory instruments.

The policy supports the investment in renewable energy facilities, like Aggeneys 1, as they contribute towards ensuring energy security through the diversification of energy supply, reducing GHG emissions and the promotion of renewable energy sources.

The White Paper on Renewable Energy of 2003 set a target of 10 000GWh to be generated from renewable energy by 2013. The target was reviewed during the renewable energy summit of 2009 held in Pretoria. The summit raised the issue over the slow implementation of renewable energy projects and the risks to the South

African economy of committing national investments in the energy infrastructure to coal technologies. Other matters that were raised include potential large scale roll out of solar water heaters and enlistment of Independent Power Producers (IPPs) to contribute to the diversification of the energy mix.

4.3.3 White Paper on the Energy Policy of the Republic of South Africa, 1998

The White Paper on Energy Policy states the need to improve the energy security in the country by means of expanding the energy supply options. This implies the increase in the use of renewable energy and encouraging new entries into the generation market. The support for the renewable energy policy is guided by a rationale that South Africa has a very attractive range of renewable resources, particularly solar and wind and that renewable applications are in fact the least cost energy service in many cases; more so when social and environmental costs are taken into account.

Government policy on renewable energy is therefore concerned with meeting the following challenges:

- » Ensuring that economically feasible technologies and applications are implemented;
- » Ensuring that an equitable level of national resources are invested in renewable technologies, given their potential and compared to investments in other energy supply options; and
- » Addressing constraints on the development of the renewable industry.

The policy states that the advantages of renewable energy 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. Therefore, the policy supports the advancement of renewable energy sources at ensuring energy security through the diversification of supply, which is in line with the proposed solar PV facility.

4.3.4 The Electricity Regulation Act (No. 4 of 2006), as amended

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.

4.3.5 Integrated Energy Plan (IEP) (2016)

The purpose and objectives of the Integrated Energy Plan (IEP) are derived from the National Energy Act (No. 34 of 2008). The IEP takes into consideration the crucial role that energy plays in the entire economy of the country and is informed by the output of analyses founded on a solid fact base. It is a multi-faceted, long-term energy framework which has multiple aims, some of which include:

- » To guide the development of energy policies and, where relevant, set the framework for regulations in the energy sector;
- » To guide the selection of appropriate technologies to meet energy demand (i.e. the types and sizes of new power plants and refineries to be built and the prices that should be charged for fuels);
- » To guide investment and the development of energy infrastructure in South Africa; and
- » To propose alternative energy strategies, which are informed by testing the potential impacts of various factors such as proposed policies, introduction of new technologies, and effects of exogenous macro-economic factors.

A draft version of the Integrated Energy Plan (IEP) was released for comment on 25 November 2016. The purpose of the IEP is to provide a roadmap of the future energy landscape for South Africa which guides future energy infrastructure investments and policy development. The development of the IEP is an ongoing continuous process. It is reviewed periodically to take into account changes in the macroeconomic environment, developments in new technologies and changes in national priorities and imperatives, amongst others.

The 8 key objectives of the integrated energy planning process are as follows:

- » Objective 1: Ensure security of supply.
- » Objective 2: Minimise the cost of energy.
- » Objective 3: Promote the creation of jobs and localisation.
- » Objective 4: Minimise negative environmental impacts from the energy sector.
- » Objective 5: Promote the conservation of water.
- » Objective 6: Diversify supply sources and primary sources of energy.
- » Objective 7: Promote energy efficiency in the economy.
- » Objective 8: Increase access to modern energy.

The IEP recognises the potential of renewable energy for power generation in South Africa and therefore supports the development of the proposed solar PV facility.

4.3.6 The National Development Plan (NDP) 2030

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. The NDP aims to achieve this by drawing on the energies of its people, growing and inclusive economy, building capabilities, enhancing the capacity of the state and promoting leaderships and partnerships throughout society. While the achievement of the objectives of the NDP requires progress on a broad front, three priorities stand out, namely:

- » Raising employment through faster economic growth
- » Improving the quality of education, skills development and innovation
- » Building the capability of the state to play a developmental, transformative role

Enabling milestones include:

- » Increased employment from 13 million in 2010 to 24 million in 2030.
- » Establish a competitive base of infrastructure, human resources and regulatory frameworks.
- » Ensure that skilled, technical, professional and managerial posts better reflect the country's racial gender and disability makeup.
- » Increase the quality of education.
- » Provide affordable access to quality health care.
- » Establish effective, safe and affordable public transport.
- » Produce sufficient energy to support the industry at competitive prices, ensuring access for poor households, while reducing carbon emissions per unit of power by about one-third.
- » Ensure that all South Africans have access to clean running water in their homes.
- » Make high-speed broadband internet universally available at competitive prices.
- » Realise a food trade surplus, with one-third produced by small-scale farmers or households.

The NDP aims to provide a supportive environment for growth and development, while promoting a more labour-absorbing economy. The proposed solar PV facility will assist in reducing carbon emissions targets and creating jobs in the local area, as well as assist in creating a competitive infrastructure base in terms of energy contribution to the national grid.

4.3.7 Integrated Resource Plan (IRP) for Electricity 2010 - 2030

The Integrated Resource Plan (IRP) for Electricity 2010 – 2030¹⁰ constitutes a subset of the IEP and is South Africa's national electricity plan. It provides a path to meet electricity needs over a 20-year planning horizon to 2030 and is being used to roll out electricity infrastructure development in line with Ministerial Determinations issued in terms of Section 34 of the Electricity Regulation Act No. 4 of 2006. The current iteration of the IRP for South Africa, initiated by the DoE after a first round of public participation in June 2010, led to the Revised Balanced Scenario (RBS) that was published in October 2010. A second round of public participation was conducted in November / December 2010, which led to several changes to the IRP model assumptions.

The document outlines the proposed generation new-build fleet for South Africa for the period 2010 – 2030. This scenario was derived based on a cost-optimal solution for new-build options (considering the direct costs of new build power plants), which was then “balanced” in accordance with qualitative measures such as local job creation.

¹⁰ It should be noted that the requirement for renewable energy generation (and specifically that from solar PV) has also been included in the latest IRP, published in August 2018 for comment. The updated IRP is yet to be finalised and promulgated.

The Policy-Adjusted IRP includes the same amount of coal and nuclear new builds as the RBS, while reflecting recent developments with respect to prices for renewables. In addition to all existing and committed power plants, the plan 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.

Figure 4.2 below indicates the new capacities of the IRP 2010 commitment. The dates shown indicate the latest date that the capacity is required in order to avoid security of supply concerns. The IRP notes that the projects could be concluded earlier than indicated, if feasible.

When promulgated in March 2011, it was indicated that the IRP should be a “living plan” which would be revised by the DoE every two years. Since the promulgation of the IRP 2010 there has been a number of developments in the energy sector in South and Southern Africa. In addition, the electricity demand outlook has changed markedly from that expected in 2010. An IRP 2010 – 2030 Update Report was prepared and released in November 2013, which estimated that the energy demand in 2030 will be in the range of 345TWh-416TWh as opposed to 454TWh as was originally expected in the policy-adjusted IRP. Therefore, this equates to a reduction from 67 800MW to 61 200MW of reliable generating capacity. In addition to the uncertainty regarding future energy demands, additional variables in the energy sector including the global agenda to combat climate change, and the resulting mitigation requirements on South Africa were taken into consideration. The aforementioned IRP Update Report of 2013 was not adopted by Parliament and was therefore never implemented.

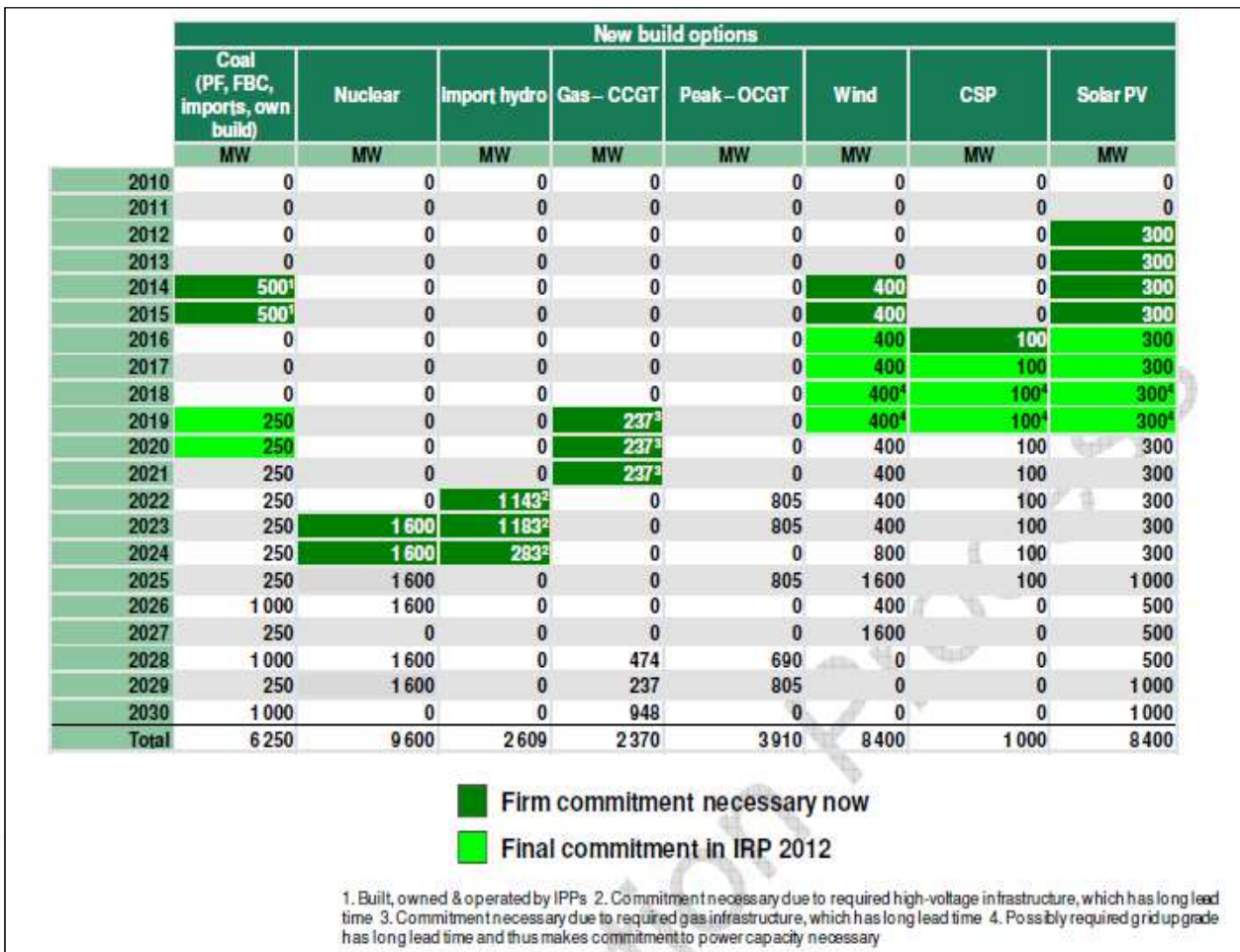


Figure 4.2: National Energy Development Commitments included in the IRP 2010.

In November 2016 a draft IRP Update – Assumption, Base Case Results and Observations (Revision 1) document was released for comment. This current update in progress is being undertaken to take into account the changed electricity landscape, in particular with regards to electricity demand and the underlying relationship with economic growth; new developments in technology and fuel options (both locally and globally); scenarios for carbon mitigation strategies, the impact on electricity supply up to 2050; and the affordability of electricity and its impact on demand and supply.

Unlike the IRP 2010 – 2030, which considered the Council for Scientific and Industrial Research (CSIR) as well as Eskom demand forecasts, the IRP Update Base Case only uses the forecast developed by the CSIR, which is illustrated below in **Error! Reference source not found.** Based on the fact that the IRP update uses the High (less energy intense) forecast, energy demand is still anticipated to increase and is expected to be in the region of approximately 52GWH by 2050.

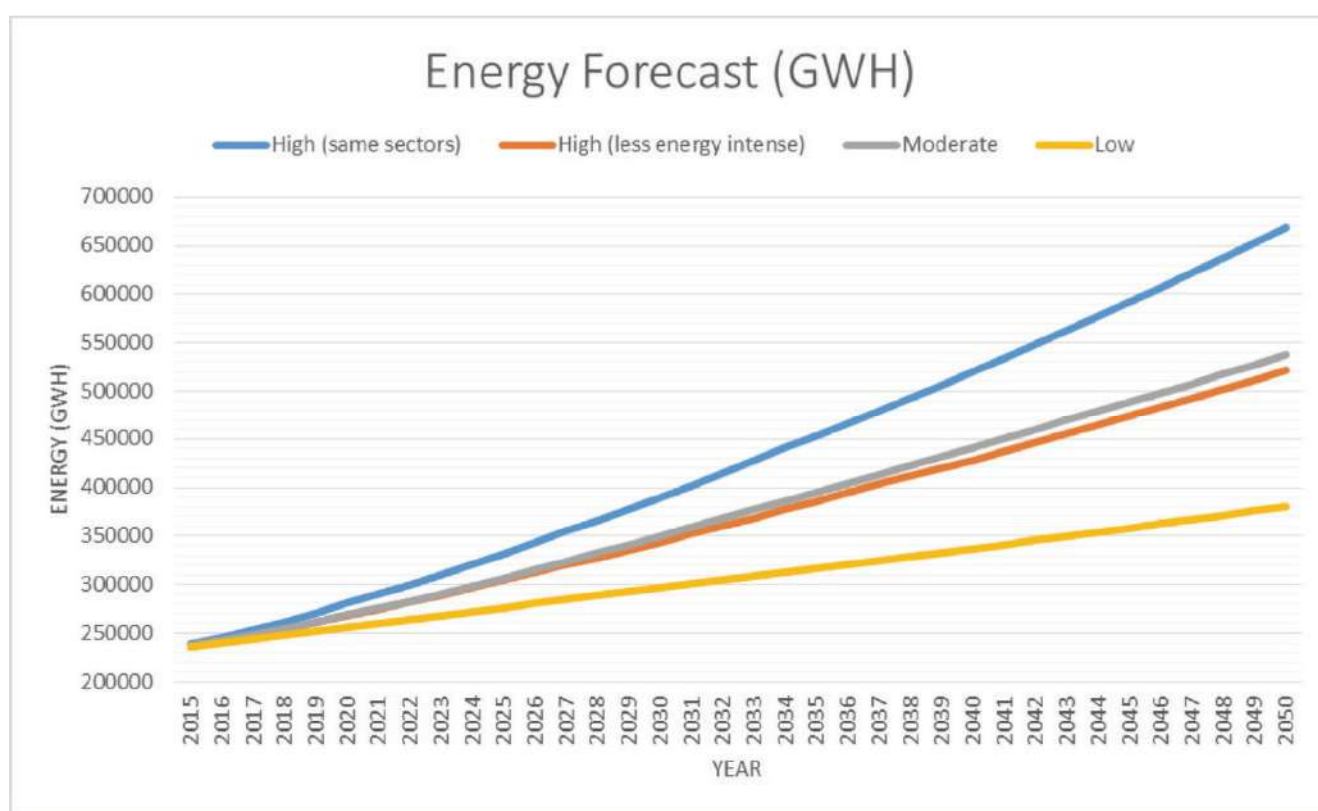


Figure 4.3: The proposed Energy Demand Forecast as developed by the CSIR.

4.3.8 Strategic Integrated Projects (SIPs)

The National Infrastructure Plan (NIP), which is fully aligned with the NDP, initiated a process of accelerated infrastructure development to enable economic growth and job creation in South Africa. The Presidential Infrastructure Coordination Commission (PICC), as the coordinator and facilitator of the NIP, subsequently identified 18 Strategic Integrated Projects (SIPs) which are large-scale infrastructure projects of national importance aimed at unlocking development potential in the country, transform the economic landscape, create new jobs, strengthen the delivery of basic services, and support the integration of African economies. A balanced approach is being fostered through greening of the economy, boosting energy security, promoting integrated municipal infrastructure investment, facilitating integrated urban development, accelerating skills development, investing in rural development, and enabling regional integration.

SIP 8 and SIP 9 of the energy SIPs supports the development of the solar energy facility which is as follows:

- » *SIP 8: 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. The proposed Aggeneys 1 is a potential SIP 8 Project.
- » *SIP 9: Electricity generation to support socio-economic development:*
The proposed Aggeneys 1 is a potential SIP 9 Project as electricity will be generated by the solar PV facility including the social and economic development benefits that will take place within the surrounding communities in the area. Therefore, SIP 9 supports the acceleration of the construction of new electricity generation capacity in accordance with the IRP 2010 to meet the needs of the economy and address historical imbalances.

In support of SIP 8, the Department of Environmental Affairs undertook a Strategic Environmental Assessment (SEA) to facilitate the implementation of sustainable green energy initiatives. This SEA identified areas where large scale wind and solar PV energy facilities can be developed in terms of SIP 8 and in a manner that limits significant negative impacts on the natural environment, while yielding the highest possible socio-economic benefits to the country (DEA, 2015). These areas are referred to as Renewable Energy Development Zones (REDZ), and 8 (eight) REDZ areas have been designated and gazetted within GNR114 of February 2018. Aggeneys 1 falls within the Springbok REDZ (8) area.

In support of SIP 10, the Department of Environmental Affairs undertook a Strategic Environmental Assessment (SEA) which aims to provide guidance for the efficient and sustainable expansion of strategic electricity grid infrastructure in South Africa. This SEA identified the optimal location for strategic corridors where transmission infrastructure expansion is needed to enable the balancing of future demand and supply requirements, while minimising negative impacts to the environment. These areas are referred to as Power Corridors, and were gazetted within GNR113 of February 2018, and Aggeneys 1 falls the Northern Transmission Corridor. The grid connection solution, including the required grid connection infrastructure for Aggeneys 1, is being assessed as part of a separate BA process.

4.3.9 Climate Change Bill, 2018

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. The following objectives are set within the Bill:

- a) Provide for the coordinated and integrated response to climate change and its impacts by all spheres of government in accordance with the principles of cooperative governance;
- b) Provide for the effective management of inevitable climate change impacts through enhancing adaptive capacity, strengthening resilience, and reducing vulnerability to climate change, with a view to building social, economic, and environmental resilience and an adequate national adaptation response in the context of the global climate change response;
- c) Make a fair contribution to the global effort to stabilise greenhouse gas concentrations in the atmosphere at a level that avoids dangerous anthropogenic interference with the climate system, within a timeframe and in a manner that enables economic, employment, social and environmental development to proceed in a sustainable manner.

Aggeneys 1 consists of a renewable energy generation facility, and would not result in the generation or release of emissions during its operation.

4.3.10 National Climate Change Response Policy 2011

Climate change is one the leading 21st century challenges that requires a global response. The adverse impacts of climate change include persistent drought and extreme weather events, rising sea levels, coastal erosion and ocean acidification, further threatening food security, water, energy and health, and, more broadly, efforts to eradicate poverty and achieve sustainable development. Combating climate change would require substantial and sustained reductions in greenhouse gas (GHG) emissions, which, together with adaptation, can limit climate change risks. The convention responsible for dealing with climate change is the United Nations Framework Convention on Climate Change (UNFCCC).

The United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 and ratified in 1994. It provides the overall global policy framework for addressing climate change and marks the first international political response to climate change. The UNFCCC sets out a framework for actions aimed at stabilising atmospheric concentrations of GHGs to avoid dangerous anthropogenic interference with the climate system.

The UNFCCC has established a variety of arrangements to govern, coordinate and provide for oversight of the arrangements described in the documentation. The oversight bodies take decisions, provide regular guidance, and keep the arrangements under regular review in order to enhance and ensure their effectiveness and efficiency. The Conference of Parties (COP), established by Article 7 of the Convention, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments, and takes decisions to promote the effective implementation of the Convention.

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.

This Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

- (a) Holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognising that this would significantly reduce the risks and impacts of climate change;
- (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production; and
- (c) Making finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

In order to achieve the long-term temperature goal set out in Article 2 of the Agreement, Parties aim to reduce the global peaking of GHG emissions as soon as possible, recognising that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter, in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

The Paris Agreement requires all Parties to put forward their best efforts through “nationally determined contributions” (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the Agreement and to inform further individual actions by Parties.

In working towards this goal, advanced economies have already included renewables in their energy mix and have planned to increase their use in order to meet their mitigation goals: Japan aims to derive 22 – 24% of its electricity production from renewable sources by 2030 and the European Union plans to reach 27% of its final energy consumption. Developing countries are also playing their part, including South Africa, which has included a goal of 17.8GW of renewables by 2030 within the IRP.

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.

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.

The policy provides support for the proposed solar PV facility, 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.

4.4 Provincial Planning and Planning Context

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

4.4.1 The Northern Cape Province Spatial Development Framework (2012)

Northern Cape Provincial Spatial Development Framework (NCSDF) lists a number of sectoral strategies and plans to be read and treated as key components of the PSDF. Of these, there are a number that are relevant to Aggeneys 1. These include:

- » Sectoral Strategy 1: Provincial Growth and Development Strategy of the Provincial Government.
- » Sectoral Strategy 2: Comprehensive Growth and Development Programme of the Department of Agriculture, Land Reform and Rural Development.
- » Sectoral Strategy 5: Local Economic Development (LED) Strategy of the Department of Economic Development and Tourism.
- » Sectoral Strategy 11: Small Micro Medium Enterprises (SMME) Development Strategy of the Department of Economic Development and Tourism.
- » Sectoral Strategy 12: Tourism Strategy of the Department of Economic Development and Tourism.
- » Sectoral Strategy 19: Provincial renewable energy strategy (to be facilitated by the Department of Economic Development and Tourism).

Section C 8.2.3 of the NPSDF, sets out the energy objectives for the Northern Cape Province. The section makes specific reference to renewable energy and objectives are listed below:

- » Promote the development of renewable energy supply schemes. Large-scale renewable energy supply schemes are strategically important for increasing the diversity of domestic energy supplies and avoiding energy imports while minimising detrimental environmental impacts.
- » Enhance the efficiency of Eskom's power station at the Vanderkloof power station.
- » In order to reinforce the existing transmission network and to ensure a reliable electricity supply in the Northern Cape, construct a 400kV transmission power line from Ferrum Substation (near Kathu/Sishen) to Garona Substation (near Groblershoop). There is a national electricity supply shortage and the country is now in a position where it needs to commission additional plants urgently. Consequently, renewable energy projects are a high priority.
- » Develop and institute innovative new energy technologies to improve access to reliable, sustainable and affordable energy services with the objective to realize sustainable economic growth and development. The goals of securing supply, providing energy services, tackling climate change, avoiding air pollution and reaching sustainable development in the province offer both opportunities and synergies which require joint planning between local and provincial government as well as the private sector.
- » Develop and institute energy supply schemes with the aim to contribute to the achievement of the targets set by the White Paper on Renewable Energy (2003).

Section C8.3.3, Energy Policy, sets out the policy guidelines for the development of the energy sector, with specific reference to the renewable energy sector.

- » The construction of telecommunication infrastructure must be strictly regulated in terms of the spatial plans and guidelines put forward in the PSDF. They must be carefully placed to avoid visual impacts on landscapes of significant symbolic, aesthetic, cultural or historic value and should blend in with the surrounding environment to the extent possible.
- » Basic Assessments undertaken for such construction must assess the impacts of such activities against the directives listed above.
- » Renewable energy sources such as wind, solar thermal, biomass and domestic hydroelectricity are to constitute 25% of the province's energy generation capacity by 2020.
- » The following key policy principles for renewable energy apply:
 - * Full cost accounting: Pricing policies will be based on an assessment of the full economic, social and environmental costs and benefits of energy production and utilisation.
 - * Equity: There should be equitable access to basic services to meet human needs and ensure human well-being. Each generation has a duty to avoid impairing the ability of future generations and their own well-being.
 - * Global and international cooperation and responsibilities: Government recognises its shared responsibility for global and regional issues and act with due regard to the principles contained in relevant policies and applicable regional and international agreements.
 - * Allocation of functions: Government will allocate functions within the framework of the Constitution to competent institutions and spheres of government that can most effectively achieve the objectives of the energy policy.
 - * The implementation of sustainable renewable energy is to be promoted through appropriate financial and fiscal instruments.
 - * An effective legislative system to promote the implementation of renewable energy is to be developed, implemented, and continuously improved.
 - * Public awareness of the benefits and opportunities of renewable energy must be promoted.
 - * The development of renewable energy systems is to be harnessed as a mechanism for economic development throughout the province in accordance with the Sustainable Development Initiative (SDI) approach or any comparable approach.
 - * Renewable energy must, first, and foremost, be used to address the needs of the province before being exported.

Considering the policy guidelines for the development of the Northern Cape energy sector, as well as the energy objectives for the province, the development of Aggeneys 1 will contribute to achieving (although only to a limited extent) the energy objectives and comply with the policy guidelines of the province in some instances.

4.4.2 Northern Cape Climate Change Response Strategy

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: "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 wild fire, with heightened requirements for effective disaster management".

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 NCP'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. The MEC further indicated that the NCP was involved in the processing 7 wind energy facility and 11 solar energy facility EIA applications (March 2011)¹¹.

The development of Aggeneys 1 will assist in achieving (although only to a limited extent) the promotion of the provincial green economy of the Northern Cape.

4.5 Local Policy and Planning Context

The local tiers of government within which Aggeneys 1 is located are the Khâi-Ma Local Municipality and the Namakwa District Municipality. The development instruments or policies at both the district and local level contain objectives which are in line with the development of Aggeneys 1. These include, economic growth, job creation, community upliftment and poverty alleviation.

4.5.1 Namakwa District Municipality Integrated Development Plan (2017-2022)

The key priority issues listed in the Namakwa District Municipality Integrated Development Plan (NDM IDP) include:

- » Basic Service Delivery;
- » Municipal Institutional Development and Transformation;
- » Local Economic Development;
- » Municipal Financial Viability and Management;
- » Good Governance and Public Participation.

The vision for the NDM is, 'Namakwa District, the centre of excellence!' and the mission statement for the NDM is summarised by the following aspects below:

- » The stimulation of radical economic and social transformation;
- » The fostering of partnership with relevant role-players;

¹¹ (www.info.gov.za/speech/DynamicAction?pageid=461&sid=22143&tid=45200).

- » Supporting and capacitating of local municipalities;
- » Transparent and accountable processes; and
- » Providing of local leadership

The development goals listed in the IDP that are relevant to the proposed solar PV facility include:

- » 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 a safe and tourism friendly environment should be furthered in order to promote tourism and investor interest in the region;
- » The promotion of human resources within and outside the organisation through training and the implementation of new technological aids.

Linked to the developmental goals are a number of developmental objectives. The following objectives are relevant to the proposed solar PV facility:

- » Promotion of SMMEs in order to strengthen the Local Economic Sector;
- » Promote the development of the tourism sector, with specific emphasis on community-based tourism; and
- » Promote the infrastructure development, including electricity.

4.5.2 Khâi-Ma Local Municipality Integrated Development Plan (2012-2017)

The Vision set out in the IDP Review for the Khâi-Ma Local Municipality is "Creating an economically viable and fully developed municipality, which enhances the standard of living of all the inhabitants/ community members of the Khâi-Ma Local Municipality through good governance, excellent service delivery and sustainable development. Simply put, the vision is "Improved and sustainable standard of living for all". Linked to the Vision is the Mission statement, which is the "Provision of transparent, accountable and sustainable service delivery".

The IDP identifies a number of Key Performance Areas (KPAs) identified by communities during Phase 1 of the IDP Process. The KPAs that are relevant to the proposed project include:

- » KPA 1: Service Delivery and Infrastructure Development
- » KPA 2: Local Economic Development

The priority issues identified in the IDP that are relevant to the project and are linked to the KPAs include:

- » Lack of Basic Services (KPA 1)
- » Poverty and Unemployment (KPA 2)
- » Lack of sport and recreational facilities and services (KPA 1)
- » Lack of sufficient and proper health services (HIV/AIDS) (KPA 1)

Some of the key social challenges identified by the community during the IDP process include:

- » Increase in drug abuse
- » Increase in young children (under 10 years) actively abusing alcohol
- » Increase in teenage pregnancies
- » Increase in crime linked to alcohol and drug abuse
- » High levels of youth unemployment
- » Increase in the prevalence of HIV & Aids

The IDP identifies a number of strategies aimed at addressing the challenges. The strategies that are relevant to and that could potentially benefit the surrounding communities, should a Community Trust be established as part of Aggeneys 1 include:

Basic Services

- » Upgrading of sanitation systems
- » Provision of electricity

Poverty and unemployment, and local economic development

- » Skills development and capacity building programmes especially amongst the youth
- » Promote Private sector and business partnerships as well as community partnerships
- » Establish Local Economic Incentives
- » Promote BBBEE and support to small business (through SEDA and provincial Programmes)
- » Upgrading of existing business centres
- » Provision of additional business facilities
- » Skills capacity building of emerging farmers, i.e. stock farming, financial management

The renewable energy sector is also recognized as a key sector. The IDP notes that a number of new opportunities have opened up for the Namakwa area since the need to facilitate the generation of sustainable energy was introduced in South Africa by Eskom and the South African government. The IDP notes that there are a number of solar projects proposed in the area and that the economic benefits from these projects are eagerly anticipated.

4.6 International Policy and Planning Context

4.6.1 United Nations Framework Convention on Climate Change (UNFCCC) and Conference of the Party (COP)

Climate change is one of the major global challenges of the 21st century that require global response. The adverse impacts of climate change include persistent drought and extreme weather events, rising sea levels, coastal erosion and ocean acidification, further threatening food security, water, energy and health, and more broadly efforts to eradicate poverty and achieving sustainable development. Combating climate change would require substantial and sustained reductions in GHG emissions, which together with adaptation, can limit climate change risks. The convention responsible for dealing with climate change is the United Nations Framework Convention on Climate Change (UNFCCC).

The UNFCCC was adopted in 1992 and entered into force in 1994. It provides the overall global policy framework for addressing the climate change issue and marks the first international political response to climate change. The UNFCCC sets out a framework for action aimed at stabilizing atmospheric concentrations of GHGs to avoid dangerous anthropogenic interference with the climate system.

The UNFCCC has established a variety of arrangements to govern, coordinate and provide for oversight of the arrangements described in the documentation. The oversight bodies take decisions, provide regular guidance, and keep the arrangements under regular review in order to enhance and ensure their effectiveness and efficiency. The Conference of Parties (COP), established by Article 7 of the Convention, is the supreme body and highest decision-making organ of the Convention. It reviews the implementation of the Convention and any related legal instruments, and takes decisions to promote the effective implementation of the Convention.

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 was 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, and thereafter open for accession.

The Paris Agreement, in enhancing the implementation of the Convention, including its objective, aims to strengthen the global response to the threat of climate change, in the context of sustainable development and efforts to eradicate poverty, including by:

- (a) Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.
- (b) Increasing the ability to adapt to the adverse impacts of climate change and foster climate resilience and low GHG emissions development, in a manner that does not threaten food production.
- (c) Making finance flows consistent with a pathway towards low GHG emissions and climate-resilient development.

In order to achieve the long-term temperature goal set out in Article 2 of the Agreement, Parties aim to reach global peaking of GHG emissions as soon as possible, recognizing that peaking will take longer for developing country Parties, and to undertake rapid reductions thereafter in accordance with best available science, so as to achieve a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century, on the basis of equity, and in the context of sustainable development and efforts to eradicate poverty.

The Paris Agreement requires all Parties to put forward their best efforts through “Nationally Determined Contributions” (NDCs) and to strengthen these efforts in the years ahead. This includes requirements that all Parties report regularly on their emissions and on their implementation efforts. There will also be a global stocktake every 5 years to assess the collective progress towards achieving the purpose of the Agreement and to inform further individual actions by Parties.

In working towards this goal, advanced economies have already included renewables in their energy mix and have planned to increase their use in order to meet their mitigation goals: Japan aims to derive 22 – 24% of its electricity production from renewable sources by 2030, and the European Union plans for them to

reach 27% of its final energy consumption. Developing countries are also playing their part, including South Africa which has included a goal of 17.8GW of renewables by 2030 within the IRP.

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 came into force on 04 November 2016, thirty days after the date (on which at least 55 Parties to the Convention accounting in total for at least an estimated 55% of the total global greenhouse gas emissions) have deposited their instruments of ratification, acceptance, approval or accession with the Depositary.

COP 23 was held in Bonn, Germany from 06 to 17 November 2017, and is the second COP to be held since COP 21. One of the key outcomes of COP 23 was the launch of the "Powering Past Coal Alliance", led by the UK and Canada. More than 20 countries joined the alliance, including Denmark, Finland, Italy, New Zealand, Ethiopia, Mexico, and the Marshall Islands; as well as the United States (US) states of Washington and Oregon. The alliance notes that analysis shows that coal phase-out is needed by no later than 2030 in the Organisation for Economic Co-operation and Development (OECD) and EU28, and by no later than 2050 in the rest of the world to meet the Paris Agreement, however it does not commit signatories to any particular phase-out date. It also does not commit the signatories to ending the financing of unabated coal power stations, but rather just restricting it.

4.6.2 The Equator Principles III (June, 2013)

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 Aggeneys 1) and apply globally to all industry sectors.

The EPs comprise the following principles:

- Principle 1:** Review and Categorisation
- Principle 2:** Environmental and Social Assessment
- Principle 3:** Applicable Environmental and Social Standards
- Principle 4:** Environmental and Social Management System and Equator Principles Action Plan
- Principle 5:** Stakeholder Engagement
- Principle 6:** Grievance Mechanism
- Principle 7:** Independent Review
- Principle 8:** Covenants
- Principle 9:** Independent Monitoring and Reporting
- Principle 10:** Reporting and Transparency

When a project is proposed for financing, the Equator Principle Financial Institution (EPFI) will categorise it based on the magnitude of its potential environmental and social risks and impacts.

Projects can be categorised as follows:

- Category A:** Projects with potential significant adverse environmental and social risks and / or impacts that are diverse, irreversible or unprecedented.

Category B: Projects with potential limited adverse environmental and social risks and / or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures.

Category C: Projects with minimal or no adverse environmental and social risks and / or impacts.

Based on the abovementioned criteria, Aggeneys 1 can be anticipated to be categorised as a Category B project.

Category A and Category B projects require that an assessment process be conducted to address the relevant environmental and social impacts and risks associated with the project. Such an assessment may include the following where applicable:

- » An assessment of the baseline environmental and social conditions.
- » Consideration of feasible environmentally and socially preferable alternatives.
- » Requirements under host country laws and regulations, applicable international treaties and agreements.
- » Protection and conservation of biodiversity (including endangered species and sensitive ecosystems in modified, natural and Critical Habitats) and identification of legally protected areas.
- » Sustainable management and use of renewable natural resources (including sustainable resource management through appropriate independent certification systems).
- » Use and management of dangerous substances.
- » Major hazards assessment and management.
- » Efficient production, delivery and use of energy.
- » Pollution prevention and waste minimisation, pollution controls (liquid effluents and air emissions), and solid and chemical waste management.
- » Viability of Project operations in view of reasonably foreseeable changing weather patterns / climatic conditions, together with adaptation opportunities.
- » Cumulative impacts of existing Projects, the proposed Project, and anticipated future Projects.
- » Respect of human rights by acting with due diligence to prevent, mitigate and manage adverse human rights impacts.
- » Labour issues (including the four core labour standards), and occupational health and safety.
- » Consultation and participation of affected parties in the design, review and implementation of the Project.
- » Socio-economic impacts.
- » Impacts on affected communities, and disadvantaged or vulnerable groups.
- » Gender and disproportionate gender impacts.
- » Land acquisition and involuntary resettlement.
- » Impacts on indigenous peoples, and their unique cultural systems and values.
- » Protection of cultural property and heritage.
- » Protection of community health, safety and security (including risks, impacts and management of Project's use of security personnel).
- » Fire prevention and life safety.

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 Aggeneys 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.

Aggeneys 1 is currently being assessed in accordance with the requirements of the 2014 EIA Regulations, as amended (GNR 326), 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.

4.6.3 International Finance Corporation (IFC) Performance Standards on Environmental and Social Sustainability (January 2012)

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. The overall objectives of the IFC PSs are:

- » To fight poverty;
- » To do no harm to people or the environment;
- » To fight climate change by promoting low carbon development;
- » To respect human rights;
- » To Promote gender equity;
- » To provide information prior to project development, free of charge and free of external manipulation;
- » To collaborate with the project developer to achieve the PS;
- » To provide advisory services; and
- » To notify countries of any Trans boundary impacts as a result of a project.

The PSs comprise the following:

- Performance Standard 1:** Assessment and Management of Environmental and Social Risks and Impacts.
- Performance Standard 2:** Labour and Working Conditions.
- Performance Standard 3:** Resource Efficiency and Pollution Prevention.
- Performance Standard 4:** Community Health, Safety and Security.
- Performance Standard 5:** Land Acquisition and Involuntary Resettlement.
- Performance Standard 6:** Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- Performance Standard 7:** Indigenous Peoples.
- Performance Standard 8:** Cultural Heritage.

Performance Standard 1 establishes the importance of:

- i) Integrated assessment to identify the social and environmental impacts, risks, and opportunities of projects.
- ii) Effective community engagement through disclosure of project-related information and consultation with local communities on matters that directly affect them.
- iii) The management of social and environmental performance throughout the life of a project through an effective Environmental and Social Management System (ESMS).

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.

Given the nature of Aggeneys 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.

CHAPTER 5: NEED AND DESIRABILITY

One of the objectives of the EIA process is to motivate for “the need and desirability for the proposed development, including the need and desirability of the activity in the context of the preferred development footprint within the approved site as contemplated in the accepted Scoping Report”, as per Appendix 3 of the 2014 EIA Regulations, as amended. The need and desirability of a development needs to consider whether it is the right time and place for locating the type of land-use / activity being proposed. Therefore, the requirement of the EIA Regulations for due consideration of the need and desirability of the project can be equated to the wise use of land, and should be able to answer the question pertaining to the most sustainable use of land within the earmarked project site.

This Chapter provides an overview of the anticipated suitability of Aggeneys 1 being developed at the preferred location from an international, national, regional, and site-specific perspective. It 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 final BA 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 Aggeneys 1 is included and discussed 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 Aggeneys 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 (SGDs).

The SGDs address global socio-economic challenges such as poverty, hunger, health, education, climate change, gender equality, water, sanitation, energy, urbanisation, environment and social justice. The SGDs consist of 17 global goals set by the United Nations. The 17 SGDs are characterised by 169 targets, and 304 indicators. Goal 7 of the SGDs 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.

Targets	Indicators
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 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.	7.A.1 Mobilised amount of United States dollars per year 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 Aggeneys 1 would contribute positively towards Goal 7 of the SGDs through the following means:

- » By generating up to 100MW 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 Energy's (DoE'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 is not a consumptive technology and 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

As Aggeneys 1 is proposed in specific response to a national government initiative, namely the DoE's Renewable Energy Independent Power Producer Procurement (REIPPP) Programme. 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 the project from a national perspective can largely be assimilated 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 policies have been developed by government to take into account 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 abovementioned policies have been extensively researched and are updated on an ongoing 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 which guides 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 that 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.*
- » *An intervention which could enhance the future solar energy landscape is 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 that 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.

On 22 August 2018 the Draft IRP 2018 was released for comment. The latest update of the IRP includes estimates that **7.82GW of PV**, 9GW of wind, 10.94GW of gas (CCGT / CCGE / OCGT), and 0.025GW of landfill gas would be required by the end of 2030¹².

In line with government policy to reduce greenhouse gas (GHG) emissions, the IRP update uses the moderate decline constraint for GHG emissions. Although this is subject to change following recent correspondence received from the Department of Environmental Affairs (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, the DoE initiated a number of IPP Procurement Programmes to secure electricity generated by a range of resources from the private sector (i.e. from 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 DoE and a Power Purchase Agreement (PPA) with Eskom as the buyer. IPP Procurement Programmes include the Renewable Energy IPP Procurement Programme (REIPPPP), the Co-generation IPP Procurement Programme, the Liquefied Natural Gas (LNG) to Power IPP Procurement Programme, and the Coal Baseload IPP Procurement Programme (CBIPPPP) (refer to **Table 5.1**).

Table 5.1: Overview of IPP Procurement Programmes and their current allocation (MW)

IPP Procurement Programme	Technology	MW	Total
Renewables	Onshore Wind	6 360 MW	14 725MW
	Concentrated solar thermal	1 200 MW	
	Solar Photovoltaic	4 725 MW	
	Biomass	210 MW	
	Biogas	110 MW	
	Landfill Gas	25 MW	
	Small hydro	195 MW	
	Small Projects	400 MW	
	Solar Parks	1 500MW	
Coal Baseload	Coal	2 500MW	2 500MW
Co-generation	Co-generation	800MW	800MW
Gas	Gas	3 000MW	3 000MW

Renewable resources are valuable in contributing towards electricity generation and diversifying South Africa's electricity mix. Under the REIPPPP the DoE 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 2 291.83MW of PV generated electricity has been

¹² These figures reflect capacities for the Least Cost Plan (IRP1) by year 2030 without Annual Build Limits on RE (IRP3).

awarded to preferred bidders across four (4) rounds of bidding to date, with 2 433.17 MW still remaining to be allocated in subsequent bidding rounds. Preferred bidders identified under any IPPPP, 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, IPPPPs therefore also contribute positively towards socio-economic development of a region, over and above job creation.

The need for new power generation from PV has therefore been identified and assessed by government at a national scale considering the national energy requirements as well as international commitments under the Paris Agreement, and provision has been made for the inclusion of new PV power generation capacity in South Africa's' energy mix. The implementation of the proposed project, therefore, 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 NDP.

The proposed project 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, Aggeneys 1 would have reduced water requirements when compared with some other generation technologies in alignment with one of the vision 2030 themes of the DWS's 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 National Development Plan (NDP), the National Infrastructure Plan 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 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).

In the Statement on Cabinet Meeting of 17 February 2016 the cabinet approved the gazetting of 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 (in GN113 and GN114). The aim of the REDZ is to streamline the regulatory process, identifying geographical areas where wind and solar Photovoltaic technologies can be incentivised and where intense grid expansion can be directed. 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**, Aggeneys 1 falls within the Springbok REDZ, which was selected by the DEA as an area highly suitable for solar energy facilities given a range of factors considered. This alignment with the REDZ area provides further support for the selection of the specific site chosen for this project.

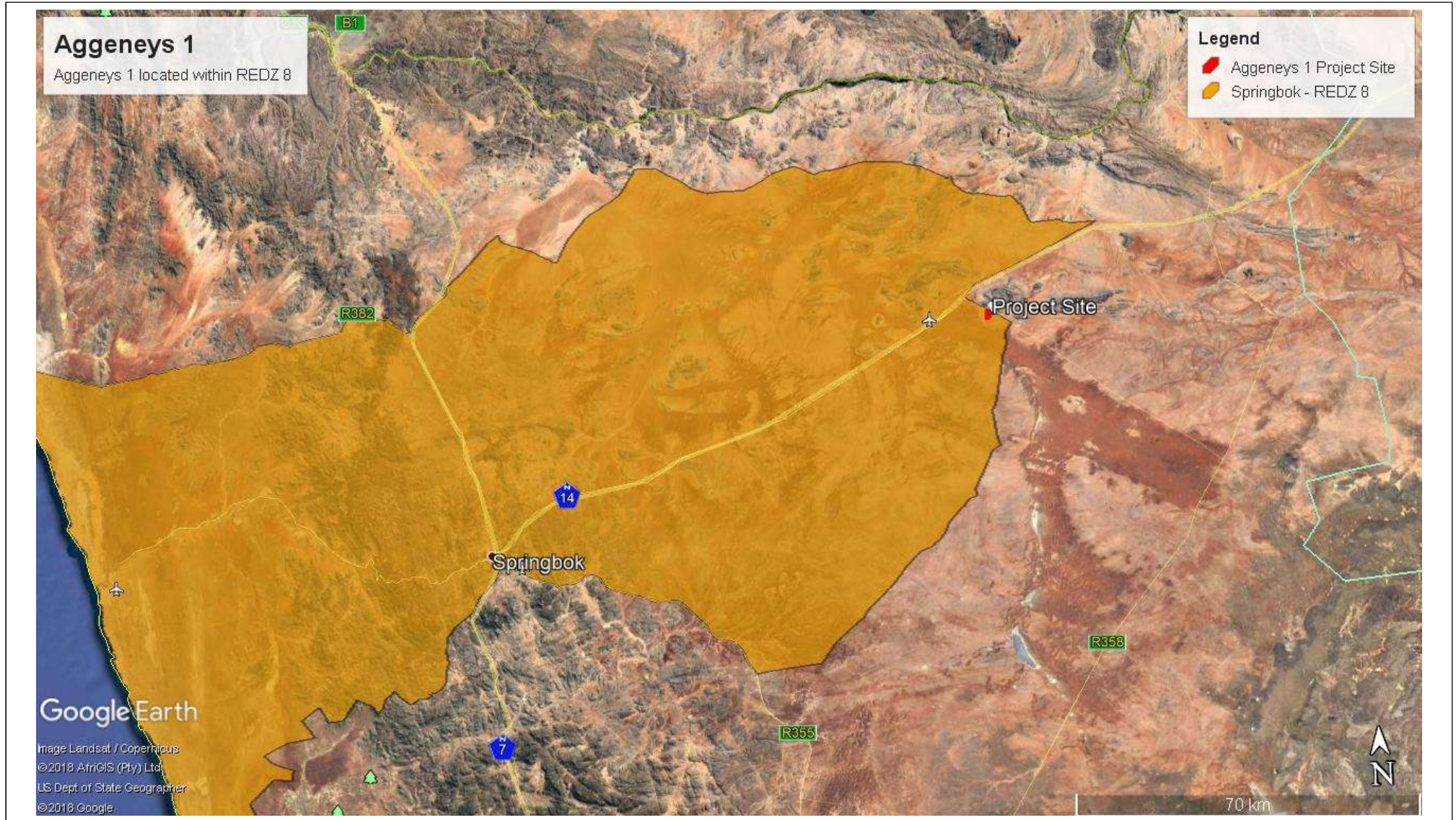


Figure 5.1: Aggeneys 1 is located within the Springbok REDZ area (zone 8), known as the Springbok REDZ

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. In 2016 South Africa had a total generation capacity of 237 006GWh. Approximately 85.7% (equivalent to 203 054GWh) of this figure was generated by coal and only 0.9% (equivalent to 2 151GWh) was generated by solar (refer to **Figure 5.2**).

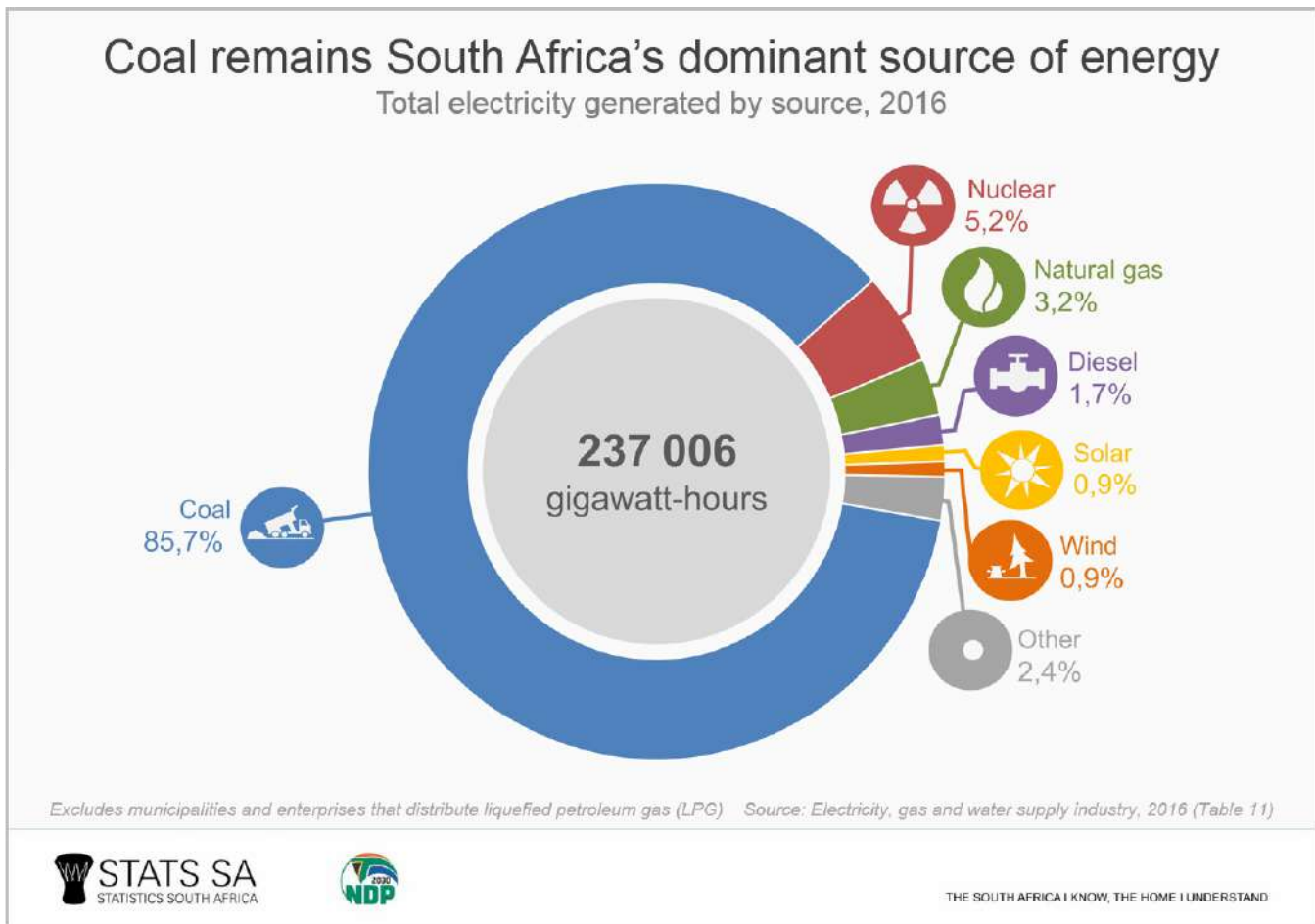


Figure 5.2: Overview of South Africa's electricity generation by source (Source: StatsSA 2016 Electricity, gas and water supply industry).

Whereas the majority of South Africa's electricity generation infrastructure is currently located within Mpumalanga Province 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 Aggeneys 1 project site within the Northern Cape is therefore considered to support the Province/Region's generation targets.

The Aggeneys area has been ear-marked as a hub for the development of solar energy projects due to the viability of the solar resource for the area. The overarching objective for the solar PV 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 Global Horizontal Irradiation (GHI) for the area derived from the World Bank Group's Global Solar Atlas is approximately 2303 kWh/m²/annum, equivalent to the highest GHI values in the country (refer to **Figure 5.3**).

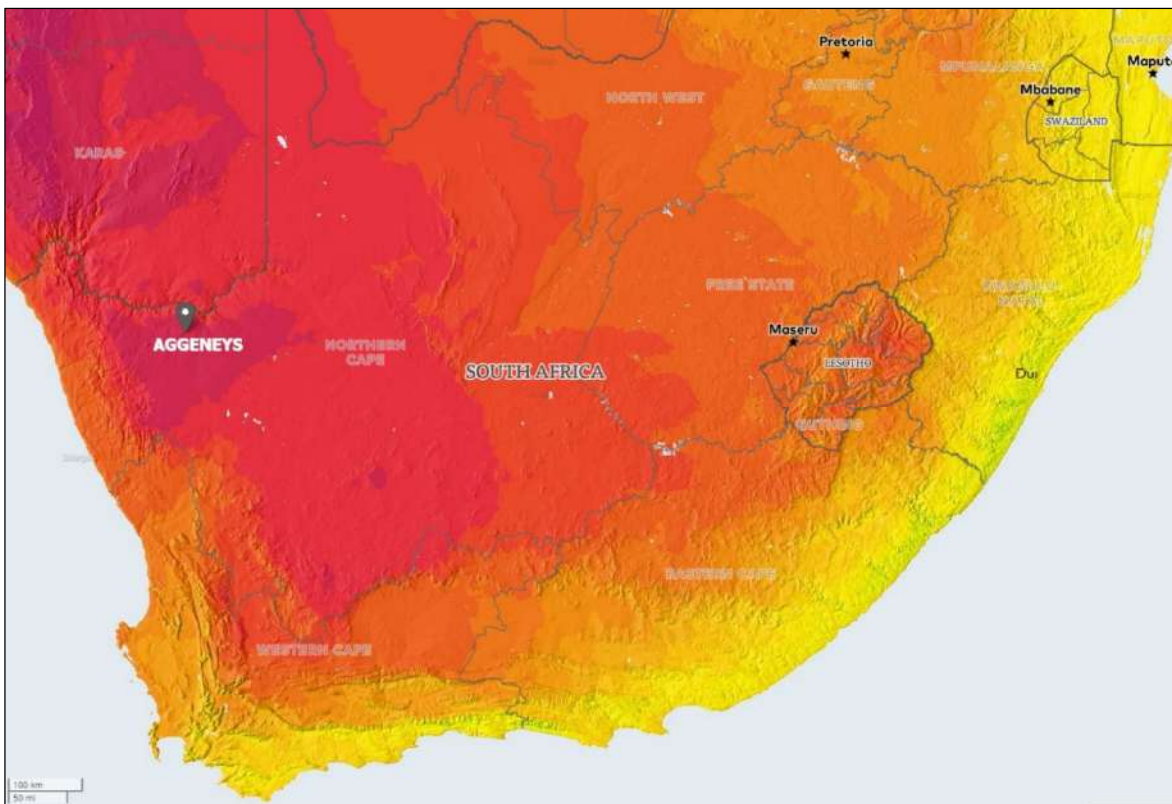


Figure 5.3: A Global Horizontal Irradiation (GHI) Map for South Africa (Source: Global Solar Atlas, <http://globalsolaratlas.info/>).

5.5 Receptiveness of the proposed project site to development of Aggeneys 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 project site has specifically been identified by the Applicant 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 Aggeneys region and other parts of the Northern Cape Province are characterised as having the highest solar irradiation values in South Africa (and which are comparable on a global scale). The actual GHI for the proposed project site is in the region of 2303 kWh/m²/annum, which is ideally suited to the development of a commercial solar PV facility and is one of the highest levels in the country.
- » **Topography:** A surface area with favourable topography facilitates the work involved in construction and maintenance of the solar PV facility. The proposed project site is characterised as having a gently undulating topography, with slopes of less than 5% over most of the area, and with an altitude above sea level of between 850 and 1000m.

- » **Site extent:** The study area of Aggeneys 1 has an extent of ~12 226ha. The extent of the study area provides the opportunity for the avoidance of sensitive environmental features and areas in terms of the placement of the project site.
- » **Site access:** Access to the project site is obtained via the existing Loop 10 gravel road, located to the north-eastern boundary of the project site. The Loop 10 gravel road is located off the N14 national road which runs on the western boundary of the project site.
- » **Grid access:** A key factor in the siting of any solar PV facility is that the project must have a viable grid connection. The Aggeneys Main Transmission Substation (MTS) is located approximately 13km south-west of the project site with the Aggeneys/Aries 400kV, Aggeneys/Harib 220kV and the Aggeneys/Nama 220kV overhead power lines running from and into the substation. In terms of Eskom's 2019-2028 Transmission Development Plan (TDP), the document currently stipulates the following planned grid infrastructure roll-outs for the Aggeneys MTS:
 - * TDP scheme "Gromis-Nama-Aggeneys 400kV lines (IPP)": Gromis-Nama 400 kV line.
 - * TDP scheme "Aggeneys-Paulputs 2nd 220 kV line": Aggeneys-Paulputs 2nd 220 kV line (built at 400 kV).
 - * TDP scheme "Aggeneys strengthening 1 (IPP)": Aggeneys 400/132 kV transformation strengthening 1 (IPP).

The grid connection point for Aggeneys 1 will be the existing Aggeneys MTS. In order to connect Aggeneys 1 to the national grid, a grid connection solution comprising specific grid connection infrastructure needs to be developed. The grid connection infrastructure will include a collector substation and a new single-circuit overhead power line of up to 220kV, and will be assessed as part of a separate Basic Assessment process.

Existing grid infrastructure within close proximity of Aggeneys 1 provides an opportunity for the project to connect to the national grid with minimal linear infrastructure (i.e. of less than 20km). The principle to minimise associated infrastructure and the resulting impacts, is also supported.

- » **Land suitability:** The current land use of the affected property is an important consideration for location selection in terms of limiting disruption to existing land use practices. The majority of the land use in the Aggeneys area is agriculture (livestock grazing) and land reserved for mining related activities. The Remaining Extent of Farm Bloemhoek 61 is one of the few available privately-owned land parcels with no land use conflicts, and with sufficient space available for a solar PV facility taking into account the avoidance of site sensitivities. Properties that avoid sensitive environmental features and simultaneously facilitate easy construction conditions (i.e. relatively flat terrain, lack of major rock outcrops, limited watercourses) are also favoured during location selection.
- » **Geographic location:** The project site for Aggeneys 1 is located within an area that has become a node (i.e. a REDZ area) for renewable energy projects, with the following solar PV facilities located proximal to the project site: Aggeneys Solar PV Facility (Preferred Bidder in REIPPPP Window 4 and the project is undergoing construction), numerous Solar Capital PV projects, and the Enamandla PVs and Letsoai CSP projects.
- » **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 developer.

5.6 Benefits of Renewable Energy and the Need and Desirability thereof

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: The proposed project 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 up-skilled to undertake certain roles during the construction and operation phases. In terms of the needs of the local community, the Local and District municipalities' Integrated Development Plans (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; unlocks opportunities to increase participation amongst all sectors of society in the mainstream economy to create decent job opportunities; promotes Local Economic Development; and enhances rural development and agriculture. A study undertaken by the DoE, National Treasury and the Development Bank of South Africa (DBSA) (June 2017) found that employment opportunities created during the construction phase of the projects implemented to date had created 40% more job years 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.

The project has the potential to make a positive contribution towards the identified community needs. In terms of the economic development requirements of the REIPPP Programme, the project will commit benefits to the local community in the form of job creation, localisation, and community ownership. In accordance with the DoE bidding requirements of the REIPPP Programme, 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. 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 during 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 projects¹³.

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 excellent renewable energy resources and competitive procurement processes, both wind power and solar PV power have now been proven as cheaper forms of energy generation in South Africa than coal power. They offer excellent value for money to the economy and citizens of South Africa while benefitting society as a whole through the development of clean energy. This is supported by the Draft IRP 2018 released for comment which follows the least cost option.

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 radiation or wind for power generation is a non-consumptive use of a natural resource that produces zero emissions during its operation.

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 REIPPP Programme has achieved carbon emission reductions¹⁴ of 25.3 million tonnes of CO₂

¹³ (http://ntww1.csir.co.za/plsql/ptf0002/PTL0002_PGE157_MEDIA_REL?MEDIA_RELEASE_NO=7526896)

¹⁴ 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.

(IPP Office, March 2018). The development of Aggeneys 1, and the associated electricity generated as a result of the solar PV 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 the Kyoto Protocol, 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. By the end of March 2018 the REIPPP Programme had created 35 702 job years (equivalent of a full time employment opportunity for one person for one year) for South African citizens including people from communities local to IPP operations (IPP Office, March 2018).

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

CHAPTER 6: APPROACH TO UNDERTAKING THE BASIC ASSESSMENT PROCESS

In terms of the EIA Regulations of December 2014 published in terms of NEMA (Act No. 107 of 1998) as amended, the construction and operation of Aggeneys 1 is a listed activity requiring environmental authorisation. In terms of GNR114 of February 2018, the application for environmental authorisation is required to be supported by a BA process based on the location of the Aggeneys 1 project site 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 associated infrastructure¹⁵. 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. In addition, a comprehensive consultation process was conducted, and included I&APs, the competent authority, directly impacted landowners/occupiers, adjacent landowners/occupiers, relevant Organs of State departments, ward councillors and other key stakeholders. This chapter serves to outline the process which 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 final 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 as a result of the development of Aggeneys 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.	The details of the public participation process undertaken for Aggeneys 1 has 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 30-day review period of the BA Report and through consultation with I&APs are included <u>as part of a Comments and Responses Report (CRR) in section 6.3.2 of this final BA Report to the DEA for decision – making.</u>
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 Aggeneys 1 has been included in section 6.4.

The grid connection solution for Aggeneys 1 will be assessed as part of a separate Basic Assessment process.

(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 Aggeneys 1 is included in section 6.5.

6.2 Relevant legislative permitting requirements

The legislative permitting requirements applicable to Aggeneys 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(1) 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 Aggeneys 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 GNR 779 of 01 July 2016. The Provincial Northern Cape Department of Environment and Nature Conservation (NDENC) is a Commenting Authority on the project.

The need to comply with the requirements of the EIA Regulations published under NEMA ensures that developers 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.

The BA process being conducted for Aggeneys 1 is being undertaken in accordance with Section 24 (5) of NEMA. Section 24 (5) of NEMA pertains to Environmental Authorisations (EAs), 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 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 the Springbok REDZ, one of the eight (8) designated REDZ areas, Aggeneys 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 Environmental Authorisation.

Table 6.1 details the listed activities in terms of the EIA Regulations of December 2014 (as amended) which apply to Aggeneys 1, and for which an Application for Environmental Authorisation has been submitted. The table also includes a description of the specific project activities which relate to the applicable listed activities.

Table 6.1: Listed activities as per the EIA regulations that are triggered by Aggeneys 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 327, 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>Aggeneys 1 will require the construction and operation of an on-site facility substation with an extent of up to 1ha and with a capacity of up to 220KV. Aggeneys 1 will be located outside of an urban area.</p>
GN 327, 08 December 2014 (as amended on 07 April 2017)	12(ii)(a)(c)	<p>The development of (ii) infrastructure or structures with a physical footprint of 100 square meters or more; where such development occurs (a) within a watercourse or (c) within 32 meters of a watercourse, measured from the edge of a watercourse.</p> <p>The development of Aggeneys 1 will require the construction of infrastructure with a physical footprint of up to ~250ha within and within 32m of ephemeral watercourses identified within the project site.</p>
GN 327, 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>Aggeneys 1 will require the storage and handling of dangerous goods for the construction and operation of the solar PV facility. Containers with a combined capacity of ~80m³ will be required.</p>
GN 327, 08 December 2014 (as amended on 07 April 2017)	19	<p>The infilling or depositing of any material of more than 10 cubic meters into, or the dredging, excavation, removal or moving of soil, sand shells, shell grit, pebbles or rock of more than 10 cubic meters from a watercourse.</p> <p>The development of Aggeneys 1 will require the removal or moving of soil within a watercourse during the construction of the solar PV facility. Ephemeral watercourses have been identified within the project site and the removal or moving of ~10m³ of soil will be required.</p>
GN 327, 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>Aggeneys 1 (considered to be an industrial development) will be constructed and operated on land used for agricultural purposes.</p>

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
		The project site of the project is located outside of an urban area and the project site will have an extent of up to ~250ha.
GN 325, 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>Aggeneys 1 will make use of solar energy as a renewable energy resource and will have a contracted capacity of up to 100MW (AC).</p>
GN 325, 08 December 2014 (as amended on 07 April 2017)	15	<p>The clearance of an area of 20 hectares or more of indigenous vegetation.</p> <p>The development of Aggeneys 1 will require the clearance of indigenous vegetation present within the project site of up to ~250ha in extent.</p>
GN 324, 08 December 2014 (as amended on 07 April 2017)	4(g)(ii)(bb)	<p>The development of a road wider than 4 meters with a reserve less than 13.5 meters (g) in the Northern Cape (ii) outside urban areas (bb) in National Protected Areas Expansion Strategy Focus Areas.</p> <p>Aggeneys 1 will require the development of access roads (including internal access roads) with a width of between 4 and 8 meters. The Aggeneys 1 project site is located outside of urban areas and within the Kamiesberg Bushmanland Augrabies National Protected Areas Expansion Strategy (NPAES) area.</p>
GN 324, 08 December 2014 (as amended on 07 April 2017)	10(g)(ii)(iii)(bb)	<p>The development and related operation of facilities or infrastructure for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of 30 but not exceeding 80 cubic meters in the (g) Northern Cape, (ii) in areas within a watercourse or wetland; or within 100 meters from the edge of a watercourse or wetland; and (iii) outside urban areas, (bb) in National Protected Areas Expansion Strategy Focus Areas.</p> <p>Aggeneys 1 will require the storage and handling of dangerous goods for the construction and operation of the solar PV facility. Containers with a combined capacity of ~80m³ will be required. Ephemeral watercourses have been identified within the project site and storage of dangerous goods will be located within 100m of the watercourses. The Aggeneys 1 project site is located within the Kamiesberg Bushmanland Augrabies National Protected Areas Expansion Strategy (NPAES) area.</p>
GN 324, 08 December 2014 (as amended on 07 April 2017)	14(ii)(a)(c)(g)(ii)(bb)	<p>The development of (ii) infrastructure or structures with a physical footprint of 10 square meters or more, where such development occurs (a) within a watercourse, or (c) within 32 meters of a watercourse, measured from the edge of a watercourse, in (g) the Northern Cape, (ii) outside urban areas, in (bb) National Protected Areas Expansion Strategy Focus Areas.</p>

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
		The development of Aggeneys 1 will require the construction of infrastructure with a physical footprint of up to ~250ha within 32m of ephemeral watercourses identified within the development footprint. The project site is located within the Northern Cape, outside urban areas and within the Kamiesberg Bushmanland Augrabies National Protected Areas Expansion Strategy (NPAES) 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 DWS). Water use is defined broadly, and includes 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.

Table 0.1 lists Water Uses associated with the proposed project and identified in terms of the NWA which require licensing either in the form of a GA, or in the form of a WUL. 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)	Impeding or diverting the flow of water in a watercourse. Ephemeral watercourses are located within the solar field of the Aggeneys 1 development footprint.
	Section 21 (i)	Altering the bed, banks, course or characteristics of a watercourse. Ephemeral watercourses are located within the solar field of the Aggeneys 1 development footprint.

In the event that the flow of water in the ephemeral watercourses is affected and the bed, banks or course characteristics are altered, application would need to be made for a WUL in accordance with the requirements of the Regulations Regarding the Procedural Requirements for Water Use License Applications and Appeals (GNR 267), or a GA registered in accordance with the requirements of Revision of General Authorisation. The process of applying for a WUL or GA registration will only be completed once a positive EA has been received and the project selected as a Preferred Bidder. This is in line with the requirements of the DWS.

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 the proposed solar PV facility, 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 (GNR 668).

6.3 Overview of the Basic Assessment Process for Aggeneys 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 amended.
- » Preparation of a BA report and EMPr in accordance with the requirements of Appendix 1 and Appendix 4 of GNR326.
- » 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:

- » Submission of the project notification letters and application form for Environmental Authorisation to the DEA and DENC.
- » 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.

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 (GNR 326) (as amended). The purpose of public participation is clearly outlined in Regulation 40 of the EIA Regulations 2014 (GNR 326) (as amended) and is being followed for this proposed project.

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.
- » Various ways are provided to I&APs to correspond and submit their comments i.e. fax, post, email.
- » 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 have been 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 a BA Report for a 30-day review period.
- » Prepare a Comments and Responses (C&R) report which documents the comments received on the BA process 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), the following summarises the key public participation activities conducted to date.

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 study 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. An initial list of key stakeholders identified and registered is listed in **Table 6.2**.

Table 6.2: List of Stakeholders identified for the inclusion in the project database during the public participation process for Aggeneys 1

Organs of State
National Government Departments
Department of Agriculture, Forestry and Fisheries (DAFF)
Department of Energy (DoE)
Department of Environmental Affairs (Biodiversity & Conservation Directorate)
Department of Mineral Resources (DMR)
Department of Rural Development and Land Reform (DRDLR)
Department of Water and Sanitation (DWS)
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)
Provincial Government Departments
Northern Cape Department of Agriculture
Northern Cape Department of Environment and Nature Conservation (DENC)
Northern Cape Department of Roads and Public Works
Ngwao Boswa Kapa Bokone (NBKB)
Local Government Departments
Namakwa District Municipality
Khâi-Ma Local Municipality
Key Stakeholders
BirdLife South Africa
Endangered Wildlife Trust (EWT)
Wildlife and Environment Society of South Africa (WESSA)
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 C1** 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 names, contact details and addresses of:

- » all persons who requested to be registered on the database 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;
- » all persons identified and approached through networking or a chain referral system to identify any other stakeholder (i.e. ratepayers associations); and
- » all persons who submitted written comments or attended meetings 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 the I&APs involved in the public participation process.

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 47D¹⁶ 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;

Section 47D of NEMA pertains to the delivery of documents, and states that:

- (1) A notice or other document in terms of this Act or a specific environmental management Act may be issued to a person –
- (a) By delivering it by hand;
 - (b) By sending it by registered mail –
 - (i) To that person's business or residential address; or
 - (ii) In the case of a juristic person, to its registered address or principal place of business;
 - (bA) By faxing a copy of the notice or other document to the person, if the person has a fax number;
 - (bB) By e-mailing a copy of the notice or other document to the person, if the person has an e-mail address; or
 - (bC) By posting a copy of the notice or other document to the person by ordinary mail, if the person has a postal address;
 - (c) Where an address is unknown despite reasonable enquiry, by publishing it once in the Gazette and once in a local newspaper circulating in the area of that person's last known residential or business address.
- (2) A notice or other document issued in terms of subsection (1)(b), (bA), (bB), (bC) or (c) must be regarded as having come to the notice of the person, unless the contrary is proved."

- (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 C3**) providing technical and environmental details on the project and how to become involved in the BA process. The BID has been distributed to identified stakeholders and I&APs. The BID was available electronically on the Savannah Environmental website (<http://www.savannahsa.com/public-documents/energy-generation>).
- » Site notices were placed on 10 April 2019 announcing the BA process at visible points along the boundary of the project site, in accordance with the requirements of the EIA Regulations. Photographs and the GPS co-ordinates of the site notices are contained in **Appendix C2**.
- » BA process notification letters announcing the BA process, notifying Organs of State, potentially affected and neighbouring landowners, as well as registered stakeholders/I&APs of the Aggeneys 1 solar PV facility project, providing background information of the project and inviting I&APs to register on the project's database, were distributed via email on **08 April 2019**. The evidence of the distribution of the process notification letters are contained in **Appendix C** of this final BA Report.
- » A newspaper advert was placed in the Gemsbok Newspaper announcing the BA process and inviting comments on the BA Report on **24 April 2019** at the commencement of the 30-day public review period. The details of the newspaper advert placement are included in **Appendix C2** of the final BA Report.
- » The BA Report was made available for review by I&APs for a 30-day review period from **24 April 2019 to 27 May 2019**. CD and hard copy versions of the BA Report were circulated to Organs of State via courier at the commencement of the review period. The BA Report was also available on the Savannah Environmental website and at the Aggeneys Public Library in Aggeneys. The evidence of distribution of the BA Report is 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 greater study 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 6.3: Public involvement for Aggeneys 1

Activity	Date
Distribution of the process notification and stakeholder reply form announcing the BA process and inviting I&APs to register on the project database.	08 April 2019
Placement of site notices on-site and in public places.	10 April 2019
Distribution of the BID	08 April 2019
Distribution of notification letters announcing the availability of the BA Report for review for a 30-day public review and comment period. These letters were distributed to Organs of State, Government Departments, Ward Councillors, landowners within the greater study area (including neighbouring landowners) and key stakeholder groups.	22 April 2019
Advertising of the availability of the BA Report for a 30-day review period in Gemsbok newspaper.	24 April 2019
30-day review period for the BA Report for comment.	24 April 2019 – 27 May 2019 (considering public holidays and national voting day)
Focus Group Meetings: <ul style="list-style-type: none"> » Affected Landowners; » Adjacent Landowners; » Authorities and Key Stakeholders (including organs of state, local municipality and community based organisations) 	<u>16 May 2019</u>
On-going consultation (i.e. telephone liaison; e-mail communication) with all I&APs	Throughout BA Report 30-day review period

The purpose of the abovementioned meetings was to engage with key stakeholders to ensure that key requirements/comments are noted and addressed as part of the BA process. Records of all consultation undertaken are included in **Appendix C**.

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

- 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 were notified by means of a notification letter (e-mail) of the release of the BA Report for a 30-day public review 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 notifications were distributed at the commencement of the 30-day review period, on 24 April 2019.

v. Identification and Recording of Comments

Comments received from I&APs to date are included in the Comments and Responses (C&R) Report attached as **Appendix C8** to this final BA Report. Comments raised by I&APs during the BA process are synthesised into this Comments and Responses Report. The C&R Report includes responses from members of the BA project team/and or the project proponent. The key issues emanating from the public participation process are summarised below in **Table 6.4**.

Table 6.4: Summary of key issues raised during the public participation process.

Summary of main issues raised by I&APs	Summary of response from EAP
<p><u>The DEA indicated that the project site is listed as a 'Very High Combined Sensitivity' astronomy advantage area, in terms of Radio Frequency Interference (RFI) and Electromagnetic Interference (EMI) according to the National Web Based Environmental Screening Tool. The Department required that an EMI and RFI study be undertaken, and that comments on the study should be sourced from the SARAO office.</u></p>	<p><u>The project site for Aggeneys 1 falls outside the high combined sensitivity area in terms of astronomy combined areas. However, a portion of the larger property within which the solar PV facility is proposed falls within this area. Therefore, Appendix O of the final BA Report includes a map illustrating the location of the Aggeneys 1 project site in relation to the high astronomy sensitive area. Furthermore, the project team unsuccessfully endeavored to source comments from the SARAO office and proof of this process is included in Appendix C4 of the final BA Report.</u></p>
<p><u>The DEA requested the project team to indicate if Activity 24 of Listing Notice 1 of the EIA Regulations, 2014 (as amended) would be triggered by the project.</u></p>	<p><u>The EAP submitted a revised application form to the Department on Friday, 31 May 2019 with the final BA Report.</u></p>
<p><u>The DEA recommended that the EAP make the necessary arrangements to conduct a joint site inspection with other officials of the PV and grid projects prior to the submission of the final BA Report.</u></p>	<p><u>Appendix C4 of the final BA Report includes proof of emails between Reuben Maroga (co-author of the final BA Report and EAP project team member), and Thando Booi (Case Officer for Aggeneys 2 grid project) indicating that it would be best to undertake the joint site inspection after the submission of the final BA Report.</u></p>
<p><u>The Northern DWS representative Ms. V Ramugondo indicated that the department rated all perennial and non – perennial rivers together with all dry riverbeds and natural drainage and associated riparian areas extremely sensitive to a development. An option of developing furthest away from the all water course would be the preferred option.</u></p>	<p><u>The freshwater specialist indicated that the sensitivity of the freshwater features within the project site was concluded on the basis of a field assessment. The subsequent EIS scoring is a ground-truthed assessment of the sensitivity of these features. Further, all reasonable efforts were made by the applicant to determine the exact layout of the facility taking into account the ground – truthed sensitivities of the project site.</u></p> <p><u>A map included in Appendix M illustrates buffer areas placed around the delineated watercourses within the project site. In addition, no infrastructure will be directly placed within the watercourses. Mitigation measures to this effect are included in Appendix L of the final BA Report.</u></p>

Public participation documentation from the process to date is included in **Appendix C**.

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 Aggeneys 1

Specialist Name	Specialist Company	Specialist Area of Expertise	Appendices
Simon Todd	3Foxes Biodiversity Consulting	Ecology Impact Assessment.	Appendix D
Eric Hermann	3Foxes Biodiversity Consulting	Avifauna Impact Assessment	Appendix E
Shaun Taylor Gideon Raath	Savannah Environmental Peer reviewed by Stephen Burton of SiVEST	Freshwater Impact Assessment	Appendix F
Garry Paterson	Agriculture Research Council –Soil, Climate and Water	Soils and Agricultural Potential Impact Assessment	Appendix G
Jon Marshall	Environmental Planning and Design	Visual Impact Assessment	Appendix H
Jayson Orton and John E. Almond	ASHA Consulting and Natura Viva CC	Heritage Impact Assessment (including the Palaeontology Impact Assessment)	Appendix I
Neville Bews	Neville Bews and Associates	Social Impact Assessment	Appendix J
Andrew Cleghorn	Knight Piésold Consulting	Stormwater Management Plan	
Andrew Cleghorn	Knight Piésold Consulting	Traffic Impact Assessment	Appendix K

Specialist studies considered direct and indirect environmental impacts associated with the development of all components of Aggeneys 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 Applicant 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. Assessment of impacts with mitigation is made in order to demonstrate the effectiveness of the proposed mitigation measures. An Environmental Management Programme (EMPr) is included as **Appendix L**.

6.5 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 footprint for the solar PV facility identified by the developer represents a technically suitable site for the establishment of Aggeneys 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 – L** for specialist study specific limitations.

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

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

- » National Environmental Management Act (Act No. 107 of 1998);
- » EIA Regulations of December 2014, published under Chapter 5 of NEMA (as amended in GNR R326 in Government Gazette No 40772 of April 2017);
- » Department of Environmental Affairs (2017), Public Participation guidelines in terms of NEMA EIA Regulations; 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 6.6 provides an outline of the legislative permitting requirements applicable to Aggeneys 1 as identified at this stage in the project process.

Table 6.6: Applicable Legislation, Policies and/or Guidelines associated with the development of Aggeneys 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 project site 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 the</p>	<p>DEA – Competent Authority</p> <p>Northern Cape DENC – Commenting Authority</p>	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>National Environmental Management Act (No 107 of 1998) (NEMA)</p>	<p>proposed project. All relevant listing notices for the project (GNR 327, GNR 325 and GNR 324) will be applied for</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 DENC</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 DENC Khâi-Ma Local Municipality</p>	<p>Noise impacts are expected to be associated with the construction phase of the project. Considering the location of the project site 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>Ephemeral watercourses are present within the Aggeney's 1 project site as identified within the Freshwater Impact Assessment (Appendix F).</p> <p>Where development activities impede or divert the flow of water in a watercourse, or alter the bed, banks, course or characteristics of watercourse, Section 21(c) and 21 (i) of the NWA would be triggered, and the project proponent would need to apply for a WUL or register a GA with the 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 likely to impede</p>	<p>Department of Mineral Resources</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 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 to ensure that the</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	any such object must apply to the Minister for approval in the prescribed manner.		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 DENC / 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, Aggeneys 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>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</p>	South African Heritage Resources Agency Ngwao Boswa Kapa Bokone (NBKB)	A full Heritage Impact Assessment (HIA) (with field work) has been undertaken as part of the BA process (refer to Appendix I of this BA Report). No heritage resources were identified within the Aggeneys 1 project site, although several isolated stone artefacts attributable to background scatter were noted. From a palaeontological perspective the area is underlain by Late Caenozoic superficial sediments such as wind-blown sands as well as alluvial and sheetwash gravels. These surface sediments are generally of low to very low palaeontological sensitivity.

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>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>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 Regulations (GNR 668). This will be determined once the final layout of the facility and its associated infrastructure within the project site has been determined.</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, GNR 324), 29 April 2014).</p>	<p>DEA Northern Cape DENC</p>	<p>Under NEM:BA, a permit would be required for any activity which is of a nature that may negatively impact on the survival of a listed protected species.</p> <p>No species of conservation concern were identified within the project site, and the species present are restricted to more widespread species. The abundance of plant species of conservation concern within the site is low and no significant impacts on such species can be expected (Ecological Impact Assessment included as Appendix D).</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<p>National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA)</p>	<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>	<p>DEA Northern Cape DENC</p>	<p>Restricted Activities and the respective requirements applicable to persons in control of different categories of listed invasive species are contained within the Alien and Invasive Species Regulations (GNR 598) published under NEM:BA, together with the requirements of the Risk Assessment to be undertaken.</p>
<p>Conservation of Agricultural Resources Act (No. 43 of 1983) (CARA)</p>	<p>Section 05 of CARA provides for the prohibition of the spreading of weeds.</p> <p>Regulation 15 of GNR 1048 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> <p>Regulation 15E of GNR 1048 published under CARA provides requirement and methods to implement control measures for different categories of alien and invasive plant species.</p>	<p>Department of Agriculture, Forestry and Fisheries (DAFF)</p>	<p>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.</p> <p>The permission of DAFF will be required if Aggeneys 1 requires the draining of vleis, marshes or water sponges on land outside urban areas. However, this is not anticipated to be relevant for the project.</p> <p>In terms of Regulation 15E (GNR 1048) 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

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			<p>directions for the use of such a weed killer.</p> <ul style="list-style-type: none"> » 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 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>DAFF</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 protected tree species present in the development area 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 a site visit which allowed for the identification of any protected tree species which may require a license in terms of the</p>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
			<p>NFA within the project site (refer to Appendix D of this BA Report).</p> <p>No NFA-protected tree species were identified within the project site.</p>
National Veld and Forest Fire Act (No. 101 of 1998) (NVFFA)	<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 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>	DAFF	While no permitting or licensing requirements arise from this legislation, this Act will be applicable during the construction and operation of Aggeneys 1, in terms of the preparation and maintenance of firebreaks, and the need to provide appropriate equipment and personnel for firefighting purposes.
Hazardous Substances Act (No. 15 of 1973) (HAS)	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	Department of Health (DoH)	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).

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<p>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>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> <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>	<p>DEA – hazardous waste</p> <p>Northern Cape DENC – general waste</p>	<p>No listed activities are triggered by Aggeneys 1 and therefore no Waste Management License is required to be obtained. General and hazardous waste handling, storage and disposal will be 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>

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
	<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>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 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>SANRAL – national roads</p> <p>Northern Cape DoT</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 will be required for vehicles carrying abnormally heavy or abnormally dimensioned loads. Transport vehicles exceeding the dimensional limitations (length) of 22m. Depending on the trailer configuration and height when loaded, some of the on-site substation components may not meet specified dimensional limitations (height and width).</p>
Provincial Policies / Legislation			

Legislation	Applicable Requirements	Relevant Authority	Compliance Requirements
<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>The Act provides lists of protected species for the Province.</p>	<p>Northern Cape Department of Environment and Nature Conservation (DENC).</p>	<p>A collection/destruction permit must be obtained from Northern Cape Nature Conservation for the removal of any protected plant or animal species found on site.</p> <p>According to the Ecological Impact Assessment (Appendix D), widespread species such as the provincially protected <i>Boscia foetida subsp foetida</i>, and <i>Hoodia gordonii</i> were recorded within the project site.</p> <p>The abundance of plant species of conservation concern within the project site is low and no significant impacts on such species can be expected.</p>

6.6.1 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 large developments located in a sensitive habitat, or which otherwise may have significant impacts on avifauna). **Table 6.7** 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 0.7: 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
	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 wetlands, 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.

For the purposes of Aggeneys 1 the project site has been classified as a Regime 2 site. Two periods of monitoring (i.e. a winter (26 to 28 June 2018) and a summer (20 to 22 March 2019) monitoring season) have been completed, and informed the Avifauna Impact Assessment, as well as the facility layout.

6.6.2 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 & Safety
 - * Community Health & Safety

6.6.3 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 Plants, 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 Plants 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 construction phase impacts have been identified and included in the EMPr prepared for Aggeneys 1 and attached as **Appendix L** to this final BA Report.

Water Usage

Although water use requirements are typically low for solar PV plants, clusters of PV plants 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:

Aggeneys 1 would require approximately 10 000m³ of water during the 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 Khai-Ma Local Municipality following a Service Level Agreement between the municipality and the developer. 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.

The preferred water source will be determined through consultation with stakeholders and relevant authorities. The recommendation that measures with which to minimise the projects water requirements must be investigated by the project developer.

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:

Aggeneys 1 is proposed on the Remaining Extent of the Farm Bloemhoek 61. The project site is comprised within a single, privately owned agricultural property. A landowner / lease agreement will be entered into between the project developer and landowner to provide for the utilisation of the land for the development of Aggeneys 1. 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 Aggeneys 1 have been assessed as part of the Visual Impact Assessment specialist study 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 L** 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 impacts associated with the development of Aggeneys 1 have been assessed as part of the Ecology Impact Assessment (refer to Appendix D) and Avifauna Impact Assessment (refer to Appendix 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 impacts have been identified, and are contained within the EMPr prepared for the project and attached as **Appendix L** to this final BA Report. Areas of ecological sensitivity are reflected in an environmental sensitivity map prepared for the project (refer to Chapter 10 and **Appendix N**) and have been utilised to inform the facility layout so that such areas are suitably 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 Aggeneys 1 have been assessed as part of the Heritage Impact Assessment conducted as part of the BA process, which includes the consideration of heritage, archaeological, and palaeontological resources. Measures with which 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 L** to this final 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. Onsite access tracks should be permeable and developed to minimise disturbance to agricultural land. 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 site can be readily accessed via the national route (N14) which is aligned with the western boundary of the study area. Access routes within the surrounding areas are also an important characteristic to consider. The N14 national route provides access to the area from Upington, Pofadder, Springbok and Johannesburg. The most appropriate access route will be utilised for the solar PV facility. Within the project site, access will be required from new / existing roads for construction purposes (and

limited access for maintenance during operation). The facility layout has been determined following the identification of site related sensitivities.

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 transformer) may be defined as abnormal loads in terms of the National Road Traffic Act (No. 93 of 1996) (NRTA) 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.

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, prepared for the project and attached as **Appendix L** to this final 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 2014 EIA Regulations (GNR 326) 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.

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 EMPr prepared for the project and attached as **Appendix L** to this final BA Report.

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, Aggeneys 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 project site, as well as the broader 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 Aggeneys 1 project site is located is described in section 7.2. » The climatic conditions of the area within which the Aggeneys 1 project site is located is discussed in section 7.3. » The biophysical characteristics of the study area, project site, 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 study area, project site, 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 project site are included in section 7.7. » The social context within which the project site 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 broader study area and the project site proposed for the development of Aggeneys 1 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.

Aggeneys is a mining town situated between Pofadder and Springbok in the north-western section of the Northern Cape Province. The town is located in the Khâi-Ma Local Municipality and within the greater Namakwa District Municipality. The project site falls within ward 4 of the Khâi-Ma Local Municipality. A regional map of the study area and the project site is provided in **Figure 7.1**. Khâi -Ma Local Municipality is a Category B municipality. The seat of the municipality is Pofadder, which is located ~ 50km north-east of the project site. The towns located within the municipal area include Aggeneys, Pella, Pofadder, Onseepkans and Witbank. Farming settlements are also located within the municipal area, which includes Dwagga Soutpan, Vrugaar, Raap-en-Skraap and Klein Pella. The municipal area is characterised by vast tracts of flat, undeveloped land and arid Karoo landscape, with scattered mountainous areas and inselbergs, as well as ephemeral rivers.

The town of Aggeneys is located to the west of the project site 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 project site 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.

The Black Mountain Mining company is located within the town of Aggeneys and the residents of Aggeneys are predominantly employees of the Black Mountain Mine. The mine comprises two shafts, known as the Deep and Swartberg Shafts. The mine produces copper, lead, zinc and silver.

The project site is also located within the Springbok Renewable Energy Development Zone (REDZ). 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.

Access to Aggeneys and the project site is via the national road, N14. 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 gravel road provides direct access to the study area and project site and is located parallel to the northern boundary of the study area.

The Aggeneis Main Transmission Substation (MTS) is located approximately 13km south-west of the project site with the Aggeneis/Aries 400kV, Aggeneis/Harib 220kV and the Aggeneis/Nama 220kV overhead power lines running from and into the substation. In terms of Eskom's 2019-2028 Transmission Development Plan (TDP), the document currently stipulates the following planned grid infrastructure rollouts for the Aggeneis MTS:

- » TDP scheme "Gromis-Nama-Aggeneis 400kV lines (IPP)": Gromis-Nama 400 kV line.

- » TDP scheme “Aggeneys-Paulputs 2nd 220 kV line”: Aggeneys-Paulputs 2nd 220 kV line (built at 400 kV).
- » TDP scheme “Aggeneys strengthening 1 (IPP)”: Aggeneys 400/132 kV transformation strengthening 1 (IPP).

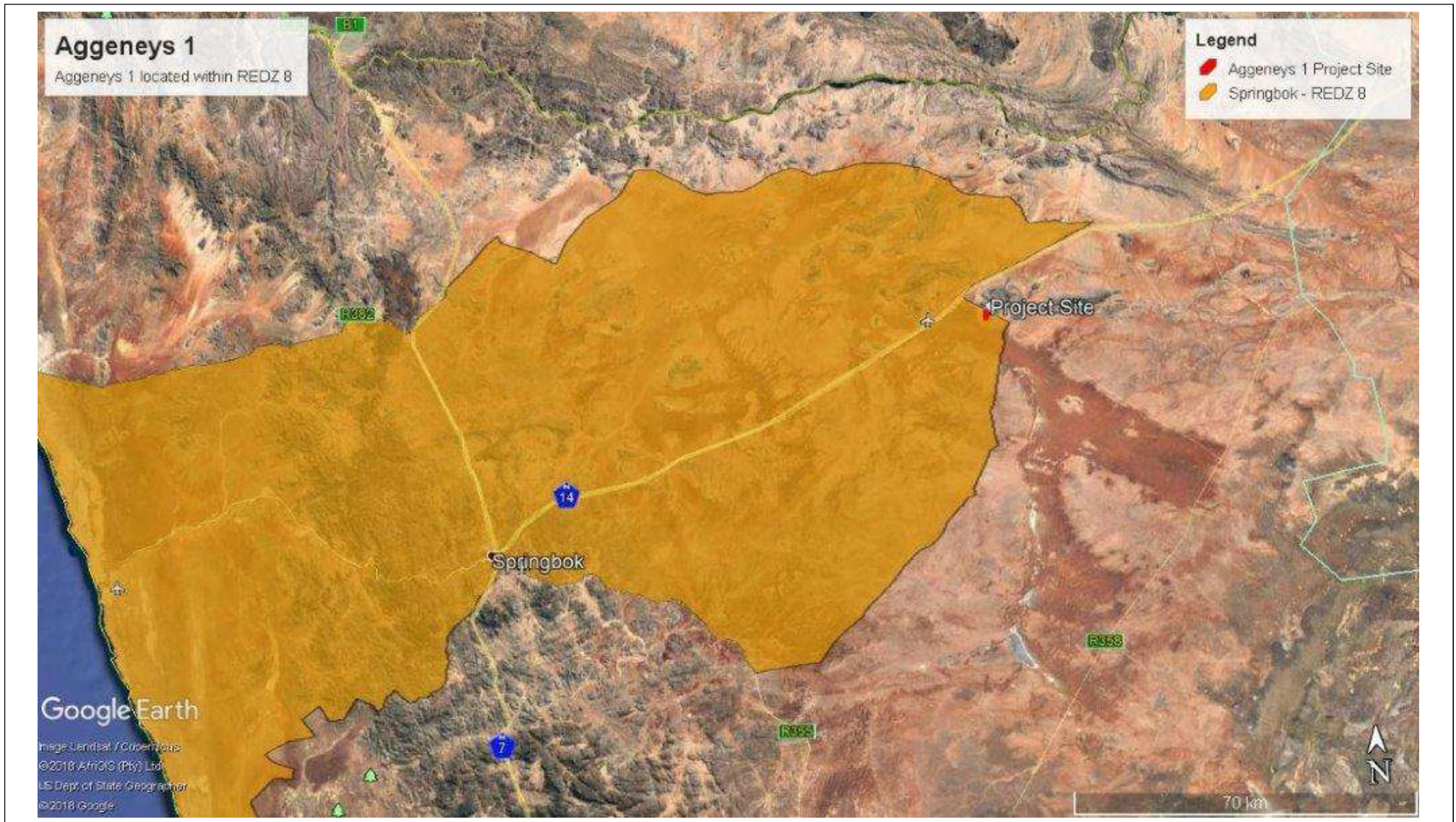


Figure 7.1: Map indicating the regional setting of the Aggeneys 1 study area and project site

7.3. Climatic Conditions

Aggeneys 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 Aggeneys 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, 7.3 and 7.4.**

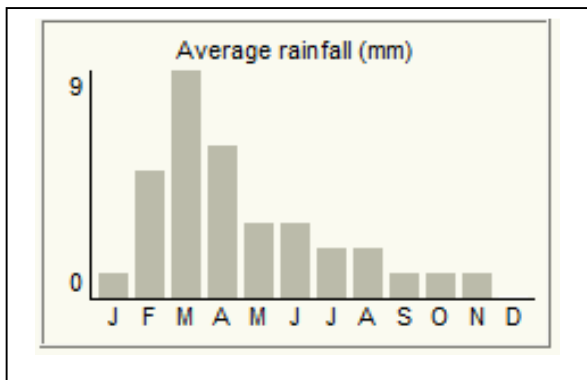


Figure 7.2: Average rainfall of Aggeneys, Northern Cape

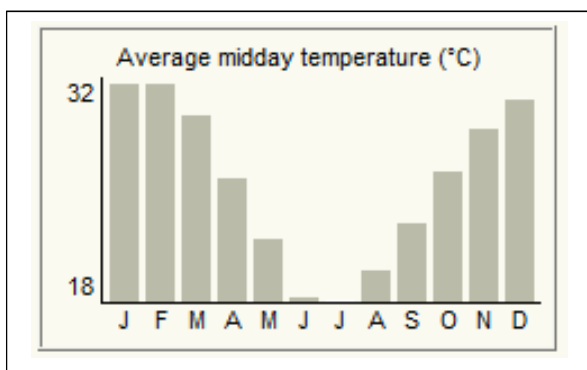


Figure 7.3: Average midday temperature of Aggeneys, Northern Cape

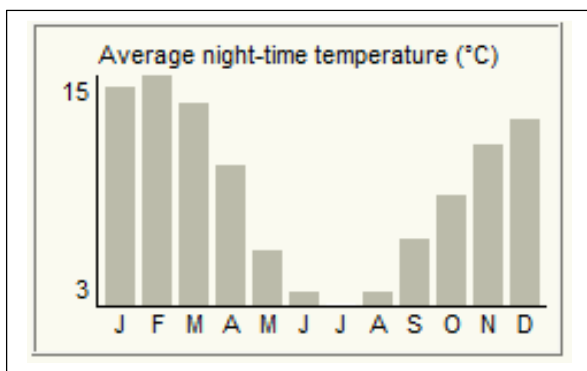


Figure 7.4: Average night-time temperature of Aggeneys, Northern Cape

7.4. Biophysical Characteristics of the Study Area

7.4.1. Topography, Terrain and Land Use

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

The Orange River flows from north-west to south-east approximately 37km north of the project site. 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 and flows into the sea on the West Coast where it forms the border between South Africa and Namibia.

The project site is located within a broad valley that drains towards the Orange River. The site is set at an elevation of 840 m – 870 m above mean sea level (amsl). The valley floor surrounding the project site 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 this region 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 project site in an east-west direction and is located outside and to the south of the project site.

Most of the project site and the surrounding areas comprises fairly flat-lying terrain between inselbergs or isolated steep rocky outcrops. The inselbergs in the vicinity of the project site are concentrated to the north-east, north-west and north-east where they form the upper valley slopes and ridgelines. Immediately to the north and north-west of the project site, a large rocky outcrop (Gamsberg) rises to approximately 1100 m amsl.

There are also two isolated areas of rocky outcrop within the valley floor to the south of the project site. These include small changes in elevation within the generally flat landscape and scattered inselbergs, in particular the Gamsberg.

7.4.2. Geology, Soils and Agricultural Potential

Geological Setting of the Project Site

The geology of the Aggeneys region consists of scattered basement inliers on the southern margins of the Ghaamberg 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 project site 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 project site, 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 downwasted 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 Caenozoic geological feature in the Aggeneys 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 traverses the study area and is located south of the project site. The palaeovalley is marked by intermittent pans and a veneer of orange-brown Kalahari wind-blown sands.

Soils and Agricultural Potential of the Project Site

The study area, including the project site, is underlain by Quaternary sediments, mostly sandy. Dunes also occur in the landscape. The study area is covered by four land types, which includes (Figure 7.5):

- » Af21 and Af26 – high base status with red soils and dunes
- » Ag62 – high base status with red soils which are mostly shallow
- » Ic151 – very rocky shallow soils

Table 7.1 below provides the details of the soils and land types present within the study area.

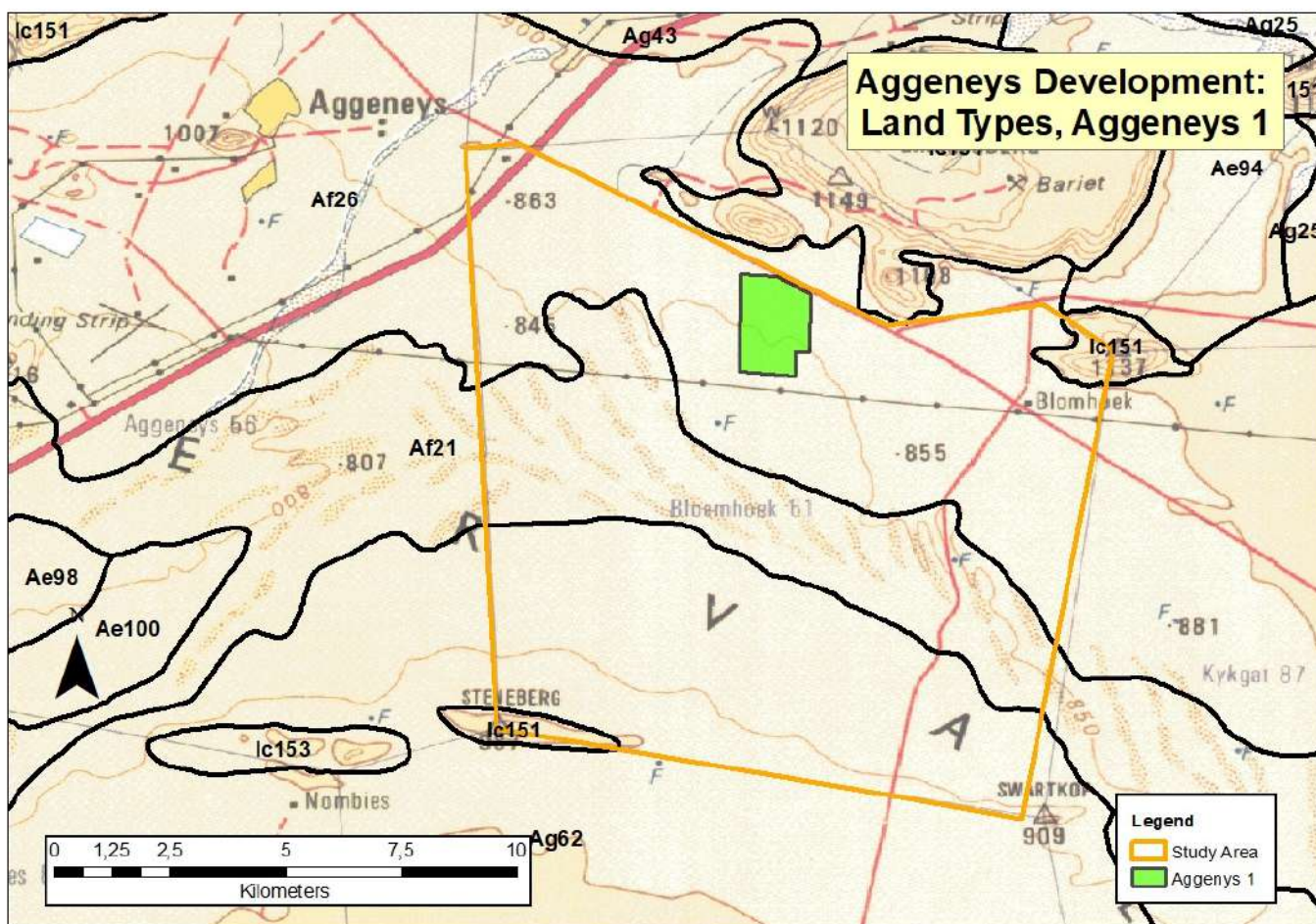


Figure 7.5: Land types present within in the Aggeneys 1 study area

Table 7.1: Details of the soils and land types present within the Aggeneys 1 study 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 Low: 100.0
	Fernwood 21	>1200	17%	Grey, sandy, structureless soils	
Ag62	Hutton 31/32	200-350	81%	Red, sandy, structureless soils on rock/dorbank	High: 0.0 Mod: 0.0
	Hutton 34/35/42/45	200-450	10%	Red, sandy, structureless soils on rock/dorbank	Low: 100.0
Ic151	Rock	-	86%	Surface rock outcrops	High: 0.0 Mod: 0.0
	Mispah 10	50-100	7%	Red to brown, sandy, structureless soils on rock	Low: 100.0

The entire extent of the Aggeneys 1 project site is located within land type Af26, which consists largely of deep, sandy soils. However, possibly due to the location of the project site at the foot of the rocky hills to the north, the presence of much shallower soils was confirmed, 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 were also observed at the surface.

There are no high potential soils present within the project site and the soils are of moderate potential at best due mainly to 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 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 project site, can be identified.

In general, the soils that do occur within the project site 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.

The soils present in the project site 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 topsoils, 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 Broader Study Area and the Project Site

i. Broad-Scale Vegetation Patterns

According to the national vegetation map, the project site is restricted to the Bushmanland Sandy Grassland vegetation type. However, according to unpublished 2016 Vegmap, the project site has been reclassified as falling within the Bushmanland Arid Grassland vegetation type. As the Bushmanland Sandy Grassland vegetation type characteristically occurs on dunes or deep red sands dominated by *Stipagrostis brevifolia*, this does not align well with the features and vegetation of the project site and it is clear that the most recent

reclassification to Bushmanland Arid Grassland can be considered as the most representative interpretation of the vegetation present. This has been confirmed in the field.

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 project site and would not be directly affected by the development.

ii. Habitats and plant communities

The vegetation of the project site consists of an arid, open grassland on shallow soils. There is gradient evident across the project site, with shallow, more gravelly soils present in the north towards the base of the Gamsberg along the Loop 10 road, which give way to somewhat deeper more sandy soils as one moves towards the Koa River valley south of the development boundary. The Koa River palaeovalley itself consists of an extensive dune system as well as broad plains with deep red soils, classified as Bushmanland Sandy Grassland. These areas are considered sensitive as they are home to the regionally endemic Red Lark.

The Aggeneys 1 project site is an open, gently sloping plain, with shallow reddish soils overlying ferricrete, which is exposed in some areas. The vegetation is homogenous and consists of *Stipagrostis* grasslands with occasional areas of more shrubby vegetation. The diversity of the vegetation is low, and while rainfall temporarily increases the abundance of forbs and annuals, diversity is never very high.

Dominant and typical species include grasses such as *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 7.6 and **Figure 7.7** provide photographs illustrating the habitats present for Aggeneys 1.



Figure 7.6: Low vegetation cover that typically occurs on the shallow soils along the norther boundary of the project site



Figure 7.7: Typical *Stipagrostis* grassland that characterises the majority of the site

iii. Listed 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 study area and project site (**Figure 7.8**). The Gamsberg, as well as the other massifs and hills in the area generally contain a high abundance of species of concern, and these are often associated with the Aggeneys Gravel Vygieveld vegetation type or specific habitats such as quartzite outcrops and gravel plains. Within the project site, no such habitats were observed to occur, and species of conservation concern present are restricted to more widespread species such as the provincially protected *Boscia foetida subsp foetida*, and *Hoodia gordonii*. The abundance of plant species of conservation concern within the project site is low and no significant impacts on such species can be expected.



Figure 7.8: *Lithops julii subsp fulleri* was observed on the gravel plains near to the Loop 10 road. The development footprint of Aggeneys 1 avoids this area entirely.

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

An extract of the Northern Cape Critical Biodiversity Areas map for the study area and the project site is illustrated below in **Figure 7.9**. The project site 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.

It is not clear from an ecological perspective why the area has been identified as an ESA, but presumably this is due to the large number of CBAs in the broader area and the need to buffer these areas and ensure connectivity of the landscape. The area to the west of the study area is the Vedanta Black Mountain "Game Camp" and is a CBA2 as is the dune system of the Koa River palaeovalley south of the study area. To the north of the project site is the Gamsberg massif and the other adjacent mountains, which are all classified as CBA1 on account of the high biodiversity value of this area.

The project site lies directly adjacent and to the south of the Loop 10 road, which would decrease the site's value for fauna, and is within an area with low flora diversity and low abundance of species of conservation concern.

The study area, including the project site is not located within one of the Northern Cape Protected Area Expansion Strategy (NC-PAES) focus areas and as such the area not currently considered important for meeting conservation targets. The project site falls within the older Kamiesberg-Bushmanland-Augrabies Focus Area of the 2011 NPAES; this has however been superseded by the 2016 NPAES¹⁷.

¹⁷ While the draft 2016 NPAES policy document is publically available, the associated spatial coverages are not currently available for public download and as result it is difficult to tell whether the site falls within the current focus areas, although it appears to fall within a gap between these areas.

While there is certainly a large amount of significant biodiversity features within the wider Aggeneys area that have been earmarked for conservation area expansion, the project site falls within a low-value habitat that in its own right is clearly not a local or regional priority.

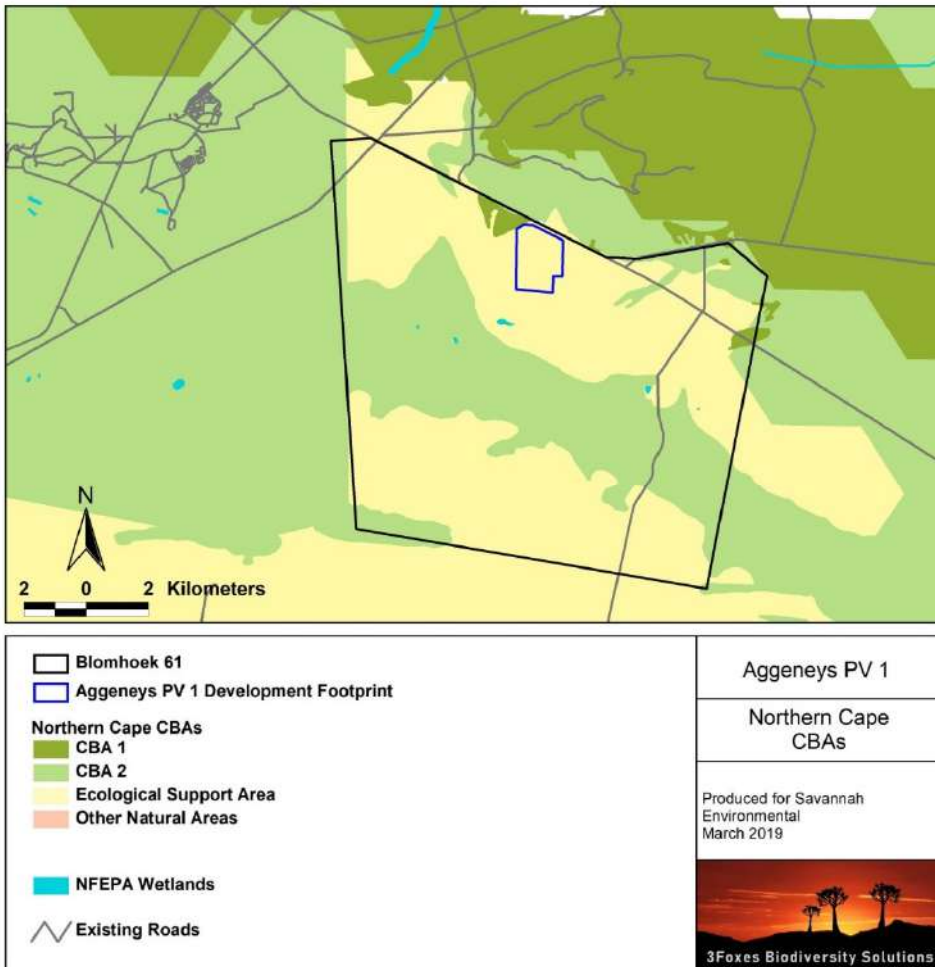


Figure 7.9: Northern Cape Critical Biodiversity Areas map overlain with the Aggeneys 1 study area and project site. The project site is located within an ESA and does not infringe on any CBAs.

v. Terrestrial Fauna

Mammals

The mammalian community at the project site is likely to be of 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 project site 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 project site 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 study area. There are no areas of particular significance for mammals at the site as the habitat is repetitive and broadly homogenous.

Two listed species may occur in the area, the Black-footed Cat *Felis nigripes* (Vulnerable) and Leopard *Panthera pardus* (Vulnerable). Given the extremely low cover at the project site 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 broader area is high with as many as 60 species known from the area, only a fraction of this is 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 plains characteristic of the study area and project site. 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 project site, which is restricted to the open plains habitat that is widespread in the area.

Amphibians

Only eight frog species are known from the area around the project site and even this is a gross overestimate of the number of amphibian species likely to be present. There are few freshwater features present and only species able to live independently of water will be present. As such the only species likely to be present within the project site would be the Karoo Toad *Vandijkophrynus gariensis*.

vi. Avifauna

Avian Microhabitats

Two avifaunal microhabitats were identified within the study 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 lies within the project site. A third but spatially insignificant habitat also occurs within the vicinity and is represented by a small rocky outcrop located to the east. The plains habitat covers the majority of the study area and features sparsely vegetated sandy flats interspersed with small drainage lines, especially in the north. The dune habitat (located well-outside of the project site, but within the study area) features deep red sand well vegetated with tall *Stipagrostis* grasses and is restricted to the southern and south western boundaries of the study area. This habitat appears to be the main habitat occupied by the Red Lark.

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 with 31 and 28 species recorded in winter and summer respectively, within the study area. Small passerines species made up the majority (ca. 70%) of the species detected, compared to non-passerines. Significantly more species and birds were detected in winter compared to summer, with the total bird abundance being five times greater. The good veld conditions that prevailed during winter (June 2018) resulted in numerous nomadic species being attracted to the area, whereas the arid conditions in late summer (March 2019) resulted in many of these species being almost entirely absent. 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 impetواني* 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 Aggeneys 1 project site) and not within the plains habitat, this relative abundance is rather unrepresentative of the species. In winter 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 Aggeneys 1 project site.

Other biome-restricted species which occurred within the project site 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 site, 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 area, while Verreaux's Eagle was seen directly adjacent to the project site. 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. Aggeneys-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 project site, both approximately 7.5km from the centre of the project site (**Figure 7.10**).



Figure 7.10: Location of two Martial Eagle nests (orange markers) in relation to the Aggeneys 1 project site (grey border, centred). Both nests are approximately 7.5km from the centre of the project site and are considered to be located at an acceptable distance from Aggeneys 1.

vii. Freshwater Features

Six ephemeral¹⁸ watercourse reaches have been identified within the northern portion of the project site, which can be classified as Lower Foothill Rivers. The ephemeral watercourses originate from culverts under the Loop 10 road, located north of the project site, which drains through the area. The watercourses are located in the Orange Primary Catchment, and in Quaternary Catchment D82C. The watercourses are located within the greater Orange Water Management Area (WMA). Refer to **Figure 7.11**.

Table 7.2 provides the details of the topography, soils and materials and riparian vegetation associated with the ephemeral watercourses.

¹⁸ Ephemeral water features flow for very short periods following rainfall. Outside of these rainfall periods, the surface remains dry.

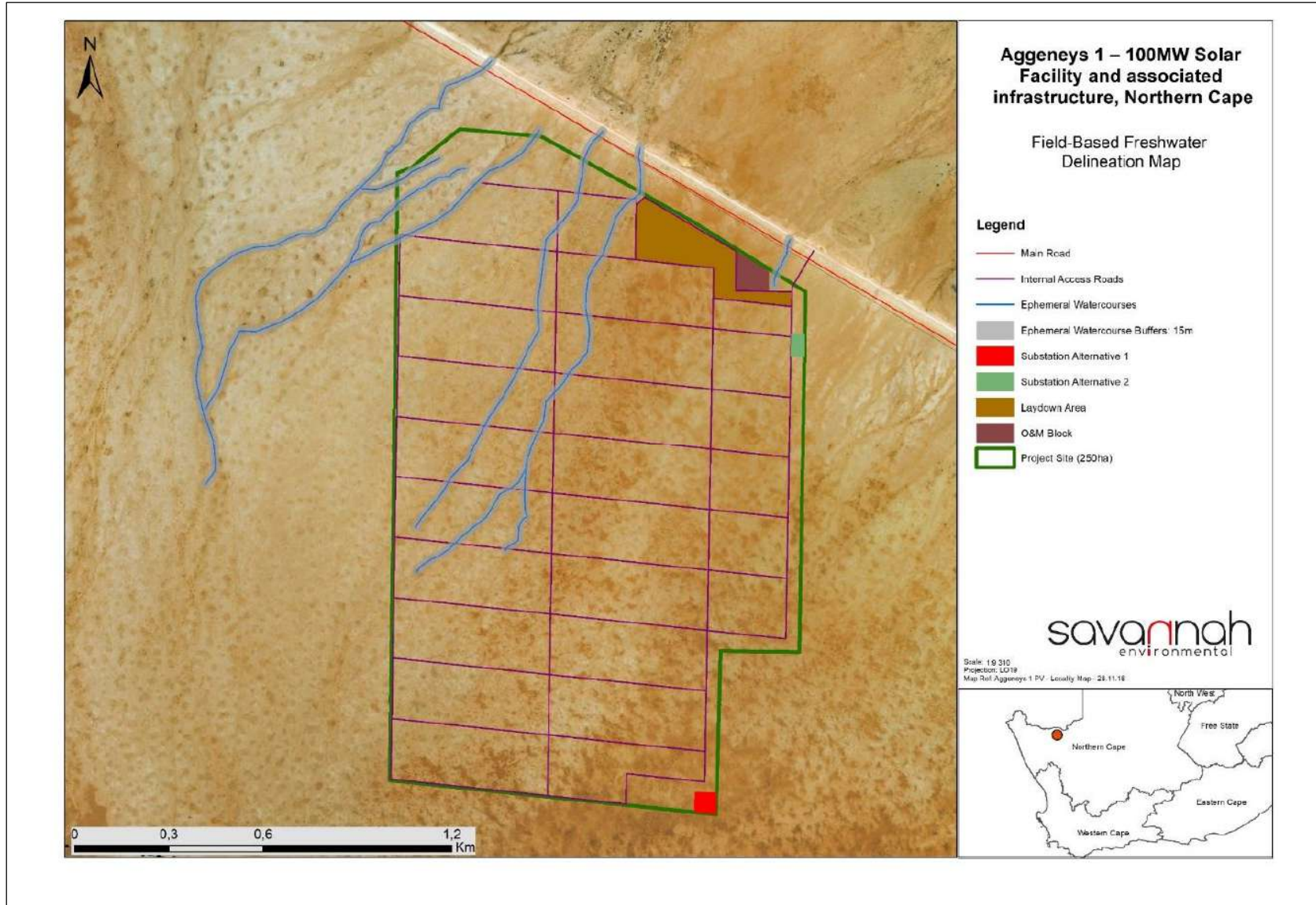





Figure 7.11: Freshwater delineation map of the ephemeral watercourses overlain with the Aggeneys 1 development footprint

Table 7.2: Details of the ephemeral watercourses located within the Aggeneys 1 project site

	Description of the detail	Photograph
<p>Topography associated with the watercourses</p>	<p>Six ephemeral watercourse reaches were identified on the project site which can be classified as Lower Foothill Rivers in terms of the national classification system. The ephemeral watercourses emanated from culverts under the Loop 10 road north of the project site boundary, which allows water run-off from the inselbergs north of the project site to drain through onto the site. As a consequence of the flat terrain, the ephemeral watercourses become very diffuse before disappearing into the landscape altogether along the length of the watercourse. Minor topographical incisions as a result of water erosion create the channel form for the ephemeral watercourses, which are relatively shallow (<0.5m) and narrow (~1-5m).</p>	
<p>Alluvial soils and deposited materials</p>	<p>Given the arid nature of the climate in the region, the hydrological regime (frequency and duration of flow) of the watercourses are typically ephemeral, flowing only after rainfall events for very short-lived periods (hours to a few days). The limited vegetation cover and exposed nature of the soils means that sediment is transported from the surrounding catchment into the watercourses, making flows relatively turbid (thick sediment laden). As a result, alluvial deposits are apparent in the dry watercourse beds when not in flow. The alluvial deposits included fine to sandy grain sediments, as well as coarse grained calcareous materials. The watercourses can be described as a Section B channel type, given that the section of the particular reach of the watercourses is in a zone of the fluctuating water table and will only have base flow at any point in the channel when the saturated zone is in contact with the channel bed. The base flow is however intermittent, with flow at any point in the channel dependent on the current height of the water table. The gradient of the channel bed is however flat enough for deposition of material to take place.</p>	

	Description of the detail	Photograph
Riparian vegetation	<p>The basal cover could be described as predominantly grassland vegetation, with some scrubland vegetation species also present. The grassland appeared to consist of a mix of graminoid species consisting mainly of <i>Stipagrostis sp.</i> and <i>Schmidtia sp.</i> The scrubland vegetation species observed was mainly <i>Boscia foetida subsp. Foetida</i>, <i>Lycium cinereum</i>, <i>Pappea capensis</i>, <i>Phaeoptilum spinosum</i> and <i>Rhigozum sp.</i> Overall, the vegetation condition appeared to be disturbed as a result of grazing impacts from livestock on the property.</p>	

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

7.5.1 Heritage and the cultural landscape

The area around the study area is very minimally developed with few traces of anthropogenic interventions. The most visually dominant anthropogenic activity, however, is the mining occurring at Gamsberg, just to the north. Several power lines and substations occur in the broader area. These together result in a modern cultural landscape that is far more dominant than the ephemeral traces of historical or prehistoric occupation of the landscape. This does not take away from the potential historical importance of the area surrounding Gamsberg, especially if the massacre mentioned below is indeed proven to have occurred at Gamsberg. This part of the landscape may therefore be associated with living heritage.

There are unconfirmed historical reports that a massacre of Bushmen may have occurred in a kloof of the Gamsberg, but surveys have failed to yield any evidence of this. Morris (2013) seems confident of this event, however, and suggests that the kloof at the south-eastern edge of the inselberg was the location where the killing occurred.

7.5.2. Archaeology

Archaeological remains were found to be very rare. Isolated flaked stone artefacts made in quartz, quartzite and crypto-crystalline silica (CCS) were noted from time to time (less than 10 artefacts), but are of no consequence and are attributed to background scatter. They are likely a mix of Pleistocene and Holocene-aged materials. On the southern boundary of the study area, an isolated lower grindstone was found lying upside down. These artefacts are known to occur on their own and are more often than not found upside down. Without associated finds they are assumed to have just been left because they were too heavy and/or cumbersome to continue carrying.

A few small stone-walled features were noted at a rocky hill 1 km east of the study area. They probably relate to shepherds, either historical or precolonial, although far more likely the former. There were three sections of walling on top of the hill (waypoint 194) and one very small section at the base of the hill to the north (waypoint 192). Further stone walling was noted alongside a small hill to the northeast of the Loop 10 road. It is worth noting, however, that in this landscape the rocky hills acted as landscape foci with the majority of archaeological finds being close to the hills.

About 1.2 km south of the project site an ephemeral artefact scatter was found along the edge of a pan at waypoint 188. The scatter included a small grindstone, two quartz flakes and two ostrich eggshell fragments. It was located on very loose wind-blown sand which indicates that there are very likely further artefacts buried beneath the surface.

Graves

No sign of any graves was identified in the proposed project site, however, approximately 1 km to the east of the site, two likely graves were found alongside a small rocky hill at waypoints 191 (**Figure 7.12**) and 193 (**Figure 7.13**). Both were oriented in an east-west direction. Their age is unknown, but they may well relate to the early colonial period.



Figure 7.12: The likely grave found at waypoint 191.



Figure 7.13: The likely grave found at waypoint 193.

Built environment

No built heritage resources occur in the study area. The nearest building of any sort is a labourer's cottage of unknown age some 4.5 km to the east of the project site.

7.5.3. Palaeontology

Almond (2018) finds that the study area is underlain by Late Caenozoic superficial sediments that are generally of low to very low palaeontological sensitivity. These sediments include wind-blown sands and alluvial and sheetwash gravels. The sands are red Kalahari sands of the Gordonia Formation (to the south of the project site), while the gravels that underlie the site are derived from the local igneous and metamorphic basement rocks. Examination of a borrow pit alongside the Loop 10 gravel road showed that these gravels continue to at least 2 m depth in this area, although they would very likely thin towards the southwest, away from the hills.

7.6. Visual Quality

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

Areas to the south of the project site appear relatively natural, while to the north, east and west there are extensive areas of mining. The small town of Aggeneys lies north east of the project site.

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 site are concentrated to the north-east, north-west and north-east where they form the upper valley slopes and ridgelines. Immediately to the north and north-west, a large rocky outcrop (Gamsberg) rises to approximately 1100 m amsl.

The project site is located within a broad valley that drains towards the Orange River. The project site is set at an elevation of 840m – 870m above mean sea level (amsl).

This landform is likely to have a number of implications for visibility of Aggeneys 1:

- » Given the relatively low nature of the proposed solar PV facility, the small changes in elevation within the generally flat landscape could help provide screening of Aggeneys 1 or could open up views over the proposed arrays; and
- » The scattered inselbergs and particularly the Gamsberg will provide screening for the proposed development.

Nature of development and land uses

The landcover can be divided into the following types:

- » *Natural Area*
- » The main landcover type surrounding the project site 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, which appears to be associated with mining.
- »
- » *Mining*
- » Mine development includes a mine located close and to the west of Aggeneys and the Black Mountain Gamsberg Mine which is an open-pit zinc mine located close and to the north of the project site.

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 taller woody vegetation occurs in limited areas including:

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

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

Linear receptors

Linear receptors include:

- » The N14 that at its closest runs approximately 4.8 km to the north west of the project site. Because this route carries a high proportion of recreational and tourism related traffic it is considered sensitive to potential change in outlook.
- » An un-surfaced local road that runs adjacent to the northern boundary of the project site (i.e. Loop 10 road). This road joins the N14 approximately 4.8km to the north west of the project site. While it is un-surfaced, it serves as the only east – west route in the region, linking a number of regional routes all of which run in a general north – south direction. This road runs for more than 200 km. In this distance there appear to be few settlements or farmsteads that are served by it. It is likely that it is used mainly by local people and mining operators. However, it is also likely to be used by more adventure minded tourists.

Point receptors

Four homesteads have been identified within the approximate limit of visibility of Aggeneys 1. These are likely to be used by local stock farmers who probably will be more concerned with the productivity of the land rather than the outlook. Should any of these homesteads be used for tourism related activities, this will increase sensitivity to landscape change.

The closest homestead is approximately 4.2km from the proposed project.

7.7 Traffic Conditions

A formal gravel access road (Loop 10 Road) currently provides access, from the national road (N14), to the study area. This gravel road then becomes a formal track, leading up to a gate used to access the project site.

The intersection of the access road and the N14 has been recently upgraded to a blacktop surfacing through the maintenance contract on the N14. This access road is currently 8m wide. The Loop 10 Road from the intersection towards the Aggeneys 1 access is a formal gravel graded road with drainage. The soil conditions are soft sand, but with stabilisation, should be adequate to carry the low volume daily loads, with regular maintenance during the construction period.

7.8 Social Context

The project site is located within the Khâi-Ma Non-Urban (NU) area and is situated approximately 11 km south-east of the town of Aggeneys. The demographic data pertaining to Khâi-Ma Non-Urban area, listed as Main Place 368002 from Census 2011, is included in **Table 7.3**.

Table 7.3: Demographic data pertaining to Khâi-Ma Non-Urban area

Geographic area	15 754.25 km ²	
Population	2 148 people	
Population density	0.14/km ²	
Households	995	
Household density	0.06/km ²	
Gender	People	Percentage
Male	1 337	62.24%
Female	811	37.76%
Population Group	People	Percentage
Black African	1 077	50.14%
Coloured	809	37.66%
White	214	9.96%
Other	42	1.96%
Indian or Asian	5	0.23

The dependency ratio, which indicates the burden placed on the working population who support children under 15 years and people over 65 years, is lower in Khâi-Ma Local Municipality at 45.7 than it is across the District and Province, which have respective dependency ratios of 51.2 and 55.7. Between 2001 and 2011

the Northern Cape had a population growth of 1.44% compared to the Namakwa district with a population growth of 0.69% and Khâi-Ma with a growth rate of 0.83% over the same period.

In 2011, the unemployment rate was highest across the Northern Cape at 27.4% and lowest across the Namakwa District at 20.1%. The Khâi-Ma Local Municipality 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 Local Municipality at a rate of 23.6%. The Namakwa District has a youth unemployment rate of 25.4%. At 3.9%, a lower percentage of the population of Khâi-Ma Local Municipality, aged 20 years and older, has no schooling when compared across the Province (11.3%) and District (6.6%).

Khâi-Ma Local Municipality has a marginally smaller average household size at 3.3 and a lower percentage of female headed households at 34.8% when compared across the Provincial and District levels. In respect of dwelling types, 86.1% of dwellings in Khâi-Ma Local Municipality are of a formal type and 46.6% of all dwellings in the area are either owned or are being paid off.

CHAPTER 8: ASSESSMENT OF IMPACTS

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

This assessment has considered the construction of a solar PV facility with a contracted capacity of up to 100MW, within a development footprint of approximately 250ha. The project will comprise the following key infrastructure and components:

- » Arrays of PV panels with a contracted capacity of up to 100MW.
- » Mounting structures to support the PV panels.
- » Cabling between the project components, to be laid underground where practical.
- » On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- » An on-site substation to facilitate the connection between the solar energy facility and the Eskom electricity grid.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing around the project site.

The project site is accessible via an existing gravel road off the N14 national road, which traverses the north-eastern corner of the study area.

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

A development footprint for the solar PV facility within the project site was proposed by the developer through consideration of the sensitive environmental features and areas identified through the pre-feasibility screening desktop study and the BA process (including independent specialist studies). Two facility on-site substation locations were provided by the developer (refer to **Figure 8.1**) for consideration in the BA. A comparative assessment of the alternatives for the project is undertaken as part of the impact assessment in order to identify the preferred alternatives from an environmental perspective.

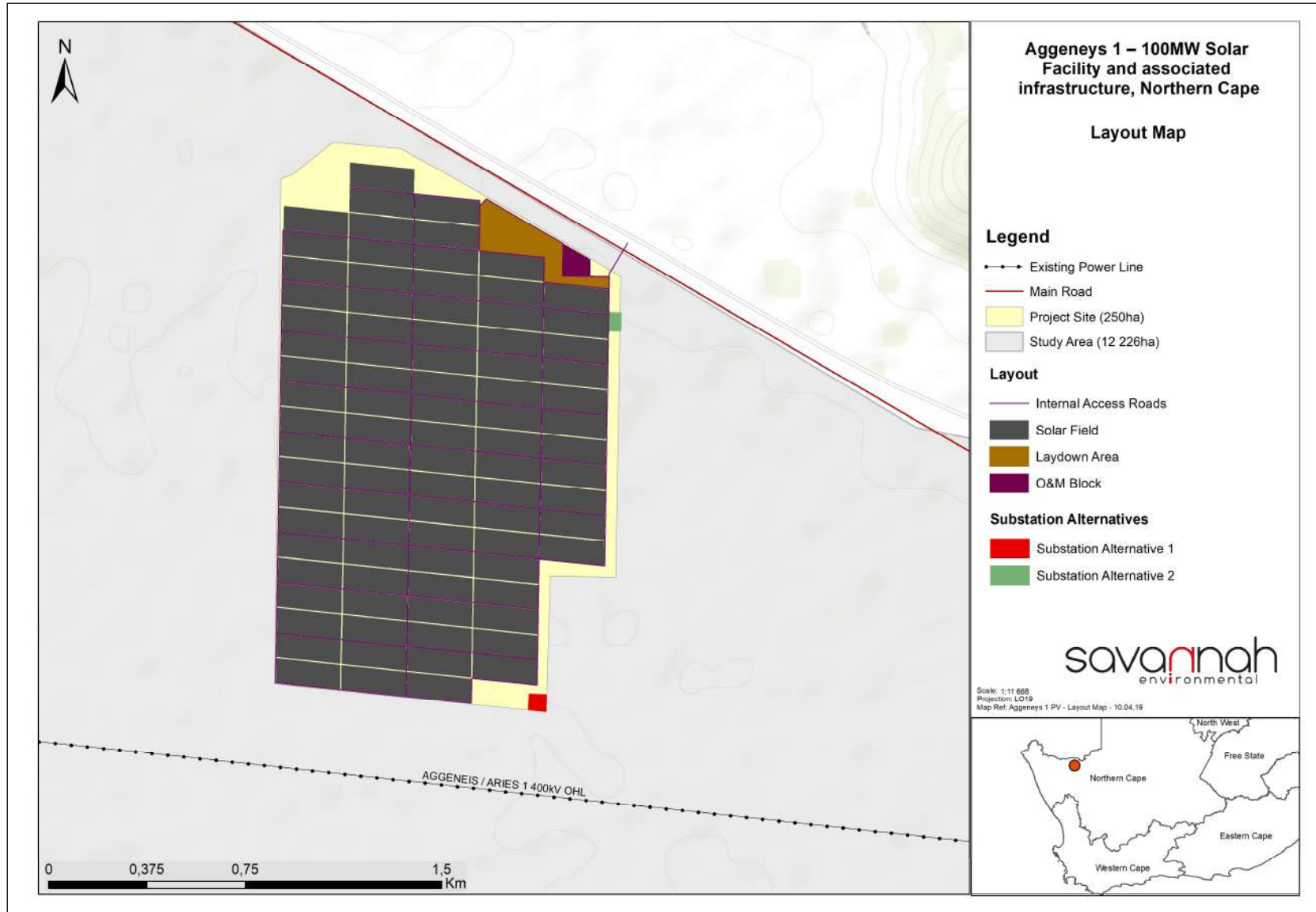


Figure 8.1: Map illustrating the proposed layout (development footprint) for Aggeneys 1 within the project site, as well as the two on-site substation location alternatives

The development of Aggeneys 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 Aggeneys 1 is estimated at 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 line¹⁹. The operation phase of Aggeneys 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 and ecological processes, 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 final 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 avoided, managed or mitigated.	The impacts and risk associated with the development of Aggeneys 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 are

¹⁹ The grid connection point for Aggeneys 1 will be the existing Aggeneis Main Transmission Substation (MTS). In order to connect Aggeneys 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 single-circuit up to 220kV overhead power line, which will be assessed as part of a separate Basic Assessment process.

Requirement	Relevant Section
	included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
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 Aggeneys 1 are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
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 Aggeneys 1 are included in sections 8.3.3, 8.4.3, 8.5.3, 8.6.3, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.
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 Aggeneys 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, 8.7.2, 8.8.2, 8.9.2 and 8.10.2
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 Aggeneys 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, 8.7.3, 8.8.3, 8.9.3 and 8.10.3..
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, 8.7.3, 8.8.3, 8.9.3 and 8.10.3.

8.2. Quantification of Areas of Disturbance on the Site

Site-specific impacts associated with the construction and operation of Aggeneys 1 relate to the direct loss of vegetation and species of special concern, disturbance of animals and loss of habitat, and impacts on soils. In order to assess the impacts associated with Aggeneys 1, it is necessary to understand the extent of the affected area.

A project site of 250ha has been identified within the study area (i.e. ~12 226ha) for the development of the solar PV facility. The development footprint (i.e. actual area of disturbance) will house the PV panels and other associated infrastructure and will be entirely contained within the project site. Therefore, considering the above the area of disturbance within the larger study area (i.e. ~12 226ha) will be ~2% of the total area/affected property.

Two alternative on-site substation locations are being assessed for Aggeneys 1. The on-site substation will serve as a connection point between the solar PV facility and the overhead power line. The on-site substation will occupy an area up to 1ha in extent.

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

Potential ecological impacts resulting from the development of Aggeneys 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 CBAs and broad-scale ecological processes. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix D** for more details).

8.3.1 Results of the Ecological Impact Assessment

The Aggeneys 1 project site is restricted to low sensitivity areas with a very small extent of medium sensitivity areas associated with some small ephemeral washes in the northeast of the site. The project site has 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 Aggeneys 1. It is important to note that the final project site was identified based on a site screening exercise that included the whole Bloemhoek 61 property with the aim of identifying those areas where there was the least conflict with biodiversity pattern and process.

Sensitive features present in the area that would not be impacted by the Aggeneys 1 development footprint include the dune system and deep sands of the Koa River Palaeovalley south of the project site, the mountains north of the study area and several areas of Aggeneys Gravel Vygieveld on the plains and lower slopes of the hills north and west of the site. There are no highly significant biodiversity features within the project site and no likely impacts associated with the development that cannot be mitigated to a low level.

Figure 8.2 below illustrates the ecological sensitivity associated with the Aggeneys 1 project site. Both substation location alternatives are also located within areas considered to be of a low ecological sensitivity.

8.3.2 Description of Ecological Impacts

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

Impacts on vegetation and protected plant species

Several protected species occur and would be impacted by the development of Aggeneys 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.

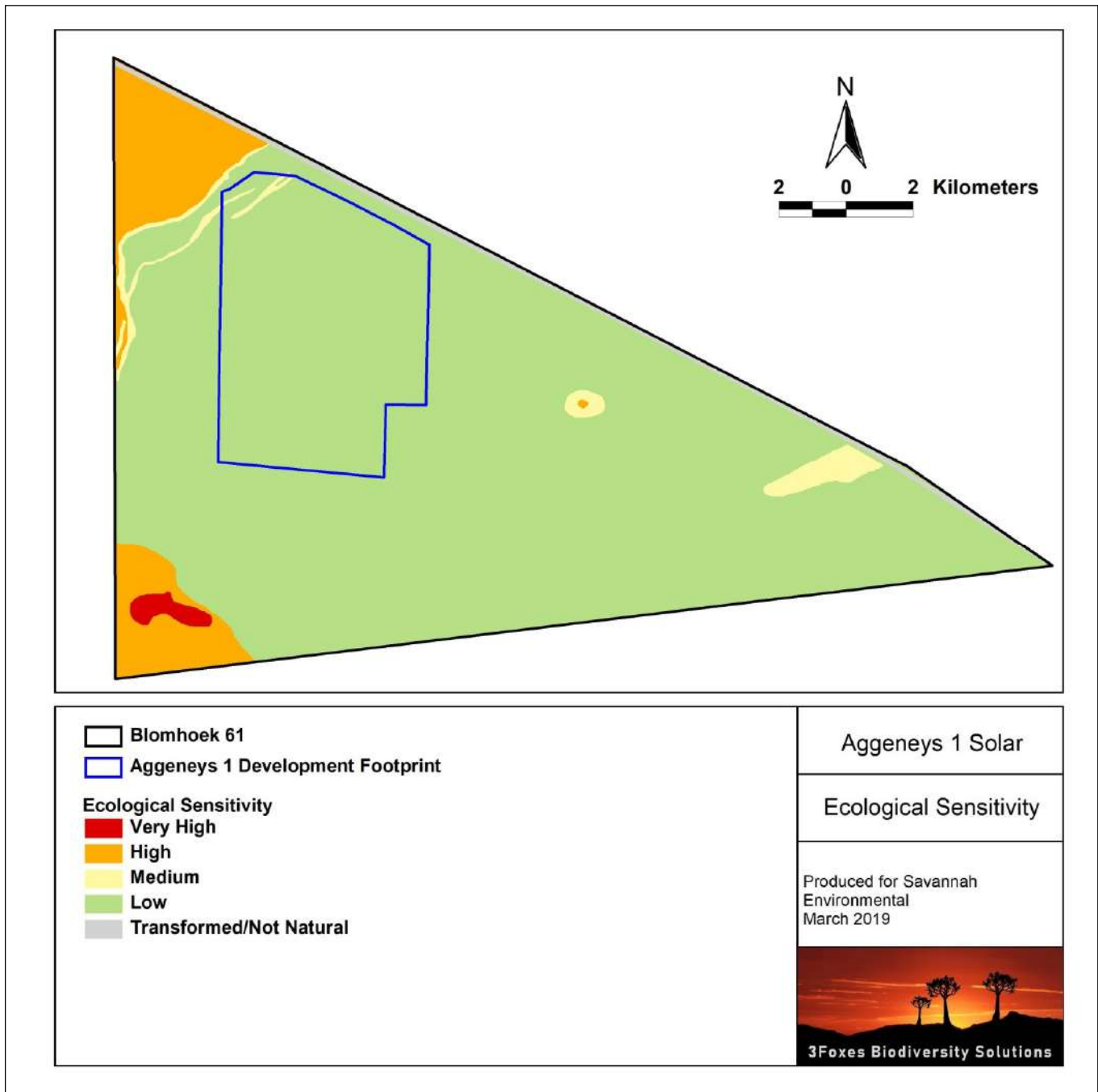


Figure 8.2: Ecological sensitivity map of the Aggeneys 1 project site. No areas of high ecological sensitivity are present within the project site

Direct faunal impacts

Increased levels of noise, pollution, disturbance and human presence during construction will be detrimental to 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 construction as well as operation and this impact will therefore be assessed for the construction and operation phase.

Impact on CBAs and broad-scale ecological processes

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, this is a potential cumulative impact of the development that is assessed. This impact will be assessed as part of the Cumulative Impact Assessment included in Chapter 9 of this BA Report.

The project site was surveyed on 16 June 2018 and 5 to 8 April 2019. Although conditions were not ideal for the field assessment, the consultant has extensive experience in the area, having worked on most of the adjacent properties on solar or mining projects over the past few years. This information was used to inform the current study where appropriate. This served to reduce the required assumptions for the study to an acceptable level.

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

The impacts assessed below apply to the project site and all alternatives proposed and assessed for Aggeneys 1.

Planning and Construction Phase Impacts

Nature: <i>Impacts on vegetation and listed or protected plant species due to construction activities</i>		
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 (5)	Moderate (4)
Probability	Definite (5)	Definite (5)
Significance	Medium (50)	Medium (45)
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"> » Pre-construction walk-through of the facility's final layout 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. » Vegetation clearing to commence only after walk-through has been conducted and necessary permits obtained. » Pre-construction environmental induction for all construction staff on site 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) to provide supervision and oversight of vegetation clearing activities. » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared. 		

- » All construction vehicles should adhere to clearly defined and demarcated roads. No off-road driving to be allowed outside of the construction area.
- » Temporary laydown areas should be located within previously transformed areas or areas that have been identified as being of 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: *Direct faunal impacts due to construction activities*

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 (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	Medium (32)	Low (28)
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:

- » All personnel should 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 should be removed to safety by an appropriately qualified environmental officer.
- » All construction vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises.
- » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should 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 should 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:		
<ul style="list-style-type: none"> » Any potentially dangerous fauna such as snakes or fauna threatened by the maintenance and operational activities should be removed to a safe location. » 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. » All hazardous materials should be stored in the appropriate manner to prevent contamination of the site. Any accidental chemical, fuel and oil spills that occur at the site should be cleaned up in the appropriate manner as related to the nature of the spill. » All vehicles accessing the site should 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 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. 		
Residual Impacts:		
Disturbance from maintenance activities will occur at a low level with the result that disturbance would be largely restricted to the site.		

Nature: <i>Habitat degradation due to erosion and alien plant invasion</i>		
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 should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for annual monitoring and rehabilitation. » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques. » There should 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 should take place according to the Alien Invasive Management Plan. 		

- » Regular (annual) monitoring for alien plants during operation 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 should 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 are likely to occur even with the implementation of control measures but would have a low impact if effectively managed.

Decommissioning Phase Impacts

Nature: Habitat degradation due to erosion and alien plant invasion

Disturbance created during decommissioning will leave the site 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 (32)	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:

- » Erosion management at the site should take place according to the Erosion Management Plan and Rehabilitation Plan. This should make provision for monitoring of the site for at least 5 years after decommissioning.
- » All erosion problems observed should be rectified as soon as possible, using the appropriate erosion control structures and revegetation techniques.
- » There should 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 should take place according to the Alien Invasive Management Plan. This should make provision for alien monitoring and management for at least 5 years after decommissioning.
- » Regular (annual) monitoring for alien plant during operation to ensure that no erosion problems have developed as result of the disturbance, as per the Alien Management Plan for the project.
- » Woody aliens should 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 should be restored to something useable by the local fauna.	
Mitigation:		
<ul style="list-style-type: none"> » All personnel should 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 should be removed to safety by an appropriately qualified environmental officer. » All vehicles should adhere to a low speed limit to avoid collisions with susceptible species such as snakes and tortoises. » All hazardous materials should 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 should be cleaned up in the appropriate manner as related to the nature of the spill. » The site should 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 Comparative Assessment of Alternatives

Both on-site substation locations are situated on very plains habitat. As a result, there are no specific preferences with regards to the two substation alternatives. The direct and indirect impacts associated with both alternatives will be similar. Both alternatives are located within a relatively uniform habitat type with no identified sensitive ecological features and, as such, both alternatives will have low ecological impacts.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Ecology		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » Low impact » Low ecological sensitive area » Acceptable » Preferred due to technical considerations 	<ul style="list-style-type: none"> » Low impact » Low ecological sensitive area » Acceptable

8.3.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of ecological impacts of Aggeneys 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, 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:

- » Pre-construction walk-through of the facility's final layout 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.
- » Vegetation clearing to be kept to a minimum. No unnecessary vegetation to be cleared.
- » Any fauna threatened by the construction activities should be removed to safety by an appropriately qualified environmental officer.
- » 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 the Aggeneys 1 solar PV facility 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 project site is considered to be of very high avifaunal sensitivity, as this supports a healthy resident population of the Vulnerable Red Lark. The presence of the Red Lark was confirmed within the study area, but outside of the project site (refer to **Figure 8.3**). The plains habitat does not currently appear to support any Red Larks based on the field surveys, and since it is a widely distributed habitat, it is considered to have a low avifauna sensitivity. There are parts of the plains habitat, to the north and southeast, which are considered to be of medium avifauna sensitivity due to the presence of greater structural diversity (presence of *Boscia* trees), presence of previously used raptor nests in *Boscia* trees, and traversing drainage lines. A small rocky outcrop located east of and outside of the project site has a high sensitivity, as this provides some habitat heterogeneity within the plains habitat and supports species such as Spotted Eagle-Owl (*Bubo africanus*). Similarly, a pan located to the south of the project site has a very high avifaunal sensitivity as it provides a unique habitat within the plains habitat but lies well beyond the development footprint of Aggeneys 1.

It is likely that development of the solar PV facility in the plains habitat with low sensitivity would generate the least impact on avifauna, provided that suitable mitigation measures are implemented during construction and operation. While the development within this low sensitivity plains habitat would result in some habitat loss for several species of widely occurring avifauna of local significance, it will not necessarily impact negatively on red-listed avifaunal species, which appear to occur sparsely within the study area.

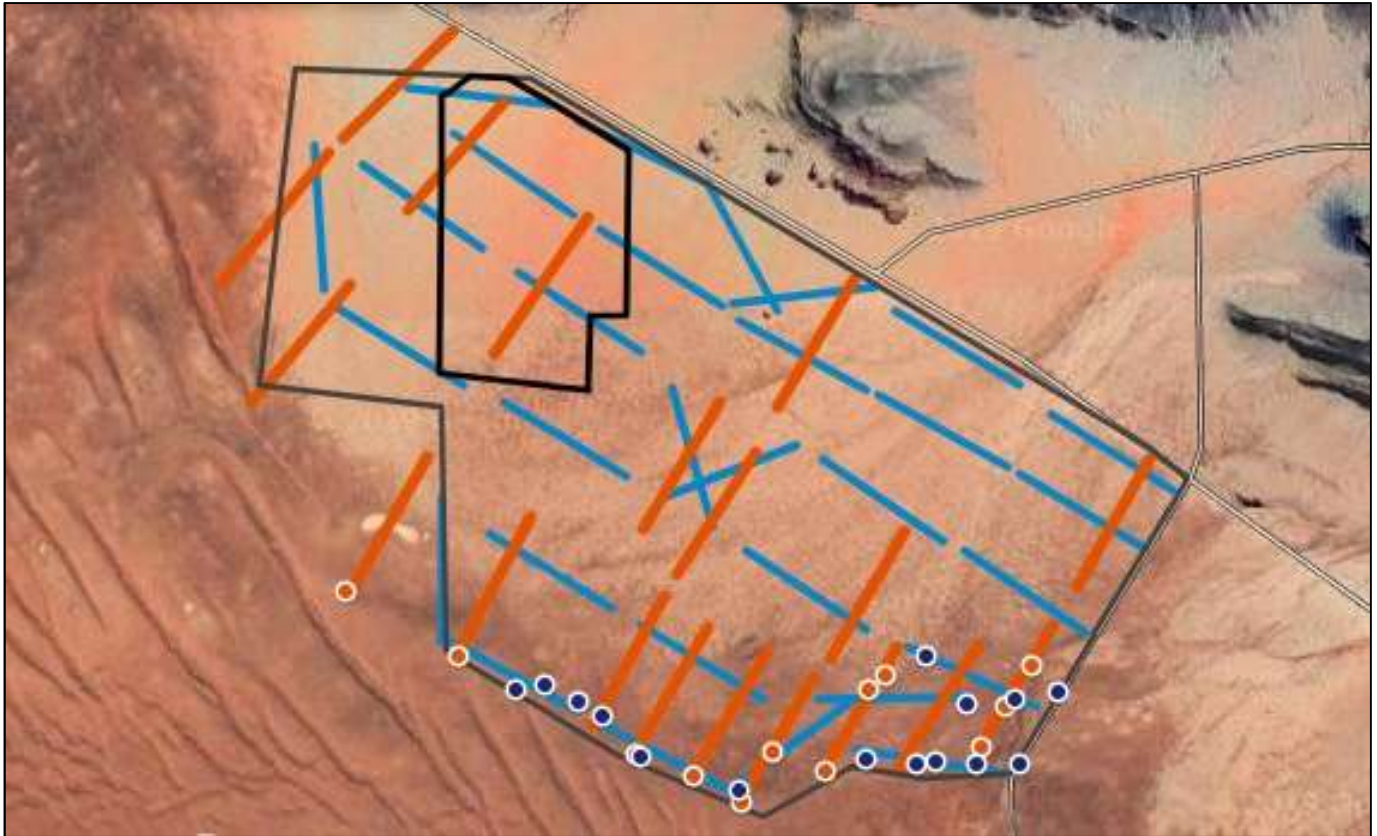


Figure 8.3: Illustration of the Red Lark sightings in winter (blue dots) and in summer (orange dots). Red Larks were clearly restricted to the dune habitat while being completely absent from the plain habitat associated with the project site in both seasons. Transects walked in winter are illustrated in blue lines and transects walked in summer are illustrated in orange lines.

Figure 8.4 provides an avifaunal sensitivity map for the Aggeneys 1 project site, inclusive of the proposed development footprint being assessed.

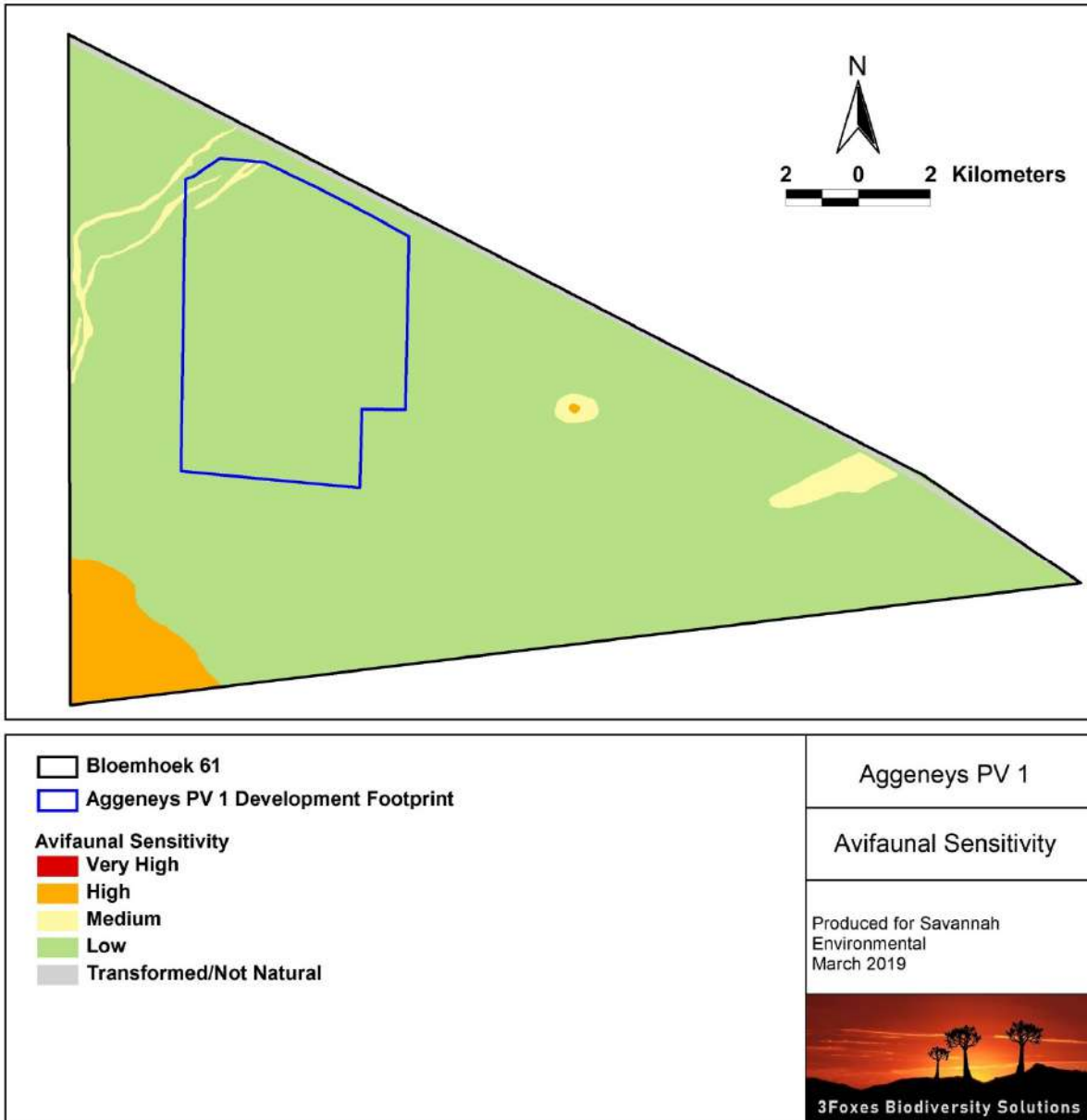


Figure 8.4: Map illustrating the avifaunal sensitivity within the Aggeneys 1 project site

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 and operation 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 fauna and flora 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 fauna 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 project site, especially red-listed avifaunal species which are less tolerant to disturbances.
- » Mortality among the local avifauna may result due to direct collisions with solar panels or entrapment along the fenced boundaries of the solar PV 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.

Decommissioning Phase

- » The decommissioning phase will result in disturbance and loss of avifaunal microhabitats due to removal and clearing of the solar field and associated infrastructure. Disturbances will be caused by increased traffic of vehicles, and particularly heavy machinery used for clearing the infrastructure.

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 declines on the project site and 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, Tractrac Chat, Karoo Chat and Mountain Wheatear *Oenanthe monticola*. The loss of habitat will be permanent while disturbance may be continuous during the operation phase of the solar PV facility. Other impacts such as disturbances caused by reflective panels are not likely to have any significant impact on these small species. The impacts in general can be expected to be minimal as these smaller species are far less susceptible to the associated impacts than larger species.

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, though seemingly scarce at the project site, may, however, be at more risk based on the 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 and operation (with and without mitigation)

Construction Phase Impacts

Nature: <i>Direct avifauna impacts during construction</i>		
Direct avifaunal impacts during construction 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 project site 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 project site 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 awareness about not 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 ECO 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. Double-fence designs where the inner electric fence is positioned within one (1) meter of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped between these. 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 operational 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 project site 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 manner 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 exclude and 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 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.

- » Environmental induction for all personnel on site to ensure that basic environmental principles are adhered to, and awareness about not 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 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 Comparative Assessment of Alternatives

The two on-site substation locations proposed as part of the development footprint are both located within an area of low avifauna sensitivity and therefore both proposed locations are considered to be acceptable from an avifaunal perspective.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Avifauna		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » Low impact » Low avifauna sensitive area » Acceptable » Preferred due to technical considerations 	<ul style="list-style-type: none"> » Low impact » Low avifauna sensitive area » Acceptable

8.4.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of avifauna impacts associated with Aggeneys 1 will be medium to low, depending on the impact being considered. Areas of medium sensitivity have been identified within the development

footprint, with no areas of high sensitivity present which will be impacted by the development of Aggeneys 1.

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 project site should be considered 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. 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. Double-fence designs where the inner electric fence is positioned within one (1) meter of the outer mesh fence may result in medium-sized non-passerine species colliding with either fence when trapped between these. 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.
- » 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.
- » 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.)

8.5. Potential Impacts on Freshwater Features

The majority of the impacts on freshwater features associated with the development would occur during the construction phase as a result of the disturbance associated with construction activities and the impacts thereof on the freshwater features present within the Aggeneys 1 development footprint. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix F** for more details).

8.5.1 Results of the Freshwater Impact Assessment

Six ephemeral²⁰ watercourse reaches were identified within the development footprint which can be classified as Lower Foothill Rivers in terms of the national classification system²¹. The ephemeral watercourses emanated from culverts under the Loop 10 road north of the study area boundary, which allows water run-off from the inselbergs north of the study area to drain through onto the project site (**Figure 8.5**).

A buffer zone of 15m for the ephemeral watercourses is to be implemented. With regards to the buffer zone, the PV panels can span over the ephemeral watercourses given the ephemerality of the watercourses and limited vegetation cover. However, the mounting structures of the PV panels must not be placed directly inside the watercourses but are permissible in the 15m buffer zone of the watercourses. The mounting structures should also be limited to the bare minimum within the buffer zone where required. Internal roads and underground cables are also permissible through the watercourses provided that the necessary water use license or general authorisation is obtained from the Department of Water and Sanitation. No other buildings or infrastructure are allowed in the watercourses and the associated 15m buffer zone.

8.5.2 Description of Freshwater Impacts

Potential impacts on the 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:

» *Impacts on the vegetation of the ephemeral watercourses*

Based on the development footprint, the PV arrays are planned over the watercourses and buffer zones identified. Vegetation clearance in the watercourses can be expected for the PV array area.

» *Impacts on the water quality of the ephemeral watercourses*

The mounting structures of the PV panel arrays may be required within the stipulated 15m buffer zone of the watercourses, but are not to be placed directly in the watercourse. With the construction of the mounting structures, the impacted area is understood to be limited to the immediate area of the mounting structure in which piling may take place. There will be some disturbance of the soils and associated clearance which will expose soils leaving the areas vulnerable to sedimentation and erosion. Sedimentation can result directly or indirectly via stormwater run-off.

In addition to the above, with the presence and movement of construction vehicles and associated machinery, there is a potential for compaction, as well as fuels and oils to spill or leak either directly into the watercourses or indirectly via stormwater run-off.

²⁰ Ephemeral water features flow for very short periods following rainfall. Outside of these rainfall periods, the surface remains dry.

²¹ These features are very typical for the Northern Cape and the site is not considered to be unique considering the presence of these systems.

Lastly, sanitation will be required for workers during the construction phase. Temporary sanitation facilities are likely to be utilised. Spillages or leaks from temporary sanitation facilities may result during the construction phase, which can enter into the ephemeral watercourses directly or via stormwater run-off within the local catchment area.

» *Impacts on the geomorphology of the ephemeral watercourses*

Internal roads will be required for the PV array areas through the watercourses. Compaction of the bed and channels of the ephemeral watercourses due to movement of vehicles is likely to take place.

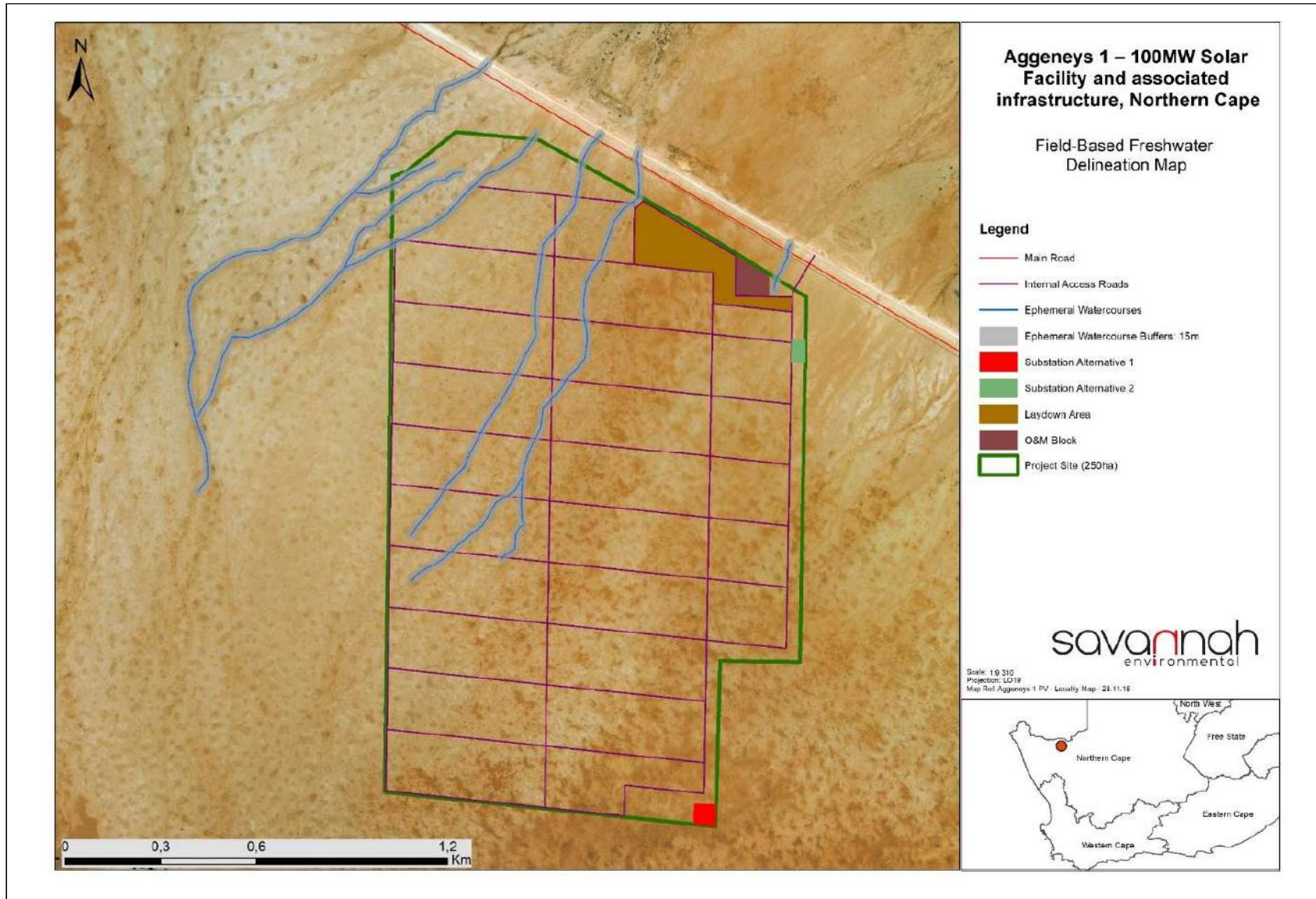


Figure 8.5: Freshwater features sensitivity map for the Aggeneys 1 project site

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

» *Vehicle movement in the watercourses during monitoring*

Vehicle movement through the ephemeral watercourses via internal roads is likely to be required during the operation phase. This activity will be associated with impacts to the watercourses in terms of compaction and possible erosion soils.

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.

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

Construction Phase Impacts

Nature: <i>Potential impacts associated with vegetation clearance in the watercourses</i>		
Clearance of vegetation associated with the ephemeral watercourses during the construction phase.		
	Without mitigation	With mitigation
Extent	Project site (1)	Project site (1)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Highly Probable (4)	Highly Probable (4)
Significance	32 (Medium)	24 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Limited	Limited
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » No laydown areas, operation and maintenance buildings are allowed in the watercourse areas and associated buffer zones. » No in-stream vegetation is to be removed unnecessarily. » Where in-stream vegetation is to be cleared, vegetation is not to be completely removed. Rather, vegetation should be trimmed to 300mm height above ground level to ensure surface roughness is maintained » The environmental officer (EO) must be present when vegetation is trimmed to supervise this process and ensure compliance with this control measure. » Alien invasive and control management plan is to be formulated and implemented. » No construction in the watercourses is to take place over the two rain peak periods associated with the watercourses (i.e. during November & between February - March). This will avoid impacts to flow, as construction will be limited to periods when the watercourses are likely to be dry. 		
Residual Impacts:		
No residual impacts are expected after implementation of mitigation measures.		

Nature: <i>Potential impacts associated with water quality in the watercourses</i>
Sedimentation of watercourses and associated erosion due to increased run-off and clearance of vegetation in the immediate catchment area. Oil and fuel leaks and spills directly in the watercourses or indirectly via stormwater run-off. Temporary sanitation facilities may pollute the ephemeral watercourses.

	Without mitigation	With mitigation
Extent	Project site (1)	Project site (1)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	High (8)	Low (4)
Probability	Probable (3)	Improbable (2)
Significance	30 (Medium)	12 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Limited	Limited
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Where mounting structures are within the buffer zone of the ephemeral watercourses, these areas need to be temporarily bunded using an appropriate structure (i.e. silt nets, sand bags, pegged wooden planks) until construction is complete at each point. » All soil stockpiles within 100m of a watercourse must be bunded using an appropriate structure (i.e. silt nets, sand bags, pegged wooden planks). » All vehicles and machinery must be checked for leaks before being allowed to operate. Should leaks be detected, the relevant vehicles and machinery must be repaired before being allowed to operate. » No storage of fuels, oils or any other hazardous substance are allowed directly in the watercourses or within 100m from any watercourse. » General storage of fuels, oils and any other hazardous substances must be contained in bunded areas. » No construction in the watercourses is to take place over the two rain peak periods associated with the watercourses (i.e. during November & between February - March). This will avoid impacts to flow, as construction will be limited to periods when the watercourses are likely to be dry. » Temporary sanitation may not be placed directly or within 100m of any ephemeral watercourse. » Temporary sanitation facilities must be regularly checked for leaks and spillages, and repaired where any leakages are detected before being allowed for use. 		
Residual Impacts:		
No residual impacts are expected after implementation of mitigation measures.		

Nature: Potential impacts associated with movement of vehicles in the watercourses		
Soil compaction of the bed of the ephemeral watercourses are expected with the movement of vehicles through the ephemeral watercourses during the construction phase.		
	Without mitigation	With mitigation
Extent	Project site (1)	Project site (1)
Duration	Very short-term (1)	Very short-term (1)
Magnitude	Moderate (6)	Low (4)
Probability	Definite (5)	Highly probable (4)
Significance	40 (Medium)	24 (Low)
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"> » Suitable crossings through the watercourses are to be implemented where required. In general, it is not expected that hard structures (road culverts) will be required in the watercourses, and that the establishment of vehicle tracks will be sufficient. However, it is recommended that gravel be used through the watercourses to assist with stabilisation and to prevent erosion within the watercourses. » The necessary water use license or general authorisation must be obtained from the Department of Water and Sanitation prior to commencing with construction activities. 		

- » Internal roads are not to be tarred.
- » Vehicle movement through the watercourses is to be limited as far as possible.
- » All internal roads through watercourses are to be monitored for erosion regularly during the construction phase.
- » Where erosion takes place, the environmental control officer (ECO) must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.
- » Construction stormwater management plan must be compiled by a suitable engineer to address general drainage and run-off issues.
- » Post-construction monitoring of the watercourses by the ECO is also required to determine the occurrence of erosion following the completion of construction.

Residual Impacts:

No residual impacts are expected to occur after implementation of mitigation measures.

Operation Phase Impacts

Nature: *Potential impacts associated with vehicle movement in the watercourses*

Soil compaction of the bed of the ephemeral watercourses are expected with the movement of vehicles through the ephemeral watercourses during the operation phase of the solar PV facility.

	Without mitigation	With mitigation
Extent	Project site (1)	Project site (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Minor (2)
Probability	Definite (5)	Highly Probable (4)
Significance	55 (Medium)	28 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	

Mitigation:

- » The necessary water use license or general authorisation must be obtained from the Department of Water and Sanitation for impacts to a watercourse.
- » Vehicle movement through the watercourses is to be limited as far as possible.
- » Internal roads are not to be tarred.
- » Crossing through watercourses must be catered for in the design of the solar PV facility, and must include for appropriate gravel beds through the watercourses to prevent erosion and to stabilise the bed of the watercourses.
- » All internal roads through watercourses are to be monitored for erosion annually during the operation phase.
- » Where erosion takes place, the managing agent must inspect the degree of erosion and propose suitable mitigation measures to prevent further erosion.

Residual Impacts:

No residual impacts are expected after implementation of mitigation measures.

8.5.4 Comparative Assessment of Alternatives

The two on-site substation locations proposed as part of the development footprint are both located within areas where no ephemeral watercourses or other freshwater features are located and, therefore, no infringement on these features is expected to occur. Therefore, both proposed locations are considered to be acceptable in terms of infringement on freshwater features.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Freshwater		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » No impact expected » Complete avoidance of freshwater features » Acceptable » Preferred due to technical considerations 	<ul style="list-style-type: none"> » No impact expected » Complete avoidance of freshwater features » Acceptable

8.2.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts on freshwater features for Aggeneys 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:

- » The PV panels can span over the ephemeral watercourses given the ephemerality of the watercourses and limited vegetation cover. However, the mounting structures of the PV panels must not be placed directly inside the watercourses, but are permissible in the 15m buffer zone of the watercourses. The mounting structures should also be limited to the bare minimum within the buffer zone where required.
- » Internal roads and underground cables are also permissible through the watercourses provided that the necessary water use license or general authorisation is obtained from the Department of Water and Sanitation.
- » No other buildings or infrastructure are allowed in the watercourses and the associated 15m buffer zone.
- » A construction and operation stormwater management plan must be compiled by a suitable engineer to address general drainage and run-off management.
- » An alien invasive and control management plan is to be compiled for the construction and post-construction phases by a suitably qualified ecological specialist, and implemented accordingly.
- » Prior to construction, a risk assessment is to be undertaken for the road crossings through the ephemeral watercourses and for the development of the PV arrays over the ephemeral watercourses. This is to be undertaken to determine the need for appropriate water use licensing with the Department of Water and Sanitation for such activities.

8.6. Assessment of Impacts on Soil and Agricultural Potential

The impact of Aggeneys 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 Aggeneys 1 project site 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 project site and the

soils are of moderate potential at best due mainly to 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 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 project site, can be identified.

In general, the soils that do occur within the study 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.

The soils present in the study 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 topsoils, 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 Aggeneys 1 from a soil perspective; these impacts include:

» *Loss of agricultural land*

In most environmental investigations, 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, 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 would be due to the 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 and operation (with and without mitigation)

Nature: <i>Loss of potentially productive agricultural land</i>		
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	18 (Low)	14 (Low)
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 impacts 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	64 (High)	10 (Low)
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.		

8.6.4 Comparative Assessment of Alternatives

No high potential soils or productive cultivated areas occur within the development footprint, or within the two on-site substation location alternatives. Therefore, the placement of the on-site substations within either of the preferred locations will be acceptable from a soils and agricultural potential perspective.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Soils and Agricultural Potential		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » No impact » Acceptable » Preferred due to technical considerations 	<ul style="list-style-type: none"> » No impact » Acceptable

8.6.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of Aggeneys 1 is expected to have a low impact on soils and agricultural potential. From the outcomes of the study undertaken, it is concluded that the solar PV facility can be developed and impacts on soils managed by taking the following into consideration:

- » Avoid any cultivated land (if present).
- » 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

Negative impacts on heritage resources will be due to loss of archaeological and palaeontological resources and an impact on the cultural landscape during the construction phase of Aggeneys 1. Potential impacts and the relative significance of the impacts are summarised below (refer to **Appendix I**).

8.7.1 Results of the Heritage Impact Assessment (including archaeology and palaeontology)

No heritage resources were identified within the development footprint, although several isolated stone artefacts attributable to background scatter were noted.

The area around the study area is very minimally developed with few traces of anthropogenic interventions. The most visually dominant anthropogenic activity, however, is the mining occurring at Gamsberg, just to the north. Several power lines and substations occur in the broader area. These together result in a modern cultural landscape that is far more dominant than the ephemeral traces of historical or prehistoric occupation of the landscape. This does not take away from the potential historical importance of the area surrounding Gamsberg. This part of the landscape may therefore be associated with living heritage.

Archaeological remains were found to be very rare. Isolated flaked stone artefacts made in quartz, quartzite and crypto-crystalline silica (CCS) were noted from time to time (less than 10 artefacts), but are of no consequence and are attributed to background scatter.

No sign of any graves was identified in the proposed project site, however, approximately 1km to the east of the site, two likely graves were found alongside a small rocky hill. No built heritage resources occur in the project site.

The development area is underlain by Late Caenozoic superficial sediments that are generally of low to very low palaeontological sensitivity. These sediments include wind-blown sands and alluvial and sheetwash gravels.

8.7.2 Description of the Heritage Impacts

Impacts to heritage (including archaeology and palaeontology) will occur mainly during the construction phase of the solar PV facility. The potential impacts expected to occur include impacts to paleontological resources, impacts to archaeological resources and graves and impacts to the cultural landscape. These are described below.

» *Impacts to palaeontological resources*

No significant impacts to palaeontological resources are expected, primarily because of the very low probability of fossils actually occurring. If impacts did occur, they would be during the construction phase with no impacts possible during later phases. Rescue of fossils discovered during construction through the implementation of a chance finds procedure would slightly reduce the potential magnitude of impacts, but this makes little difference to the overall assessment. It should be noted that, although impacts with mitigation may still be negative, the possibility of positive impacts occurring does exist if workers are vigilant and protect fossils in situ so that the maximum amount of contextual information can be recorded when the fossil is rescued.

» *Impacts to archaeological resources and graves*

No significant impacts to archaeological resources are expected, primarily because of the very low probability of impacts to culturally significant sites. No significant sites were located within the development footprint. The only possible impact of minor significance would be if people visited the rocky hills of the area and disturbed the archaeological features (including graves). The chance of this happening is rated as improbable, and with awareness training provided by the ECO this would become very improbable.

» *Impacts to the cultural landscape*

Impacts to the cultural landscape will occur but because of existing impacts (power lines, a substation and mining) in the area this impact is not considered to be of great significance and is not a fatal flaw. Importantly, the gravel road past the project site is not considered to be a scenic route and the site is quite far from the N14. The landscape is largely natural with anthropogenic features, aside from the modern ones, being poorly represented. Clustering of landscape impacts is generally preferred which means that this location, quite close to a large substation and mining area, is appropriate for electrical development. Only one potential issue has been identified and this relates to a possible San massacre site located some 5 km to the east of the project site. Impacts to this cultural landscape element are unlikely to be significant due to distance and other closer and more significant disturbances. There are no practical mitigation measures to screen the proposed development and the significance therefore remains the same before and after mitigation.

8.7.3 Impact tables summarising the significance of impacts on heritage resources related to the solar PV facility and associated infrastructure during construction (with and without mitigation)

Only construction phase impacts on heritage resources are expected to occur.

Nature: <i>Potential impacts to palaeontological resources</i>		
Fossils may be impacted during any excavation work for foundations or electrical cabling.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)

Duration	Permanent (5)	Permanent (5)
Magnitude	Minor (2)	Minor (1)
Probability	Very improbable (1)	Very improbable (1)
Significance	8 (Low)	7 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
» Implement a chance fossil find procedure to ensure recovery of isolated fossils found during construction.		
Residual:		
It is never possible to locate and rescue all isolated fossils, especially when they are likely to be extremely sparse. Even with some fossils rescued there will always be some lost.		

Nature: *Impacts to archaeological resources and graves*
Archaeological stone artefacts and/or graves may be impacted during any excavation work for foundations or electrical cabling.

	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Permanent (5)	Permanent (5)
Magnitude	Low (4)	Minor (1)
Probability	Improbable (2)	Very improbable (1)
Significance	20 (Low)	7 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
» Ensure that the rocky hills in the area with their archaeological features (including graves) are not disturbed.		
» Report any dense concentrations of artefacts seen during construction activities (although the chances of such material being present are virtually zero).		
Residual:		
No sampling of archaeological resources has been suggested because they have insufficient cultural value. As such, the few isolated artefacts present would be lost. This is of no consequence.		

Nature: *Impacts on the cultural landscape*
The cultural landscape would be impacted through the addition of electrical/industrial infrastructure to a landscape that is generally natural and rural in character.

	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Low (4)
Probability	Definite (5)	Definite (5)
Significance	50 (Medium)	50 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	

<p>Mitigation:</p> <ul style="list-style-type: none"> » Ensure that best practice measures such as minimising the area of disturbance and rehabilitating (where appropriate) timeously are implemented.
<p>Residual:</p> <p>Because it is not possible to screen the solar PV facility, there will always be a residual impact but, due to the existing visual impacts in the area, this is not considered significant.</p>

8.7.4 Comparative Assessment of Alternatives

The two on-site substation location alternatives have no specific impacts associated with them. Both alternatives are considered to be acceptable and the impacts associated with both locations are regarded as identical.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Heritage		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » No impact » Acceptable » Preferred due to technical considerations 	<ul style="list-style-type: none"> » No impact » Acceptable

8.7.5 Implications for Project Implementation

With the implementation of mitigation measures by the developer, contractors, and operational staff, the significance of impacts of Aggeneys 1 will be low or medium, depending on the impact being considered. From the outcomes of the heritage assessment, it is concluded that that the development of the solar PV facility and associated infrastructure is acceptable.

The following recommendations need to be implemented as part of the development:

- » Monitoring would be required is to ensure that the small rocky hill and associated no-go area to the east of the site remains undisturbed throughout the duration of the project. This will be the responsibility of the ECO.
- » If any change in the footprint occurs, then an archaeologist should be consulted for an opinion on whether a survey is required.
- » If any archaeological or palaeontological material or human burials are uncovered during the course of development then work in the immediate area should be halted. The find would need to be reported to the heritage authorities and may require inspection by an archaeologist. Such heritage is the property of the state and may require excavation and curation in an approved institution.
- » Implement a chance fossil find procedure to ensure recovery of isolated fossils found during construction.

8.8. Assessment of Visual Impacts

Negative impacts on visual receptors will occur during the undertaking of construction activities and the operation of Aggeneys 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 fact that the terrain is relatively flat will mean that the solar PV facility is likely to be viewed in profile by all identified receptors within the area. It will therefore be seen as a dark line in the landscape. Distance will dictate how obvious the dark line is.

The surrounding landscape has been shown to generally have a relatively low level of visual absorption capacity. This means that relatively unbroken views of Aggeneys 1 are likely to be possible.

Due to its tourism importance, the N14 is likely to be one of the most sensitive visual receptors. 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 substation (in either location) is not likely to be highly obvious. It may however be visible above the height of the PV array.

The Loop 10 road, located along the northern boundary of the project site, is likely to be largely used by local people and mine operators but it may also be used by a small percentage of tourism related traffic. The Loop 10 road is however not considered a scenic route. The PV array will be orientated towards the road. The PV array and onsite substation will therefore be obvious from the road, with the array being highly obvious. The impact of the substation will be subject to the alternative that is selected. On-site substation location Alternative 2, being located adjacent to the road will be highly obvious, whereas Alternative 1 being located approximately 2km from the road and partially screened by the solar array, is unlikely to be highly obvious.

Due to the fact that the majority of adjacent land is subject to mining, there are very few homesteads in the area. The nearest homestead is approximately 4.6km from the proposed project. This homestead does not appear to be inhabited, although stock pens adjacent to the homestead appear to be used. The PV array is likely to be seen as a relatively dark line that is unlikely to be highly obvious on the horizon.

Aggeneys is the only settlement in the vicinity, at its closest it is approximately 8.9km from Aggeneys 1. This is outside the Approximate Limit of Visibility of the proposed array. It is within the Approximate Limit of Visibility of taller elements including the on-site 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 un-surfaced road to the north of the project ; and
- » The N14

Aggeneys aerodrome is located approximately 10.5km to the west of Aggeneys 1. Due to the location of the facility relative to the airport it would only be possible for reflected light from the array to affect pilots on the northern flight path into the aerodrome.

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 Aggeneys 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 Aggeneys 1 is illustrated in **Figure 8.6**.

8.8.2 Visual Assessment

Visual impacts will occur during the construction and operation of Aggeneys 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 Aggeneys 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 un-surfaced local road (i.e. Loop 10 Road) that runs to the north of the project site.
- » 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 road (i.e. Loop 10 road) which is located to the north of the project site.
- » Glare could affect the northern flight path of the Aggeneys Aerodrome.
- » Lighting impacts.

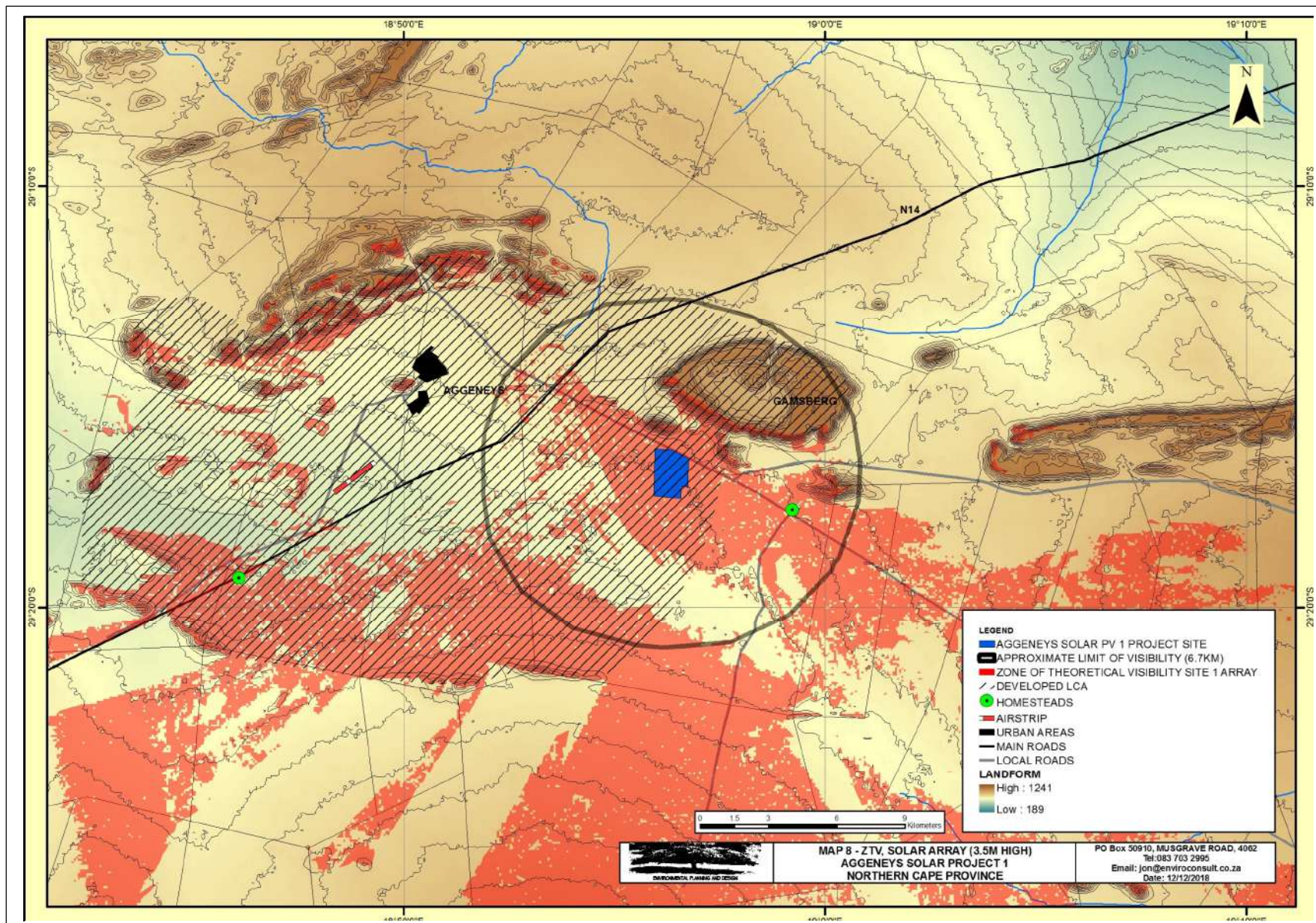


Figure 8.6: Zone of Theoretical Visibility for the PV array associated with the development of Aggeneys 1 within the project site

8.8.3 Impact table summarising the significance of visual impacts during construction and operation (with and without mitigation)

<p>Nature: <u>Change in the character of a relatively natural area to the south and east of the Aggeneys 1 (Landscape Change)</u></p> <p>The solar PV facility is located on the eastern edge of a landscape character area that is influenced by development. To the south and east, the landscape becomes increasingly less influenced by development. There is a possibility that Aggeneys 1 will extend the influence of development into this relatively natural area.</p> <p>The solar PV facility 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.</p> <p>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.</p> <p>Electrical infrastructure relating to the on-site substation will be in the order of 10m high that could potentially be visible for approximately 11.3km, however, this is likely to be comprised of relatively slim structures that are unlikely to be obvious at this distance.</p> <p>The above factors will result in the project being seen as an obvious hard geometric form extending the visual influence of development to the east. It is obvious therefore that the rural character of the landscape is likely to be affected. This is only likely to modify the Rural Landscape Character Area (LCA) over a relatively small area extending the visual influence of development approximately 2km into the Rural LCA.</p>		
	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	24 (Low)	21 (Low)
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	
<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; and » Retain natural buffer areas adjacent to the adjacent un-surfaced road. <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 project site; 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 Zone of Theoretical Visibility (ZTV) analysis indicates that the PV array could be visible intermittently over approximately 1.7km of the road at a distance of approximately 4.8km. The array forming the bulk of the development is relatively low not exceeding 3.5m in height. While 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 solar PV facility.

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. A glimpse of the proposed solar PV facility that is unlikely to be obvious will therefore not change the character of the view from the road in any significant way.

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Small (0)	Small (0)
Probability	Very improbable (1)	Very improbable (1)
Significance	6 (Low)	6 (Low)
Status (positive or negative)	Neutral, the character of the rural outlook from the road is highly unlikely to be modified in any significant way.	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.	No irreplaceable loss.
Can impacts be mitigated?	Yes but this is highly unlikely to change the level of impact.	

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 project site.

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 un-surfaced local road (i.e. Loop 10 road) that runs to the north of the site*

No high level overview of the project is possible. It will be seen from a relatively low level and it will appear as a dark line in the landscape

The proposed array forming the bulk of the development is relatively low - not exceeding 3.5m in height. While this could be visible for up to approximately 12km of the road, the array will start to visually blend with the background around 2.7km from the development.

Taller electrical infrastructure relating to the on-site substation will be in the order of 10m high that could potentially be visible for approximately 11.3km, however, this is likely to be comprised of relatively slim structures that are unlikely to be obvious at this distance. The on-site substation location alternative 2 being located adjacent to the road, is likely to be highly obvious from the road whereas alternative 1 being located approximately 2km from the road and being partially screened by the array is not likely to be highly obvious.

The proposed project will therefore be obvious from approximately 6km of the road although it may be visible over approximately 12km.

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 Aggeneys 1. 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	Array with on-site substation alternative 1 Low (4)	Array with on-site substation alternative 1 Minor to Low (3)
	Array with on-site substation alternative 2 Low to moderate (5)	Array with on-site substation alternative 2 Low (4)

Probability	Probable (3)	Probable (3)
Significance	Array with on-site substation alternative 1 30 (Medium)	Array with on-site substation alternative 1 27 (Low)
	Array with on-site substation alternative 2 33 (Medium)	Array with on-site substation alternative 2 30 (Medium)
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 as a negative impact.	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.	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.	

Mitigation:

Planning:

- » Plan to set back the development from the road as far as possible. During initial work, a 100m setback was proposed. This will ensure that the array associated infrastructure and the security fence does not crowd the road. It will also ensure that there is a band of natural vegetation beside the road providing a link with the surrounding natural landscape.
- » 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.

Operation:

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

Decommissioning:

- » Remove infrastructure not required for the post-decommissioning use of the site;
- » 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 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 certainly no secondary tourism use associated with the structure. Therefore the owners / inhabitants are unlikely to be sensitive to the possible landscape change.

There are other structures apparent on on-line mapping, including;

- » 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 4.6km to the south east of Aggeneys 1. It is set at a slightly higher level than the site but not so high that an overview of the solar PV facility will be possible.

The proposed array forming the bulk of the development is relatively low - not exceeding 3.5m in height. While this could be visible for up to approximately 12km of the road to the north of the site, the array will start to visually blend with the background around 2.7km from the development. The on-site 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 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 to Low, (3)	Minor, (2)
Probability	Improbable (2)	Improbable (2)
Significance	18 (Low)	16 (Low)
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	

Mitigation:

Planning:

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

Operation:

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

Decommissioning:

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

Residual Impacts:

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.

Nature: *Character of the landscape as seen from local settlement areas*

The only settlement area that might be affected is the small town of Aggeneys. The ZTV assessment indicates that elements associated with Aggeneys 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	6 (Low)	6 (Low)
Status (positive or negative)	Neutral, it is unlikely that there will be a significant change in the character of the view from Aggeneys.	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.	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 un-surfaced local road (i.e. Loop 10 road) that runs adjacent to the northern boundary of the project site gradually rises from the site towards the N14, it is possible that glare could affect this section of the road particularly during winter months.

The 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 in the immediate vicinity of Aggeneys 1.

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site and immediate surroundings (2)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Small (0)
Probability	Probable (3)	Very improbable (1)
Significance	24 (Low)	6 (Low)
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:		

Operation:

» Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the northern edge of the array. Another option could be to include a slight adjustment to the angle of repose of solar panels, however, the applicant has indicated that this is not feasible because it would impact negatively on power production; a screen fence is therefore the preferred mitigation method.

Residual Impacts:

There are no residual risks.

Nature: *Glare impacts that could affect the northern flight path of Aggeneys Aerodrome*

Aggeneys Aerodrome is approximately 10.5km to the west of Aggeneys 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	16 (Low)	6 (Low)
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 proves to be problematic, the only mitigation possible would be adjustment of the angle of repose of the panels. Due to distance, a minor adjustment in the angle is likely to be all that is needed. The applicant has indicated that adjusting the angle of the panels is not economically feasible given the potential for reduction in energy production. As indicated, if glare does occur it will only affect the peripheral vision of a pilot and it is therefore not anticipated to be problematic (low significance). However, the applicant is consulting with the mine (the owner of the landing strip) and with CAA on this matter and they will aim to find a practical solution with the mine, should glint and glare be a problem.

Residual Impacts:

There are no residual risks.

Nature: *Potential visual impact of operational, safety and security lighting of the facility at night on observers*

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.

To the south and east of Aggeneys 1 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.

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

	Without mitigation	With mitigation
Extent	Site and immediate surroundings (2)	Site (1)
Duration	Long term (4)	Long term (4)
Magnitude	Low (4)	Small to minor (1)

Probability	Definite (5)	Improbable (2)
Significance	50 (Medium)	12 (Low)
Status (positive or negative)	The appearance of a large lit area may be accepted by most people because it is so close to the N14, major mining operations as well as Aggeneys, all of which are well lit. It is likely however that some people will see the expansion of lighting as a negative impact.	Neutral, if the lights are generally not visible then the occasional light is unlikely to be seen as negative.
Reversibility	It would be possible to change the lighting / camera system so the impact cannot be seen as an irreplaceable loss.	No irreplaceable loss
Irreplaceable loss of resources?	High	High
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; » 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 the site; and » Keep lighting low, no tall mast lighting should be used. 		
Residual Impacts:		
No residual risks have been identified.		

8.8.4 Comparative Assessment of Alternatives

The on-site substation location Alternative 2 is located close to the Loop 10 road and will therefore have a higher visual influence on the travellers making use of the road than Alternative 1, which is located further south of the road. Alternative 1 is located approximately 2km from the road and is partially screened by the array and is therefore unlikely to be highly obvious. By comparison, Substation Alternative 2 is located adjacent to the road and it will be highly obvious.

Therefore, considering the above Alternative 1 is considered as the preferred alternative from a visual perspective as it provides the opportunity to reduce the impacts on the road users to a lower and acceptable significance.

Aspect: Visual		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » Greater distance from the Loop 10 road » Lower significance » Preferred 	<ul style="list-style-type: none"> » Highly obvious from the Loop 10 road » Acceptable

8.8.5 Implications for Project Implementation

Overall, the significance of the visual impacts is expected to range from moderate to low, depending on the impact being considered, as a result of the generally undeveloped character of the landscape. From the outcomes of the visual assessment, it is concluded that the development of the solar PV facility and associated infrastructure is acceptable. The following mitigation is possible:

- » Retain natural buffer areas adjacent to the adjacent un-surfaced road.
- » Plan to set back the development from the Loop 10 road as far as possible. During initial work, a 100m setback is proposed. This will ensure that the array associated infrastructure and the security fence does not crowd the road. It will also ensure that there is a band of natural vegetation beside the road providing a link with the surrounding natural landscape.
- » Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the northern edge of the array. It might also include a slight adjustment to the angle of repose of solar panels. A small adjustment is likely to be sufficient mitigate possible impacts. The applicant has indicated that an adjustment to the angle of repose of solar panels could impact negatively on power production. A screen fence may therefore be the preferred mitigation method.
- » Use low key lighting around buildings and operational areas that is triggered only when people are present

8.9. Assessment of Social Impacts

Potential social impacts and the relative significance of the impacts associated with the development of Aggeneys 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 Aggeneys 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.

Although Aggeneys 1 is likely to change the sense of place of the area during the operation phase, it will also have significant benefits in respect of the supply of renewable energy into a grid system heavily reliant on coal powered technology. In this sense the project forms part of a national effort to reduce South Africa's carbon emissions and therefore carries with it a significant benefit.

Having carefully considered all the social impacts associated with the development of Aggeneys 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 Aggeneys 1, both positive and negative impacts are expected to occur.

Negative impacts associated with the construction phase includes:

- » Impacts related to annoyance, dust and noise
- » Increase in crime
- » Increased risk of HIV and AIDS
- » Influx of construction workers and job seekers
- » Hazard exposure

- » Disruption of daily living patterns
- » Disruption of services supplies and infrastructure

Positive impacts associated with the construction phase includes:

- » Positive economic impacts

Negative impacts associated with the operation phase includes:

- » Transformation of the sense of place

Positive impacts associated with the operation phase includes:

- » Positive economic impacts

8.9.3 Impact tables summarising the significance of social impacts during construction and operation (with and without mitigation measures)

Construction Phase Impacts

Nature: <i>Annoyance, dust and noise</i>		
Annoyance, dust and noise generated through construction activities.		
	Without mitigation	With mitigation
Extent	Local (1)	Local (1)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Low (4)
Probability	Highly probable (4)	Highly probable (4)
Significance	36 (Medium)	28 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Apply appropriate dust suppressant to gravel roads on a regular basis. » Ensure that vehicles used to transport sand and building materials are fitted with tarpaulins or covers. » Ensure all vehicles are roadworthy and drivers are qualified and made aware of the potential noise and dust issues. » Appoint a community liaison officer to deal with complaints and grievances from the public 		
Residual Impacts:		
No residual impacts area associated with annoyance, dust and noise.		

Nature: <i>Increase in crime</i>		
An increase in crime associated with the construction phase of the solar PV facility		
	Without mitigation	With mitigation
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (7)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	36 (Medium)	33 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	Not certain	Not certain

Irreplaceable loss of resources?	Could occur in some cases	Could occur in some cases
Can impacts be mitigated?	To some extent	
Mitigation:		
<ul style="list-style-type: none"> » All workers should carry identification cards and wear identifiable clothing. » Fence off construction site and control access to these sites. » Appoint an independent security company to monitor the site. » Appoint a community liaison officer. » Encourage local people to report any suspicious activity associated with the construction site to the community liaison officer. » A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor and sub-contractors remain responsible and accountable. This will also facilitate the identification and implementation of additional mitigation measures if required. » Prevent loitering within the vicinity of the construction camp as well as construction sites by recruiting off site via an offsite recruiting office/agent, whatever is most appropriate. 		
Residual Impacts:		
<ul style="list-style-type: none"> » If crime levels do rise in the area it may take some time before they are restored to the previous low level. » Depending on the crimes committed victims may suffer long-term effects as a result of their experience. 		

Nature: <i>Increased risk of HIV and AIDS</i>		
Increased risk of HIV and AIDS due to the influx of workers, job seekers and deliveries and availability of disposable income.		
	Without mitigation	With mitigation
Extent	Regional (4)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	High (8)	Moderate to High (7)
Probability	Highly probable (4)	Highly probable (4)
Significance	64 (High)	60 (Medium to High)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Ensure that an onsite HIV and AIDS policy is in place and that construction workers are exposed to a health and HIV/AIDS awareness educational programme within the first month of construction. » Provide voluntary and free counselling, free testing and condom distribution services to the workforce. » Where feasible extend the HIV/AIDS programme into the community with specific focus on schools and youth clubs. 		
Residual Impacts:		
The area currently has a very low HIV prevalence rate and any increase in this rate would have serious consequences that could last over an extended period. People contracting HIV and their families will suffer life changing consequences.		

Nature: <i>Influx of construction workers and job seekers</i>		
Influx of construction workers and job seekers resulting in a temporary change in demographics		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (6)	Moderate (5)

Probability	Definite (5)	Definite (5)
Significance	50 (Medium)	45 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Communicate, through Community Leaders and Ward Councillors, the limitation of opportunities created by the project to prevent an influx of job seekers. » Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work. » Draw up a recruitment policy in conjunction with Community Leaders and Ward Councillors and ensure compliance with this policy. 		
Residual Impacts:		
With the mine being in the area it is possible that after construction has been completed some workers may remain in the hope that they will find employment at the mine which, if not carefully managed, may lead to the establishment of informal dwellings.		

Nature: <u>Hazard Exposure</u>		
Exposure to hazards associated with construction activities and the delivery of heavy machinery and equipment to site.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (7)	Moderate (6)
Probability	Definite (5)	Definite (5)
Significance	55 (Medium)	50 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Ensure all construction equipment and vehicles are properly maintained at all times. » Ensure that operators and drivers are properly trained and make them aware, through regular toolbox talks, of any risk they may pose to the community. Place specific emphasis on the vulnerable sector of the population such as children and the elderly. » Ensure that fires lit by construction staff are only ignited in designated areas and that the appropriate safety precautions, such as not lighting fires in strong winds and completely extinguishing fires before leaving them unattended, are strictly adhered to. » Make staff aware of the dangers of fire during regular tool box talks. » A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor, and sub-contractors remain responsible and accountable and to facilitate the identification and implementation of additional mitigation measures if required. » Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably equipped in the mechanism of raising concerns and having these addressed. » Compile and implement a Fire Management and Emergency Preparedness Response Plan. 		
Residual Impacts:		
» It would be important to ensure that all excavations and construction sites are rehabilitated and made safe after construction to reduce the risk of residual impacts.		

Nature: <i>Disruption of daily living patterns</i>		
Disruption of daily living patterns due to construction activities and deliveries of machinery and heavy equipment to site.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (7)	Moderate (6)
Probability	Highly probable (4)	Probable (3)
Significance	44 (Medium)	30 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Ensure that, at all times, people have access to their properties as well as to social facilities. » All vehicles must be road worthy and drivers must be qualified, obey traffic rules, follow speed limits and be made aware of the potential road safety issues. » Heavy vehicles should be inspected regularly to ensure their road safety worthiness. » 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 due to construction activities. 		
Residual Impacts:		
As long as any excavations and building sites are swiftly rehabilitated after construction it is likely that there will be no residual impacts.		

Nature: <i>Disruption of services supplies and infrastructure</i>		
Disruptions of community facilities and infrastructure due to construction activities and an influx of workers		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (7)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	33 (Medium)	30 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	Yes	Yes
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Regularly monitor the effect that the construction activities is having on public infrastructure and immediately report any damage to infrastructure to the appropriate authority; 		
Residual Impacts:		
As long as any damage to existing infrastructure is promptly repaired and most workers are recruited locally, there should not be any residual impacts.		

Nature: <i>Economic impacts</i>		
Positive economic impacts associated with job creation and stimulation of the local and regional economies.		
	Without enhancement	With enhancement
Extent	Regional (2)	Regional (2)
Duration	Short-term (2)	Short-term (2)

Magnitude	Moderate (6)	Moderate (7)
Probability	Probable (3)	Highly probable (4)
Significance	30 (Medium)	44 (Medium)
Status (positive or negative)	Positive	Positive
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	no
Can impacts be mitigated/enhanced?	Yes	
Enhancement:		
<ul style="list-style-type: none"> » Local residents should be recruited to fill semi and unskilled jobs. » Women should be given equal employment opportunities and encouraged to apply for positions. » A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction. » A procurement policy promoting the use of local business must, where feasible, be put in place to be applied throughout the construction phase. » As far as possible local contractors that are compliant with Broad-Based Black Economic Empowerment (B-BBEE) criteria should be used. 		
Residual Impacts:		
Skills development amongst local communities during the construction phase of the project could have a positive effect in respect of the employability of some people living within these communities.		

Operation Phase Impacts

Nature: <i>Transformation of the sense of place</i>		
Transformation of the sense of place due to the nature of the project.		
	Without mitigation	With mitigation
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate to High (6)	Moderate (5)
Probability	Definite (5)	Definite (5)
Significance	65 (High)	60 (Moderate to High)
Status (positive or negative)	Negative	Negative
Reversibility	Difficult to reverse	Difficult to reverse
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Apply the mitigation measures suggested in the Visual Impact Assessment Report (Appendix H of this BA Report). » Ensure that all affected landowners and tourist associations are regularly consulted. » A Grievance Mechanism should be put in place and all grievances should be dealt with in a transparent manner. » The mitigation measures recommended in the Heritage Impact Assessment should be followed. 		
Residual Impacts:		
The residual impact would be the long-term change in the sense of place of the area.		

Nature: <i>Economic Impacts</i>		
The creation of jobs, business opportunities and source of revenue for local authorities.		
	Without enhancement	With enhancement
Extent	Regional (3)	Regional (4)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (6)	Moderate (7)

Probability	Probable (3)	Highly probable (4)
Significance	39 (Medium)	60 (Medium high)
Status (positive or negative)	Positive	Positive
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated/enhanced?	Yes	
Enhancement:		
<ul style="list-style-type: none"> » Implement a training and skills development programme for locals. » Ensure that the procurement policy supports local enterprises. » Establish a social responsibility programme either in line with the REIPPP BID guidelines or equivalent. » Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme. » Ensure that any trusts or funds are strictly managed in respect of outcomes and funds. 		
Residual Impacts:		
The development of the local communities in respect of skills and economic support could extend over a prolonged period.		

8.9.4 Comparative Assessment of Alternatives

The assessment of the two on-site substation locations was undertaken through the consideration of the visual impacts associated with the two alternatives, as discussed in section 8.8.4.

In addition, apart from being highly obvious from the Loop 10 gravel road, Alternative 2 will also be in closer proximity to pedestrians, cyclists and motor vehicles using the Loop 10 road. As such, from a social perspective Alternative 1 is the preferred on-site substation location for the development of Aggeneys 1.

Aspect: Social		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	<ul style="list-style-type: none"> » Lower visual impact » Preferred 	<ul style="list-style-type: none"> » In closer proximity to road users of the Loop 10 road. » Acceptable

8.9.5 Implications for Project Implementation

The significance of the positive impacts associated with the social aspects that will be affected by Aggeneys 1 ranges from medium to medium high with the implementation of the enhancement measures recommended. These enhancement measures include:

- » A skills transfer plan should be put in place at an early stage and workers should be given the opportunity to develop skills which they can use to secure jobs elsewhere post-construction.
- » A procurement policy promoting the use of local business must, where feasible, be put in place to be applied throughout the construction phase.
- » Establish a social responsibility programme either in line with the REIPPP BID guidelines or equivalent.
- » Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme.

The significance of the negative impacts associated with the social aspects that will be affected by Aggeneys 1 ranges from low, medium and high with the implementation of the recommended mitigation measures. The mitigation measures include:

- » Appoint a community liaison officer to deal with complaints and grievances from the public
- » A grievance mechanism must be prepared and communicated to surrounding landowners and local communities, to ensure that the project proponent, EPC contractor and sub-contractors remain responsible and accountable. This will also facilitate the identification and implementation of additional mitigation measures if required.
- » Ensure that an onsite HIV and AIDS policy is in place and that construction workers are exposed to a health and HIV/AIDS awareness educational programme within the first month of construction.
- » Develop and implement a local procurement policy which prioritises "locals first" to prevent the movement of people into the area in search of work.
- » Draw up a recruitment policy in conjunction with Community Leaders and Ward Councillors and ensure compliance with this policy
- » Where necessary training should be provided on the implementation of the grievance mechanism to ensure that those who are most likely to be affected by the project are suitably equipped in the mechanism of raising concerns and having these addressed.
- » Compile and implement a Fire Management and Emergency Preparedness Response Plan.
- » 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 due to construction activities.
- » Regularly monitor the effect that the construction activities is having on public infrastructure and immediately report any damage to infrastructure to the appropriate authority;
- » Ensure that where communities' access is obstructed that this access is restored to an acceptable state.

8.10. Assessment of Impacts on Traffic

Traffic impacts have been identified and assessed for the development of Aggeneys 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 a 100MW solar PV facility 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 daily trips. 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 on the project site. These employees will come from the towns of Pofadder (57.5km) or Springbok (116km) and will 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.

The solar PV facility is expected to operate for a minimum period of 20 years and will operate 7 days a week, during daylight hours. The Operation and Maintenance plan includes monitoring and reporting on the performance of the facility. 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 hour = (60 employees x 30%) / 1.2 persons per vehicle = 15 vehicles per hour

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 hour = (60 employees x 70%) / 15 persons per vehicle = 3 vehicles per hour

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 construction period, the additional traffic should not have a significant effect on the internal roads, access roads or surrounding road network.

8.10.2 Description of Traffic Impacts

Traffic impacts are expected during the construction and operation phases of Aggeneys 1, as per the impact's tables included in section 8.10.3 below.

8.10.3 Impact tables summarising the significance of impacts on traffic during the construction and operation phases (with and without mitigation)

Construction Phase Impacts

Nature: <u>Construction phase traffic impacts</u>		
Traffic will be generated during the construction of Aggeneys 1. These impacts will relate to the transportation of project components and employees.		
	Without mitigation	With mitigation
Extent	Regional (2)	Regional (1)

Duration	Short-term (2)	Short-term (2)
Magnitude	Minor (2)	Minor (2)
Probability	Probable (2)	Probable (2)
Significance	12 (Low)	10 (Low)
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. » Construction materials to be sourced from local suppliers as much as possible 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 Aggeneys 1. These impacts will relate to the presence of the operation and maintenance staff at the facility.		
	Without mitigation	With mitigation
Extent	Regional (1)	Regional (1)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (3)	Minor (2)
Probability	Probable (3)	Probable (3)
Significance	24 (Low)	21 (Low)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
» Staff and general trips should occur outside of peak traffic periods		
Residual Impacts:		
None expected to occur.		

8.10.4 Comparative Assessment of Alternatives

The location of the on-site substation within the development footprint of Aggeneys 1 is not expected to have any relevant impact on traffic. Therefore, both on-site substation location alternatives are considered to be acceptable from a traffic perspective.

Considering the above, the technically preferred alternative is nominated as the preferred alternative for the on-site substation location, which is Alternative 1.

Aspect: Traffic		
On-site Substation	Alternative 1 (technically preferred)	Alternative 2
	» Acceptable » Preferred due to technical considerations	» Acceptable

8.10.5 Implications for Project Implementation

The traffic impacts associated with the development of Aggeneys 1 will be low following the implementation of the mitigation measures. No impacts of 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

8.11. Assessment of the 'Do Nothing' Alternative

The 'do-nothing' alternative (i.e. no-go alternative) is the option of not constructing Aggeneys 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.

a) Land use and agriculture

There are no high potential soils present within the project site and the soils are of moderate potential at best due mainly to 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 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 project site, can be identified.

In general, the soils that do occur within the project site 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 project site, and study area, the undertaking of productive agricultural activities will not be possible and will be highly restricted if attempted. The development of Aggeneys 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 Aggeneys 1 is ~2% of the total extent of the study area (Remaining Extent of the Farm Bloemhoek 61, 12 226 ha 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 larger area (including this site) was demarcated as a REDZ area.

In addition, the landowner would obtain an income from the facility (as the developer 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: Aggeneys 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 Aggeneys 1 within the Khai-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 Aggeneys 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 Aggeneys 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 Aggeneys 1 is only proposed to contribute a contracted capacity of up to 100MW, 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 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 Draft IRP 2018 there is currently 1 474MW of installed PV capacity, while an additional 814MW has been committed between 2020 and 2022, and an additional 5 670MW 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.

d) 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 Aggeneys 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 (less than 2% of the larger 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 Aggeneys 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 landowners due to the revenue that will be gained from leasing the land to the developer.
- » 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 Aggeneys 1.

CHAPTER 9: ASSESSMENT OF POTENTIAL CUMULATIVE IMPACTS

As identified and assessed in Chapter 8, a solar PV facility may have effects (positive and negative) on natural resources, the social environment and on the people living in a project area. The preceding impact assessment chapter has reported on the assessment of the impacts associated with Aggeneys 1 largely in isolation (from other similar developments).

The Aggeneys 1 study area and project site, proposed for the development of the solar PV facility is located within a Renewable Energy Development Zone (REDZ). The specific REDZ zone within which the project is proposed is known as 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 developments.

The DoE, under the REIPPP Programme, released in 2011 a request for proposals (RFP) 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 45 PV facilities currently operational (Energyblog, 2018²²). It is, therefore, important to follow a precautionary approach in accordance with NEMA to ensure that the potential for cumulative impacts²³ are considered and avoided where possible.

This chapter assesses the potential for the impacts associated with Aggeneys 1 to become more significant when considered in combination with the other known or proposed solar PV facility projects within the area.

²²<https://www.energy.org.za/data-and-tools>

²³ 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 final 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 Aggeneys 1 are included and assessed within this chapter.

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 Aggeneys 1 within the project site 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 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 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 Aggeneys 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 project site. 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 Aggeneys 1, there are several solar PV facilities located within a 30km radius of the project site (refer to **Figure 9.1** and **Table 9.1**), all at

various stages of approval²⁴. 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 broader area (within a 30km radius) of the Aggeneys 1 project site

Project Name	Location	Approximate distance from Aggeneys 1	Project Status
ABO Wind Aggeneys 2 (1 x 100MW PV)	Within the Remaining Extent of the Farm Bloemhoek 61	Directly adjacent and to the east of Aggeneys 1	In process
Solar Capital Blomhoek (12 x 75MW PV))	Within the Remaining Extent of the Farm Bloemhoek 61	Within the larger study area, within the southern section of the property	Approved
Biotherm Aggeneys PV Solar Energy Facility (1 x 40MW PV)	Within Portion 1 of the Farm Aroams 57	~5km to the north west	Preferred Bidder Round 4 (under construction)
Biotherm Letsoai (2 x 150MW CSP)	Located on the property directly south of the Remaining Extent of the Farm Bloemhoek 61	~15km to the south	Approved
Biotherm Enamandla (4 x 75MW PV)	Located on the property directly south of the Remaining Extent of the Farm Bloemhoek 61	~15km to the south	Approved
Building Energy Sol Invictus (2 x 150MW PV and 4 x 75MW PV)	Within Portion 5 of the Farm Ou Taaibosmond	~30km to the west	Approved
Sato Zuurwater (5 x 75MW PV and 1 x 60MW PV)	Within Portion 3 of the Farm Zuurwater 62	~20km to the west	Approved
Boesmanland Solar (1 x 75MW PV)	Within Portion 6 of the Farm Zuurwater 62	~15km to the west	Approved
Mainstream Solar (1 x 250MW PV/CPV)	Within Portion 2 of the Farm Namies South 212	~25km to the east	Approved
Aurora Power Solution Black Mountain Mine Solar (1 x 19MW PV)	Within Portion 1 of the Farm Aggeneys 65	~10km to the west	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, DOE, NERSA and Eskom) due to the following reasons:

- » There may be limitations to the capacity of the existing or future Eskom grid;
- » Not all applications will receive a positive environmental authorisation;

²⁴ 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 REIPPP Programme 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 broader area and Aggeneys 1 are therefore qualitatively assessed in this Chapter. The following potential impacts are considered:

- » Cumulative impacts on ecological processes
- » Cumulative impacts on freshwater features
- » Cumulative impacts on avifauna
- » Cumulative impacts on soil and agricultural potential
- » Cumulative impacts on heritage resources
- » Cumulative visual impacts
- » Cumulative socio-economic impacts
- » Cumulative traffic impacts

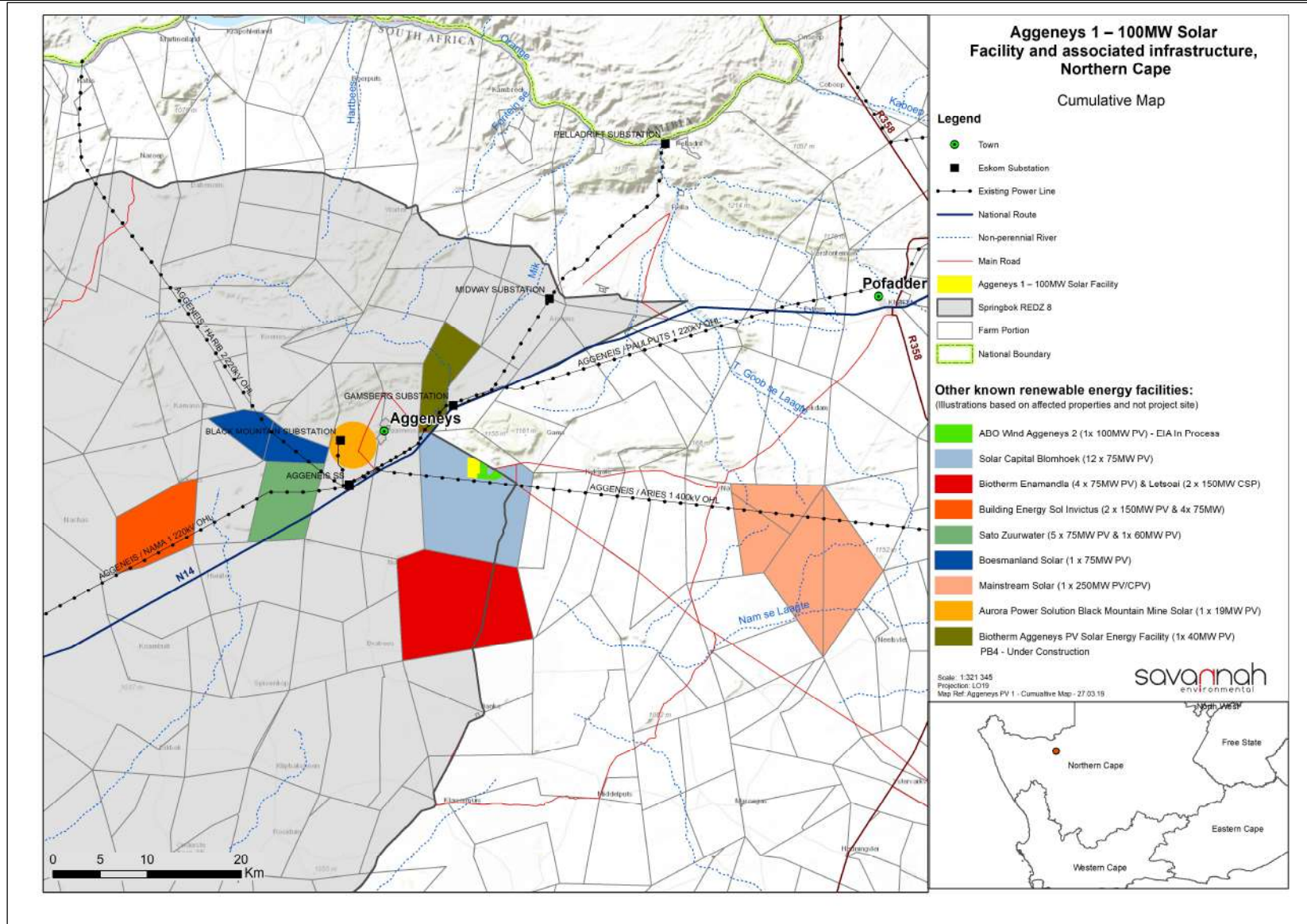


Figure 9.1: Identified solar PV facility projects located within a 30km radius of the Aggeneys 1 project site that are considered as part of the cumulative impact assessment for the Aggeneys 1 solar PV facility

9.3 Cumulative Impacts on Ecological Processes

An impact on CBAs and broad-scale ecological processes has been identified as the primary ecological impact from a cumulative perspective (refer to **Appendix D**). 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, this is a potential cumulative impact associated with the development of Aggeneys 1.

The ecological impacts associated with Aggeneys 1 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 Aggeneys 1 will contribute to cumulative habitat loss and other cumulative impacts in the wider Aggeneys 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 facility 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 as this has been demonstrated to be a common impact associated with existing PV plants. » 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 the Aggeneys 1 solar PV facility 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 (5)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (30)
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 facility which cannot be well mitigated.
Mitigation:	
<ul style="list-style-type: none"> » 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 site, which should include management of biodiversity within the affected areas, as well as that in the adjacent areas around the facility under the control of the developer. 	

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 broader area may impact avifauna, as habitat loss is a major contributor to declines in avifauna (Birdlife International, 2018). The aggregation of numerous solar PV facilities in a region has the potential to compound environmental impacts, and because this impact 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 Aggeneys 1 and the solar PV facilities within the surrounding area will be of a medium significance.

Nature: <i>Habitat loss</i>		
The development of Aggeneys 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:		
<ul style="list-style-type: none"> » Minimise the development footprint as far as possible. A cover of indigenous grasses should be encouraged and maintained within the 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 facility 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 the facility should be fenced-off to include only the developed areas and should include as little undeveloped ground or natural veld as possible. In addition, there should not be electrified ground-strands present within 30cm of the ground and the electrified strands should 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 1 m 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 Aggeneys 1 will be of a medium significance.

Nature: Potential cumulative impacts to the freshwater resources		
Indirect impacts due to catchment level changes to surface roughness, alteration of hydrology, as well as direct impacts related to physical alteration and degradation of freshwater resources in general.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (3)	Regional (3)
Duration	Long-term (4)	Long-term (4)
Magnitude	Low (4)	Moderate (6)
Probability	Probable (3)	Probable (3)
Significance	33 (Medium)	39 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	Low	Low
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » The necessary precautions undertaken to minimise direct impacts to watercourses and avoid impacting watercourses directly as far as possible. » Prevent complete clearance of vegetation on the project sites associated with the Solar PV facilities within the area, to maintain some level of surface roughness to assist with control of increased run-off in the catchment. » Sedimentation preventative measures to be implemented to prevent sedimentation via run-off at a catchment level. » Erosion protection measures to be implemented to watercourses where required. » Ensure that all fuels, oils and hazardous substances are kept out of all watercourses at a safe distance (i.e. 100m from any watercourse) and that storage areas are sufficiently bunded to prevent run-off containing substances entering watercourses. 		

9.6 Cumulative Impacts Soil and Agricultural Potential

Cumulative impacts from a soil's perspective are 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 low.

Nature: <i>Cumulative impacts from a soils perspective</i>		
Cumulative impact of Aggeneys 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"> » To 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)

Cumulative heritage impacts have been identified for Aggeneys 1 (refer to **Appendix I**).

Archaeological resources are the most common heritage resources on this landscape but, even so, are rare. The resources tend to occur in conjunction with water sources and rocky hills which are usually protected from impacts for other reasons (i.e. ecology, fresh water). This means that impacts tend to be minimal. The only significant archaeological sites are known to have been destroyed in the area through mining within the Gamsberg Inselberg. In that case mitigation was conducted but significant resources remain under threat. Other heritage resources, aside from the landscape itself, are sparse and significant cumulative impacts are not expected to occur. Clustering of renewable energy facilities close to the mining area and Aggeneys Substation will reduce the impacts to the broader landscape.

Although the significance of cumulative heritage impacts is medium, this can be offset to a degree by the fact that the project lies within a REDZ which has been earmarked for renewable energy development. The indirect result is that heritage resources in other areas will have a far greater chance of being protected.

Nature: <i>Cumulative heritage impacts</i>		
The addition of multiple solar PV facilities and related infrastructure can result in widespread destruction of heritage resources and increased visual clutter in the natural and cultural landscape.		
	Without mitigation	With mitigation
Extent	Local (2)	Local (2)
Duration	Long term (4)	Long term (4)
Magnitude	Low (2)	Low (2)
Probability	Definite (5)	Definite (5)
Significance	40 (Medium)	40 (Medium)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	No	
Mitigation:		
» Ensure that best practice measures such as minimising the area of disturbance and rehabilitating timeously (where appropriate) are implemented.		

9.8 Cumulative Visual Impacts

Cumulative visual impacts have been identified and assessed for the development of Aggeneys 1 (refer to **Appendix H**).

Due to the fact that Aggeneys 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 un-surfaced road to the north of the project are also assessed as likely to have a medium significance due to the location of Aggeneys 1 and other proposed projects. The cumulative contribution of the 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: <i>Landscape change</i>
Aggeneys 1 will extend the general influence of development and specifically solar projects into a relatively natural rural area to the south and east of the site.
In addition there are solar projects proposed within 30km of Aggeneys 1, eight of which are located within the relatively natural Rural Landscape Character Area (LCA).

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 Aggeneys 1 will largely affect the Developed Landscape Character Area, it is only likely to have a relatively small contribution to landscape change which largely relates to introducing development into the more natural Rural Landscape Character Area.

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

Mitigation:

Planning:

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

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 project site; 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.

Nature: *Character of the landscape as seen from the N14*

Aggeneys 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
<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 project site. <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>Nature: <i>Change in the character of the landscape as seen from the un-surfaced local road (i.e. Loop 10 road) that runs to the north of Aggeneys 1</i></p> <p>Because the road runs adjacent to the northern boundary of the project site, it will be visible from the road. Key mitigation includes including a setback between the road and the project. Due to the fact that the project will be visible for a relatively short section of the road and due to the nature of traffic on the road, if the setback is put in place the probable impact of the project is likely to be low.</p> <p>It is also possible that other solar projects will be developed within 30km and to the east of Aggeneys1, that are serviced by this road 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 could result in greater landscape change than those within the Developed Landscape Character Area.</p> <p>The overall cumulative impact could therefore have a medium significance. Aggeneys 1 is likely to result in a relatively low contribution to this overall impact.</p>		
	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 (3)	Moderate to Low (5)
Probability	Probable (3)	Probable (3)
Significance	Low (27)	Medium (36)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No
Can impacts be mitigated?	Yes	Unknown
<p>Mitigation:</p> <p><u>Planning:</u></p> <ul style="list-style-type: none"> » Plan to set back the development from the road. During initial work, a 100m setback was proposed. This will ensure that the array associated infrastructure and the security fence does not crowd the road. It will also ensure that there is a band of natural vegetation beside the road providing a link with the surrounding natural landscape. » 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:

- » 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 project site particularly the development setback area from the local road.

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 local homesteads

Aggeneys 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 some distance from the project. 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 does not appear to be any homesteads that are likely to be affected by potential projects.

The cumulative impact is therefore also likely to be improbable with 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)	Improbable (2)
Significance	Low (16)	Low (18)
Status (positive or negative)	Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No
Can impacts be mitigated?	Yes	Unknown

Mitigation:

Planning:

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

Operation:

- » 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 project site.

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*

The only settlement area that might be affected is the small town of Aggeneys. Aggeneys 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 irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	No mitigation is necessary	Unknown
Mitigation: No mitigation required		

Nature: *Cumulative impact of glare on the unsurfaced road (i.e. Loop 10 road) to the north of Aggeneys 1*

It is possible that glare from Aggeneys 1 could affect travellers on the road during early evening and early morning.

While a detailed assessment of other projects has not been undertaken, it is possible that Aggeneys 1 within the same property as the proposed project and other projects on different properties to the east will cause additional impact. The probability of glare being an issue will increase to "probable" and due to the spread of the possible projects the extent increases to "regional".

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

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

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	Reversible	Reversible
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	
Mitigation: » Should glare prove problematic on this road, mitigation might include the implementation of a screen fence along the edge of an array. Another option could be to include a slight adjustment to the angle of repose of		

solar panels, however, the applicant has indicated that this is not feasible because it would impact negatively on power production; a screen fence is therefore the preferred mitigation method.

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 will increase to probable and due to the spread of the possible projects the extent increases to "regional".

Aggeneys 1 is unlikely to add significantly to glare issues associated with solar PV development in the area relating to the aerodrome, due to the distance from Aggeneys 1.

	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Site and immediate surroundings (2)	Regional (3)
Duration	Long term (4)	Long term (4)
Magnitude	Minor (2)	Minor (2)
Probability	Improbable (2)	Probable (3)
Significance	Low (16)	Low (27)
Status (positive or negative)	Negative	Negative
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss.	No irreplaceable loss.
Can impacts be mitigated?	Yes	

Mitigation:

- » Should glare prove problematic, mitigation might include a slight adjustment to the angle of repose of solar panels, however, the applicant has indicated that this is not a feasible mitigation method and they will 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 Aggeneys 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 development does occur to the east of Aggeneys 1, it is highly possible that these developments will extend lighting into the Rural Landscape Character Area. If appropriate mitigation measures are applied as recommended for Aggeneys 1 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. Neutral	Neutral
Reversibility	High	High
Irreplaceable loss of resources?	No irreplaceable loss	No irreplaceable loss
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 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 impacts is medium to high, depending on the impact being considered. The significance of the positive impacts is of a high significance.

The negative cumulative impacts include an increased risk of HIV, transformation of the sense of place and disruptions to services, supplies and infrastructure. The positive cumulative impacts include the positive economic impacts expected from a cumulative perspective.

Nature: <i>Risk of HIV</i>		
Increased risk of HIV and AIDS due to the influx of workers, job seekers and deliveries and availability of disposable income.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (4)	Regional (5)
Duration	Long-term (4)	Long-term (5)
Magnitude	Moderate to High (7)	Moderate to High (8)
Probability	Highly probable (4)	Highly probable (4)
Significance	High (60)	High (72)
Status (positive or negative)	Negative	Negative
Reversibility	Not reversible	Not reversible
Irreplaceable loss of resources?	Yes	Yes
Can impacts be mitigated?	Yes	
Mitigation:		
<ul style="list-style-type: none"> » Mitigation can only be implemented on a regional basis and are not project specific. » Ensure that all companies coming into the area have and are implementing an effective HIV/AIDS policy. » Introduce HIV/ADS awareness programs to schools and youth institutions. » Carefully monitor and report on the HIV status of citizens in the region. » Be proactive in dealing with any increase in the HIV prevalence rate in the area. 		

Nature: <i>Transformation of sense of place</i>		
Transformation of the sense of place due to the nature of the development.		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (3)	Regional (4)
Duration	Long-term (4)	Long-term (5)
Magnitude	Moderate (5)	High (7)
Probability	Definite (5)	Definite (5)
Significance	Moderate to high (60)	High (80)
Status (positive or negative)	Negative	Negative
Reversibility	Difficult to reverse	Difficult to reverse
Irreplaceable loss of resources?	Yes	Yes

Can impacts be mitigated?	Yes
<p>Mitigation: Mitigation measures can only be implemented on a regional basis and are not project specific.</p> <ul style="list-style-type: none"> » Consider undertaking a cumulative impact assessment to evaluate the changes taking place across the area on a broader scale. » Form a regional work group tasked with addressing the effect of changes to the sense of place of the region. » Establish grievance mechanisms to deal with complaints associated with changes to the area. » Enlighten the public about the need and benefits of renewable energy. » Engage with the tourism businesses and authorities in the region to identify any areas of cooperation that could exist. 	

<p>Nature: <i>Service, supplies and infrastructure</i> Disruptions of community facilities and infrastructure due to construction activities and an influx of workers and pressure on the supply of municipal services.</p>		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (2)	Regional (3)
Duration	Short-term (2)	Medium-term (3)
Magnitude	Moderate (6)	High (8)
Probability	Probable (3)	Probable (4)
Significance	Low (30)	Medium (56)
Status (positive or negative)	Negative	Negative
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
<p>Mitigation: Mitigation measures can only be implemented on a regional basis and are not project specific.</p> <ul style="list-style-type: none"> » Engage with the municipal authorities to ensure that they are aware of the expansion planned for the area and the possible consequences of this expansion. » Ensure that local labour is recruited in respect of these developments in the area. 		

<p>Nature: <i>Positive Economic Impacts</i> Positive economic impacts in respect of the creation of jobs and business opportunities and revenue source for local authorities.</p>		
	Overall impact of the proposed project considered in isolation	Cumulative impact of the project and other projects in the area
Extent	Regional (4)	Regional (5)
Duration	Long-term (4)	Permanent (5)
Magnitude	Moderate (7)	Very high (9)
Probability	Highly probable (4)	Highly probable (4)
Significance	Medium (60)	High (76)
Status (positive or negative)	Positive	Positive
Reversibility	Yes, reversible	Yes, reversible
Irreplaceable loss of resources?	No	No
Can impacts be mitigated?	Yes	
<p>Enhancement: Enhancement measures can only be implemented on a regional basis and are not project specific.</p> <ul style="list-style-type: none"> » Implement a training and skills development programme for locals. » Ensure that the procurement policy supports local enterprises. 		

- » Establish a social responsibility programme in line with the REIPPP.
- » Work closely with the appropriate municipal structures in regard to establishing a social responsibility programme.
- » Ensure that any trusts or funds are strictly managed in respect of outcomes and funds allocated.

9.10 Cumulative Traffic Impacts

Cumulative traffic impacts have been identified for the simultaneous construction and operation of Aggeneys 1 and the directly adjacent Aggeneys 2. Cumulative impacts have also been identified considering the construction and operation of Aggeneys 1 and other solar PV facilities within the area (refer to **Appendix K**).

The cumulative traffic impacts associated with Aggeneys 1 will be of a medium or low significance, depending on the impact being considered.

Nature: <i>Construction phase cumulative impacts associated with the development of Aggeneys 1 and Aggeneys 2</i>		
Cumulative traffic impacts are expected to occur during the construction of Aggeneys 1 and Aggeneys 2, assuming construction is being undertaken simultaneously.		
	With mitigation	Without mitigation
Extent	Regional (3)	Regional (3)
Duration	Short-term (2)	Short-term (2)
Magnitude	Moderate (4)	Minor (3)
Probability	Very likely (3)	Very likely (3)
Significance	Low (27)	Low (24)
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"> » Delivery of abnormal components should be staggered for each of the developments under construction » Construction programmes for each of the developments approved for construction should be staggered » Staff and general trips should occur outside of peak traffic periods 		

Nature: <i>Operation phase cumulative impacts associated with the development of Aggeneys 1 and Aggeneys 2</i>		
Cumulative traffic impacts are expected to occur during the operation of Aggeneys 1 and Aggeneys 2, assuming operation is being undertaken simultaneously.		
	With mitigation	Without mitigation
Extent	Regional (2)	Regional (2)
Duration	Long-term (4)	Long-term (4)
Magnitude	Moderate (4)	Low (3)
Probability	Very likely (3)	Very likely (3)
Significance	Low (30)	Low (27)
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"> » Vehicle trips to be staggered outside peak periods 		

Nature: <i>Construction phase cumulative impacts associated with the development of Aggeneys 1 and other solar PV facilities</i>		
Cumulative traffic impacts are expected to occur during the construction of Aggeneys 1 and other solar PV facilities, assuming construction is being undertaken simultaneously.		
	With mitigation	Without 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 should be staggered for each of the developments under construction		
» Construction programmes for each of the developments approved for construction should be staggered		
» Staff and general trips should occur outside of peak traffic periods		

Nature: <i>Operation phase cumulative impacts associated with the development of Aggeneys 1 and other solar PV facilities</i>		
Cumulative traffic impacts are expected to occur during the operation of Aggeneys 1 and other solar PV facilities, assuming operation is being undertaken simultaneously.		
	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)	Low (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 Aggeneys 1 impacts in isolation and compared to the cumulative impacts of Aggeneys 1 and other solar PV facilities within a 30km radius from the project site. Cumulative impacts are expected to occur with the development of Aggeneys 1 throughout all phases of the project life cycle and within all areas of study considered as part of this BA Report. The main aim for the assessment of cumulative impacts considering Aggeneys 1 is to test and determine whether the cumulative development will be acceptable within the landscape proposed for the development, 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 Aggeneys 1 are predominately low to medium, depending on the impacts being considered, with cumulative impacts on

the social environment being high in some instances. A summary of the cumulative impacts are included in **Table 9.2** below.

Table 9.2: Summary of the cumulative impact significance for Aggeneys 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	Medium	Medium
Soil and agricultural potential	Low	Low
Heritage (archaeology and palaeontology)	Medium (without mitigation)	Medium (with mitigation)
Visual	Low	Medium to low (depending on the impact being considered)
Social	Negative social impacts – low, medium to high or high (depending on the impact being considered) Positive social impacts - medium	Negative social impacts – medium or high (depending on the impact being considered) Positive social impacts - high
Traffic	Medium to low (without mitigation) (depending on the impact being considered)	Medium to low (with mitigation) (depending on the impact being considered)

The following can be concluded regarding the cumulative impacts of Aggeneys 1:

- » **Ecological processes:** There will be no unacceptable loss of threatened or protected vegetation types, habitats or species due to the development of the Aggeneys 1 and other solar PV facilities within the surrounding area. Cumulative impacts on CBAs and broad-scale ecological processes will be of a medium to low significance.
- » **Avifauna:** There will be no unacceptable risk to avifauna or loss of avifauna habitats or species due to the development of the Aggeneys 1 and other solar PV facilities within the surrounding area. Cumulative impacts as a result of loss of unprotected vegetation types from the broader area which may impact avifauna habitat ranges from low to medium significance.
- » **Freshwater features:** There will be no unacceptable loss of freshwater features or resources due to disturbance associated with construction activities and increased runoff 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 medium 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 Aggeneys 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 development of Aggeneys 1 and other solar PV facilities within the surrounding areas. Cumulative impacts on heritage relates to the widespread destruction of heritage resources and increased visual clutter. The significance of the cumulative impact will be medium.

- » **Visual:** There will be no unacceptable impact on the visual quality of the landscape associated with the development of Aggeneys 1 and other solar PV facilities within the surrounding area. Cumulative visual impacts relate to change in the character of the landscape as seen from the N14 and the un-surfaced local road (i.e. Loop 10 road) that runs to the north of Aggeneys 1, cumulative impact on local homesteads, settlements, and glint and glare. 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 impacts relate to risk of HIV, transformation of sense of place and disruptions of community facilities and infrastructure. There will be no unacceptable risk or impacts to the social aspects and characteristics of the town of Aggeneys with the development of Aggeneys 1 and other solar PV facilities within the surrounding area.
- » **Traffic:** There will be no unacceptable impact on traffic associated with the development of Aggeneys 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 to low. No impacts of a high significance have been identified.

Based on the specialist cumulative assessment and findings, the development of Aggeneys 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 Aggeneys 1 cumulative impacts will be of a low to high significance. There are, however, no impacts or risks identified to be considered as unacceptable with the development of Aggeneys 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

ABO Wind Aggeneys 1 PV (Pty) Ltd, a Special Purpose Vehicle (SPV) established by ABO Wind Renewable Energies (Pty) Ltd, proposes the development of a 100MW solar PV facility, as well as associated infrastructure on a site located near the town of Aggeneys in the Northern Cape Province. The solar PV facility will be known as Aggeneys 1. A study area²⁵ has been identified for the development of Aggeneys 1 which constitutes the entire extent of the Remaining Extent of the Farm Bloemhoek 61. The study area is located approximately 11km south-east of the town of Aggeneys (measured from the centre of the study area). The study area falls within the jurisdiction of the Khâi-Ma Local Municipality and the greater Namakwa District Municipality.

A smaller and more defined project site²⁶ has been identified within the larger study area by the applicant for the development of Aggeneys 1. The project site is located within the central portion of the study area, along the northern boundary. The preferred project site is the area within the study 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 Report (BA Report). It is considered that the project site is of a sufficient extent to provide opportunity for the avoidance of major environmental sensitivities.

Aggeneys 1 will have a contracted capacity of up to 100MW. The facility will also include specific infrastructure, namely:

- » Arrays of PV panels with a contracted capacity of up to 100MW (AC).
- » Mounting structures to support the PV panels.
- » Cabling between the project components, to be laid underground where practical.
- » On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- » An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing around the project site.

The project site is accessible via an existing gravel road off the N14 national road, which traverses the north-eastern corner of the study area.

²⁵ The study area is defined as the Remaining Extent of the Farm Bloemhoek 61, which has an extent of ~12 226ha.

²⁶ The project site is the identified location within the larger study area within which the proposed solar PV facility will be sited. The project site will house the PV panels and other associated infrastructure to be constructed for Aggeneys 1. The project site is ~250ha in extent.

ABO Wind Aggeneys 1 PV (Pty) Ltd has confirmed that the project site is suitable for a solar energy 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 final BA Report includes the following information required in terms of Appendix 1: Content of the BA Report:

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 Aggeneys 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 Aggeneys 1 has been included as section 10.6. An Environmental Sensitivity and Layout map of Aggeneys 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 project site. A summary of the positive and negative impacts associated with Aggeneys 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 Aggeneys 1 have been included in section 10.7.
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 Aggeneys 1 should be authorised has been included in section 10.7.

10.2. Evaluation of Aggeneys 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 Aggeneys 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 both the development footprint and alternatives proposed for Aggeneys 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 EAP and presents a combined and informed opinion of the environmental impacts associated with the project.

No environmental fatal flaws were identified in the detailed 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 Aggeneys 1 identified and assessed through the BA process include:

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

10.2.1 Impacts on Ecology

The Ecological Impact Assessment assessed the impact of Aggeneys 1 on the sensitive ecological features present within the project site for the life-cycle of the project. The assessment identified impacts within 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 prior to the implementation of mitigation.

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 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 Aggeneys 1 and its associated infrastructure within the. 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 project site 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.

The nominated preferred on-site substation location alternative from an ecological perspective is Alternative 1.

10.2.2 Impacts on Avifauna

The Avifauna Impact Assessment (**Appendix E**) is based on the findings of two site visits undertaken in mid-winter (26 to 28 June 2018) and again in late summer (20 to 22 March 2019). The avifauna impacts identified

to be associated with Aggeneys 1 will be negative and local in extent. The duration of the impacts will be long-term, for the lifetime of the PV facility.

During the construction phase (and decommissioning phase) of Aggeneys 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 Aggeneys 1.

Impacts on avifauna during the operation phase of Aggeneys 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 a high 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 project site for Aggeneys 1 is considered to represent a broadly suitable environment for the location of a solar PV facility. Considering that the study area supports a typical bioregional avifaunal assemblage within an extensive vegetation type, and that there are no known breeding or roosting sites of red-listed priority species within close proximity (<3 km), there are no impacts associated with the development that are considered to be of high residual significance and which cannot be mitigated to a low acceptable level. Therefore the development of Aggeneys 1 is considered to be acceptable from an avifaunal perspective.

From the results of the avifauna impacts assessment, it can be concluded that no fatal-flaws will be associated with the development of Aggeneys 1.

The nominated preferred on-site substation location alternative from an avifauna perspective is Alternative 1.

10.2.3 Impacts on Freshwater Features

The assessment of freshwater features assessed the impact of Aggeneys 1 on the freshwater features present within the project site for the life-cycle of the project.

During the construction phase, impacts include vegetation clearance in watercourses, impacts to water quality in the watercourses and impacts associated with the movement of vehicles through watercourses. 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 mitigation.

During the operation phase, the impact relates to the movement of vehicles through watercourses located within the development footprint. The significance of the impact will be low following the implementation of the mitigation measures by the recommended specialist. No impacts of a high significance were identified for the project.

From the findings it can be concluded that the development of Aggeneys 1 will have an overall negative impact of low significance with the implementation of the recommended mitigation measures. The construction of the solar PV facility and the associated infrastructure is therefore supported from a freshwater

features perspective and considered acceptable subject to obtaining of the necessary water use license from the Department of Water and Sanitation.

The nominated preferred on-site substation location alternative from a freshwater perspective is Alternative 1.

10.2.4 Impacts on Soil and Agricultural Potential

Two impacts have been identified to be associated with the development of Aggeneys 1 from a soils perspective. These impacts include the loss of potentially productive agricultural land through the undertaking of construction activities and panel installation; and increased wind erosion due to disturbance of the soil. Both impacts are expected to occur during the construction and operation phases. No fatal flaws have been identified from a soils and agricultural potential perspective and all impacts can be mitigated to be within low and acceptable levels of impact. Therefore, the development of Aggeneys 1 is considered to be acceptable from a soils and agricultural perspective.

The nominated preferred on-site substation location alternative from a soils and agricultural potential perspective is Alternative 1.

10.2.5 Impacts on Heritage Resources

The heritage impacts expected during the construction phase include impacts to palaeontological resources, archaeological resources and graves and impacts to the cultural landscape. There are no heritage resources present within the development footprint, although several isolated stone artefacts attributable to background scatter were noted. Impacts to heritage resources were identified to be associated with Aggeneys 1 for the construction phase. No impacts are expected to occur during the operation phase of the solar PV facility.

The significance of the impacts ranges from medium to low, with the implementation of the recommended mitigation measures. No impacts of high significance are expected, and the development of Aggeneys 1 is considered to be acceptable from a heritage perspective.

The nominated preferred on-site substation location alternative from a heritage perspective is Alternative 1.

10.2.6 Visual Impacts

The Visual Impact Assessment identified negative impacts on visual receptors during the construction and the operation phase of Aggeneys 1. The impacts includes a change in the character of a relatively natural area, a change in the character of the landscape as seen from the N14, the Loop 10 road and local homesteads, a change in the landscape as seen from local settlement areas, glare impacts which could affect travellers on the Loop 10 road 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 on observers. The significance of the impacts ranges between medium and low, with the implementation of the recommended mitigation measures. No impacts of a high significance are expected to occur.

The Visual Impact Assessment concluded that the development of Aggeneys 1 will largely impact visually on an area where there currently is strong influence of urban and urban fringe development and therefore changes to the landscape quality are unlikely to be problematic. In conclusion, the development of Aggeneys 1 is considered to be acceptable from a landscape and visual impact perspective.

The nominated preferred on-site substation location alternative from a visual perspective is Alternative 1.

10.2.7 Social Impacts

The Social Impact Assessment identified that most social impacts associated with the development of Aggeneys 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 nuisance, dust and noise impacts, an increase in crime, an increased risk of HIV and AIDS, an influx of construction workers and job seekers to the area, exposure to hazards, disruption of daily living patterns and disruption of services supplied and impacts on infrastructure. The significance of the negative construction phase impacts ranges between low, medium and medium to high, with the implementation of recommended mitigation measures. The positive social impacts associated with the construction of Aggeneys 1 includes positive economic impacts and the stimulation of the area's economy. The significance of the positive impacts will be medium with the implementation of the recommended enhancement measures.

Impacts associated with the operation of the solar PV facility will be both positive and negative. The negative impacts are related to a transformation in the sense of place which has a significance of medium to high, with the implementation of the recommended mitigation measures. The positive impacts associated with the operation of Aggeneys 1 relates to positive economic impacts, including the creation of jobs, business opportunities and a source of revenue for local authorities. The significance of the positive impacts will be medium to high with the implementation of the recommended enhancement measures.

The nominated preferred on-site substation location alternative from a social perspective is Alternative 1.

10.2.8 Impacts on Traffic

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, and the development of Aggeneys 1 is therefore considered to be acceptable from a traffic perspective.

The nominated preferred on-site substation location alternative from a traffic perspective is Alternative 1.

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.

The Aggeneys 1 solar PV facility is located within the Springbok Renewable Energy Development Zone (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 developments and it is expected that several solar PV facilities will be developed within these focus areas.

Considering all aspects, cumulative impacts associated with Aggeneys 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 Aggeneys 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 features	Medium	Medium
Soil and agricultural potential	Low	Low
Heritage (archaeology and palaeontology)	Medium (without mitigation)	Medium (with mitigation)
Visual	Low	Medium to low (depending on the impact being considered)
Social	Negative social impacts – low, medium to high or high (depending on the impact being considered)	Negative social impacts – medium or high (depending on the impact being considered)
	Positive social impacts - medium	Positive social impacts - high
Traffic	Medium to low (without mitigation) (depending on the impact being considered)	Medium to low (with mitigation) (depending on the impact being considered)

Based on the specialist cumulative assessment and findings regarding the development of Aggeneys 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 there are no impacts or risks identified to be considered as unacceptable with the development of Aggeneys 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 Aggeneys 1, the following sensitive areas/environmental features have been identified and demarcated within the project site (refer to **Figures 10.1** and **Appendix M**). These features have been considered by the developer for the development of Aggeneys 1.

- » **Ecology** – The entire Aggeneys project site is located within a plains habitat considered to be of a low ecological sensitivity. Within the north-western corner of the project site washes have been identified and are of a medium ecological sensitivity. Sensitive ecological areas only occur outside of the project site which includes gravel plains located to the north west.
- » **Bird habitat and Sensitive Areas** – The entire Aggeneys project site is located within a plains habitat considered to be of low sensitivity to avifauna. Within the north-western corner of the project site washes have been identified and are of a medium avifauna sensitivity. Other sensitive avifaunal areas outside of the project site include gravel plains, located to the north west.
- » **Freshwater features:** Six ephemeral watercourse reaches were identified within the project site and classified as Lower Foothill Rivers in terms of the national classification system. The ephemeral watercourses emanated from culverts under the Loop 10 road north of the project site boundary, which allows water run-off from the inselbergs north of the study area to drain through onto the project site. It is acceptable for PV panels to span over the ephemeral watercourses given their nature and extent and limited vegetation cover. However, the mounting structures of the PV panels must not be placed directly inside the watercourses. Internal roads and underground cables are also permissible through the watercourses provided that the necessary water use license or general authorisation is obtained from the Department of Water and Sanitation. No other buildings or infrastructure are allowed in the watercourses and the associated 15m buffer zone.
- » **Heritage features:** No heritage resources were identified within the development footprint, although several isolated stone artefacts attributable to background scatter were noted. The only no-go area identified is located outside of the project site and will not be impacted by Aggeneys 1.

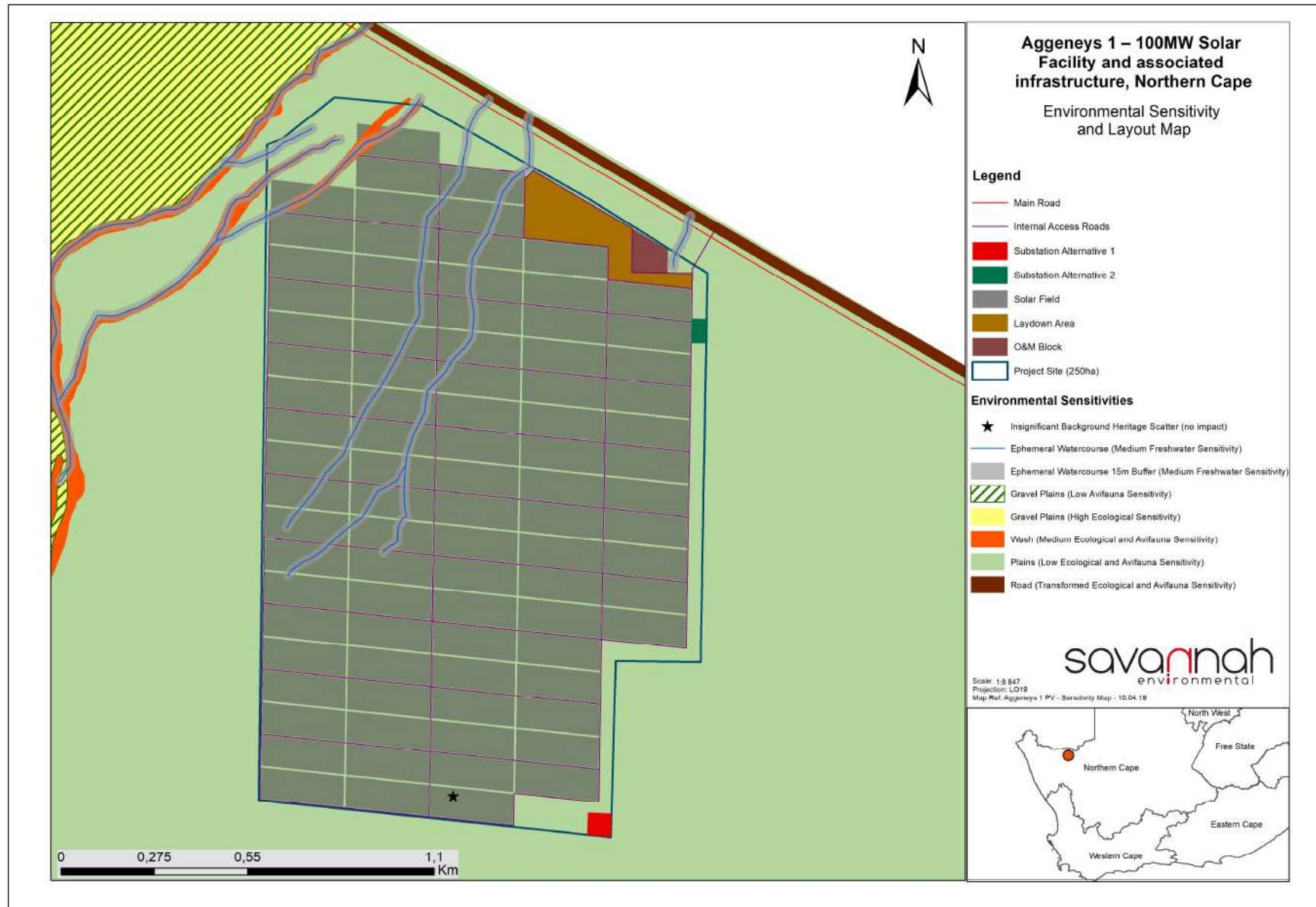


Figure 10.1: Environmental sensitivity map overlain with the development footprint considered for the development of Aggeneys 1

10.4. Assessment of Alternatives and the Identification of the Preferred Alternatives

As part of the BA process undertaken for Aggeneys 1, feasible layout alternatives have been identified and assessed on the same level for the development (refer to Chapter 3 for more details). The assessment of the alternative locations of the facility substation and the acceptability of the alternatives for implementation as part of Aggeneys 1 was considered by the specialists and was assessed comparatively as part of the impact assessment chapter (Chapter 8) of this BA Report. The layout alternatives assessed for Aggeneys 1 includes an assessment of two on-site substation locations as part of the development footprint for the solar PV facility, as described below.

» Alternative 1 (preferred from a technical perspective):

Substation Alternative 1, which is the technically preferred alternative, is the location of the on-site substation in the south-eastern corner of the project site. This location of the on-site substation Alternative 1 is the technically preferable option as it would result in a shorter distance between Aggeneys 1 and the Aggeneis MTS, as well as the consolidation of linear infrastructure associated with the power line²⁷ considering the location of the power line in relation to existing Eskom power line infrastructure within the area.

» Alternative 2:

On-site substation Alternative 2 is to be located within the northern portion of the project site and along the eastern boundary of the development footprint, to the east of the solar field.

The alternatives indicated as preferred in the description above are the alternatives that have been identified by the developer as being technically preferred. **Table 10.2** provides the results of the comparative assessment undertaken for the on-site substation location alternatives from an environmental perspective and identifies the preferred on-site substation location alternative for Aggeneys 1 and the environmental acceptability thereof.

Table 10.2: Results of the comparative assessment undertaken for the layout alternatives proposed for Aggeneys 1 and the identification of the preferred alternative from an environmental perspective²⁸

Specialist Field	Preferred on-site substation location alternative from an environmental perspective
Ecology	Alternative 1 (no preference from an ecological perspective, the technically preferred alternative is therefore nominated as preferred)
Avifauna	Alternative 1 (no preference from an avifaunal perspective, the technically preferred alternative is therefore nominated as preferred)
Freshwater features	Alternative 1 (no preference from a freshwater features perspective, the technically preferred alternative is therefore nominated as preferred)

²⁷ To be assessed as part of a separate Basic Assessment Process.

²⁸ In instances where all alternatives are acceptable, the technically preferred has been assigned as the preferred alternative from an environmental perspective.

Specialist Field	Preferred on-site substation location alternative from an environmental perspective
Soil and agricultural potential	Alternative 1 (no preference from a soils and agricultural potential perspective, the technically preferred alternative is therefore nominated as preferred)
Heritage (archaeology and palaeontology)	Alternative 1 (no preference from a heritage perspective, the technically preferred alternative is therefore nominated as preferred)
Visual	Alternative 1 (preferred due to the opportunity to reduce the impacts on road users to a lower and acceptable significance)
Social	Alternative 1 (preferred due to the opportunity to reduce the impacts on road users to a lower and acceptable significance)
Traffic	Alternative 1 (no preference from a traffic perspective, the technically preferred alternative is therefore nominated as preferred)

Considering the results of the comparative assessment, it can be concluded that both on-site substation locations are environmentally acceptable, and that Alternative 1 (as the technically preferred alternative) is therefore recommended.

It must be noted that the on-site substation location, as assessed within this BA Report, is linked to the grid connection solution for the solar PV facility, which is being assessed as part of a separate Basic Assessment process. Ultimately, the location of the on-site substation being assessed as part of this application for Environmental Authorisation will depend on the final grid connection solution identified for the project through the assessment of feasible alternatives, and as part of a separate Basic Assessment process.

Considering the above, both on-site substation location alternatives are considered to be acceptable from an environmental and social perspective and therefore both alternatives are considered to be acceptable as part of the development of Aggeneys 1.

10.5. 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.
- » *An increase in traffic* - The construction, operation and decommissioning of Aggeneys 1 will create an increase in traffic, however this increase will be minimal and of a low significance.
- » *Visual impacts associated with the PV Facility* - The development of Aggeneys 1 may have a visual impact within a 6.7km radius of the solar PV facility, which will be of a medium-low significance with the implementation of the recommended mitigation measures.
- » *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 high agricultural potential.

Benefits of Aggeneys 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 preconstruction, 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.
- » 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. Aggeneys 1 will contribute to achieving goals for implementation of renewable energy and sustaining a 'green' economy within South Africa.

The benefits of Aggeneys 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 the project site within areas considered to be acceptable for the proposed development, the benefits of the project are expected to outweigh the environmental costs of the solar PV facility.

10.6. Overall Conclusion (Impact Statement)

The construction and operation of a solar PV facility with a contracted capacity of up to 100MW on a study area located near Aggeneys in the Khâi-Ma Local Municipality, of the greater Namakwa District Municipality has been proposed by ABO Wind Aggeneys 1 PV (Pty) Ltd. A technically viable project site and development footprint was proposed by the developer and assessed as part of the BA process. The assessment of the development footprint (through the consideration of layout alternatives) within the project site 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 Aggeneys 1 within the project site. The developer has proposed a technically viable and suitable layout alternative for the development footprint, which has been assessed as part of the independent specialist studies. Through this assessment the preferred on-site substation alternative has been identified, and assigned as part of the preferred layout map for the Aggeneys 1 project. The facility layout assessed through this BA process is considered as the most appropriate development footprint for the Aggeneys 1 solar PV facility and 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**. The preferred layout overlain with the environmental sensitivities is included as **Figure 10.3**.

Through the assessment of the development of Aggeneys 1 within the study area and project site it can be concluded that the development of the solar PV facility is environmentally acceptable (subject to the implementation of the recommended mitigation measures).

10.7. Overall Recommendation

Considering the findings of the independent specialist studies, the impacts identified, the development footprint proposed by the developer, the avoidance of the sensitive environmental features within the project site, 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 Aggeneys 1 is acceptable within the landscape and can reasonably be authorised for the identified preferred alternatives (**Figure 10.2**).

The following infrastructure would be included within an authorisation issued for the project:

- » Arrays of PV panels with a contracted capacity of up to 100MW.
- » Mounting structures to support the PV panels.
- » Cabling between the project components, to be laid underground where practical.
- » On-site inverters to convert the power from a direct current (DC) to an alternating current (AC).
- » An on-site substation to facilitate the connection between the solar PV facility and the Eskom electricity grid.
- » Site offices and maintenance buildings, including workshop areas for maintenance and storage.
- » Temporary laydown areas.
- » Internal access roads and fencing around the project site.

The following key conditions would be required to be included within an authorisation issued Aggeneys 1:

- » On-site substation location Alternative 1 must be authorised for the Aggeneys 1 solar PV facility.
- » All mitigation measures detailed within this final 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 Aggeneys 1 is considered key in achieving the appropriate environmental management standards as detailed for this project.
- » The environmental authorisation sought through this application and BA process is for a 10-year period as this project will need to be selected as a Preferred Bidder by the Department of Energy (DoE).
- » Following the final design of Aggeneys 1, a final layout must be submitted to DEA for review and approval prior to commencing with construction.
- » 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.
- » Before construction commences individuals of listed species within the development footprint that would be affected, must be counted and marked and translocated, where deemed necessary by the ecologist conducting the pre-construction walk-through survey. Permits from the relevant provincial authorities, i.e. the Northern Cape Department of Environment and Nature Conservation (DENC), must be obtained before the individuals are disturbed.
- » All conditions recommended by the Department of Environmental Affairs Directorate: Biodiversity and Conservation on 29 May 2019 should be adhered to.

- » The necessary water use license or general authorisation must be obtained from the Department of Water and Sanitation (DWS) for impacts to a watercourse prior to construction.
- » The project footprint must be kept as small as possible.
- » 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.

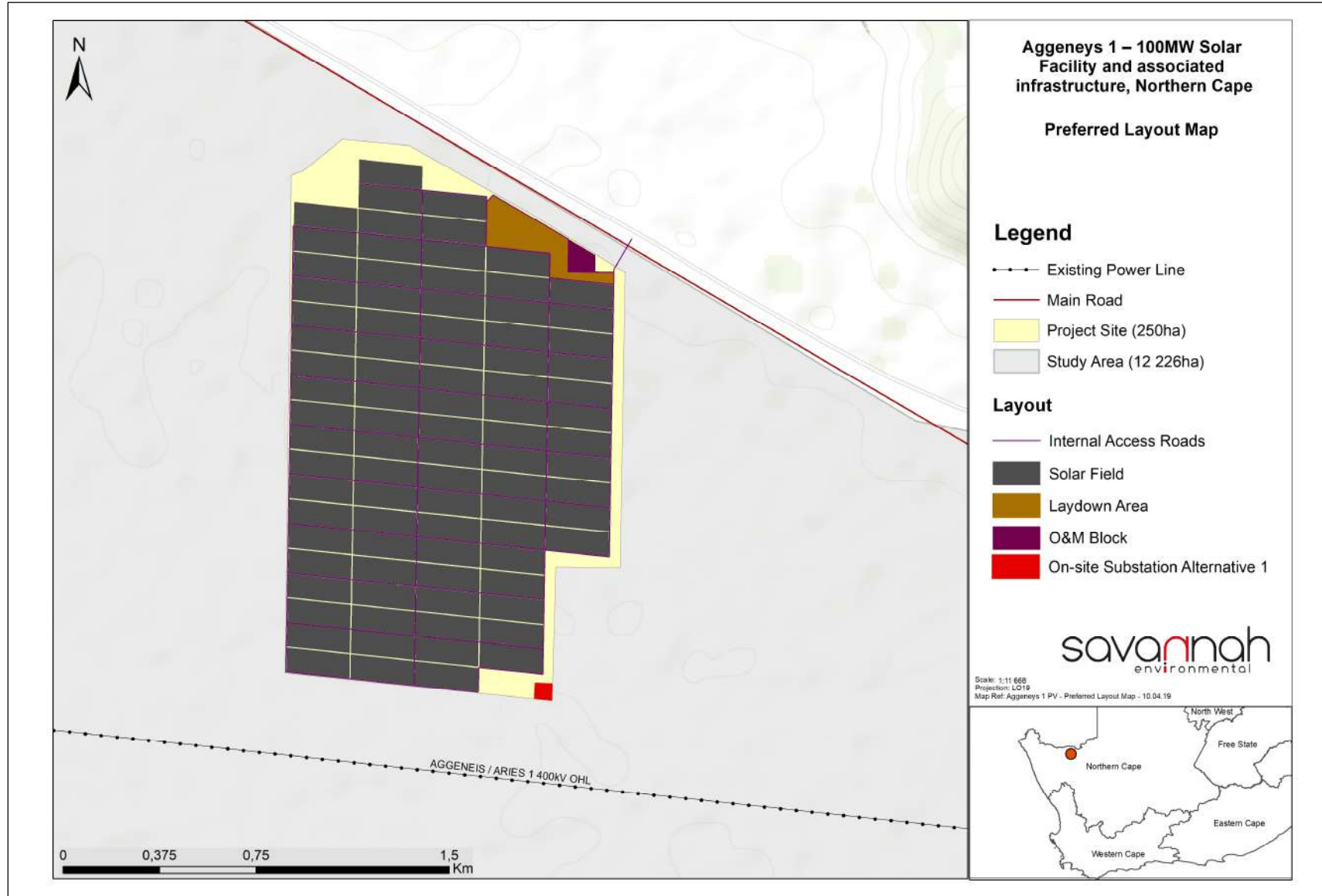


Figure 10.2: Final preferred layout map of the preferred development footprint for Aggeneys 1, as was assessed as part of the BA process (A3 map included in Appendix M)

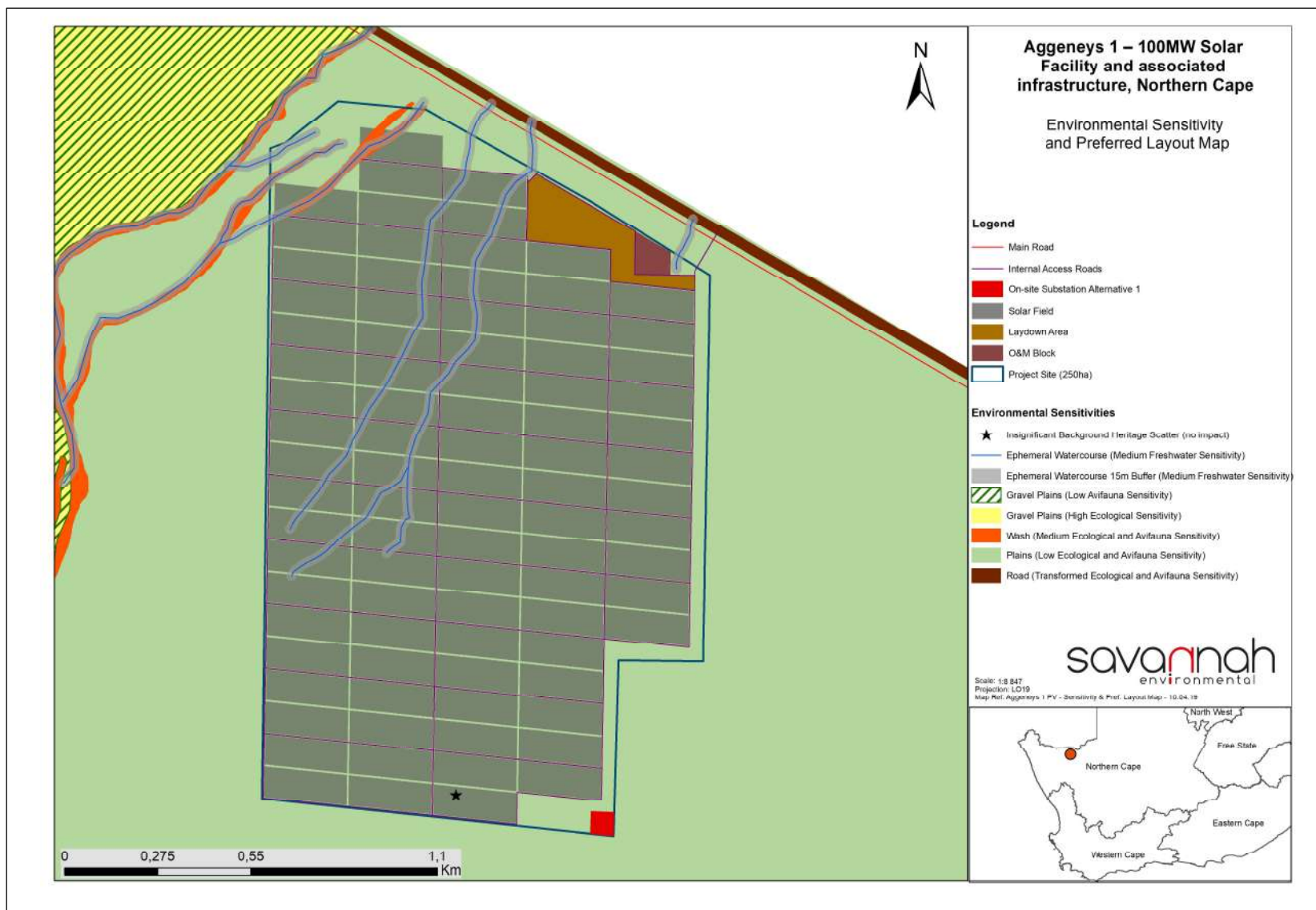


Figure 10.3: Final preferred layout map of the preferred development footprint for Aggeneys 1, as was assessed as part of the BA process, overlain with the environmental sensitivities (A3 map included in Appendix M)

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